Toward an Inclusive Vision of Water Resources Development in Western Nepal

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Overview of USAID's Digo Jal Bikas Activity

There is an urgent need to address water resources development and management plans in western Nepal, a region that has much potential for economic development but is highly vulnerable to climate change impacts. It is also rich in natural resources, with many biodiversity hotspots and much scope for tourism. USAID's Digo Jal Bikaas Activity sought to promote sustainable water resource development in western Nepal. The activity conducted studies on water accounting in terms of the available renewable water resources in time and space, present water demands, and water-related risks. Furthermore, the activity supported the establishment of a database to house the information generated as well as the natural characteristics, accompanying ecosystem services, and all water-related physical infrastructure and modifications of the study area. This helped fill key knowledge and information gaps, and provide datasets that will be useable for a diverse array of analyses and planning purposes in the future The activity was implemented by International Water Management Institute (IWMI), along with Duke University, Kathmandu University, and the Nepal Water Conservation Foundation between 2016-2019 and covered three river basins in the Karnali and Sudurpaschim provinces of Nepal – the Karnali, Mohana, and the Mahakali.

Tools for Decision-makers and Implementers

- Hydrological models to assess temporal and spatial water balances and availability in the Mahakali, Karnali and Mohana basins.
  - The models have been used to assess water availability in the National Irrigation Master Plan developed by the Department of Water Resources and Irrigation and Government of Nepal.
  - These models will be accessible through the IWMI water data portal and can used for basin-wide and project-specific planning (http://waterdata.iwmi.org/).
- 18 Climate Future (CF) matrices developed for Western Nepal
  - Projections from 19 Regional Climate Models (RCMs) have been visualized into CF matrices for three regions (mountain, hill, terai), two global Representative Concentration Pathways (RCPs 4.5 and 8.5) and three 25-year future time frames.
  - 10 bias-corrected future climate scenario projections prepared.
  - The projected climate data and scenarios will be accessible via the IWMI water data portal (http://waterdata.iwmi.org/).
- Environmental flows calculator for western Nepal
  - This software package simulates environmental flow (EF) requirements in the Karnali-Mohana river basin at 157 locations, using both holistic as well as hydrological methods.
  - EFs can be used in environmental impact assessments and water infrastructure planning to define the quantity and timing of water flows required to sustain river biodiversity, ecosystem services and livelihoods.
  - The EF calculator can be customized to generate EF requirements at rivers outside of the study basins, too.
  - The EF values from the calculator will be incorporated in the National Irrigation Master Plan developed by the Department of Water Resources and Irrigation and Government of Nepal.
- Hydro-Economic Model (HEM) to explore multiple scenarios for basin development
  - Modeling examined the environmental, social, and economic benefits and trade-offs resulting from different pathways for water resource development.
  - HEM can be modified to simulate and analyze additional scenarios to inform local or basin level water resources development.
- Bio-physical, social-economic and livelihoods database for Western Nepal
  - Rich dataset can be utilized by for planning purposes (http://waterdata.iwmi.org/).

Key Lessons Learned

- Pilots in Mellekh, Doti and Kunebata aimed to improve dry-season irrigation through formation of collectives, rehabilitation of ponds, gender training, and provision of solar pumps and piping.
  - Beneficiaries have strengthened linkages with local institutions and increased crop productivity, as a result of high-value crop promotion and agro-vet training.
  - Challenges include social inclusion, short timeframes, and establishing local value chains.
  - Solutions need to fit the local context in bio-physical and social terms, as opposed to silver bullet solutions.
- Gender equality and social inclusion
  - Needs to be integrated into water sector policies and practices, as the professional culture currently favors technocratic "fixes."
  - River basin planning including hydropower and irrigation development requires informed and accountable decision-making with close involvement of key stakeholders across scales and sectors, including the diverse views of local communities.
- Bio-physical assessment
  - The basin's diverse agro-ecological zones (i.e., Trans-Himalayan zone, mountain, hills and Terai) have different bio-physical characteristics. Precipitation, for example, ranges from less than 500 mm in the Trans-Himalayas to over 2,000 mm in the mountain and hill regions.
  - Similarly, net water yield ranges from less than 400 mm in the Trans- Himalayas to more than 1,000mm in the mountains and hills.
- Preparing for the Future Climate
  - Use of location and application-specific climate projections in any climate change planning is necessary as projections vary spatially across Western Nepal and local values are higher than projections for South Asia.
  - Average temperatures and rainfall variability will both increase with climate change.
  - Prolonged monsoon rains, and sporadic rain events in the drier months are projected. These changes and associated uncertainty should be incorporated into strategies and future plans for disaster risk reduction, infrastructure development, and livelihood improvement.
  - Current dependency of agriculture on rainfall should be reduced given the projections for increased variability and uncertainty in rainfall. Interventions should emphasize integrated measures to increase natural and artificial recharge and storage of water.

- Trade-offs and synergies to explore multiple scenarios for basin development through HEM
    - The trade-off between hydropower and irrigation is limited, because storage improves year-round water availability for agricultural production.
    - Large-scale plants generate more power and revenue than small ones designed for domestic demand and rural electrification, but there is a tradeoff between exporting energy to India versus using water for irrigation in the Terai.
    - Environmental trade-offs need to be assessed in detail for specific projects.
    - A better understanding of trade-offs will contribute to more transparent development dialogues across sectors and regions. The HEM can be modified to simulate and analyze additional scenarios to inform local or basin level water resources development and planning.
- Environmental flows (EF) assessment
    - There is an urgent need to incorporate EFs in the development and management of hydropower and irrigation infrastructure to sustain river biodiversity, ecosystem services and livelihoods.
    - The EF requirement should mimic the natural flow of the river, including both high and low flows.
    - The Environmental flows calculator for Western Nepal, developed in the project, can be applied to generate EF values for any river stretch.

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