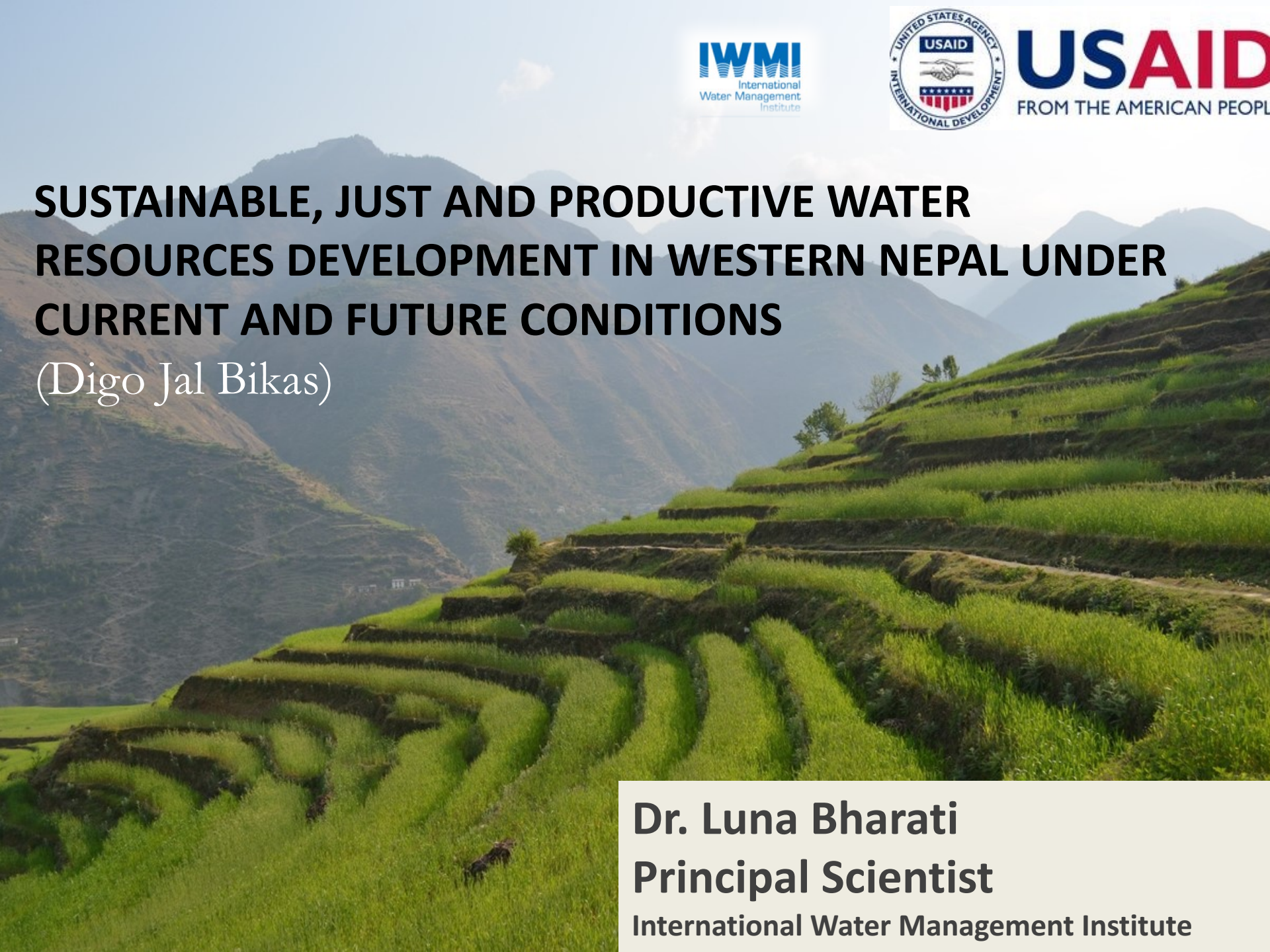


SUSTAINABLE, JUST AND PRODUCTIVE WATER RESOURCES DEVELOPMENT IN WESTERN NEPAL UNDER CURRENT AND FUTURE CONDITIONS

(Digo Jal Bikas)

