



Building a water-resilient future:

How digital innovations can address today's urban water challenges

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Water is the lifeblood of our planet. It is essential for human life, our environment, and our economies. Yet rapid urbanization, aging infrastructure, and the escalating impacts of climate change are creating a perfect storm for urban water systems.





Consider these facts:

- **Half** the world's population that lives in urban areas, projected to hit 70% by 2050.¹
- **40%** The global water demand that is expected to exceed supply by 2030.²
- **USD 5.5 trillion** Cumulative global investment gap in infrastructure needed by 2035.³
- **4,000** Extreme weather events between 2014 and 2023 that caused around USD 2 trillion in economic losses globally.⁴
- **USD 4.3 trillion** Total water-related losses since 1970, which continue to rise each decade.⁵

A water-resilient city is one that can endure and prosper amid shocks and stresses related to water, such as droughts, floods, storm surges, contamination, or unplanned infrastructure disruptions. These cities also address slow-moving risks, including land subsidence linked to declining groundwater levels, deteriorating water quality, and shifting weather patterns that affect natural hydrological systems and urban runoff.

This e-book will explore how digital solutions are empowering us to build a more resilient future, ensuring our cities can not only survive, but thrive in the face of water-related shocks and stresses.

Sources:

1. <https://ourworldindata.org/urbanization>
2. https://commission.europa.eu/topics/environment/water-resilience-strategy_en
3. <https://www.mckinsey.com/~media/mckinsey/business%20functions/operations/our%20insights/bridging%20infrastructure%20gaps%20how%20has%20the%20world%20made%20progress%20v2/mgi-bridging-infrastructure-gaps-discussion-paper.pdf>
4. The economic cost of extreme weather events: could cost economy \$2 trillion over the last decade - ICC - International Chamber of Commerce
5. Atlas of Mortality and Economic Losses from Weather, Climate and Water-related Hazards (1970-2021)

Three urban water resilience challenges



Floods

Densely built cities with limited permeable surfaces and outdated stormwater systems are a recipe for disaster. Since the 1970s, 44% of all disaster events have been flood related. These floods not only threaten lives and property, but also trigger geotechnical risks like landslides and contamination runoff, harming delicate ecosystems.



Scarcity

Urban drought affects everything from public health and social stability to agriculture and industry. By 2050, over a quarter of the world's major cities could deplete their current water sources. This situation not only impacts the availability of drinking water, but also threatens industries, agriculture, and energy production that are vital to urban economies.



Environmental degradation

Extreme water events disrupt the natural water cycle with devastating consequences and impact on the environment. Protecting and restoring natural ecosystems, such as wetlands and forests, is crucial for mitigating these environmental risks and enhancing the overall resilience of our water systems.

Transforming water resilience with intelligent, connected digital technologies

Managing the complexity around urban water cycle requires a system-based approach. The countless data points and interactions between assets, the environment, and human activity can now be understood and managed effectively using innovative digital solutions and open data platforms powered by AI.

Digital solutions help increase resilience and mitigate risks by:

Strategy	Action
Hazard mitigation	Reducing the magnitude or frequency of a hazard, such as by improving drainage or protecting aquifers.
Exposure reduction	Moving people and critical assets out of harm's way through smarter zoning and land-use planning.
Sensitivity reduction	Decreasing vulnerability to hazards by strengthening infrastructure and implementing early warning systems.
Increased adaptive capacity	Improving the ability to cope and adjust through measures like predictive modeling and community preparedness.



Where innovation meets execution

Shaping next-generation urban infrastructure built for flood resilience. Bentley Systems provides a comprehensive suite of above and below ground digital solutions to address today's water resilience challenges at every stage of the infrastructure lifecycle.



Design and build

Bentley's solutions enable engineers to understand catchment behavior, design resilient stormwater systems that account for climate change, and ensure smooth, low-risk construction through digital delivery and progress tracking.

- Shanghai Water designed a new pump station to reduce Yangtze River flooding, seamlessly connecting all participants and improving collaborative efficiency by 25%.

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Image courtesy of Shanghai Water Engineering Design and Research Institute Co., Ltd.

Operate and maintain

We empower operators with real-time flood risk monitoring, early warning systems, and ongoing analysis of urban flood dynamics. Predictive maintenance ensures critical infrastructure is always ready to perform when it's needed most.

- Ahead of 2025's Mardi Gras celebration, Forte & Tablada worked with the city of New Orleans to keep the big easy safe and dry.

