25th International Congress on Modelling and Simulation, Darwin, NT, Australia, 9 to 14 July 2023
mssanz.org.au/modsim2023

Assessing climate change impacts on dual-priority water rights in carryover systems at basin scale

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Abstract: Climate is an essential component of water management, but it projects an extra threat to freshwater systems. Changes in the mean and variability of climate variables (such as rainfall, and temperature) alter the hydrological mean and variability and impact water availability for humans and ecosystems. It is important to consider the effects of climate change as a core part of water planning to ensure a full accounting of risks.

Here, we research the climate change impact on the yield of 'dual-priority' water rights systems across 12 Australian catchments based on four bias-corrected global climate models and a simple analytical technique (Ren et al. 2022). We first evaluated the feasibility of the analytical technique against a water resources simulation model in the Goulburn River basin, Australia. The results showed that this method performs well. Meanwhile, the results showed that under future climate conditions, the mean annual runoff of these catchments will decrease, but annual runoff variability will increase, except for some catchments in northern Australia. Similar to the trend of mean annual runoff, water availability of high-priority water rights (HPWR) and low-priority water rights (LPWR) decreased for most catchments except for some catchments in northern Australia. For example, under the Representative Concentration Pathway (RCP) 8.5 scenario, South Dandalup shows about -53.53% and -56.81% decrease in terms of HPWR and LPWR yield respectively in the 2070s. Overall, changes in mean annual runoff have a more significant influence on the water yield of high and low-priority water rights than annual flow variability.

REFERENCES

Ren, P., Stewardson, M., Peel, M., 2022. A simple analytical method to assess multiple-priority water rights in carryover systems. Water Resources Research, 58, e2022WR032530.

Keywords: *Water yield, climate change, carryover system*