

New climate change study: Number of people suffering extreme droughts will double

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Michigan State University is leading a global research effort to offer the first worldwide view of how climate change could affect water availability and drought severity in the decades to come.

By the late 21st century, global land area and population facing extreme

droughts could more than double—increasing from 3% during 1976-2005 to 7%-8%, according to Yadu Pokhrel, associate professor of civil and [environmental engineering](#) in MSU's College of Engineering, and lead author of the research published in *Nature Climate Change*.

"More and more people will suffer from extreme droughts if a medium-to-high level of global warming continues and [water management](#) is maintained at its present state," Pokhrel said. "Areas of the Southern Hemisphere, where [water scarcity](#) is already a problem, will be disproportionately affected. We predict this increase in water scarcity will affect food security and escalate human migration and conflict."

The research team, including MSU postdoctoral researcher Farshid Felfelani, and more than 20 contributing authors from Europe, China and Japan are projecting a large reduction in natural land water storage in two-thirds of the world, also caused by [climate change](#).

Land water storage, technically known as terrestrial water storage, or TWS, is the accumulation of water in snow and ice, rivers, lakes and reservoirs, wetlands, soil and groundwater—all critical components of the world's water and energy supply. TWS modulates the flow of water within the hydrological cycle and determines [water availability](#) as well as [drought](#).

"Our findings are a concern," Pokhrel said. "To date, no study has examined how [climate](#) change would impact land water storage globally. Our study presents the first, comprehensive picture of how global warming and socioeconomic changes will affect land water storage and what that will mean for droughts until the end of the century."

Felfelani said the study has given the international team an important prediction opportunity.

"Recent advances in process-based hydrological modeling, combined with future projections from global climate models under wide-ranging scenarios of socioeconomic change, provided a unique foundation for comprehensive analysis of future water availability and droughts," Felfelani said. "We have high confidence in our results because we use dozens of models and they agree on the projected changes."

The research is based on a set of 27 global climate-hydrological model simulations spanning 125 years and was conducted under a global modeling project called the Inter-Sectoral Impact Model Intercomparison Project. Pokhrel is a working member of the project.

"Our findings highlight why we need climate change mitigation to avoid the adverse impacts on global water supplies and increased droughts we know about now," Pokhrel said. "We need to commit to improved water resource management and adaptation to avoid potentially catastrophic socio-economic consequences of [water](#) shortages around the world."

More information: Pokhrel, Y., Felfelani, F., Satoh, Y. et al. Global terrestrial water storage and drought severity under climate change. *Nat. Clim. Chang.* (2021). doi.org/10.1038/s41558-020-00972-w , www.nature.com/articles/s41558-020-00972-w

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