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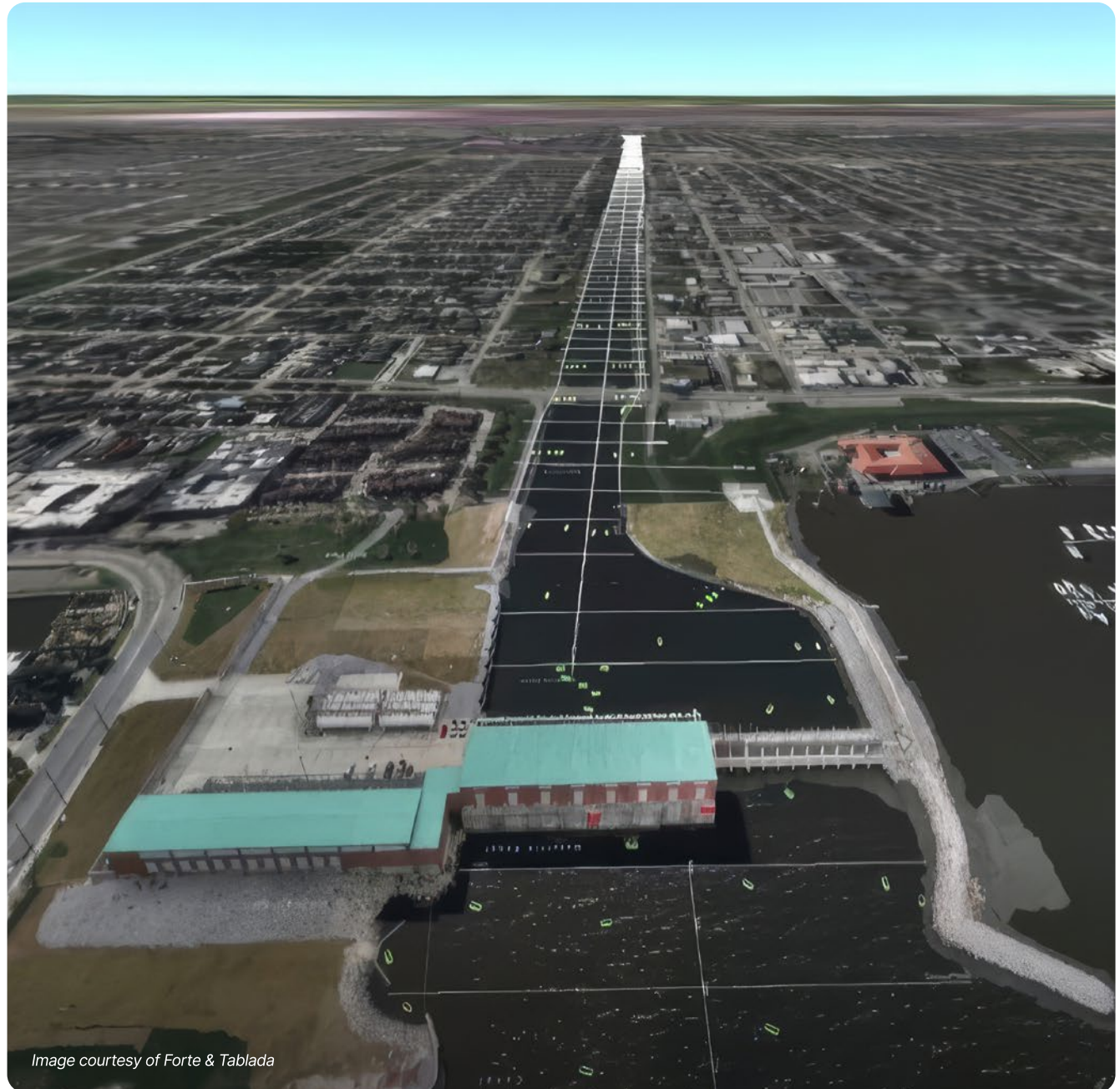


Image courtesy of Forte & Tablada

**Innovating resilient infrastructure
that keeps cities thriving through
water scarcity**

Bentley's innovative solutions empower engineering professionals to mitigate water scarcity impacts across every stage of the asset lifecycle.



Design and build

Bentley's digital tools support sustainable water management through detailed modeling of water resources, designing for system-wide water efficiency, and reducing water use during construction activities.

- The EchoWater Project is helping relieve a multiyear drought in saving USD 400 million for reinvestment into recycled water for California agriculture, improving groundwater sustainability.

[Read the story](#)



Operate and maintain

Secure your water supply by optimizing system performance, monitoring water use in real time, and using predictive analytics to detect leaks and prevent failures before they disrupt service.

- Sabesp established an open, connected hydraulic modeling environment for São Paulo, resulting in a 30% reduction in overflows and backflows.

[Read the story](#)



Image courtesy of Sabesp

**Developing urban infrastructure
designed to withstand environmental
risks from extreme water events**

With Bentley's innovative solutions, engineering teams can address the environmental impacts of extreme water events, from flooding to drought, throughout every stage of the lifecycle.



Design and build

Understand complex water cycles, map vulnerable habitats, and design systems that mitigate storm and sewage impacts. Our solutions help optimize water treatment plant operations to protect our natural ecosystems.

- Jacobs designed an expansion to an advanced wastewater treatment plant with a reality model, accurately visualizing existing conditions to reduce modeling time.

