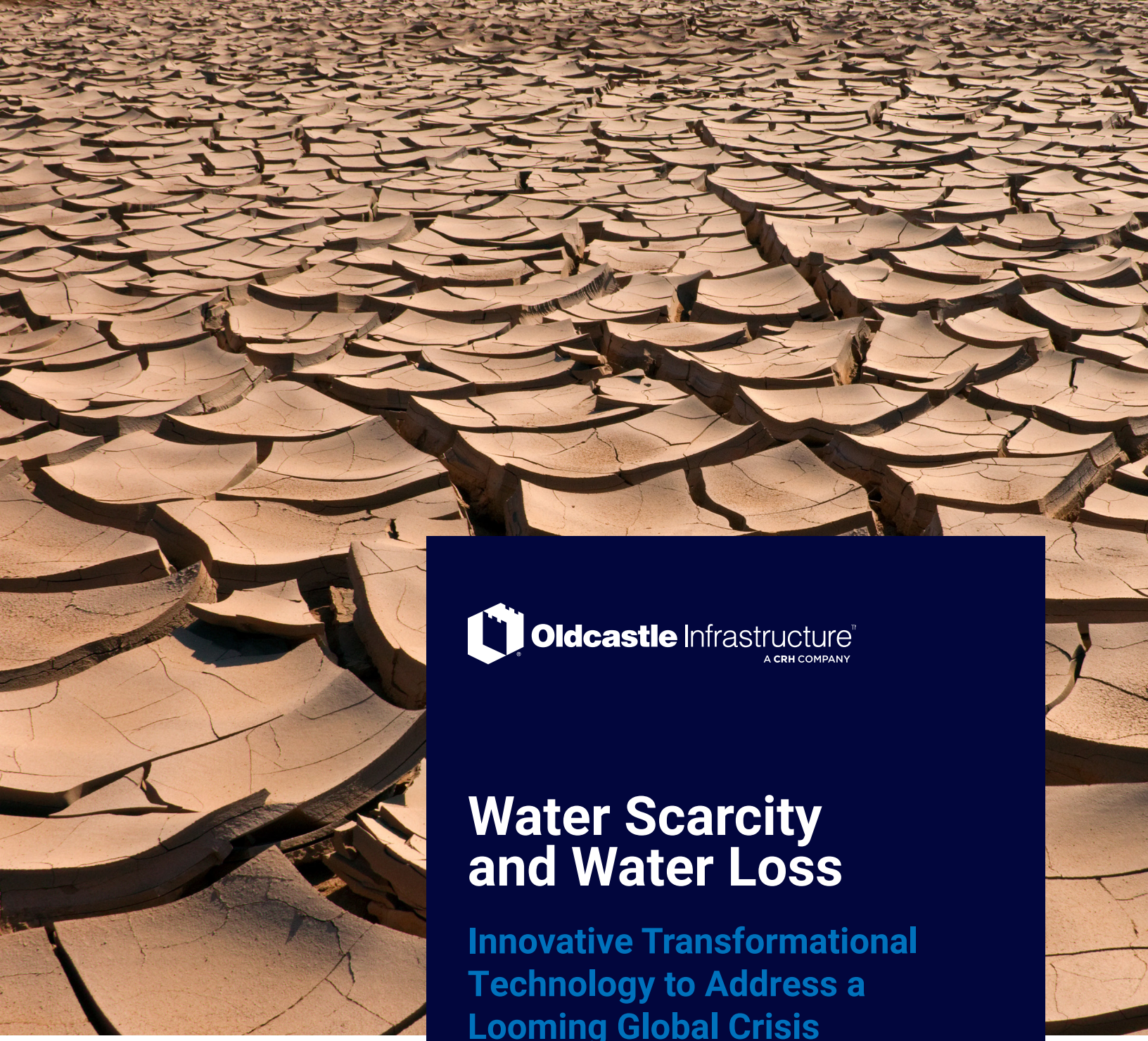

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Water Scarcity and Water Loss

Innovative Transformational Technology to Address a Looming Global Crisis

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Water scarcity is a global existential threat. Alarm bells have been ringing world-over for years as dwindling supplies of freshwater pose a risk to everything from human health to agriculture, manufacturing, and even national and global security.

Exacerbated by population growth and environmental factors, water scarcity touches every corner of the globe. About 4 billion people, representing nearly two-thirds of the global population, experience severe water scarcity during at least one month of the year. Even in the United States, the US EPA admits that 40 of 50 states are facing water shortages within the next year[1].

