

Latest climate models show more intense droughts to come

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The Maranoa River south of Mitchell, Queensland, during the 2017 drought.
Credit: Chris Fithall (Flickr Creative Commons CC BY 2.0)

An analysis of new climate model projections by Australian researchers from the ARC Centre of Excellence for Climate Extremes shows southwestern Australia and parts of southern Australia will see longer and more intense droughts due to a lack of rainfall caused by climate change.

But Australia is not alone. Across the globe several important agricultural and forested regions in the Amazon, Mediterranean and southern Africa can expect more frequent and intense [rainfall](#) droughts. While some regions like central Europe and the boreal forest zone are projected to get wetter and suffer fewer droughts, those droughts they do get are projected to be more intense when they occur.

The research published in *Geophysical Research Letters* examined rainfall-based drought using the latest generation of [climate](#) models (known as CMIP6), which will inform the next IPCC assessment report on [climate change](#).

"We found the new models produced the most robust results for future droughts to date and that the degree of the increase in drought duration and intensity was directly linked to the amount of greenhouse gases emitted into the atmosphere," said lead author Dr. Anna Ukkola.

"There were only slight changes to the areas of drought under a mid-range emissions scenario versus a high-emissions pathway. However, the change in the magnitude of drought with a higher emissions scenario was more marked, telling us that early mitigation of greenhouse gases matters."

Much of the earlier research into future droughts only considered changes to average rainfall as the metric to determine how droughts would alter with global warming. This often produced a highly uncertain picture.

But we also know that with climate change, rainfall is likely to become increasingly variable. Combining metrics on variability and mean rainfall, the study increased clarity around how droughts would change for some regions.

The researchers found the duration of droughts was very closely aligned to changes in the average rainfall, but the intensity of droughts was much more closely connected to the combination of average rainfall and variability. Regions with declining average rainfall like the Mediterranean, Central America and the Amazon are projected to experience longer and more frequent droughts. Meanwhile other regions, such as the boreal forests are expected to experience shorter droughts in line with increasing [average rainfall](#).

However, the situation is different for drought intensity alone with most regions projected to experience more intense rainfall droughts due to increasing rainfall variability. Importantly, the researchers were unable to locate any [region](#) that showed a reduction in future drought intensity. Even regions with long-term increases in rainfall, such as central Europe, can expect more intense droughts as rainfall becomes more variable.

"Predicting future changes in drought is one of the greatest challenges in climate science but with this latest generation of models and the opportunity to combine different [drought](#) metrics in a more meaningful way we can gain a clearer insight into the future impacts of climate change," said Dr. Ukkola.

"However, while these insights grow clearer with each advance, the message they deliver remains the same—the earlier we act on reducing our emissions, the less economic and social pain we will face in the future."

More information: Anna M. Ukkola et al. Robust future changes in meteorological drought in CMIP6 projections despite uncertainty in precipitation, *Geophysical Research Letters* (2020). [DOI: 10.1029/2020GL087820](#)

Provided by ARC Centre of Excellence for Climate Extremes (CLEX)

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