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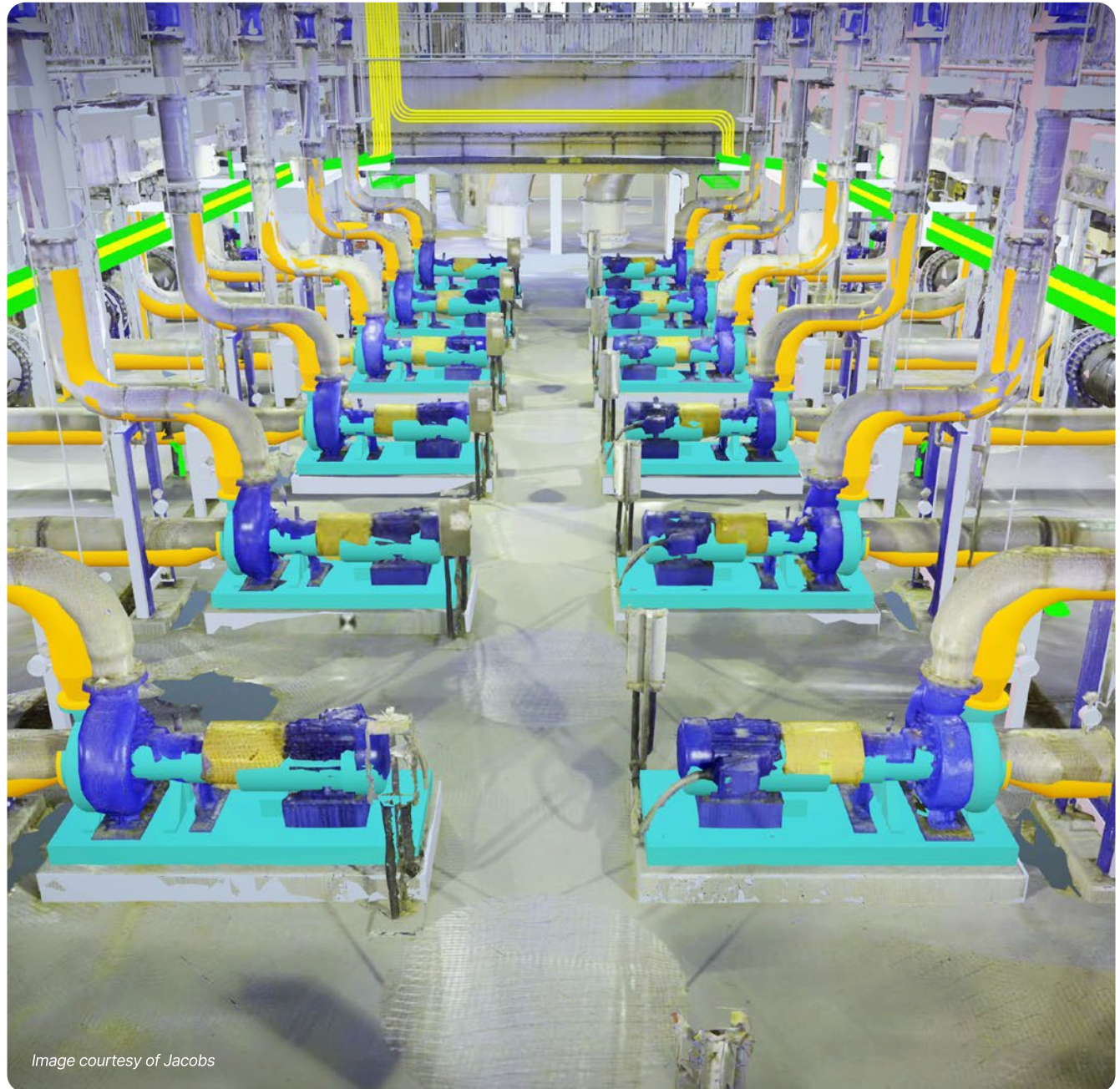


Image courtesy of Jacobs

Operate and maintain

Monitor both natural and human-made systems by integrating above and below ground data to mitigate risks and prevent failures. Optimize operations to reduce your carbon footprint, minimize resource use, and extend the life of your assets.

- Geoambiente's award-winning digital approach protects Brazilian communities' water supply, reducing remediation costs by 70% and saving USD 1.4 million.

[Read the story](#)



Start building your water-resilient future today

Water resilience is not a distant goal; it is an achievable outcome that can be implemented at every level, from daily operations to large-scale city planning. Having access to the right information and the right tools enables engineers, operators, and city leaders to act proactively, rather than reacting to crises.

Bentley Systems empowers infrastructure professionals to communicate effectively, plan strategically, and act decisively when it matters most. A water-resilient city is one where people, businesses, and nature can thrive together. By creating efficient, reliable, and adaptable infrastructure, we can build the vibrant and successful cities of the future.

Bentley's industry solutions and software products address all water resilience challenges. Discover how we can future-proof your urban water infrastructure.

[Learn more](#)



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