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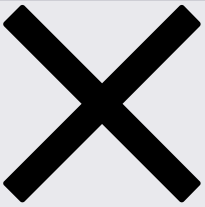

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April 21, 2022

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Sustainable Groundwater Use Could be Answer to Africa's Water Issues

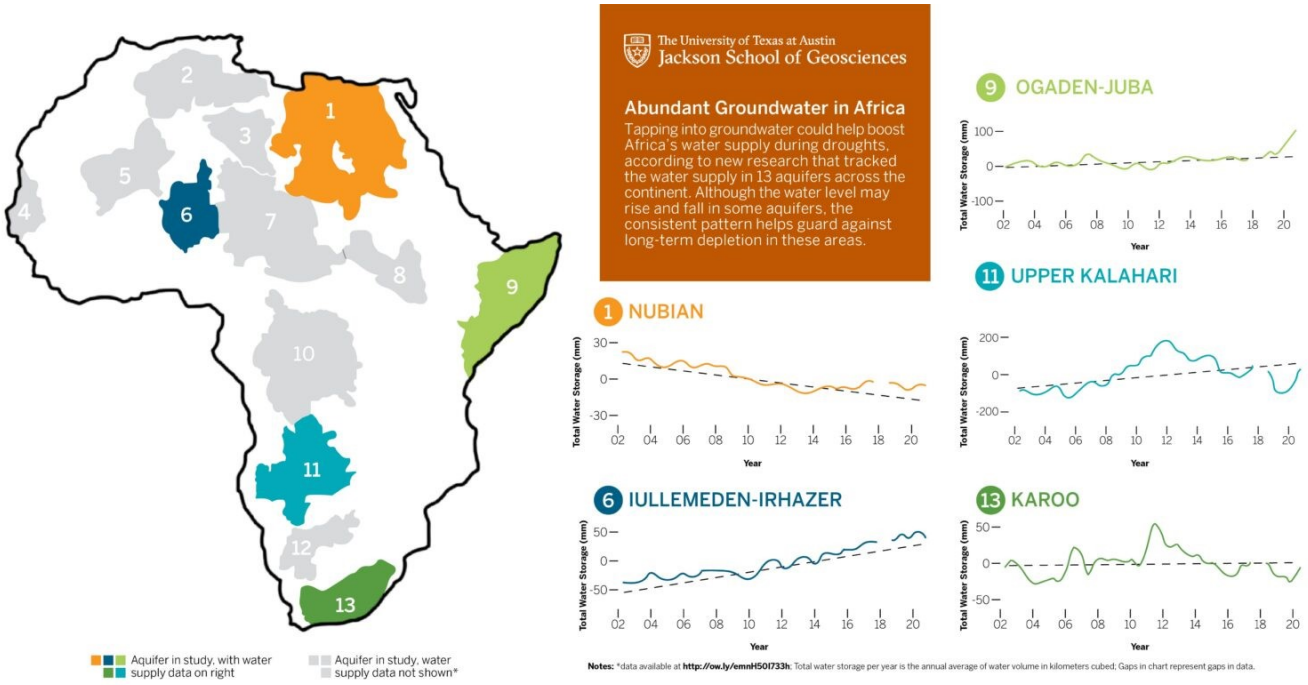
Extremely low water levels in Cape Town's largest reservoir reveal tree stumps during the water crisis of 2018. Credit: Zaian.

AUSTIN, Texas — Tapping into groundwater can help communities in Africa diversify their water supply and strengthen their drought defenses, according to a study led by scientists at The University of Texas at Austin.

The study, which was published in *Environmental Research Letters*, tracked long-term water storage gains and losses across Africa's 13 major aquifers and found opportunities for sustainably withdrawing groundwater across much of the continent.

The data showed that even though certain sub-Saharan aquifers sometimes faced water level declines, the levels consistently and quickly recovered during rainy periods, which helps guard against overuse.

"Groundwater levels go up and down," said lead author Bridget Scanlon, a senior research scientist at the Bureau of Economic Geology. "People need to know the dynamics of this resource and optimize for its use."



A graphic showing the 13 major aquifers in Africa and the total water storage per year in 5 of those aquifers from 2002 – 2020. Total water storage is the annual average of water volume in kilometers cubed. To see the total water storage for the remaining aquifers visit: www.jsg.utexas.edu/news/

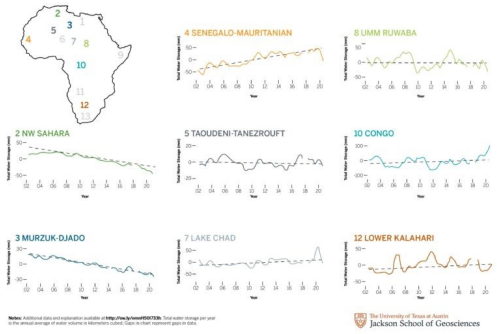
The researchers used data from NASA's GRACE satellites to track total water storage in the aquifers from 2002 to 2020. The result is an 18-year timeline that provides a longer-term perspective on water trends and what drives them.

Most cities in Africa rely on surface water from lakes, rivers and human-made reservoirs. But there is an abundance of groundwater across the continent, with annual groundwater recharge being comparable to the volume of water that flows through the Congo, Nile, Niger and Zambezi rivers each year combined.

The study highlighted different regional trends for groundwater across the continent.

