Brackish groundwater can augment supplies, relieve stress on freshwater resources

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Credit: AI-generated image (disclaimer)

Development of brackish groundwater in the United States, if carried out responsibly, can augment supplies and relieve growing stress on freshwater resources, according to an issue brief from Rice University's Baker Institute for Public Policy.

"Brackish Groundwater: Current Status and Potential Benefits for Water Management" describes the current state of brackish groundwater use and development in the U.S. Because water is regulated primarily at the state level, the paper considers four examples of states with specific regulations for brackish groundwater resources—Texas, Florida, Arizona and New Mexico—and discusses management objectives and policy recommendations that will encourage the responsible use of this resource.

The brief was co-authored by Regina Buono, the Baker Botts Fellow in Energy and Environmental Regulatory Affairs at the Baker Institute; Katherine Zodrow, postdoctoral research associate in the institute's Center for Energy Studies; Pedro Alvarez, the George R. Brown Professor of Materials Science and NanoEngineering; and Qilin Li, associate professor of civil and environmental engineering and of materials science and nanoengineering.

"Researchers have documented a growing disparity between water supply and demand, which is caused by a rapidly increasing population, economic growth, drought and rising calls for environmental flows," the authors wrote. "The shortage, if left unaddressed, is likely to lead, ultimately, to crisis or conflict between water users, with the attendant effects on the economy and human well-being. Increased understanding and utilization of unconventional water resources will increase water security and assist economic growth into the future. Facilitating the responsible development of brackish groundwater will help relieve pressure on freshwater resources and mitigate potential water crises in the years to come."

Brackish groundwater has a high concentration of total dissolved solids (TDS), including the common salt sodium chloride. It is often defined as water containing between 1,000 and 10,000 parts per million (ppm) TDS. (Seawater contains about 35,000 ppm TDS, and the secondary

standard for drinking water in the U.S. is 500 ppm TDS.) The cost of extracting groundwater is proportional to its depth, and many regions of the U.S. have brackish groundwater within 1,000 feet of the land surface.

In Texas, several oil and gas well operators are turning to brackish groundwater as an alternative source of water. The use of brackish water for hydraulic fracturing operations has increased, especially in the Eagle Ford, Permian and Anadarko basins, more arid parts of the Texas that lack easy access to freshwater.

Due to differences in brackish groundwater sources, recharge rates and connectivity with fresh aquifers, policy development requires a detailed understanding of hydrogeology, and regulation of brackish aquifers may vary depending on the aquifer type, the authors said. Different states have chosen different definitions for brackish or impaired aquifers, resulting in a variety of approaches to regulating the resource. Because brackish groundwater contains a high level of salts, it requires advanced treatment prior to most common uses.

Allowing the current system of groundwater governance to control this resource is a missed opportunity to facilitate the expansion of water supply, to provide an incentive for smarter, targeted water use and to enable freshwater conservation, the report stated.

The authors caution that water resources should be regulated and managed in a way that encourages brackish groundwater development without adversely affecting freshwater resources, creates regulatory certainty, protects potential brackish groundwater resources for the future and respects property rights. "Legislators and agency regulators must be careful to find the proper balance between deregulation that may lead to environmental harm and restrictions that may make the use of brackish groundwater economically unviable," they wrote.

"Also important are laws that protect both freshwater sources and brackish groundwater sources, which are likely to serve as important water resources now and in the future," the authors wrote. "Finally, acquiring better knowledge and understanding of hydrogeological resources will allow policymakers to make better decisions about how to manage brackish groundwater resources and protect aquifers, both brackish and fresh."

The issue brief draws upon a longer article by the authors, "A New Frontier in Texas: Managing and Regulating Brackish Groundwater," which will be published in the June issue of the journal *Water Policy*.

More information: A New Frontier in Texas: Managing and Regulating Brackish Groundwater: bakerinstitute.org/files/9307/

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