

Analysing water security using NARClIM 2.0 climate projection

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Abstract: Many regional towns in New South Wales (NSW) experienced severe water restrictions during past droughts, such as the Millennium Drought and the "Tinderbox" Drought. With projected population growth and drier future climate, these water security issues are expected to worsen. The NSW Government is developing regional water strategies (RWSs) to provide a range of tools and solutions for managing each region's water security risks over the next 20 to 40 years. A key objective of these strategies is to improve water security and better prepare communities for future droughts.

The RWSs have been informed by high-quality regional climate projections from the NSW and Australian Regional Climate Modelling (NARClIM) project. NARClIM combines globally recognized science and multidisciplinary expertise to deliver regional climate projections for south-eastern Australia. The first 12 RWSs used NARClIM 1.0 climate data. Since then, a new generation of NARClIM data, known as NARClIM 2.0, has become available (Giovanni Di Virgilio et al., 2025). This data offers 150 years of continuous climate modelling (1951 to 2100) at a 4-km spatial resolution, including both historical and future projections. NARClIM 2.0 has adopted the latest global greenhouse gas emissions scenarios from the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, including low (SSP1-2.6), mid (SSP2-4.5), and high (SSP3-7.0) emissions scenarios. This improved resolution allows the data to better inform decision-making and planning at the local and regional levels, such as climate risk assessments for individual suburbs or planning zones.

For the latest RWS being developed for the Fish-River Wywandy region (covering Upper Coxs, the Blue Mountains, and Upper Macquarie), we have used NARClIM 2.0 projection data in conjunction with paleo-stochastic data. For this project, we have built a new integrated river system model encompassing these three regions (Podger et al., 2025), with a focus on the demand and supply components of local water utilities (Trim et al., 2025). The model was used to develop a comprehensive understanding of water security for the local water utilities in the region under baseline and future climate and population projections. This paper presents the study's findings, highlighting key water security issues that will be used to evaluate various options for improving water security in the region as part of the Fish-River Wywandy RWS.

The findings indicate significant reductions in inflows throughout the region, affecting all water users in the region. Bathurst and Orange are projected to be particularly impacted by the combined effects of population growth and climate change. Over the next forty years, under the SSP2-4.5 scenario, these towns are expected to face prolonged periods of elevated water restrictions necessary to meet Critical Human Water Needs. The situation is further exacerbated under the SSP3-7.0 climate scenario.

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