



NO PLAN B

RESILIENT ORGANIZATIONS AND DIGITAL SMART ATTITUDES MITIGATE RISKS IN WATER SAFETY AND SUSTAINABILITY

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Water safety and sustainability are more fragile than we think. There is no plan B when it comes to water goals, and failure is not an option. If we are to achieve the UN SDG 6, which is clean water and sanitation for all by 2030, much more needs to be done. But access to potable water is one of the most challenging issues that the world faces — from India's looming water crisis, with rural areas so desperate for access to clean water; to the subtropical area in Brazil, where they face the worst water crisis in nearly 30 years; to threatening droughts in water scarce regions in the western United States.

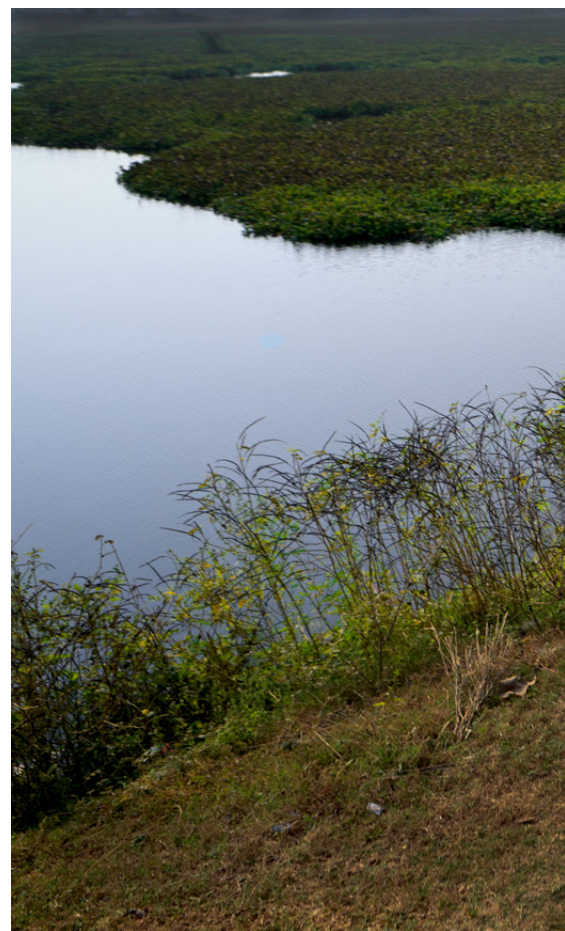
If we are to combat climate change and its impacts, as in SDG 13, we need to work smarter to become more resilient leveraging digital solutions to speed up our actions and make the changes sustainable. Climate change has triggered many unplanned rainfall events that wreak havoc with water resource and utility operations, leaving communities vulnerable to water supply disruption or worse.

Digital solutions help to speed up delivery of water to people in need

In India, the government is also looking for ways to have clean water available across the country, particularly in small rural villages. In the almost 400 villages of Khatan in the state of Uttar Pradesh, approximately one and a half million people struggle on a daily basis to access clean water. In these villages, many women walk several kilometers each day to fetch water preventing them from earning a living. They often take their children on the long trek, preventing them from attending school and obtaining a good education. Water is the top priority of these villages.

Uttar Pradesh State Water and Sanitation is improving the state's water infrastructure with a mission to bring drinking water to every household. The Khatan Group of Villages Water Supply Scheme was awarded to Larsen & Toubro Construction. The project includes designing and constructing an intake well to collect water from the Yamuna River, as well as an approach

Water professionals worldwide are helping to bring safe and secure supply to water-scarce areas. Engineers are simulating and evaluating scenarios, searching for optimized solutions to combat the effects of climate change to drive solid contingency plans for seasonal droughts, which are becoming more severe.



bridge that connects to a water treatment plant, 40 intermediate booster pumping stations, 121 elevated storage tanks to distribute the water through a 1,531-kilometer pipeline network, and a 2,129-kilometer distribution pipeline network that serves the community. Larsen & Toubro Construction needed to provide a complete solution, from concept to commissioning, that extends into 10 years of operation and maintenance for what will be an integrated smart water system.

