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Impacts of climate change on the flow of the transboundary Koshi River

The irrigation sector plays a vital role in the global agricultural food production system. It utilizes about 70% of total annual freshwater consumption in the world. It is well known fact that seasonal variations due to abrupt rainfall can significantly alter river flows that can further drastically distress water availability for irrigation schemes. Abrupt climate-driven changes in temperature and rainfall patterns are expected to affect the availability of water in the Himalayan region. Even the hydrological regimes of associated upstream basins are going to be impacted to a great extent.

In this paper, authors Kaini et al. (2021) have used high-resolution (10 km × 10 km spatial resolution) downscaled rainfall and temperature data to project likely impacts of climate change on the hydrological regime of the transboundary Koshi River basin, and assess the implications of future water availability for agricultural production in the Sunsari Morang irrigation system in particular and on the wider Nepal Terai and Indian irrigation areas in general. Assessment is carried out using the recent Representative Concentration Pathways (RCPs) 4.5 and 8.5 for short-term (2016–2045), midcentury (2036–2065) and end-of-century (2071–2100) periods. Downscaled precipitation and temperature data from four GCMs/ensembles representing cold/dry, warm/dry, cold/wet and warm/wet climatic extremes for each study period and climate change scenario are used in the Soil and Water Assessment Tool (SWAT) for hydrological modelling.

Many studies indicate that climate change could potentially increase the average annual river flows in the Bagmati, Kaligandaki, Karnali and Mahakali River basins in Nepal. This will affect the availability of irrigation water and coverage of cropped area, for example areas for both paddy and wheat cultivation will increase. Use of high-resolution climate data is helping in getting better accuracy of hydrological predictions. This could further improve the projections of future water availability in a basin. Since general circulation models (GCMs) use coarser-resolution data (spatial resolution: 100–250 km, and temporal resolution: daily or monthly), the projection are inadequate for catchment's level decisions. There are many studies which employ downscaling techniques, in order to get a more improved resolution to produce climate data that integrates both local and regional climatic and topographic variations.

Source: Kaini, S., Nepal, S., Pradhananga, S., Gardner, T. and Sharma, A.K., 2021. Impacts of climate change on the flow of the transboundary Koshi River, with implications for local irrigation. International Journal of Water Resources Development, 37(6), pp.929-954.
Full paper can be accessed at
https://www.tandfonline.com/doi/full/10.1080/07900627.2020.1826292