Data-Driven Approaches Helping Public Sector with Sustainable Water Management

A recent UNICEF research revealed that half of the world's population could be living in areas facing water scarcity by as early as 2025. Some 700 million people could be displaced by intense water scarcity by 2030.

As grim as these facts sound, the water industry indeed faces several pressing challenges in the form of a severe imbalance between a growing population's demands and an almost consistent supply, aging infrastructure, in-optimal performance, contamination, and increasing regulatory laws aimed at reducing the discharge of effluents from water treatment operations. Moreover, the most significant obstacle to water management has been the asset-intensive nature of the industry, with pipelines, pumps, and wells spread over acres of land, well beyond the control and management of a few plant operators. So when something goes wrong, for example, a leak, breakage, overflow, or contamination occurs, severe consequences (expensive asset damage or critical health issues) ensue before it is actually corrected or rectified.

Zypryme, an Austin-based research agency, surveyed over 100 water utility professionals and found that aging infrastructure, capital costs, and leaks/breaks are among the top three issues facing utilities.

Consequently, it is vital to look for solutions that enhance reliability, maintenance, and productivity in water utilities and ensure clean and fresh water is available widely for the consumption of one and all. Additionally, it is

In today's highly digitized world, defining a sustainable strategy for smart water management that uses powerful technologies — right from the Industrial Internet of Things (IIoT) to machine learning to artificial intelligence, Big Data, and predictive analytics is essential to redefine and modernize traditional water ecosystems.

Industrial IIoT, in particular, in the form of sensors, flow meters, and edge devices, are being used to collect on-field data to create situational awareness and identify leaks, sewer overflows, and faulty equipment before these require costly repairs. Research shows that water utilities expect to realize operational efficiency, decision-making rooted in analytics, and increased security as the top three benefits realized from using IIoT applications.

This blog will give you further insights into data-driven approaches for sustainable water management and how modern technologies like **IoT, AI, and predictive analytics** can be easily integrated to address specific issues and areas of concern in water utility operations.

What is Smart Water Management?

Smart Water Management (SWM) integrates complex systems and advanced technologies to monitor and control the usage and quality of water and maintain associated water assets (like pumps, pipes, etc.)

Anything from sensors to meters to actuators and data processing and visualization tools, a wide variety of hardware and software optimize production, consumption, and distribution of water, increase reusage, protect water assets, and enable smart and sustainable water management.

How are sustainable technological solutions enabling Smart Water Management (SWM)?

AI, machine learning, Data, predictive analytics, IoT are helping water utilities make smarter use of water assets to control water quality, optimize production and consumption, and intelligently monitor assets to enhance reliability and maintenance and optimize costs.

IoT sensors, meters, and other real-time monitoring systems **increase the visibility and transparency of processes** in the water supply and water treatment ecosystems. Together with AI, machine learning, and big data analytics, different stakeholders can **study performance insights on various resources, predict issues, and initiate rapid responses** before the problem escalates and becomes costly to remediate.

Smart water management not only **reduces operational costs in the long run** but also **optimizes the use of human power and machinery** and **helps achieve sustainability goals**, including reduced carbon footprint and pollution and preservation of water resources.

Sensors have a broad range of use cases in water utility and water treatment plants and wastewater treatment centers. They can keep a check on water flow, temperature, flow, water contamination, leakages (with leak and moisture sensors), and sewer overflows. Data generated from the field can be used for **predictive analytics** and analyzed to enable **real-time monitoring, quality control, and proactive maintenance**. Furthermore, they can also measure the following:

- Raw catchment water quality
- Chemical composition of water
- Storage reservoir quantity
- Distribution pipeline pressure
- Equipment and machinery wear and tear

Fully automated distribution and precision algorithms that use AI, machine learning, and advanced analytics to control and regulate water distribution. For example, environmental sensors like soil moisture and crop condition sensors enable smart irrigation by monitoring current water intake. **AI algorithms, Big Data, and predictive analytics** then calculate ideal irrigation based on water requirements and weather forecasts to determine the amount of water needed.

Supervisory Control and Data Acquisition (SCADA) systems play a key role in water treatment plants. They are used to collect data from water quality sensors, before and after treatment, and water treatment equipment, to improve water quality and detect and repair equipment failures before they lead to wastage of precious water resources.

- Flow meters identify chemical imbalances, overflows, and leaks and send data to plant operators in real-time for instantaneous action.
- The SCADA system allows plant operators to connect cameras throughout the facility, which can be accessed remotely through mobiles and tablets, to ensure assets are secure and repairs are done efficiently.
- SCADA can be used to automate some of the most basic and repetitive tasks at treatment plants. For example, a SCADA system may automatically identify leaks and overflows and collect this data to conduct repairs when required.
- A SCADA system collects volume and pressure readings from the entire water distribution network and displays this information all at once, thus reducing the cost and effort of maintaining water resources.

How Acuvate helped a large government organization that manages a city's water supply to streamline data collection, storage, and distribution for real-time insight generation

Our client is a large government organization that provides more than 1.1 billion US gallons of water each day to more than 9 million residents. The client has a complex network of nineteen reservoirs, three controlled lakes, and 8,000 miles of water mains, tunnels, and aqueducts and also manages the combined sewage system that carries stormwater runoff and sanitary waste. They maintain a network of IoT sensors across its water management assets to measure water temperature, Ph and chlorine levels, and turbidity — in real-time.

Challenges they faced:

- Water Data Scientist were unable to access critical water quality data real time as the data was residing in Legacy Water Systems ERPs/ Scada systems / IOT Sensors
- Operations teams were unable to detect water quality issues proactively because of the time it requires to collate data from multiple data sources.
- Customer Service desk were getting overwhelmed with water quality complaints since the data has not yet reached the operations team.
- 70+ Siloed Systems & 90 disparate database were creating data integrity problems due to duplication / stale data.
- No data governance

The Solution: A data-driven sustainable solution to help water departments monitor and control water quality parameters.

Features:

- Data pipelines that can ingest from Legacy water quality ERP systems & Scada systems & IOT Sensors
- Realtime Dashboard & report templates available for water quality monitoring.
- Reusable Common Data model for capturing Water quality data coming from ERP / Scada / IOT sensors.
- Data Governance Solution with Data Cataloguing, Data Lineage for entire Water Supply IT Landscape.
- AI based Predictive Maintenance using Anomaly detection and Forecasting techniques
- Solution scalable to 100 Petabytes of data.
- Data queried using Natural Language through chatbot hosted on Microsoft Teams
- Data Governance with Data Cataloguing, Data Lineage for entire IT Landscape.

Benefits:

This solution helped the water department by

- Reducting data discovery time for Water scientists by 95%.
- Reducing Data quality issues 70%
- Saving 1500-person day/year by reducing ticket volume.

How can Acuvate help?

At Acuvate, we offer a state-of-the-art solution that helps water departments monitor and control water quality parameters, leveraging new-age tech such as AI and predictive analytics. The solution unifies data from siloed systems, provides real-time and proactive insights, anticipates issues, initiates proactive corrective measures, helps fix issues faster, and reduces the number of customer complaints so that agencies can provide clean and safe drinking water to citizens.

Our ready-to-use solution can be deployed without any modifications to the existing IT landscape, and within 3-4 months leveraging reusable components.

With our proven experience we have done successful rollouts of our award-winning SLG solutions for large SLG agencies.

To know more, please feel free to schedule a personalized consultation with our experts.