In sub-Saharan Africa, the study found that most aquifers increased their water supply during the period. However, the data show that water levels frequently underwent big swings, too. The study found that these swings closely tracked with climate patterns that are known to influence rainfall in the region, such as El Niño, the Indian Ocean Dipole (IOD) and La Niña. El Niño and IOD generally increase rainfall in eastern Africa and decrease rainfall in southern Africa, whereas La Niña generally has the opposite effect.

This pattern means that although years with little rainfall can cause sharp declines in water storage, the rain eventually returns and readily refills the aquifers when it does. This helps protect the groundwater from long-term depletion, Scanlon said.



A graphic showing the locations of 13 major aquifers in Africa and the total water storage per year in 8 of those aquifers from 2002 – 2020. Total water storage is the annual average of water volume in kilometers cubed. To see the total water storage for the remaining aquifers visit: www.jsg.utexas.edu/news/

"We can more confidently say that these recharge events occur, and you can depend on them over the long term," Scanlon said. "You can assume then that you're going to get that recharge every several years."

Western Africa also saw an overall increase in water levels in most aquifers. But here the increase was relatively steady and probably due to land use changes. The researchers cite other studies that have linked rising groundwater levels in the area to the clearing of deep-rooted shrubland for crops with shallower roots.

And even in northern Africa, where groundwater showed a steady decline in water storage due to all three of its aquifers being tapped for irrigation, the study notes that the sheer volume of water held in these aquifers provides an extra buffer. However, sharp declines may occur locally, affecting groundwater supplies in local wells and oases.

"Having visited Africa several times and looked directly at the challenge with limited access to water for basic drinking and agricultural needs, I think results from this study could be important for long-term planning as the population of Africa continues to emerge from poverty into prosperity," said Scott Tinker, director of the Bureau of Economic Geology.

Jude Cobbing, a water, sanitation and hygiene adviser for the humanitarian organization Save the Children, has experience working on water development projects in Africa. He said that the study provides a data-driven perspective that can help assuage concerns about overuse, particularly in sub-Saharan Africa.

"We need better use of groundwater, a better understanding of groundwater, and we need to start taking groundwater more seriously," he said. "I think a paper like this helps advance that argument."

The study was co-authored by Ashraf Rateb, a research scientist associate at the bureau, and scientists from the NASA Goddard Space Flight Center, the University of KwaZulu-Natal, the British Geological Survey, the University College London, and the International Food Policy Research Institute.

The Bureau of Economic Geology is a research unit of the Jackson School of Geosciences.

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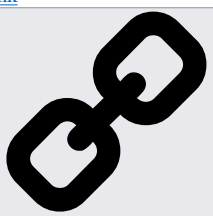

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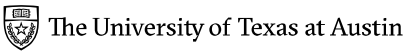

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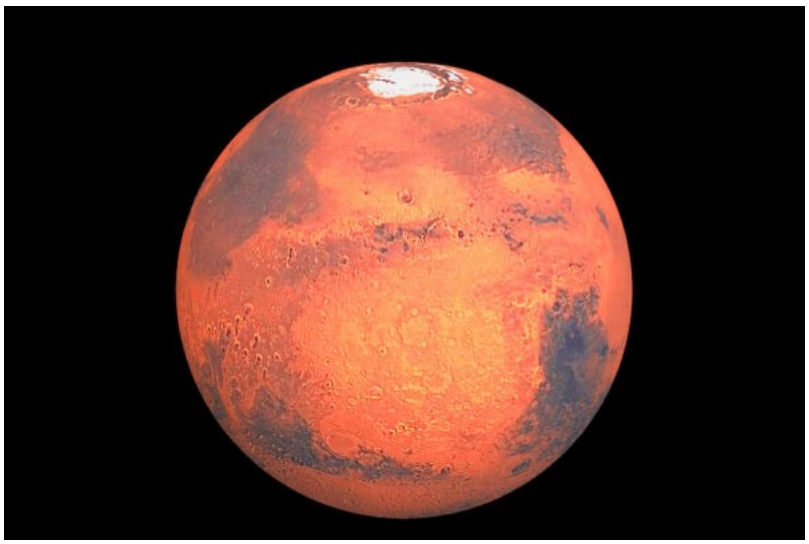

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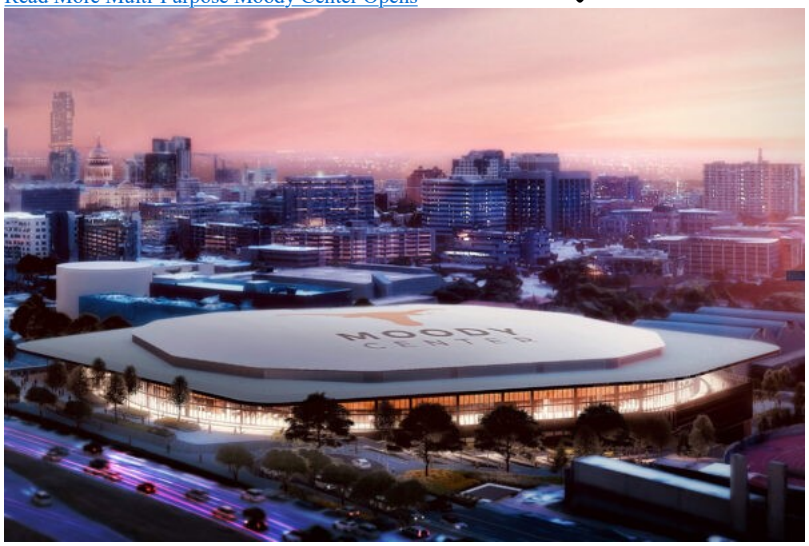

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