Dr. Luna Bharati
Principal Scientist
International Water Management Institute

Nepal: The Water Context

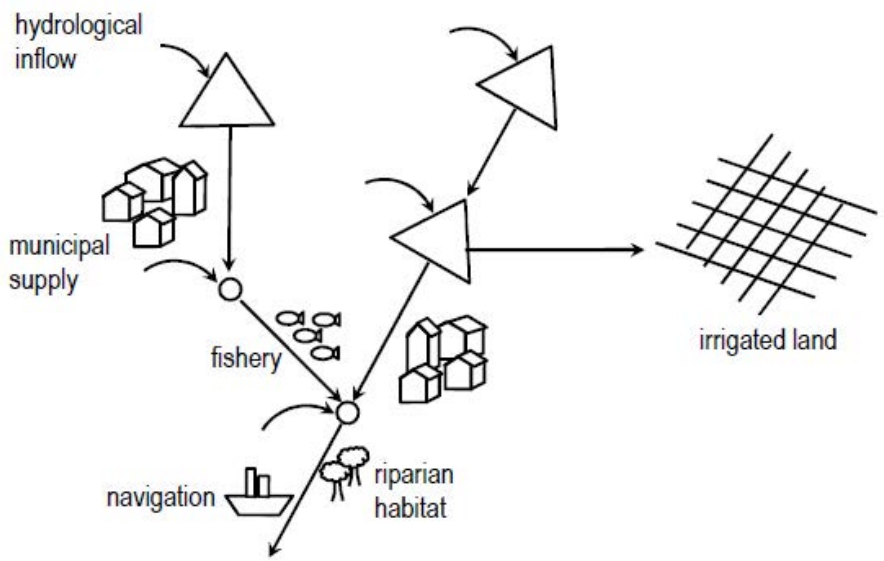
- Water resources remain a particularly under-developed sector
  - < 7% of total available WR are managed for economic & social purposes (WECS, 2005)
  - ~1.6% of economically feasible hydropower potential has been harnessed (WECS, 2010)
  - Only 24% of arable land is irrigated
  - Vast GW resources in Terai have not been developed for agriculture
  - Crop productivity is significantly lower than rest of South Asia (Bartett et al., 2010)

- The general perception is that if this resource is properly harnessed, it would be the **ticket out of poverty** through economic growth mainly in the hydropower and agriculture sectors.

Water resource planning

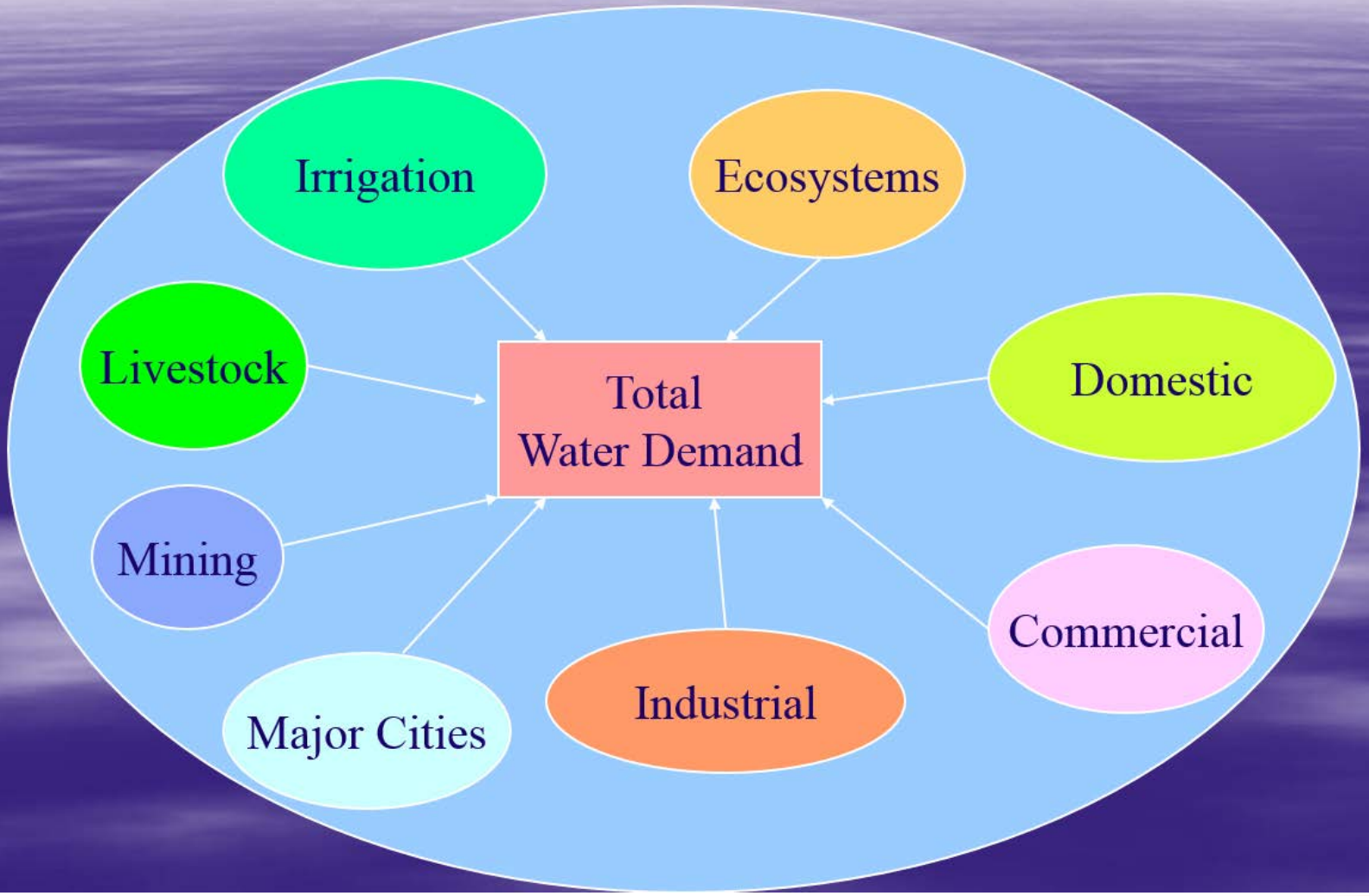
- Should ideally meet demands and achieve many societal objectives (‘**balanced**’) under a wide range of plausible futures (‘**robust**’)

