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Climate Futures for Western Nepal

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In the mid-hills of Western Nepal where people rely on springs as a primary water resource, threats of climate-induced drought loom large. Still, an abundance of water in the greater region, steep gradients in the north and fertile plains in the south inspire many visions for water resources development for economic growth. The projects Building Climate Resilience of Watersheds in Mountain Eco-Regions (BCRWME), which implements interventions to improve year-round water availability in the mid-hills, and Digo Jal Bikas (DJB), which investigates optimal water resource development pathways for Western Nepal, run in parallel to address these concerns and visions. Planning for water resources development and climate adaptation both require a comprehensive understanding of the impacts of climate change on future water availability. However, prior South Asian climate change studies have: i) evaluated climate change at a coarse scale for the greater Hindu Kush Himalayas (HKH) region ii) addressed precipitation and temperature separately using different model ensembles. These studies do not provide sufficient basis for narrowing down the long list of climate models for practical planning applications at a finer scale, such as intended in the BCRWME and DJB projects.

Considering the needs of water resources development planners and decision-makers, our study provides a comparative assessment of multiple regional climate model (RCMs) in the current Coordinated Regional Downscaling Experiment (CORDEX) for South Asia using the Australian Climate Futures framework specifically for Western Nepal. We classified plausible future changes in both temperature and precipitation between 2020 - 2070 as simulated by all the RCMs into ranges of best, worst and most likely scenarios and visualized their relative likelihood. To understand the variation in climate futures for the different terrains, the framework is applied to Western Nepal by further disaggregating the region geographically into northern mountains, mid-hills and southern flatlands. Such spatial disaggregation shows that the likelihood for different climate futures varies for the different geographic regions. The visualization of climate futures based on the multi-model analysis is used to identify representative climate futures to use in further assessments studies for project sites throughout Western Nepal under the BCRWME and DJB projects. The climate futures developed here can be applied directly as decision support tool by planners and researchers for investigating impacts of climate change in Western Nepal on aspects beyond water management.