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EXPLAINER

What Is Smart Water Management?

Water utilities can create a digital model of their water distribution network and install sensors to monitor their operation and collect real-time data. Photo credit: ADB.

Digital technology can improve data collection and analytics to support proactive decisions and increase the efficiency of water utilities.

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Introduction

Smart water management systems can provide a more resilient and efficient water supply system, reducing costs and improving sustainability. High-technology solutions for the water sector include digital meters and sensors, supervisory control and data acquisition (SCADA) systems, and geographic information systems (GIS).

This explainer is adapted from proceedings of a workshop conducted by the Asian Development Bank (ADB) in Tashkent, Uzbekistan for the water sector. The workshop introduced smart systems and focused on remote monitoring of water networks using smart meters and other instruments.

Why Smart Technology?

Smart technology can change conventional water and wastewater systems into instrumented, interconnected, and intelligent systems.

- Instrumented: the ability to detect, sense, measure, and record data.
- Interconnected: the ability to communicate and interact with system operators and managers.
- Intelligent: the ability to analyze the situation, enable quick responses, and optimize troubleshooting solutions.
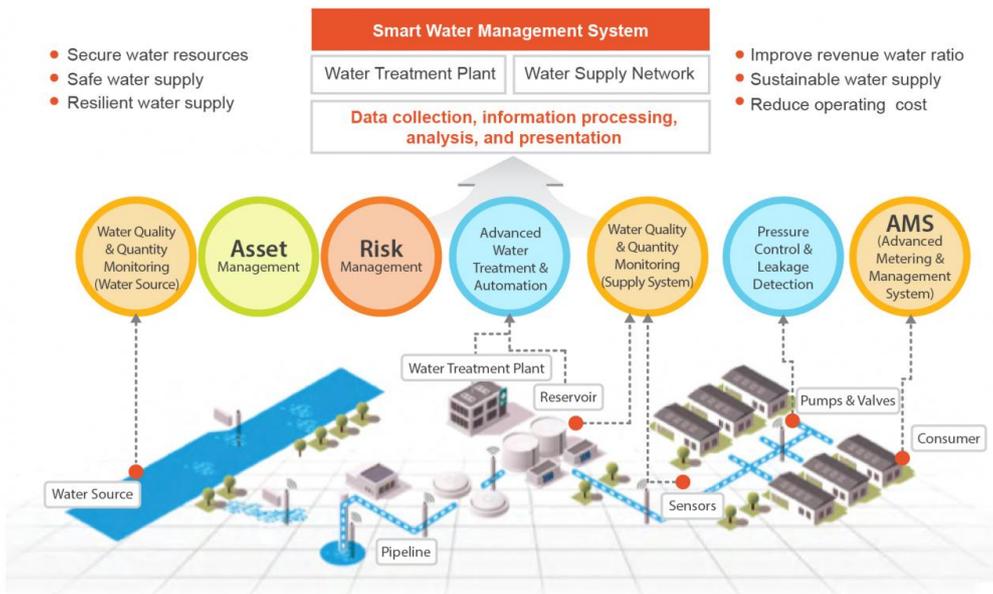
Source: You Kwangtae, CEO, UnU Civil & Environmental Engineering, Republic of Korea

Smart Applications in the Water Sector

Generally, technology for smart water management have four components with a wide range of applications (Table 1).

Table 1: Technology for Smart Water Management

Components	Purpose	Example Applications

1. Digital output instruments (meters and sensors)	To collect and transmit information in real time.	- Rain gauges, flow meters, water quality monitoring and other environmental data - Acoustic devices for real-time leakage detection - Video camera for asset management - Smart water meters for measuring consumption - Pressure monitoring for leakage detection and pump optimization
2. Supervisory control and data acquisition (SCADA) systems	To process information and remotely operate and optimize systems and processes.	- Pressure management - Pump station optimization - Water treatment plant control - Sewage treatment plant control - Environmental controls, reservoirs, flows, etc.
3. Geographic information system (GIS)	To store, manage, manipulate, and analyze spatial information.	- Asset mapping and asset management - Fully integrated network models - Environmental data analysis and management
4. Software	To store, use, and report data. For modeling infrastructure and environmental systems to improve design, decision making, and risk management.	- Usually integrated with GIS and/or SCADA systems to manage water networks, control pressure, monitor leakage, etc. - Improved decision making and risk management - Customer data bases - Smart metering, billing and collections - Hydraulic design and optimization - Water resources and hydrological modelling for water security - Cloud-based data management and hosting options

Smart systems can provide accurate and up-to-date information that enable informed and systematic, rather than ad hoc, decision-making by water managers. These can automate tasks and reduce staffing requirements. For example, by employing smart technology, the Seoul Metropolitan Government in the Republic of Korea needs only 80 people to manage the city's water supply systems.

Countries that have tested smart water technology, such as the Republic of Korea, provide a model for the development of smart systems in the water sector, which includes turnkey solutions in equipment installation, training in technology/software use, and maintenance. A workshop in Seoul shared Korean expertise in smart technology and innovative policies for waste and wastewater management.

Another way to get access to technology as well as funding for smart systems is to partner with the private sector. The workshop in Tashkent also discussed promoting public-private partnerships in the water sector.

Smart technologies in the marketplace are not limited to water supply management. These may be applied across a number of sectors and used for integrated urban planning. When implementing smart systems, utilities and cities should consider integrating data collection and data use across sectors, such as water and wastewater management, transport, buildings, energy (e.g. district heating and cooling), public space and security, communications, and environmental management. Where possible, smart city implementation should tap into existing public or private networks, which include local area networks, cellular 4G/LTE networks, fiber/copper networks, and low-power wide area networks.

Where to Start

The most important place to start is to meter flows in discrete areas (district metered areas) to understand production, distribution, sales, etc. By building accurate water balances of each area, losses can be calculated and problem areas targeted for rehabilitation or leakage reduction initiatives.

A next step would be to improve asset management. Building a digital spatial database of assets in GIS is important for developing strategic plans for network upgrades and rehabilitation.

If assets and networks can be monitored remotely in real time (flow, pressure, etc.) through smart systems, leakage detection, for example, can be undertaken in real time. Water network simulations can also allow real-time decision making to optimize performance.

The first stage described above is not "smart" in that it does not require innovative technology but uses only water meters. However, it is a smart investment that can greatly improve efficiency, and it is a precursor to other smart investments.

Resources

Asian Development Bank. 2018. Public-Private Partnerships and Smart Technologies for Water Sector Development. Manila.

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