- Main Challenge:
  - Reach a shared vision on how to develop a basin/ country
  - Identify robust, balanced plans?



Source: Harou, 2014

Sectoral Water Demands



About DJB Project

Basins:

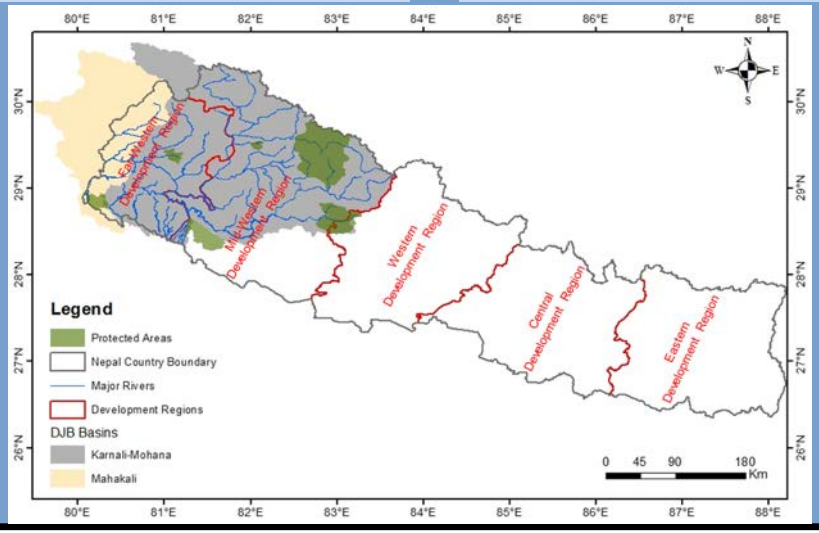
- Karnali-Mohana
- Mahakali

Funding:

USAID FROM THE AMERICAN PEOPLE

Implementation

- IWMI (Lead)
- Duke University, KU, NWCF (Collaborators)