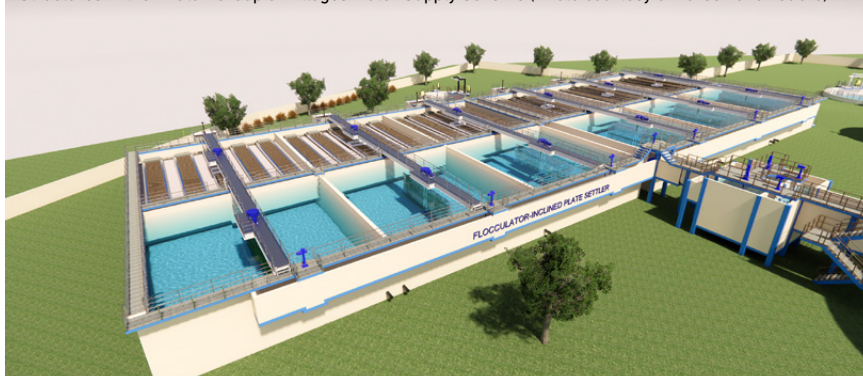
There were many engineering challenges, magnified by a very tight timeline. Within six months, the team had to generate 890 BIM models for 200 different structures, all considering various soil interactions. The design of the water supply system proved to be a significant challenge, so the team turned to Bentley software to help determine the best and most economical design.

Using OpenFlows WaterGEMS, the engineering team rapidly designed the network, putting them ahead of sched-

ule. With the help of STAAD.Pro, the team was able to quickly design the structural foundations for the treatment facility, elevated storage tanks, and other structures, allowing the design work to be completed 30% faster than they would have using manual methods. They used PLAXIS to secure the safety of the work area, determining safe excavation sloping and saving time and money. The engineering design phase was thankfully ahead of schedule saving two precious months due to digitalization.

Enabling access to water for the community, and completing this project faster, will have enormous value for the local households, food, culture, health, education, economics, as well as the integrity of the natural environment. The project will enable 1.5 million people to achieve sustainable health through quality drinking water. From improving access to education to enabling women to earn a wage instead of fetching water, this social commitment is impacting the quality of life in this area.

Structures in the Khatan Group of Villages Water Supply Scheme (Photo courtesy of Larsen and Toubro)



Woman in India fetching water on a daily basis.

A contingency plan to ensure supply in the event of drought

After a severe water crisis, over 100 municipalities in Brazil declared a state of emergency, and rationing and supply rotation went into effect. This water crisis triggered engineers in the city of Joinville to develop contingency plans to maintain the water supply during drought conditions. Preliminary simulations produced water shortages, so they sought a more comprehensive network study. They used Bentley applications to create a digital twin and perform hydraulic analysis of the dis-

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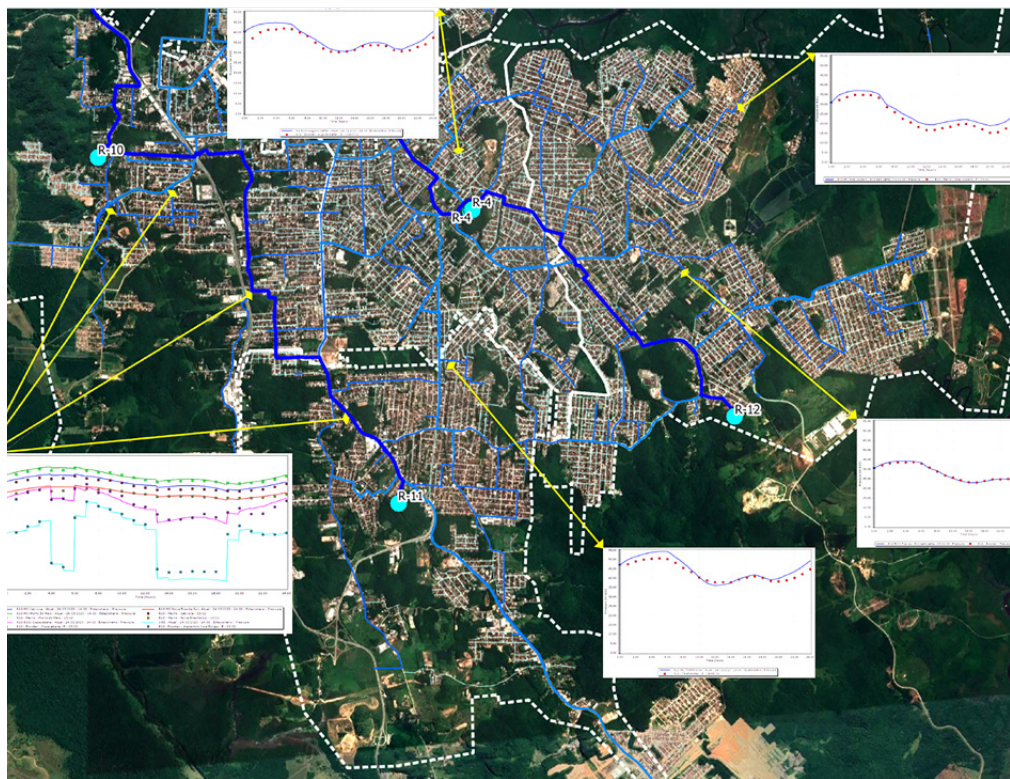
Engineers in the city of Joinville used Bentley applications to create a digital twin and perform a hydraulic analysis of the system

