

The future of America's drinking water

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In 2020 wildfires ravaged more than 10 million acres of land across California, Oregon and Washington, making it the largest fire season in modern history. Across the country, hurricanes over Atlantic waters yielded a record-breaking number of storms.

While two very different kinds of natural disasters, scientists say they were spurred by a common catalyst—climate change—and that both also

threaten drinking [water supplies](#). As the nation already wrestles with [water shortages](#), contamination and aging [infrastructure](#), experts warn more frequent supercharged climate-induced events will exacerbate the pressing issue of safe drinking [water](#).

It's no surprise then that the Biden-Harris administration has identified safe drinking water as one of the nation's top priorities. Below, Stanford water experts Rosemary Knight, Newsha Ajami and Felicia Marcus discuss safeguarding drinking water from climate-driven disasters; emphasizing a modern approach to infrastructure investments; and focusing on watershed and water source protection. Knight is a professor of geophysics in the Stanford School of Earth, Energy & Environmental Sciences (Stanford Earth); Ajami is director of urban water policy with Stanford's Water in the West program; and Marcus is the William C. Landreth Visiting Fellow at Water in the West.

Whether it's floods, fires, storms, droughts or sea level rise, climate impacts have a direct influence on water supplies. What types of climate mitigation policies should the Biden team enact to protect drinking water?

Marcus: Grants and low-cost financing for community preparedness, especially for underserved communities, to adapt and plan for climate impacts would make a tremendous difference. The [federal government](#) should be doing leading-edge research, technology development and dispersion for lower-cost sensor and treatment systems for drinking water. Finally, the administration can explicitly make drinking water its highest priority for research and development, funding, and updating regulations based upon science.

Ajami: Water has to be the central part of both climate mitigation and

adaptation discussions. Today we are facing many challenges that are the consequence of our approach to securing water and energy resources over the 20th century, building infrastructure networks under the assumption of abundance and overlooking inherent environmental interlinks. Source protection, demand management and public engagement strategies should be at the center of any climate policy.

News stories, such as the lead contamination of Flint, Michigan's water in 2014, have shown failing or poorly managed infrastructure is at the heart of the potable water crisis. What types of infrastructure investments are key to ensuring access to safe water? What should the Biden team do to spur change?

Ajami: There are multiple challenges at play here: aging infrastructure, lack of infrastructure, cost of service, infrastructure operation and maintenance costs, and navigating impacts of [climate change](#). The new administration has the opportunity to address many of these challenges through a holistic effort and having a systems-level approach by investing in water diversification strategies, multi-benefit and decentralized infrastructure (including green infrastructure, stormwater capture and reuse), and data and governance systems for innovative infrastructure solutions.

Marcus: A short list would include upper watershed protection to protect source waters; better treatment systems all along a watercourse, as communities take out and then return water through wastewater systems and natural treatment systems; basic financing for communities that can't afford adequate drinking water systems; and support for changing out lead piping and faucets in schools and homes. Funding, better regulation and communication can make a world of difference.

Groundwater supplies drinking water to 99 percent of rural populations, but overpumping has led to aquifer depletion and water contamination. What federal and state actions can alleviate growing pressures on groundwater?

Knight: We need to change our approach to land use planning by recognizing that the most valuable use for some land is to become a site for managed recharge of the underlying groundwater system. Getting more water into regions below the ground increases the amount of stored water and can help prevent subsidence. The challenge is identifying the optimal locations for recharge zoning and requires seeing below the ground to find coarse-grained materials, such as sand and gravel, that can act as fast paths to move the water from where it is at the surface to the required depths for recharge. This is an area of work I'm currently focused on and it presents great potential to replenish and grow groundwater reserves.

Ajami: I see our groundwater supplies as our social security system; we all contribute and withdraw from it at different times. Unless we collectively contribute to it and protect it from degradation and contamination, there will be none left for future generations to draw from. I believe collaborative governance and land use management are the two most important parts of achieving groundwater sustainability, and neither can work without reliable data sources and accounting mechanisms.

Are there any technological innovations that could dramatically advance water treatment, monitoring or recharge?

Knight: We now have geophysical systems, deployed using helicopters or towed behind ATVs, that can provide fantastic underground images, mapping out fast paths for groundwater. Last month we flew along the base of the Sierra Nevada in Tulare and Fresno counties, looking for these fast paths at the mouths of rivers coming out of the mountains. The recent advancements in geophysical technology and our ability to process and interpret the acquired data position us to move forward aggressively with a new approach, where zoning for recharge becomes an integral part of land use planning. This approach could be implemented throughout California.

Ajami: I do not believe our problem currently is lack of technological advancement but our outdated and fragmented governance structure, regulatory process, rigid laws, and obsolete business models and practices skewed toward gray, once-through, centralized infrastructure systems. Any advancement that can overcome these challenges can open up opportunities for innovative 21st-century solutions to be incorporated into our existing aging centralized water systems. Investing in soft infrastructure including data systems, IT infrastructure, digital solutions, new models or decision support tools, and updated performance measures are key in this process of shepherding the paradigm shift in the water sector and providing equitable access to safe drinking water.

Provided by Stanford University

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