

Climate action can limit Asia's growing water shortages

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Roughly 60 percent of the global population lives in Asia, often with limited access to water. Credit: Massachusetts Institute of Technology

Even "modest" action to limit climate change could help prevent the most extreme water-shortage scenarios facing Asia by the year 2050,

according to a new study led by MIT researchers.

The study takes an inventive approach to modeling the effects of both climate change and economic growth on the world's most heavily populated continent. Roughly 60 percent of the global population lives in Asia, often with limited access to [water](#): There is less than half the amount of freshwater available per inhabitant in Asia, compared to the global average.

To examine the risk of water shortages on the continent, the researchers conducted detailed simulations of many plausible economic and climate pathways for Asia in the future, evaluating the relative effects of both pathways on water supply and demand. By studying cases in which economic change (or growth) continues but the climate remains unchanged—and vice versa—the scholars could better identify the extent to which these factors generate water shortages.

The MIT-based team found that with no constraints on economic growth and climate change, an additional 200 million people across Asia would be vulnerable to severe water shortages by 2050. However, fighting climate change along the lines of the 2015 Paris Agreement would reduce by around 60 million the number of people facing severe water problems.

But even with worldwide efforts to limit climate change, there is a 50 percent chance that around 100 million people in southern and eastern Asia will experience a 50 percent increase in "water stress"—their inability to access safe water—and a 10 percent chance that water shortages will double for those people.

"We do find that a mitigation strategy can reduce the heightened risk of water stress in Asia," says Adam Schlosser, deputy director for science research at MIT's Joint Program on the Science and Policy of Global

Change, and co-author of a newly published paper detailing the findings. "But it doesn't solve it all."

The paper, "The Impact of Climate Change Policy on the Risk of Water Stress in Southern and Eastern Asia," is being published today in the journal *Environmental Research Letters*. The authors are Xiang Gao, a Joint Program research scientist; Schlosser; Charles Fant, a former Joint Program postdoc and a researcher at Industrial Economics, Inc; and Kenneth Strzepek, a Joint Program research scientist and a professor emeritus at the University of Colorado.

The research team also uses models that track municipal and industrial activities and their specific water-demand consequences across many smaller subregions in Asia. Irrigation tends to be a major driver of water consumption, leading to diminished access to water for other uses.

Overall, the researchers conclude, through the mid-21st century, "socioeconomic growth contributes to an increase in water stress" across the whole region, but climate change can have "both positive and negative effects on water stress." The study turns up a notable amount of regional variation in the effects of climate change within Asia. Climate change by itself is likely to have a more adverse impact on water access in China than in India, for instance, where a warming climate could produce more rain.

Apart from the most likely scenarios, another significant finding is that the potential for extreme [water stress](#) is associated with unabated climate change. As the authors state in the paper, "A modest greenhouse gas mitigation pathway eliminates the likelihood of ... extreme outcomes" in water access. But without any such [climate](#) measures, "both countries have a chance of experiencing extreme water shortages by midcentury," Gao says.

The study is part of a series of papers the research team is producing to assess water risks across southern and eastern Asia, based on modeling that captures the natural and managed aspects of the water systems across the region. A 2016 paper by the group established that there was a significant risk of [water shortages](#) for about 1 billion people in Asia by 2050. The current paper focuses on the impact of [climate change policy](#), and a future paper will analyze the implications of adaptation strategies.

"There are no easy options," Schlosser says, of the various ways of limiting [climate change](#). "All of them carry associated costs, and our continued research is looking at the extent to which widespread adaptive and water-efficient measures can reduce risks and perhaps be cost-effective and more resilient."

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More information: Xiang Gao et al. The impact of climate change policy on the risk of water stress in southern and eastern Asia, *Environmental Research Letters* (2018). [DOI: 10.1088/1748-9326/aaca9e](https://doi.org/10.1088/1748-9326/aaca9e)

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