Water by the Numbers

2.3 Billion

people live in water-stressed countries, of which 733 million live in high and critically water-stressed countries. (UN-Water, 2021)

3.2 Billion

people live in agricultural areas with high to very high water shortages or scarcity, of whom 1.2 billion people – roughly one-sixth of the world's population – live in severely water-constrained agricultural areas.

(FAO, 2020)

4 Billion

About 4 billion people, representing nearly two-thirds of the global population, experience severe water scarcity during at least one month of the year.

(Mekonnen and Hoekstra, 2016)

40 of 50

In the USA, 40 of 50 states will face water shortages within the next year.

35%

Globally, around 35% of all treated drinking water is lost before it reaches consumers each year.

2 Trillion

The U.S. alone loses a staggering 6 billion gallons of treated drinking water every day due to leaks – this equates to 2 trillion gallons of drinking water lost annually.

[1]US EPA. https://www.epa.gov/watersense/statistics-and-facts

A Ticking Time Bomb

In the face of global water scarcity, aging infrastructure and the associated breakdown and leakage from old drinking water distribution systems is a ticking time bomb. Consequently, the effective management of non-revenue water (NRW), especially through leakage detection and repair, is critical to combating water scarcity. NRW, defined as water loss due to leaks, theft, or metering inaccuracies before it reaches the consumer, is a major contributor to water scarcity.

Globally, around 35% of all treated drinking water is lost as NRW each year[2]. The United States alone loses a staggering 6 billion gallons of treated drinking water every day due to leaks – this equates to 2 trillion gallons of drinking water lost annually[3].

[2]International Water Association – The Water Manager's Non-Revenue Water Handbook. https://iwa-network.org/learn_resources/the-managers-non-revenue-water-handbook/

[3]American Society of Civil Engineers (ASCE) – Infrastructure Report Card (2021). "Drinking Water." https://infrastructurereportcard.org/wp-content/uploads/2017/01/Drinking-Water-2021.pdf

What Happens When a City Runs Out of Water?

Between 2015-2018, **Cape Town, South Africa** encountered a drastic 1-in-400 year drought. Combined with overpopulation and government failure in water infrastructure, the severe conditions took the city of 4.6 million to the brink of "Day Zero," a point which Cape Town would run out of water.

Residents were restricted to 50 liters (13.2 gallons) of water a day – that's enough for a 90-second shower, two quarts of drinking water, one cooked meal, two hand washings, two teeth brushings and one total flush. For comparison the average American uses 88 gallons of water a day, according to the EPA.

Residents began building dry composting toilets. Signs for "Waterless Car Washes" sprang up around the city.

What eventually saved the city was a combination of sustained public communications and innovative engineering solutions – along with timely rainfall. (Foresight Africa, 2023).

In **Jackson, MS** a public health crisis occurred in 2022 when the intersection of two disasters, water treatment plant infrastructure failure and river flooding, left 160,000 people, along with hospitals, fire stations and schools without safe drinking water. In many cases, the communities had no water service at all.

Exacerbating the problem, the US EPA found that Jackson's water distribution system also had numerous leaks and line breaks, with crews reporting repairing five or six each day. The disaster created a political debate highlighting infrastructure neglect and racial discrimination.

With more cities around the world facing rapid urbanization, climate change and aging infrastructure, the future is concerning. Many experts agree that a comprehensive assessment of global urban water scarcity is needed to identify cities at risk and investigate feasible solutions. The clock is ticking.

Water as a precious resource can cause devastating effects when disasters such as infrastructure failure or flooding strike.

Billions Down the Drain

Cities aren't just losing water, they're also losing money. In addition to capacity and availability strain, the operational costs incurred by water loss pose a significant financial strain on communities. An American Society of Civil Engineers (ASCE) report estimates that the aforementioned losses cost U.S. municipalities and local water utilities $7.6 billion each year, putting tremendous pressure on water utilities and local communities to cover expenses. Such high operational costs may hinder investments in infrastructure upgrades and lead to increased water bills for consumers, perpetuating a cycle of financial strain.

Challenges to Sustainable Water Management Solutions

The growing demand for water, along with its unpredictable availability, rising maintenance costs, treatment expenses, and distribution challenges, underscores the importance of sustainable water management solutions.

A key consideration is the fact that the median age of water utility workers is almost 50 - and that over half of all of our utility workers are nearing retirement in the next decade. As we are not rapidly backfilling those jobs with a younger generation, that sets the stage for needing to adopt technologies that can take the manpower we have and optimize it to create more efficiency.

