

# Can Big Data save our water infrastructure?

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Friday, February 19, 2016 - 1:49am

Children getting lead poisoning from the water supply in Flint, Michigan, this winter served as a wake-up call to a problem that has been lurking yet well-known for years: The nation's water infrastructure is seriously aged and in need of replacement.

That's evident, too, from the water leakage and pipe bursting that happens regularly in cities all over the country. About one-sixth of the nation's clean water supply, or some 2 trillion gallons a year of treated and delivered water, leaks out of the vast underground water infrastructure before it reaches end users, according to the American Water Works Association.

In some cities, 30 to 40 percent of water sent through their systems ends up as non-revenue water that leaks somewhere along the way or that a busted meter fails to pick up.

"Most of our buried drinking water infrastructure was built 50 or more years ago, in the post-World War II era of rapid demographic change and economic growth. In some older urban areas, many water mains have been in the ground for a century or longer," the association stated in its report, [Buried No Longer: Confronting America's Water Infrastructure Challenge \(PDF\)](#).

And more than a million miles of pipes beneath our streets are "nearing the end of its useful life and approaching the age at which it needs to be replaced." Additionally, meters are malfunctioning, so water utilities are not getting revenue for a lot of the water they clean and distribute.

Regional water utilities and municipalities have been slowly replacing pipes and meters, typically when they break.

But it's a massive undertaking that the AWWA estimated costs upwards of \$1 million a mile, and that one Bay Area water utility said averages \$2.4 million per mile in replacement costs. Nationwide, it will cost a trillion dollars over the next two decades, according to the Environmental Protection Agency.

Yet because water utilities are missing out on revenue from lost water, they are often strapped to make the infrastructure investments.

Government and think tanks are scrambling to come up with an answer. "A large consistent capital flow is needed," says [Ernst & Young Global Limited in a recent white paper](#) (PDF). Yet many water utilities are burdened by bond debt, and water rates revenues are structured to cover treatment and distribution with little left over to consider capital projects.

## Big data and IoT to the rescue?

Just as data and [Internet of Things](#) (IoT) companies have swooped into the energy management marketplace with tools to help building managers, homeowners, hospitals and campuses with detailed and location-based views of their electricity use and potential for energy efficiencies, we're beginning to see IoT strategies for analyzing water infrastructure.

Jesse Berst, chairman of the Smart Cities Council, advocated IoT as a way to inventory a water utility's thousands of miles of pipes for potential leaks and malfunctioning. [Writing in WaterWorld](#), he said, some new "sensor technologies have arrived on the market to help water utilities survey their underground pipes and detect real and potential leaks."

Using smart readers, or in the least automated meter reading, lets utilities detect leaks based on discrepancies in billing statements. Comparing the water going into the water network or into a neighborhood, home or office, and comparing it with what the meter picks up can help to pinpoint a leak or broken meter. Then advanced metering infrastructure (AMI) that uses data management software of the IoT type along with deployed sensors is a step up in detection — for well off cities or larger utilities that can afford these systems.

But therein lies the rub.

Most water utilities are very small. The EPA counts 52,000 water utilities across the U.S. A small fraction— some 8 percent — serve 82 percent of the population.

"The water utility sector is massively fragmented," said Trevor Hill, the CEO of [Fathom](#), a startup in the water utility data management system. He estimates that only 300 utilities have more than 30,000 meter customers.

But a veteran of the water utility industry from years as the CEO of Global Water Resources in Arizona, he said he has come up with an answer for the myriad small water utilities across the U.S. and has begun to deploy it.

He developed a cloud-based software platform for water utilities and founded Fathom Global Water Management to provide it as a software-as-a-service to water utilities. After 25 years in the water industry, he said he had some "epiphanies" on how the fragmented industry could scale its use of technology, Hill said in an interview, shortly after his company announced a new round of financing and its selection into the CleanTech 100 of promising startups.

Most water companies are too small to invest in sophisticated data systems that would allow them to better track the condition of their pipes and perform smart metering. But Fathom puts meter-reading systems on the cloud and offers smart meter services of water management, automated billing, customer service — and leak and meter failure detection — to small utilities.

Data analytics from meters, Hill said, can allow water utilities to detect troubled pipes and meters without having to dig underground or physically inspect them. That's because "we can correlate what goes into the distribution system and where it being used (or use measured by

metering)." If the mathematics don't add up, that can indicate the presence of a leak or broken metering.

The revenue opportunity for Fathom is in the billing operation. At the moment, a majority of small utilities still rely on payments by paper, by phone or even in-person.

"The billing operations (in the average water utility) is 10 times more expensive than in the power industry or telcos because the infrastructure affordable to the average small water utility is not nearly as good," in meter-to-customer and meter-to-billing, Hill said.

He said his platform "enables a smart grid for water utilities...We can go into cities and give them smart grid services of meter-to-customer." Several California cities, including Torrance and South Pasadena, are customers. Typically, customers have uncovered 5 to 15 percent of water revenues they had not been realizing.

But having a workable product is not enough to answer the problem in the current water market, analysts say.

Various water meter data reading products have been put forth, both for utilities and for companies aiming to manage their water conservation.

Some companies are offering water management data services as an adjunct to energy management — using the same or similar software. [Aquicore](#) is primarily an energy management data analytics company but it has a water-management product as well. Both Aquicore's IoT-based energy and water data tools are offered to building owners and campuses.

[Microsoft's CityNext division](#) which has developed solutions to help make cities more resilient, and [IBM's Smarter Cities](#) have application services to help water utilities to adopt smart metering and IoT services.

But building the wherewithal and incentive for water utilities to invest in any of these IoT water management technologies is a challenge because water is priced so cheaply.

"Right now there is a lot of talk (about water management technologies) particularly with droughts going on," Navigant Research analyst Benjamin Freas. "One of the challenges is water prices.

"Water is too cheap. The price of water is prohibiting a lot of investment in the area," he said.

Berst of the Smart Cities Council nonetheless encouraged utilities to consider such solutions to the giant water leakage problem lurking under our nation's city streets and byways. He mentioned both [Microsoft's CityNext](#) services and [IBM's Smarter Cities](#).

Indeed, preventing water leaks and water waste anywhere will gain more traction if the price of water were higher.

As weather patterns fluctuate in the Western U.S. and elsewhere, the jury is still out on whether water will gain appreciation — in price and conservation.