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Potential Climate Change Impacts on the Hydrological System of the Harvey River Catchment

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Abstract : Climate change is likely to impact the Australian continent by changing the trends of rainfall, increasing temperature, and affecting the accessibility of water quantity and quality. This study investigates the possible impacts of future climate change on the hydrological system of the Harvey River catchment in Western Australia by using the conceptual modelling approach (HBV mode). Daily observations of rainfall and temperature and the long-term monthly mean potential evapotranspiration, from six weather stations, were available for the period (1961-2015). The observed streamflow data at Clifton Park gauging station for 33 years (1983-2015) in line with the observed climate variables were used to run, calibrate and validate the HBV-model prior to the simulation process. The calibrated model was then forced with the downscaled future climate signals from a multi-model ensemble of fifteen GCMs of the CMIP3 model under three emission scenarios (A2, A1B and B1) to simulate the future runoff at the catchment outlet. Two periods were selected to represent the future climate conditions including the mid (2046-2065) and late (2080-2099) of the 21st century. A control run, with the reference climate period (1981-2000), was used to represent the current climate status. The modelling outcomes show an evident reduction in the mean annual streamflow during the mid of this century particularly for the A1B scenario relative to the control run. Toward the end of the century, all scenarios show a relatively high reduction trends in the mean annual streamflow, especially the A1B scenario, compared to the control run. The decline in the mean annual streamflow ranged between 4-15% during the mid of the current century and 9-42% by the end of the century.

Keywords : climate change impact, Harvey catchment, HBV model, hydrological modelling, GCMs, LARS-WG
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