

Water may be scarce for new power plants in Asia

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Climate change and over-tapped waterways could leave developing parts of Asia without enough water to cool power plants in the near future, new research indicates.

The study found that existing and planned [power plants](#) that burn coal for energy could be vulnerable. The work was published today in the journal *Energy and Environment Science*.

"One of the [impacts of climate change](#) is that the weather is changing, which leads to more extreme events—more torrential downpours and more droughts," said Jeffrey Bielicki, a co-author of the study and an associate professor with a joint appointment in the Department of Civil, Environmental, and Geodetic Engineering and the John Glenn College of Public Affairs at The Ohio State University.

"The power plants—coal, nuclear and [natural gas power plants](#)—require water for cooling, so when you don't have the rain, you don't have the stream flow, you can't cool the power plant."

That is already a problem for some power plants in the United States, Bielicki said, where extreme weather patterns, which are increasingly frequent especially in hotter months, have reduced water supplies.

But, this study suggests, it is likely to be an even greater problem in developing parts of Asia—Mongolia, Southeast Asia and parts of India and China—where more than 400 gigawatts of new coal-fired power

plant capacity are planned for operation by 2030. (By comparison: The largest coal-fired power plant in Ohio has the capacity to produce about 2,600 megawatts of electricity; the new plants planned for developing Asia are the equivalent of more than 150 similar facilities.)

That increasing power production will itself be part of the problem, the researchers found, creating greater demand for water at the same time that climate change significantly limits the supply.

"Capacity expansion and climate change combined is going to reduce the water available to cool power plants," said Yaoping Wang, lead author of the study and a former doctoral student at Ohio State. Wang, now a research assistant professor at The University of Tennessee, did some of this research while on a fellowship at the International Institute for Applied Systems Analysis in Austria.

Cooling is critical to a plant's ability to operate—without it, machinery can overheat, causing a shutdown that could disrupt the flow of electricity to homes and businesses, and creating the potential for additional pollution.

The researchers analyzed databases of existing and planned coal-fired power plants, and combined that information with high-resolution hydrological maps to evaluate the possible strain on [water supplies](#) throughout the region. Then they applied different climate scenarios—increases in global temperature of 1.5, 2 and 3 degrees Celsius (2.7—4.8 degrees Fahrenheit) above pre-industrial levels, increases set out as milestones in the Paris Agreement, a 2016 international accord to address [climate change](#).

The researchers then considered different cooling systems and potential use of post-combustion CO₂ capture equipment, and the water that might be needed to run them.

The numbers showed that there simply would not be enough water to cool all the power plants, but there is also a lot of local variability, Wang said.

The takeaway for agencies that plan and permit plants across developing Asia, she said, is that they must evaluate the renewable water available near each power plant, taking into account water use by other plants.

Bielicki said this may require difficult decisions like reducing the number of planned power plants.

"There's often a perceived tension between developing your economy and protecting the environment," he said. "Some of the results of this study are saying, 'hey, we expect you're going to run into problems, so you should selectively change your plans, but also thin out your existing power plants, because as you're adding new [power plants](#), you're creating more competition for the water. Your economy needs water, but your ecosystems and people need [water](#), too.'"

More information: Yaoping Wang et al, Vulnerability of existing and planned coal-fired power plants in Developing Asia to changes in climate and water resources, *Energy & Environmental Science* (2019). [DOI: 10.1039/C9EE02058F](https://doi.org/10.1039/C9EE02058F)

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