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Paris climate pact could limit Colorado River runoff reductions

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The new agreement at the Paris climate talks to reduce greenhouse gas emissions in hopes of holding off future global warming will help — but hardly end — the Colorado River's chronic water supply problems, experts say.

The 196 countries that met in Paris over the past two weeks agreed Saturday on a commitment to keep global temperatures from rising no more than 2 degrees Celsius, or 3.6 degrees Fahrenheit. That would compare to pre-industrial temperatures, from the time before the Industrial Revolution ushered in the intense emissions of CO2 and other greenhouse gases into the air.

To protect the countries most vulnerable to climate change, the pact calls for "pursuing efforts" to limit the temperature rise to no more than 1.5 degrees C. That's far more challenging a task, since the planet is already expected to cross that line by the middle of the century, the Washington Post reported.

Many smaller nations, particularly those already facing severe sea-level rise, pushed hard for the 1.5 degree limit. Since global temperatures have already risen about 1 degree C since pre-industrial times, that would mean an additional increase of no more than a .5 to a 1-degree C future temperature increase. Some scientists have predicted that global temperatures could rise 4.5 degrees C by 2100 without emission cuts.

For Arizona and other states that depend on the Colorado, smaller temperature increases could mean less reduction than forecast in river runoff — which ultimately furnishes drinking water for Tucson and Phoenix as well as irrigation water for farmers across Central and Southern Arizona.

'Decarbonize'

Diana Liverman, a University of Arizona climate researcher who attended the Paris talks for more than a week, said that actually showing enough of a reduction of carbon emissions for each country to meet the temperature goals would be difficult.

A better goal would be for nations to agree to "decarbonize" — eliminate their use of carbon-based fuel sources — by 2050, Liverman said.

The countries' commitments to specific emission reductions — as opposed to long-term

temperature goals — would still raise temperatures by more than 3 degrees C, "so the key will be if they agree to review those commitments every 5 years or so and ramp them up so that peak temperature drops below 1.5 C," she said in an email before the agreement was reached.

"But even a broad acceptance that we need to stay below 1.5 C to avoid dangerous climate change is good," said Liverman, co-director of UA's Institute for the Environment. Overall, the agreement is "pretty amazing," she said shortly after it was reached.

Difficulties ahead

For Arizona and the Southwest, it's possible that it will take some time for emission cuts to translate into significant improvements for the Colorado, experts said.

They say greenhouse gases that have already built up in the oceans but haven't yet been released to the atmosphere will make it difficult, if not impossible, to hold down future temperature increases.

Beyond that, the river's runoff since 2000 has already declined nearly 20 percent — around twice what the federal government predicted would occur by 2050. While natural forces such as drought are considered a major cause of the runoff decline, many experts led by University of Arizona researcher **Jonathan Overpeck** have said warmer weather has aggravated the drought's impacts.

The warming has reduced snowpack and snowmelt that contribute to runoff. If future greenhouse gas emissions are reduced and temperature increases are moderated, that won't eliminate the problems already occurring on the river.

For every 1 degree C temperature increase, it's believed that Colorado River runoff at Lee's Ferry near Lake Powell in northern Arizona decreases about 6 percent, said University of California-Los Angeles Professor **Dennis Lettenmaier** and climate researcher **Daniel Cayan** of the Scripps Institution of Oceanography in La Jolla, California, respectively. Both have done extensive research on climate change impacts on the river.

In the past, various researchers predicted that continued warming and other climate changes could reduce the Colorado's runoff from as little as 6 percent to as much as 45 percent by 2050.

If global temperatures were to rise no more than 2 degrees C, that would limit future runoff reductions to a little bit more than 10 percent, said Cayan, who also is a researcher for the U.S. Geological Survey. If temperatures were to rise 3 degrees C, runoff would be reduced another 5 to 6 percent, he said.

"I think trying to keep greenhouse gas concentrations on the more moderate end really does matter," he said.

At the same time, an increase of 6 percent runoff reduction per 1 degree C is not the largest reduction that could occur, added UCLA's Lettenmaier, a geography professor. A range of assumptions goes into these forecasts, so if you use different assumptions, the runoff could decline further, he said.

“One thing we are concerned about is, ‘Are we underestimating it?’ ” he said of potential future runoff declines.

Finally, one problem already plaguing the Colorado’s water supply will not get much help from this climate agreement no matter what. It’s the river’s structural deficit, reaching up to 1.2 million acre-feet a year alone in the Lower Basin that includes Arizona and California.

It’s causing Lake Mead to drop as much as 12 feet per year.

The structural deficit is due to chronic overuse of available water and to the overallocation of the river’s supply that has existed since all seven river basin states but Arizona signed the Colorado River Compact back in 1922 (Arizona signed in 1944). Drought and climate change have only aggravated the structural deficit’s impacts, say officials of the U.S. Bureau of Reclamation, which runs the river, and the Central Arizona Project, which delivers river water to Phoenix and Tucson.