tribution system, guaranteeing water supply while saving BRL 4.5 million as a result of maximizing operational performance and efficiency. Technology enabled this innovative solution and gave residents peace of mind.

Preparation for rapid response to climate events

When Hurricane Ida released intense rainfall over the Commonwealth of Pennsylvania, New Jersey, and New York, real-time data and automated analysis triggered immediate alerts and notifications to key engineers and the authorities. The complete and self-sustaining Dam Safety Monitoring Solution uses a network of sensors to monitor conditions ranging from rainfall, pore pressure, deformation, reservoir lake level, and other metrics to provide automated site-specific insights on the condition of the dam and water distribution system.

In the case of Hurricane Ida, such data was used to establish alerts that triggered notifications that were autonomously sent to key engineers and authorities when thresholds (or predefined warning limits) were exceeded. Bentley's sensemetrics infrastructure IoT solution helped to alert the counties to conduct evacuations in a timely matter when multiple dam sites lost power. Through use of real time automated monitoring, the Dam Safety Officer was able to address the rapidly deteriorating conditions that nearly reached overtopping conditions and maintained an enhanced safety response for the surrounding areas.



Complexity and interdependency between systems are managed through the digital twin (Photo courtesy of Companhia Águas de Joinville).

Groundwater supply to vulnerable communities

Water supplies are under pressure and over utilized so surface water is an easy water source for people to see, develop, and manage. But groundwater is invisible. This hidden resource is, therefore, much more difficult to regulate and manage. That is where groundwater models are key to bringing water to vulnerable communities faster than ever before.

In a South Sudan refugee camp, the Groundwater Relief organization used Bentley's Seequent Leapfrog models to create a 3D groundwater model to better understand the geological profile of the camp. The model helped the engineers to discover additional water resources, a deeper system, and a shallow system, right beneath their feet.

Accelerating the timeline on Sustainability Goals for Water



The Larsen & Toubro project demonstrates the importance of accelerating access to clean water. The UN SDG 6 established this lofty universal call to action as part of the 17 sustainability goals agreed upon by the United Nations General Assembly in 2015 to achieve a better and more sustainable future for all by the year 2030. SDG 6 is to ensure availability and sustainable management of clean water and sanitation for all. It encompasses six outcome-oriented targets, including safe and affordable drinking water and improving water quality.

But globally, we need more. We are making good progress with Bentley and Larsen & Toubro working together to accelerate the delivery of water supply to the communities of India. However, it is estimated overall globally that by 2025, the number of people that will live in water-scarce regions due to growing drought issues caused by climate

change and population growth will in fact increase, not decrease. In many places we will be in a worse position than we were in 2015 when the goal was established. More people will have difficulty accessing a clean, safe water supply on a daily basis. And by 2050, more than half the world's population

could be living in water-stressed regions due to the impact of climate change and droughts, urbanization as well as conflict and war.

Water safety and sustainability are more fragile than we think. There is no plan B when it comes to water goals, and failure is not an option. We are all part of the solution and digital will help us get there faster. Sustainability means rethinking how we do things, and doing things smarter and with greater transparency. Collaborating with stakeholders in a connected digital twin environment will help us learn from the past, make better decisions today, and create a better future for all.

At Bentley, our mission is to provide innovative software and services for the enterprises and professionals who design, build, and operate the world's infrastructure – advancing both the global economy and the environment for improved quality of life. Connecting the entire water cycle, engineering firms trust Bentley software to accelerate the design and construction phase, then once in operation, utilities can optimize the smart and resilient water system to avoid supply interruptions, ensure compliance to regulations, and mitigate risks. Partnering for success to digitalize the water project and asset lifecycle, Bentley and its users are leading the way to the digital water future.

