

DEPLOYING IOT AND SMART DATA IN THE GLOBAL BATTLE FOR WATER

How enterprises can control water
usage and mitigate portfolio risk



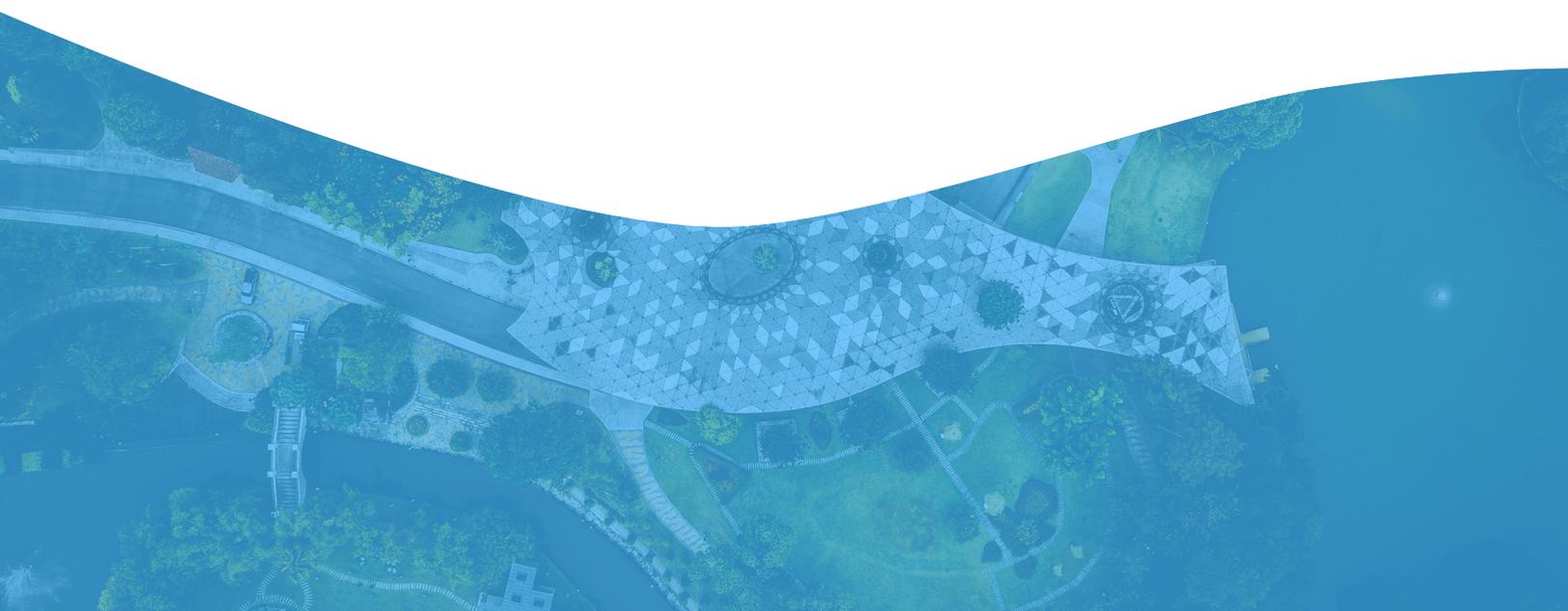
EXECUTIVE SUMMARY

Water scarcity is the great global crisis of our time.

More than 2 billion people lack access to safe drinking water.ⁱ Dozens of countries, including the U.S. and Mexico, will face extreme water shortages in the next 25 years.ⁱⁱ

There is no singular cause. Extreme undervaluation and excessive water use, exacerbated climate change, increased urban migration and rapid population growth, and aging infrastructure are all contributing factors to growing water scarcity.

Many of problems we now face can be addressed with the right technological implementations at the global and market levels. The Internet of Things and advanced data analytics afford unprecedented access and visibility into water usage and will play a pivotal role in the reduction of global water consumption.



THE IMPACT OF WATER SCARCITY

Severe water scarcity has already affected some of the most prominent cities and regions around the world, creating social and economic instability for large portions of the global population:

**\$2.2
BILLION**

The economic cost of California's drought in 2014 affecting breweries, rice supplies, fashion, semiconductor manufacturing, golf courses and other industries.

**WORST
DROUGHT IN
70 YEARS**

In 2008, Barcelona was forced to import tens of millions of gallons of water during its worst drought in 70 years.ⁱⁱⁱ A report from the Basque Center for Climate Change, a research center focused on studying the causes and effects of climate change, estimated the total economic loss as almost 1 percent of Catalonia's GDP.^{iv} The drought affected almost every facet of public life, including agriculture, industry, trade and tourism, banking, education, and health services.^v

**40 POST-
PONED
SURGERIES**

In 2012, the largest municipal hospital in New Delhi, India, was forced to postpone 40 surgeries due to lack of water. Surgeons were unable to sterilize their instruments, clean operating rooms or even wash their hands.^{vi}

**14 MEGACITIES
FACING
WATER
SCARCITY**

In 2015, Trucost—an organization owned by the S&P Dow Jones Indices dedicated to providing the data, tools and insights companies, investors and policymakers need to transition to a low-carbon, resource-efficient economy—announced that 14 of the world's 20 megacities were “experiencing water scarcity or drought conditions.”^{vii}

THE INTERRELATED CAUSES OF WATER SCARCITY

The causes of water scarcity around the world are well documented.