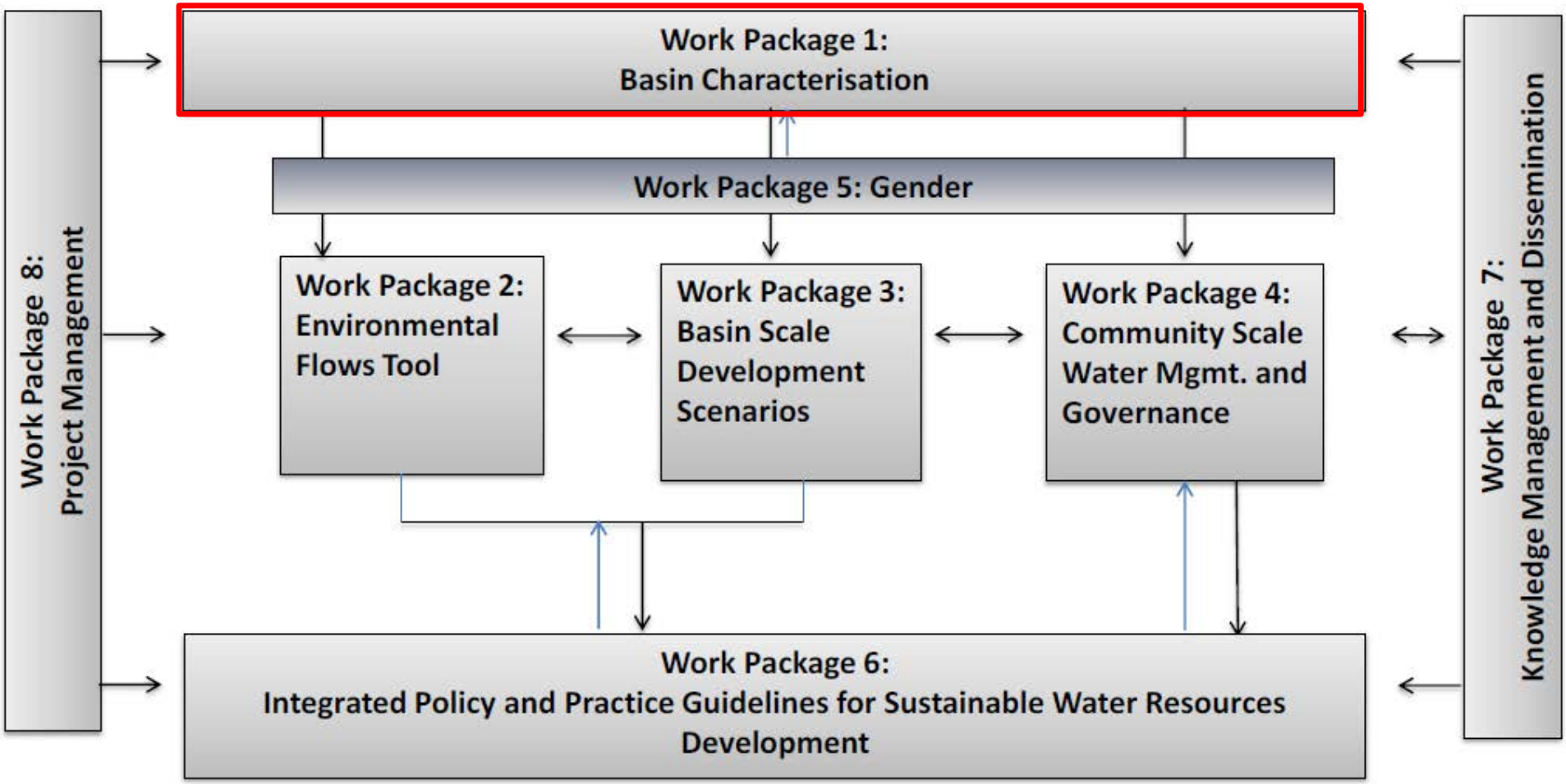
Digo Jal Bikas

Goal:

- Promote sustainable WRD in Western Nepal
  - Achieved through **balancing** of
    - Economic growth
    - Social Justice
    - Healthy & Resilient ecosystems

