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WHITE PAPER / **SMART INFRASTRUCTURE**

REAL-TIME WATER DATA: THE KEY TO AMERICA'S SMART CITIES

BY Eric Sokol, ENV SP

Real-time data monitoring is already revolutionizing drinking water, stormwater and wastewater systems. Now, cities are beginning to expand applications for the approach. In the Great Lakes region, city leaders are implementing a network of sensors that is transforming Lake Erie into a "smart lake" fit for a smart city.

Real-time data tracking capabilities are becoming more important to America's aging infrastructure, which is overstressed by years of use, population increases and the impacts of climate change. The capability to isolate weak spots and minimize leaks in wastewater and stormwater systems slashes time and costs for repairs and replacements. This allows utilities with limited budgets and workforce to efficiently invest using ratepayer dollars.

SMART INFRASTRUCTURE AT THE SOURCE

The next step in smart infrastructure is to apply these technologies and techniques to water at its source, gathering data about quality, loss and usage that helps communities care for their precious resources — whether they are surface water sources such as lakes and rivers or groundwater sources such as aquifers and springs.

Incorporating smart technologies at a watershed and source water level offers significant benefits:

- The ability to generate a large amount of data quickly — gathering in one day what previously might have taken a year.
- Real-time information that can be paired with historical data to increase predictive capabilities.
- Instant alerts to system changes, reducing the need for cost-prohibitive manual collection.
- The capability to shift to a proactive approach to water quality management, anticipating and combating negative trends before they develop into full-blown issues.
- Greater accuracy and efficiency in water quality measurement processes.
- Ease of use, with data accessible in one place through internet-enabled devices.
- Connection between gray and green infrastructure within the built environment.

Many of these measurement tools — from remote sensing and SCADA tools to mesh sensor networks — rely on "internet of things"-based technologies. It's a cost-effective solution, minimizing the need for expensive, traditional fixed-network infrastructure. By connecting smart sensors with smart devices, the internet of things allows real-time information about consumption, quality and loss to be gathered from not just faucets and pipelines, but also from the water source itself. This true smart city approach allows for more efficient and sustainable use and reuse of water resources.

CREATING A 'SMART LAKE'

The five interconnected freshwater bodies known as the Great Lakes are an essential global resource, accounting for one-fifth of the world's fresh water supply and providing drinking water for 40 million people. The Great Lakes account for more than half of border trade between the United States and Canada. According to *Business Insider*, if the region were its own country, its GDP would qualify it as the world's third-biggest economy. Utilities tasked with managing large systems with a smaller population are looking for innovative solutions to implement smart technologies across their infrastructure.

Protecting the health of the Great Lakes watershed is essential to the health and economic well-being of the region. In recent years, harmful algae blooms — the result of phosphorus-rich fertilizer runoff from farm fields — has become one of Lake Erie's greatest threats. The Cleveland Water Alliance, a network of corporations, universities, research institutions and government agencies, is facing the looming crisis with tech-driven innovation, using smart infrastructure to transform Lake Erie into the first "smart lake" in the Great Lakes region.

The lake is dotted with smart buoys equipped with sensors and webcams that transmit real-time water quality data, scientific data and snapshots back to shore. These sensors focus on identifying and tracking issues like harmful algal blooms, hypoxia (by measuring

blue/green algae), turbidity, pH levels, conductivity and cyanobacteria. Plans include additional monitoring tools such as smart drain tools and nanosensors that detect and track phosphorous and nitrogen levels. Eventually, the system will provide precise information to better monitor soil health. This information will lead to real-time action that could save the agriculture community money, and the data can help guide soil management practices to reduce runoff. The information could contribute to a reduction in their out-of-pocket costs for fertilization chemicals.

INCREASING THE RETURN ON INFRASTRUCTURE INVESTMENT

According to the American Water Works Association, $1 trillion will be necessary to bring the nation's infrastructure up to grade. Incorporating a smart city approach delivers the best return on the investment, from smart sewers to smart electricity grids. Coordinating with other departments can help incorporate smart technology as part of other essential work. If roadway improvements already require digging up the ground, use that opportunity to replace some water mains with ones that have smart sensor capabilities.

Projects of all sizes can benefit from a smart city approach. Seek out guidance from experienced consultants for a road map to your project approach. Federal funding is available via the America's Water Infrastructure Act to support the implementation of smart technology and the development of green infrastructure. Consider pairing larger, longer-term water infrastructure projects with green stormwater techniques that help address issues at the surface level.

The use of smart water technologies in new applications — such as the smart lake in the Great Lakes region — continues to prove the effectiveness of the approach. Exploring innovative uses for smart water infrastructure can revolutionize how cities and utilities design and maintain water systems.

BIOGRAPHY

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