— UNDERVALUATION OF WATER

Despite water's undeniable contribution to the global ecosystem—not to mention every living thing's survival—it is the most acutely undervalued resource on Earth. This is truer of the United States than almost every other country. The U.S. is the second-highest consumer of water per capita, trailing only New Zealand. The average American in 2016 used 418,052 gallons of water. ^{ix}

**IN THE U.S., ONE
GALLON OF WATER
COSTS ON AVERAGE
EIGHT-HUNDREDTHS
OF A CENT.
BY COMPARISON:**

A gallon of whole milk costs **\$2.28**

A gallon of gas costs **\$2.84**

A gallon of BEHR Premium Plus black paint costs **\$32.98** at The Home Depot ^x

— POPULATION GROWTH AND URBAN MIGRATION

The U.S. Census Bureau estimated in the months before World Population Day 2018 (July 11, 2018) that the world population eclipsed 7 billion people in 2012. ^{xi} Rapid population growth—1.16 percent annually, according to 2017 data from the World Bank ^{xii}—inevitably means greater strain on food demand and production, the key ingredient in which is, of course, water. When considered within the context of a population that is expected to exceed 9.8 billion in 2050 and 11.2 billion in 2100, the potential implications become severe. ^{xiii}

People are also migrating to urban centers at greater rates, placing additional strain on aging infrastructure. A 2018 United Nations report studying the patterns and effects of urbanization found that 55 percent of the global population—about 4.2 billion people—already resides in urban centers, compared to just 30 percent in 1950. ^{xiv} The same study estimated that, by 2050, 68 percent of the world's population will live in cities.

— AGING INFRASTRUCTURE

The combination of an increased population and denser urban centers will place untenable strain on existing water infrastructure unless significant investments and capital improvements are made on each major continent.

The U.S., for instance, has an estimated 1 million miles of pipes that deliver drinking water. Many of those pipes were built in the mid-20th century with a lifespan of 75 to 100 years. The fading integrity of existing infrastructure leads to about 240,000 water main breaks each year, wasting more than 2 trillion gallons of potable water. The 2017 Infrastructure Report Card calculated that leaking or aging pipes “are wasting 14 to 18 percent of each day’s treated water,” the equivalent of 15 million households.^{xv}

The same report cited the average pipe replacement rate in the U.S. as .5 percent per year, far too low to maintain the quality of infrastructure needed to sustain a growing population.

The challenge of confronting aging infrastructure—which will cost an estimated \$1 trillion in the U.S. alone—is not unique to North America. In 2017, the U.N. adopted Sustainable Development Goal 6 (SDG6), aimed at ensuring safe access to water and sanitation for all. The U.N. estimates that the amount of capital investment required to attain that goal must reach \$1.7 trillion by 2030.^{xvi}

— DEFORESTATION

The massive deforestation of tropical rainforests has the dichotomous effect of reducing the planet’s ability to absorb carbon dioxide and stabilize rainfall. The rainforests’ ability to do both is threatened, as up to 80,000 acres are lost to deforestation everyday.^{xvii}

Pandemic deforestation accounts for as much as 15 percent of global carbon emissions, more than the all the cars and trucks in the world combined.^{xviii} The aggregated result, especially in vital ecological regions such as the Amazon, eliminates the critical cooling effect forests have on the entire planet, while also creating more unpredictable global precipitation patterns:

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“Deforestation in the Amazon region of South America (Amazonia) influences rainfall from Mexico to Texas. Similarly, deforesting lands in Central Africa affects precipitation in the upper and lower U.S. Midwest, while deforestation in Southeast Asia was found to alter rainfall in China and the Balkan Peninsula. It is important to note that such changes primarily occur in certain seasons and that the combination of deforestation in these areas enhances rain in one region while reducing it in another.”^{xix}



WATER SCARCITY IS NOT THE NEXT GENERATION'S PROBLEM.

It already affects billions of people, making it perhaps the most universal challenge for a globalized populace, as well as making water conservation technology both a tangible solution and a lucrative investment. Many enterprises are already making significant investments and inroads in sustainability technology and water conservation to combat many of the causes of water scarcity. More so than ever, the right technology implementations can both reduce risk and deliver demonstrable return on investment in both financial and water savings for enterprises willing to invest in them. Regardless of the impetus for the investment—sustainability, financial incentive, marketing strategy—the result will be the same.