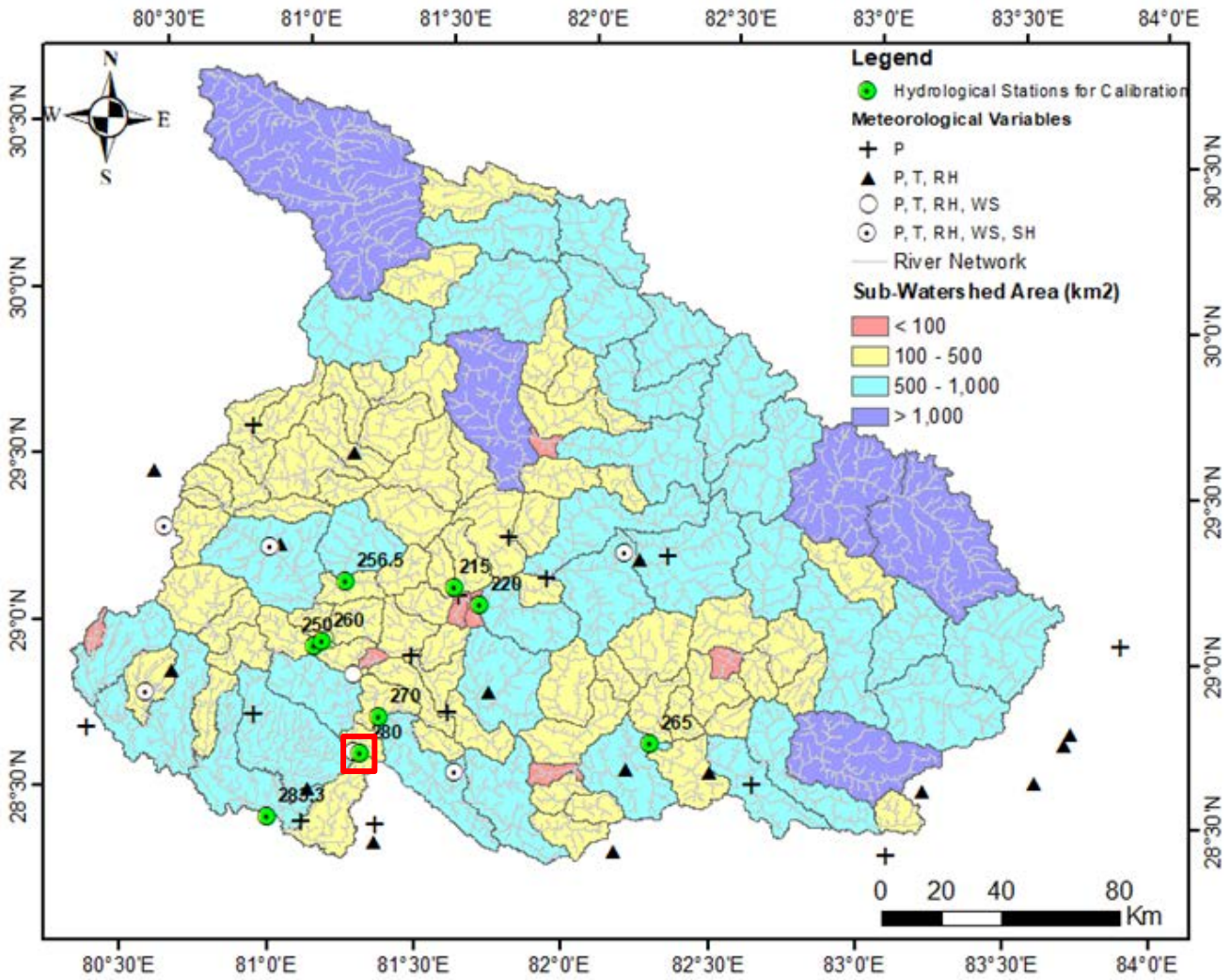
Objectives:

- Construction of Sound Knowledgebase
- Development & Application of Tools, Models & Approaches
- Support the development of Integrated Policy & Management Guidelines


Work Package 1:
Basin Characterisation
Work Package 5: Gender
Work Package 2:
Environmental
Flows Tool
Work Package 3:
Basin Scale
Development
Scenarios
Work Package 4:
Community Scale
Water Mgmt. and
Governance
Work Package 8:
Project Management
Work Package 7:
Knowledge Management and Dissemination
Work Package 6:
Integrated Policy and Practice Guidelines for Sustainable Water Resources
Development

WP1 Basin Characterization: Hydrological Modeling for Inflows

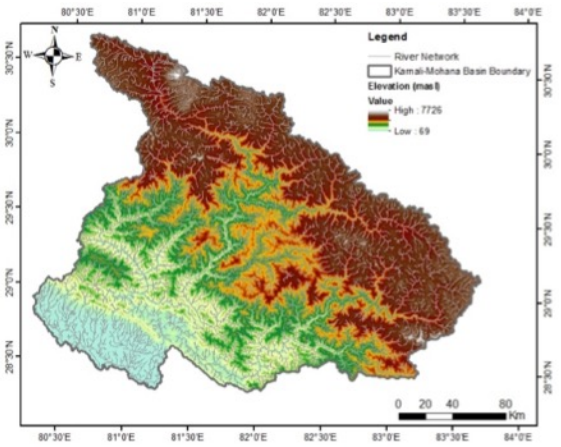
- SWAT model set-up for **water availability** assessment



