

State of California Tackles Drought with IoT & Blockchain

The Freshwater Trust, IBM Research and SweetSense Inc. aim to make groundwater usage sustainable

SAN FRANCISCO, Feb. 8, 2019 /PRNewswire/ -- The Freshwater Trust (TFT), a 501(c)(3) nonprofit working to protect and restore freshwater ecosystems, is partnering with IBM Research (NYSE: [IBM](#)) and SweetSense Inc., a provider of low-cost satellite connected sensors, to pilot technologies which can accurately monitor and track groundwater use in one of the largest and most at risk aquifers in North America. Additional research support will be provided by the University of Colorado Boulder.

Jointly funded by the Water Foundation and the Gordon and Betty Moore Foundation, the project's scientists and engineers will demonstrate how the blockchain and remote IoT sensors can accurately measure groundwater usage transparently, and in real-time in California's Sacramento San Joaquin River Delta.

The sensors will transmit water extraction data to orbiting satellites and then to the [IBM Blockchain Platform](#) hosted in the [IBM Cloud](#). The blockchain will record of all data exchanges or transactions made in an append-only, immutable ledger. The blockchain also uses "smart contracts," whereby transactions are automatically executed when the conditions are matched.

Through a web-based dashboard, water consumers, including farmers; financiers and regulators will all be able to monitor and track the use of groundwater to demonstrate how sustainable pumping levels can be achieved through the trading of groundwater use shares in the State of California. Individual users who require groundwater amounts beyond their share cap will be able to "purchase" groundwater shares from users who do not require all of their supply at a market-regulated rate.

For example:

- A strawberry farmer is planning to take the season off to prepare for an organic crop the following harvest. The farmer can trade or sell her water credits on the blockchain to another farmer.
- Due to a particularly dry season a winery realizes it will need additional ground water to avoid losing the vintage. The vintner can purchase additional water shares, without negatively impacting the aquifer.

"The future success of these sustainability plans hinges on being able to track and report groundwater use, and likely will also require a robust way to trade groundwater shares as well," said Alex Johnson, Freshwater Fund Director with TFT. "Our strategic intent is to harness new technologies to develop a system that makes getting groundwater more sustainable, collaborative, accurate and transparent process, which is why we are using the blockchain. We now have the project team and funding to do it, and a strong network of partners in the region that are open to an initial testing and building phase."

"Based on a research project in Kenya with USAID, the Millennium Water Alliance and other partners we are now applying our expertise in building decision support systems for water management for surface and groundwater data aggregation, workflow optimization and analytics to address similar challenges in California. With the addition of the blockchain we can bridge critical trust and transparency gaps making it possible to build a robust, scalable and cost-efficient platform for managing precious groundwater supplies anywhere in the world," said Dr. Solomon Assefa, Vice President, Emerging Market Solutions and Director, IBM Research - Africa.

The group will pilot the system in northern California's Sacramento-San Joaquin River Delta, an area often referred to as the "nexus of California's statewide water system." The river delta covers 1,100 square miles and

provides water to the San Francisco Bay Area and coastal and southern California and supports dozens of legally protected fish, plant and animal species. In addition, nearly 75% of this land is used for agriculture.

The sensor technology is provided by SweetSense Inc, which is currently monitoring the groundwater supplies for over a million people in Kenya and Ethiopia, with plans to scale to 5 million by the end of the year. The sensor data are transmitted over satellite networks to an online data analytics platform.

"By remotely monitoring groundwater use using our sensors, we're able to help improve and maintain sustainable access to water supplies for people, farmers, and livestock. The work we're doing in Africa is directly translatable to California," said Evan Thomas, CEO of SweetSense and Mortenson Chair of Global Engineering at the University of Colorado Boulder. "Our research team at the University of Colorado will assist in modeling groundwater use through the sensor data and satellite detected rainfall and weather correlations."

The collaboration began in response to the Sustainable Groundwater Management Act (SGMA), which was signed into California law in 2014. SGMA mandated the creation of Groundwater Sustainability Agencies (GSAs), local groups that are responsible for ensuring regional groundwater supplies are sustainably managed. The GSAs are charged with developing and implementing a plan to make their local groundwater usage sustainable by 2040.

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About The Freshwater Trust

Since 2016, TFT has built multiple programs in the basin. In response to another bill, Senate Bill 88, TFT developed a [measurement method](#) for surface water diversion that addresses the unique qualities of the Northern Delta region. In 2017, 148 surface water diversions covering more than 29,000 farmed acres in the region — including wine grapes, pears, corn, alfalfa, safflower, tomatoes and wheat — had enrolled in our five-year study. For groundwater concerns in the same area, TFT helped support the formation of the [Northern Delta Groundwater Sustainability Agency](#). This means 17 local agencies formed into one integrated agency and have begun work on a unified plan for sustainably managing groundwater use. These agencies are understaffed, so TFT provides the capacity to gather and analyze data and develop effective sustainability measures.

About IBM Research



For more than seven decades, IBM Research has defined the future of information technology with more than 3,000 researchers in 12 labs located across six continents. Scientists from IBM Research have produced six Nobel Laureates, 10 U.S. National Medals of Technology, five U.S. National Medals of Science, six Turing Awards, 19 inductees in the National Academy of Sciences and 20 inductees into the U.S. National Inventors Hall of Fame. For more information about IBM Research, visit www.ibm.com/research.

About Sweet Sense

SweetSense Inc.'s mission is to improve transparency, accountability, and cost-effectiveness of remote water, energy, and infrastructure projects to improve health and quality of life. Daily, SweetSense is monitoring millions of people's water supplies across Africa and North America. We fix the Internet of Broken Things®.

The University of Colorado Boulder Mortenson Center in Global Engineering combines education, research, and partnerships to positively impact vulnerable people and their environment by improving development tools and practice. Our vision is a world where everyone has safe water, sanitation, energy, food, shelter, and infrastructure.

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