



Nepal Development Research Institute

Water and Climate Program

Nepal is endowed with abundant water and land resources that can support socio-economic development. The high climate and hydrological variability is however a major challenge to water security. Climate change is expected to further exacerbate this, leading to rising temperature, changes in precipitation patterns, melting glaciers, and increasing floods, landslides and droughts. The Water and Climate Program (WCP) undertakes research and outreach activities to create knowledge and evidence that support policies and actions on climate resilient water resources development and management in the country

Water Availability and Use

The annual average surface and ground water availability of Nepal is about 225 billion cubic meters, equivalent to 7,700 cubic meters per capita per annum. Unequal distribution over the year and across river basins means that some areas face water scarcity in the dry months, and floods and landslides in the wet months (monsoon).

The current water use is a small fraction of the water resources available. The country has committed to provide safe water supply and sanitation to all by 2030, provide year-round irrigation to all irrigable land and develop hydropower potential to fuel its socio-economic development. Water demand for industrial, cultural and religious uses, and environment are important to be met while utilizing the available water resources for productive uses.

Water at the Core of all SDG Goals

Nepal's achievement of the SDGs will depend on how well it manages its water and land resources. Nepal is still "hostage to hydrology" as its water, energy, food and environmental security are dependent on the climate (monsoon rainfall) as we lack the soft (institutions and governance) and hard (physical) infrastructure required to manage the climate variability.

The WCP research thus focuses on themes such as IWRM, IFRM, Nature-based Solutions/ Ecosystem-based Adaptation, Climate Change Data Analysis/Modeling, and Climate Risk Management. We also focus on the use of satellite-based products to supplement the climate and hydrological data scarcity.

Climate Resilience

Nepal is one of the most vulnerable countries to climate change and climate hazards such as floods and landslides. The findings of WCP research have pointed out that future climate is highly uncertain and the practice of using historical hydrological data to design projects is no longer valid as the future is expected to be different from the past (due to non-stationarity of climate data). Hence, the concept of "resilience" is necessary in water resources project design and planning. Resilience is defined in two parts, one is "robustness" which means our decisions are appropriate for different probable (expected) futures, and second is "flexibility" which means our design and planning should be able to adapt to an unexpected future (i.e., the "unknown unknown"). Resilience is thus the ability to reorganize in order to sustain the performance of a system in response to transformational changes due to climate and other stresses.

Current Projects

- Rainfall extremes under future climate change with implications for urban flood risk "Tomorrow's Cities – Urban Risk in Transition" supported by GCRF, UK (Apr 2021 – Mar 2024)
- "Understanding the gender, equality, social inclusion and distributional implications of the economics of climate change, the costs of adaptation, and bankable adaptation projects (ECONOGENESIS)" supported by FCDO-IDRC. (April 2023 – March 2025)

Partnership and collaboration

Our partners, collaborators and clients we have worked with include:

Government intuitions: Ministry of Energy, Water Resources and Irrigation, Water and Energy Commission Secretariat, National Planning Commission, Ministry of Forests and Environment, Department of Hydrology and Meteorology, Nepal Electricity Authority, High Powered Committee for Integrated Development of Bagmati Civilization, Provincial Governments and Local Governments.

Recent Projects

- Establishment of end-to-end flood early warning system in Koshi and West Rapti river basins in Nepal, Department of Hydrology and Meteorology, Nepal (Apr 2017 – June 2018)
- Adaptation to Climate Change in Hydroelectricity Sector in Nepal, Climate and Development Knowledge Network (CDKN) (Feb 2015 – Dec 2016)
- Disaster Risk Reduction and Climate Change Adaptation in Koshi River Basin, Nepal, CDKN, Global Change System for Analysis Research and Training (START) (July 2012 – Dec 2013)

International Partners: ADB, World Bank, WFP, UNDP, USAID, FCDO, IDRC, ICIMOD, Institute for Global Environmental Strategies (IGES), GCRF/UK, International Center for Water Hazard and Risk Management (ICHARM), Japan, Public Work Research Institute (PWRI), Japan, Climate and Development Knowledge Network (CDKN), Global Change System for Analysis Research and Training (START).

Academia, NGOs and Private Organizations: Tribhuvan University, Kathmandu University, Asian Institute of Technology, University of Massachusetts, Amherst, High Mountain Asia Team (HIMAT), NASA, University of Edinburgh, Practical Action, Global Climate Adaptation Partnership (GCAP, UK Met-Office, Paul Watkiss Associates, Danish Hydraulic Institute, International Water Management Institute, Independent Power Producers' Association of Nepal, Nepal Consultant, GEOCE Consultants, CMS, South Asia Institute of Advanced Studies, National Society for Earthquake Technology - Nepal (NSET).



Water and Climate Team:

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The Water and Climate Core Team works closely with NDRI experts on Livelihood and Food Security, Environment and Health, Economics, Gender and Disaster Risk Management to cover the multi-faceted dimensions of water and climate.

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