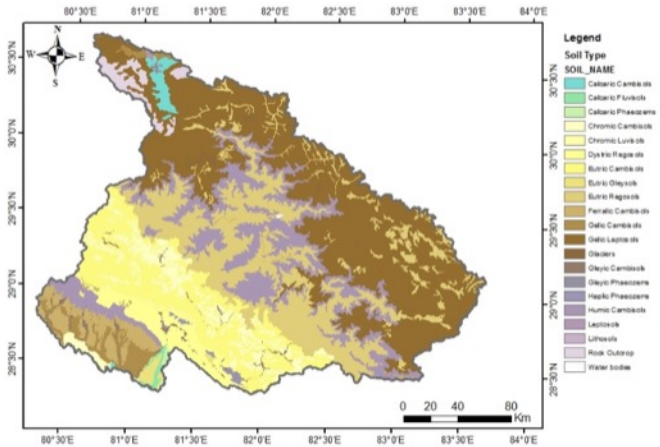
- 111 sub-basins
- 36 precipitation stations
- 22 Temperature & Humidity stations
- 5 stations for sunshine hours
- 7 stations for wind speed
- 24 hydrological stations (9 selected)
- Model calibration: improving

Example of Karnali-Mohana Basin

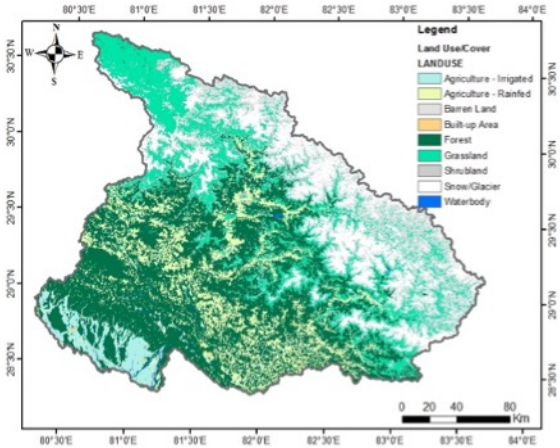
WP1 Basin Characterization



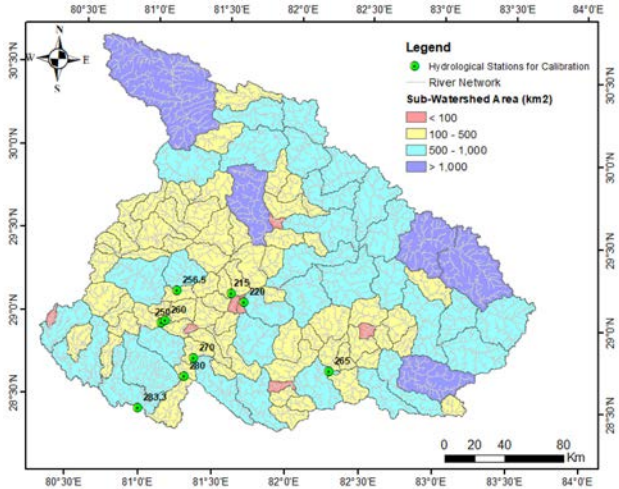
Topography: 69-7726 masl



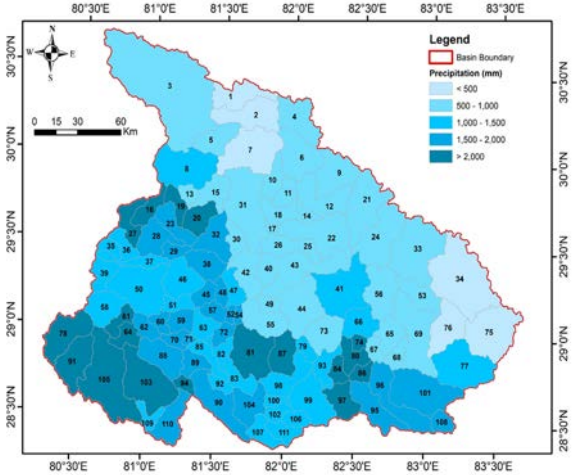
Soil: 21 types (SOTER)