CASE STUDY

THE THACHER SCHOOL

“By implementing Banyan’s smart water technology, we’re not only able to conserve water and save money, but can and have integrated water insights into our marketing strategy.

– Ed Bennett, director of facilities, The Thacher School

Battling drought in California’s Ojai Valley

The Thacher School is a coeducational, college preparatory independent boarding school in Ojai, California, a particularly drought-susceptible region in the southern part of the state. The constant and pervasive threat of widespread drought combined with the ever-present maintenance requirements of Thacher’s sprawling and complex 427-acre campus created troublesome challenges for the school if left unchecked. For Thacher’s staff and board of trustees—the latter of which views water scarcity as a top threat to the school’s operability, sustainability, admission’s process, fundraising efforts and to the student body as a whole—doing nothing was not an option.

Prior to Thacher’s partnership with Banyan, the school’s decision-makers set a target of 85 percent water usage reduction compared to 2013 levels. After making a series of common-sense decisions around water usage—watering later at night, qualitatively reducing water usage, installing sections of natural turf—the school had cut its usage significantly, but not enough to meet its goals. To hit the rest of its water savings targets, director of facilities Ed Bennett began to examine IoT and data analytics technologies that could provide a total water management solution.

Bennett sought a platform that could monitor and control both indoor and outdoor water usage across the campus’s 300,000 square feet and 123 buildings, as well as a data visualization component that enabled him to analyze and control water usage from his mobile phone as he was out and about on campus.

He’s now able to do both with Banyan Water Central, Banyan’s mobile-friendly water management dashboard. The results, Bennett says, have been great so far, with Banyan contributing significantly to Thacher’s overall water savings of 40 percent.

RESOLVING THE WATER CRISIS

Initiatives aimed at solving issues of water scarcity generally fall into two different schools of thought: inducing behavioral change or driving market-wide adoption of conservation technologies.

The first attempts to change individual behavior by enforcing enhanced regulations around water usage. We're seeing this more frequently as cities and regions lose access to potable water. In February 2018, for instance, Capetown officials set a cap of 13 gallons per person per day.^{xx} Residents were reusing shower water, recycling machine water and flushing toilets only once a day.

It worked for a time, as Day Zero—the day when the City of Capetown would turn off its water taps and force residents to retrieve their water from designated collection points—was pushed from July to sometime in 2019. However, even with these enhanced regulations, there will come a time, very, very soon, when the city is again threatened with a total lack of water.

The issue with these types of regulations is not that they're bad ideas. Individual behavior change is, on some level, necessary to reduce water usage. But they tend to be enforced or lifted based on weather patterns and rainfall, which will continue to become more unpredictable as climate change and deforestation affect entire regions and continents.

The extreme change we're already witnessing casts serious doubts on our ability to accurately forecast and rely on rainwater as a consistent and viable solution to the water crisis.

It's also true that, until water's price is accurately tied to its value, behavior change will simply be next to impossible.

The second school of thought advocates for widespread adoption of smart technology to monitor, optimize and ultimately reduce water usage. Enterprises have the opportunity to gain unprecedented access and visibility into how water is used for irrigation and landscaping, in cooling towers and in buildings. The ability for these devices and sensors to exchange data and information in real time presents lucrative openings to create new efficiencies across entire operational systems, increase asset value and generate new cost-savings that were heretofore unavailable.

The potential benefits of these technological implementations—and the problems they solve—are as clear as the factors that created such need for them in the first place.

- As rates continue to increase, the need to properly allocate water—and to avoid excessive and unnecessary usage—becomes more prominent.
- As infrastructure ages, the risk of undetectable leaks also increases. The current rate of 240,000 main leaks per year will undoubtedly rise, creating more headaches for facility managers, property owners, portfolio managers and others who may be footing the utility bill for an underground leak that went undetected for a month or more.
- Enterprises gathering and utilizing water-related insights turn water from a cost into an asset that increases profit margins, optimizes operations and ultimately conserves water.
- Asset values of individual properties automatically rise when IoT technology is installed.
- For business leaders more concerned with the environmental or sustainable element of water savings, reputational risk is also a concern. In an era of increasing values-based brand loyalty, sustainability initiatives can act as a competitive differentiator, a source of pride for a brand and as a marketing opportunity to target customers or stakeholders who share similar values.

IN 2017 ALONE, BANYAN INCREASED ITS CLIENTS' ASSET VALUE BY \$20 MILLION.

ABOUT BANYAN

Founded in 2011, Banyan Water is the leading provider of data-driven water conservation for the built environment. Using smart devices and real-time monitoring and analytics, Banyan protects Earth's most precious resource while generating untapped revenue for clients. Since the company's inception, Banyan has saved more than 2.8 billion gallons of water—enough to meet the needs of more than 700,000 households for a month—and in 2017, increased customer asset value by \$20 million. For more information, visit www.banyanwater.com.



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