

EXPERT COMMENTARY

As the effects of climate change threaten our very survival, ensuring access to water is quickly becoming one of the defining issues of the 21st century, writes [Gregory Smith](#), president and chief executive officer at Instar



Reimagining water use for North America's agriculture

With the majority of freshwater withdrawals attributed to the agricultural industry, enhancing the efficiency of our water use in agricultural infrastructure will be key in securing our future.

Over the past two years, the world has experienced first-hand what can occur when warning signs are ignored and a crisis is allowed to reach its peak. Doctors and researchers in infectious diseases had long cautioned and predicted the devastating impact a virus could have on our public systems if appropriate preparations were not given the attention or investment required.

Yet, the world was largely unprepared for the novel coronavirus when it

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began to spread in 2019. While efforts to enhance systems and preparedness were made in response to each health emergency as it occurred, proactively safeguarding our cities before the next major event will require continued investment, maintenance and planning.

Within agricultural infrastructure, we are seeing a very similar pattern play out. In 2021, the drought conditions in California reached the most severe levels in more than 100 years, with 88 percent of land listed as in

“extreme” or “exceptional” drought by the US Drought Monitor. In addition to threatening critical access to drinking water, the multi-year drought has widespread implications for agricultural industries.

Damaging food production

The effects of climate change leave the environment hotter and drier year after year, leading to increased frequencies of wildfires. This further impacts food production through direct destruction and indirect effects such as smoke damage to growing crops.

According to the California Department of Food and Agriculture, the state

is responsible for producing more than 30 percent of vegetables and 60 percent of fruits and nuts for the US, turning a water shortage in one state into a potential food and economic issue for a nation. Although California has made progress on water sustainability initiatives, the State Water Resources Control Board still reports a need for around \$4.7 billion in funding to ensure accessible, uncontaminated water flow for Californian residents.

At a global level, 'water crisis' has ranked as one of the top risks by the World Economic Forum every year since 2012, building as a significant yet preventable threat to human survival. Our future will be determined upon our ability to develop new approaches to food and water management, including the ways in which one sector impacts the other. A successful plan for agriculture necessitates access to water and enhancing our water management to mitigate drought depends on agriculture, which accounts for 70 percent of freshwater use globally.

Creating future resilience

Learning from crises of the past, it will be more important than ever to make substantive investments in how we manage our natural resources and strengthen our communities, particularly as it pertains to agricultural infrastructure. As former US president Theodore Roosevelt once said: "The more you know about the past, the better prepared you are for the future." While we cannot prevent the existing impacts of climate change on our environment, we can learn from the past, make the most of what we have, and plan for a resilient future.

In August 2021, the US declared an official water shortage for the first time in the country's history, impacting more than 40 million citizens dependent on the Colorado River system,

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while the water supply at Lake Mead, America's largest reservoir, is currently at its lowest level since 1936.

While the creation of more freshwater or reversing the impact of climate change so far is not currently feasible without massive global collaboration and expense, we can prioritise addressing the current impacts on climate change by making the most of

our existing resources. Precision and smart technology will guide the next agricultural revolution, by monitoring existing water supply to make our infrastructure more effective and to reduce unnecessary waste.

One such improvement in reducing wastewater is water metering technology. By harnessing the power of real-time data, this helps to promote sustainability by optimising water distribution to the crops that need it most. With more effective water distribution, agricultural infrastructure systems can prioritise which plants get watered and when, reducing and reallocating the supply for other essential services.

Smart solutions

Water metering technology can also extend to leak detection, enabling users to quickly identify and repair where necessary to prevent waste and improve operational efficiencies. According to the US Environmental Protection Agency, around 75 percent of water is lost through pipeline leakage. Reclaiming some of this lost water could be pivotal to our ability to make smarter, more efficient use of a finite resource.

A great example of emerging smart solutions is the N-Drip, a micro-irrigation system developed by Hebrew University of Jerusalem professor Uri Shani. An alternative to traditional flood irrigation, the N-Drip is entirely recyclable and energy efficient, while maximising yield potential, especially when compared to traditional techniques, making it a great option for farmers looking for a precise, affordable and sustainable water management solution.

We have the methods and the technology to make our water use more efficient, but these solutions will only be enough if they are enacted before the water shortage develops into a global crisis. By proactively shifting our water use towards sustainability, we can

empower our communities to respond to future food and water demand with much more ease and flexibility.

Beyond enhancing the efficiency of our existing systems, emerging technology is also providing a pathway to create new sources of freshwater through options such as desalination. As only 2.5 percent of the earth's water is freshwater, this is a significant opportunity – removing salt, chemicals and other particulates to produce clean, potable water.

Desalination plants

Given the abundance of seawater and other non-potable water sources available, desalination is an attractive solution as freshwater scarcity grows globally. The Carlsbad Desalination Plant in California was built with this in mind, to develop a sustainable, drought-resilient source of freshwater for the future. Carlsbad, the biggest desalination plant in North America, treats saltwater to produce around 50 gallons of freshwater each day, enough to supply approximately 8 percent of the consumption in the San Diego area.

Another opportunity to create new freshwater can be found from an unexpected source: the oil and gas industry. Depending on the level of treatment, produced water, extracted while gathering oil and gas, can be used for a myriad of purposes, including within midstream energy production where less than half of the produced water is reused.

Oilfield Water Logistics (OWL), a growing platform providing midstream water infrastructure and services to the energy industry in Texas, New Mexico, Colorado, Utah and Wyoming, introduced a new mobile water treatment unit in October 2020 to offer water treatment and reuse to customers on site, improving efficiency and reducing waste.

With the capability to treat up to

50,000 barrels of produced water per day for immediate reuse, OWL can help preserve local aquifers, while countering produced water volumes which the EnergyMakers Advisory Group reports are expected to grow from 1.9 billion barrels in 2019 to 4.8 billion barrels in 2024. By recycling the water, companies can replace what would have otherwise come from fresh surface water bodies,

“Precision and smart technology will guide the next agricultural revolution”

freeing up much-needed water for our farms or other essential use.

In other regions of the US, produced water has been successfully reused and blended with other water sources to irrigate thousands of acres in the Powder River Basin in Wyoming and Montana, restoring overgrazed range land and food and drinking water for livestock. In California, around 20 percent of the 80 billion gallons of oilfield water produced in 2013, from wells that were not hydraulically fractured, were treated and used for irrigation of crops for human consumption.

Reimagining the future

Water use in agriculture hits the intersection of our two basic human needs. To improve, it will require strategic intervention, proactive investment and learning from the successes and challenges of the past.

The crises threatening the security of our water and food are here, and the time for action is now. Learning from the experience in California and other water-stressed regions, enacting preventative measures to mitigate disasters through investments in much-needed infrastructure, and implementing enhanced management systems for our water resources can help us to improve the world for ourselves and for future generations.

The impacts of climate change may, like the global pandemic, be unprecedented, but they will not be unforeseen. To quote the playwright George Bernard Shaw: “If history repeats itself, and the unexpected always happens, how incapable must man be of learning from experience.” The future of infrastructure, and of our communities, will depend on our ability to carry these lessons forward, prioritising and championing the essential systems that will ultimately define the longevity and resilience of our world. ■