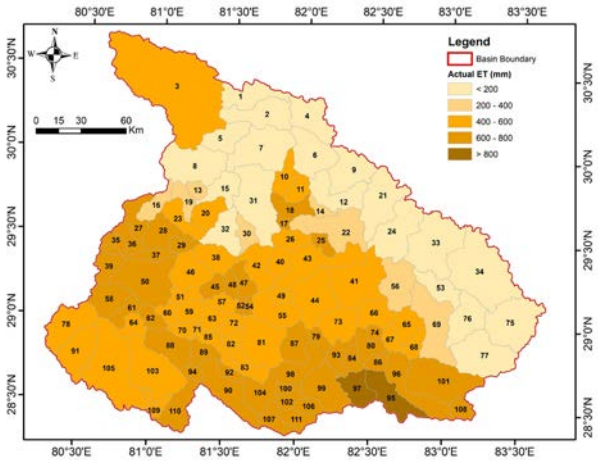
Land Cover



111 sub-basins; 9 Q-stations for calibration



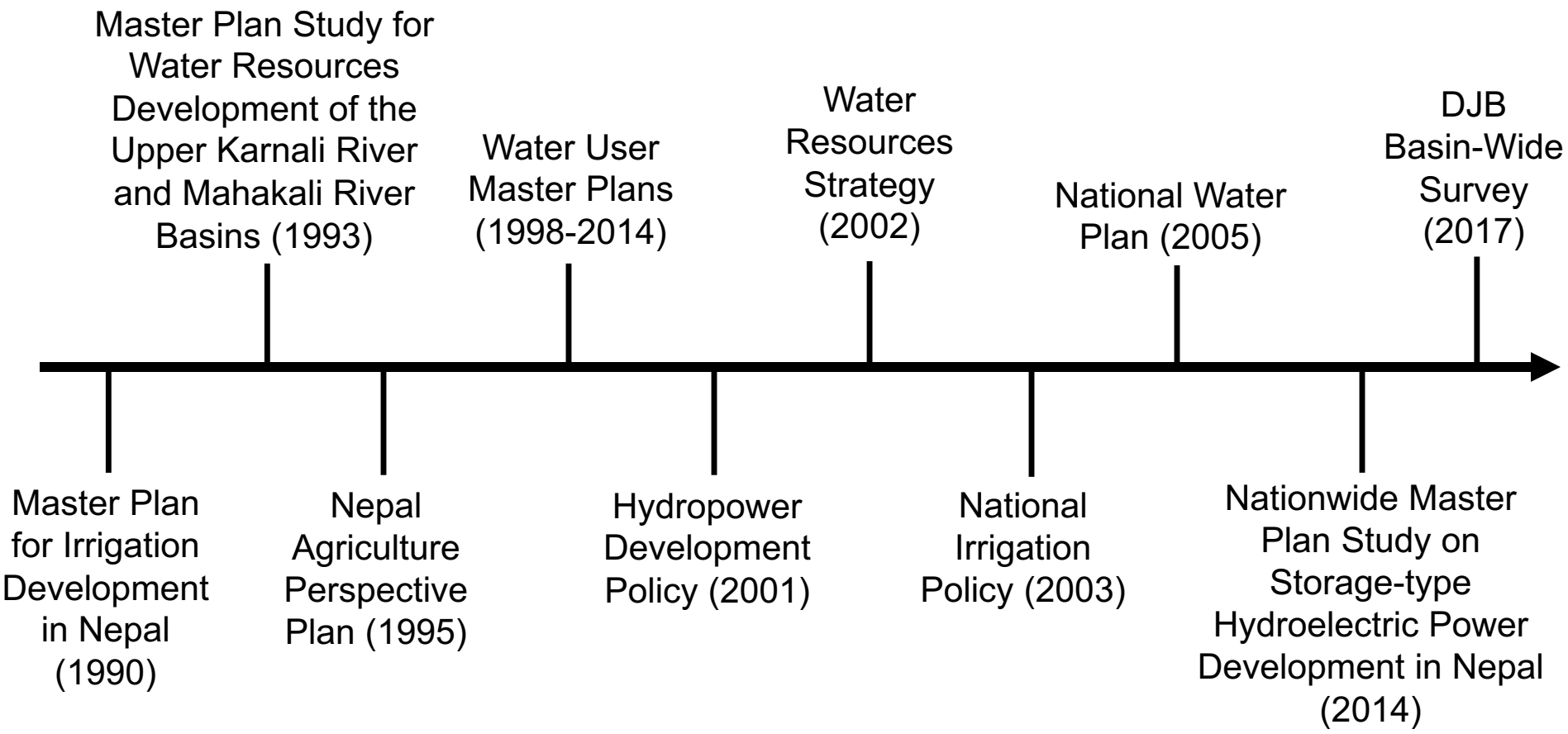
Precipitation 365 to 2,585 mm



Actual Evapotranspiration

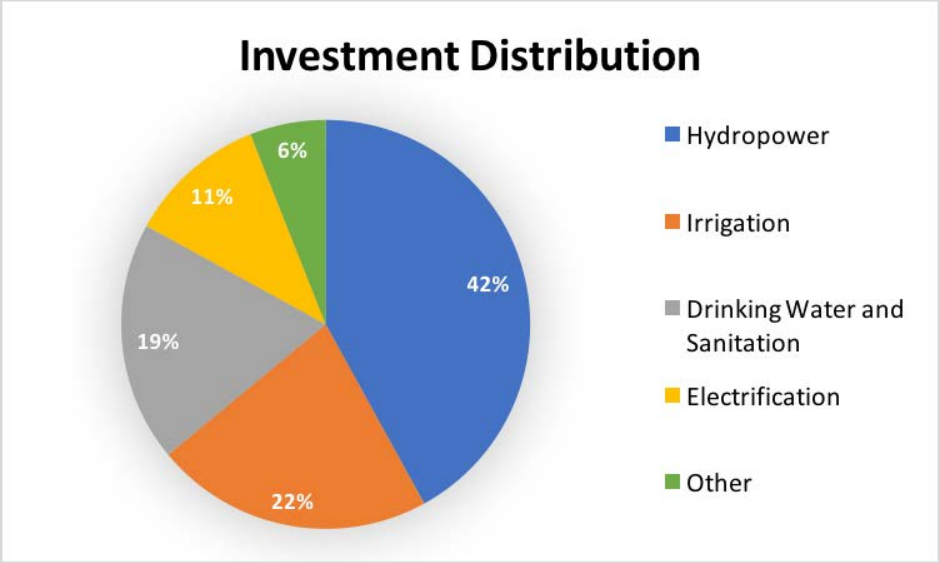
Example of Karnali-Mohana Basin

WP1 Basin Characterization: Decision-making structure, policies & process



Future Basin Development: National Water Plan 2005

- Focus on multi-sector, multi-participant approach to water resource management
- Objectives:
  - Poverty reduction
  - Drinking water access
  - Increased agricultural productivity
