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Assessing climate change impacts on operation and planning characteristics of Pong Reservoir, Beas (India)

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Abstract In India, there is a considerable change in both spatial and temporal patterns of the monsoon rainfall, resulting in reduced crop yields and increasing uncertainty in the agriculture-based livelihoods of the rural population. Changes in rainfall, temperature and evapotranspiration are affecting water resources availability and demands, and hence the performance of irrigation water supply facilities such as reservoirs and canal diversions. In order to accommodate these changes in the water resources situation, there must be substantial improvement in water use and management efficiency but this can only be meaningfully done if the impact of climate change and variability is quantified. Consequently, this work has investigated the effects of climate change and variability on irrigation water security in Beas River basin in India by characterising the yield and performance (reliability, resilience and vulnerability) of the associated Pong Reservoir for current (baseline) and climate-change perturbed future horizons. Climate change perturbations based on CGCM3.1 (third generation coupled GCM) for the A1B and B2A IPCC SRES socio-economic scenarios, appropriately downscaled to basin scale were used. The whole analysis was conducted within a Monte Carlo simulation framework, thus enabling the variability and uncertainty associated with each of these variables to also be quantified. The results show that future inflow series to the Pong will exhibit higher inter-annual variability than the baseline, necessitating increased reservoir capacity to meet existing irrigation water demands. In terms of overall performance, while the reliability (both volume- and time-based) was largely unaffected by climate change, the resilience significantly deteriorated especially for the A1B scenario. There were also noticeable changes in the rule curves as a result of climate change.

Key words rule curves; reservoir operation; climate change