It's important to note that technologies like AI will not be replacing peoples' jobs – but making their jobs easier. Technology can reduce the burden of multitasking, increase productivity, inform decision making, and reduce workplace stress.

Key Challenges to New Management

Aging Infrastructure
Outdated systems lead to leaks and potential contamination.

Resource Scarcity
Climate change and overuse strain water supplies, making conservation essential.

Budget Limitations
Financial constraints hinder essential upgrades.

Regulatory Challenges
Evolving standards demand significant investments.

Old Techniques Work Like a Dog

Addressing water loss often entails the use of various techniques and methods to detect and repair leaks in the pipes that distribute drinking water. Historically, these techniques have included the use of dogs trained to smell chemicals in treated drinking water, field staff using listening sticks pressed to the ground to attempt to hear leaks, and visible inspection of ground conditions to look for the presence of water or the beginning of a sink hole. Unfortunately, these methods are time and resource intensive and often inaccurate.

Vessel

A black labrador mix named Vessel was trained to successfully detect water leaks for Central Arkansas Water (CAW). The scent of chlorine triggers the dog's response.

Credit: Brown and Caldwell

New Technology is the Key

To combat water loss effectively, we must turn to innovative solutions powered by technology. Artificial Intelligence (AI) and real-time sensing offer transformative opportunities to fix leakage and increase our water supply sustainably and efficiently. By implementing advanced sensor networks and AI models, utilities can detect leaks in real-time, even in remote areas, before they escalate into major crises.

Using actionable AI enables a comprehensive approach to addressing water loss including the precise detection of leaks, sizing, and localization within water distribution systems. Accurate identification of leak sizes and locations enables prompt and cost-efficient repairs by utilities, substantially minimizing water loss. Oldcastle Infrastructure offers an industry leading turn-key approach to water loss management and leak detection. Using expertly trained field teams, state-of-the-art sensors, powered by FIDO Tech's actionable AI with a 94% (and improving) accuracy, leaks are detected, pinpointed accurately and sized to enable the prioritization of repairs, thereby minimizing non-revenue water loss and operational costs.

Importantly, Oldcastle Infrastructure's AI is one of a kind. It's the only solution that can size leaks to help fix the largest and most impactful leaks first – which helps to drive and maximize instant return-on-investment. Moreover, the AI is entirely material agnostic: it works on any kind of pipe across a network, including transitions between material types. The field-based technology employed is also non-invasive – small sensors are deployed within meter and valve boxes using magnets that do not interfere with infrastructure.

Leak Detection Technology Capabilities

Leak Sizing
Technology accurately ranks leak sizes across water delivery networks.

Advanced AI
AI is trained using verified data, effectively reducing false positives by filtering out extraneous background noise.

Dynamic Asset Tracking
Each leak is treated as a living asset and tracked throughout its entire lifecycle-providing global feedback, minimizing false positives and increasing accuracy.

Platform & Sensor Agnostic
The tech works with any acoustic file from any sensor, providing immediate data on leak presence, size and location.

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Oldcastle Infrastructure, a CRH Company, leads the market in advanced water loss management. Combining advanced artificial intelligence with the vast experience of Oldcastle Infrastructure's field professionals allows the company to collect, analyze, and deliver actionable data-driven insights from a single trusted source.

Smart Technology and Process Designed for Optimal NRW Management

1 Map
Networks are mapped using GiS data to ensure optimal sensor deployment and coverage. Then, the requested areas are prioritized.

2 Deploy
Our expert team installs sensors across the network.

3 Analyze
Data is securely collected and transmitted to FIDO Tech AI for analysis.

4 Pinpoint
Fierld engineers pinpoint and mark the exact locations of each prioritized leak.

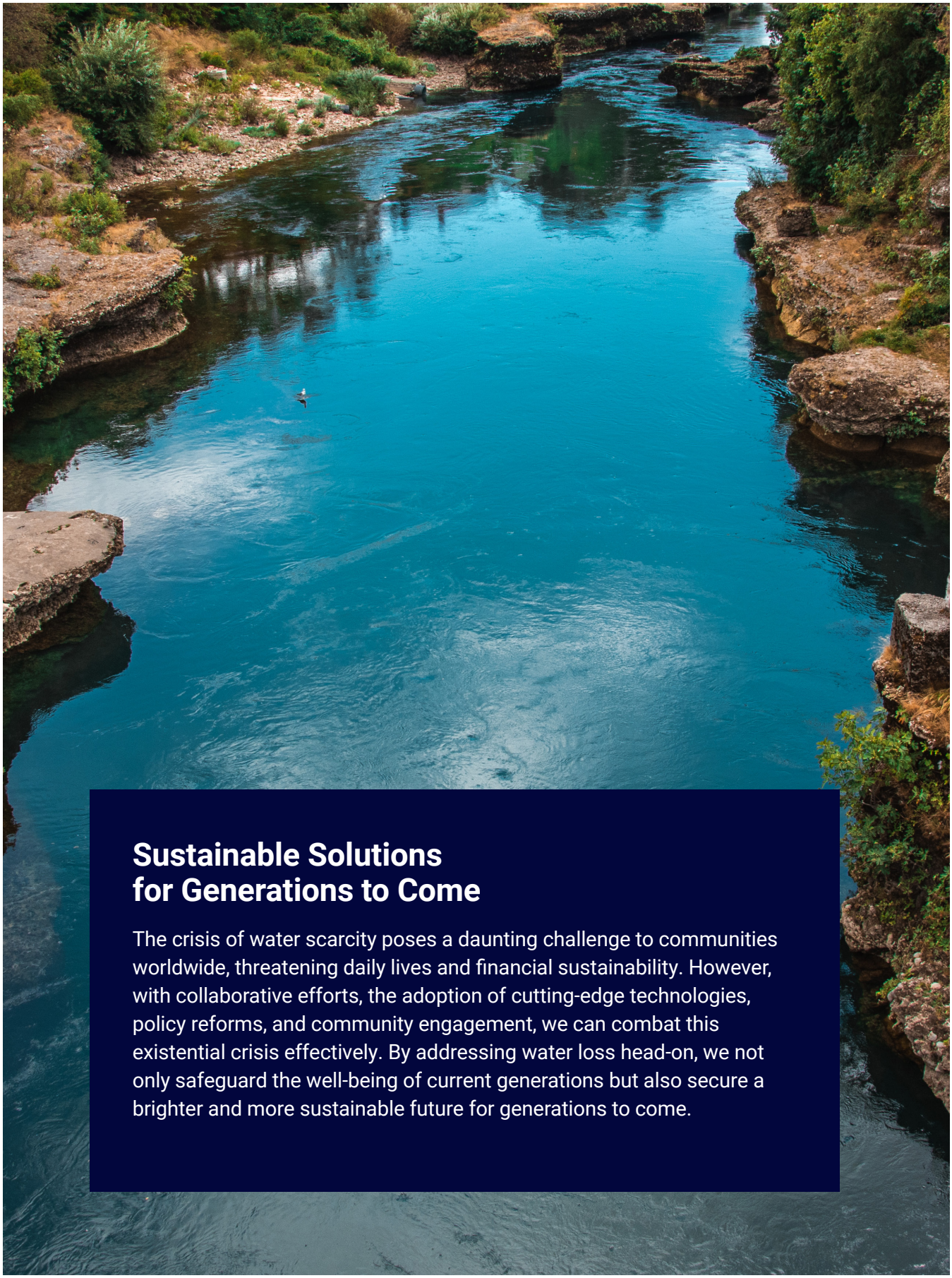
5 Validate
Our expert team installs sensors across the network.

6 Report
Upon sharing post - repair dig and flow data, final evaluation and reporting are provided to quantify savings.

Robust Water Policy is Also Critical

To combat water loss effectively, we must turn to innovative solutions powered by technology. In addition to new technologies, government and community support is critical to promoting sustainable and cost-effective water management. Robust policy and guidance are indispensable in creating an environment conducive to tackling water loss. Governments must encourage and resource water utilities to invest in infrastructure upgrades, water loss audits, and incentivize reduction in water loss.

Additionally, implementing measures to reduce water theft and incentivize water conservation can yield tangible results in curbing water loss. Moreover, empowering communities with knowledge about water conservation and the consequences of water loss fosters a sense of responsibility and encourages active participation. Community-driven initiatives, educational campaigns, and outreach programs can significantly reduce water wastage and promote a culture of sustainable water use.



Sustainable Solutions for Generations to Come

The crisis of water scarcity poses a daunting challenge to communities worldwide, threatening daily lives and financial sustainability. However, with collaborative efforts, the adoption of cutting-edge technologies, policy reforms, and community engagement, we can combat this existential crisis effectively. By addressing water loss head-on, we not only safeguard the well-being of current generations but also secure a brighter and more sustainable future for generations to come.

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