  - Energy generation for domestic use
  - Energy generation for export
  - Preparation for water-induced disasters
  - Sustainable use of natural resources
  - Community participation



WP2: Desktop Environmental Flow Calculator for Western Nepal

Develop a desktop tool to calculate environmental flows in Western Nepal incorporating both hydrological and ecological criteria

Use the IWMI Environmental Flow Calculation method – currently based only on hydrology

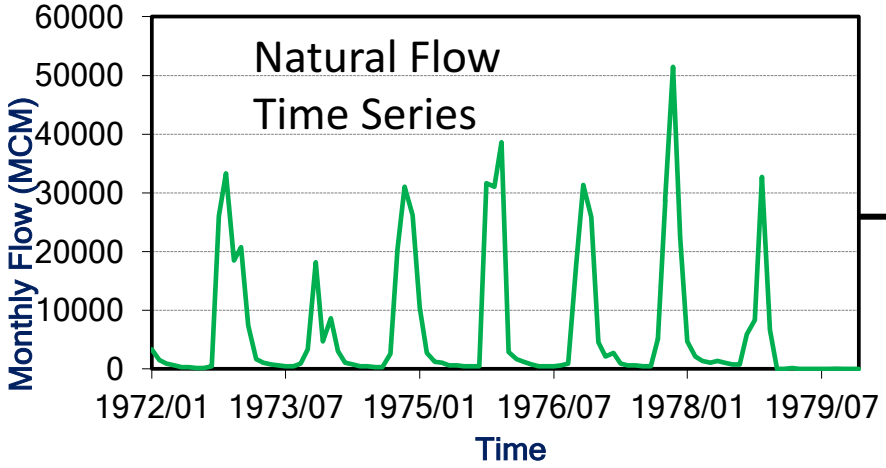
Incorporate ecological criteria into the estimation process

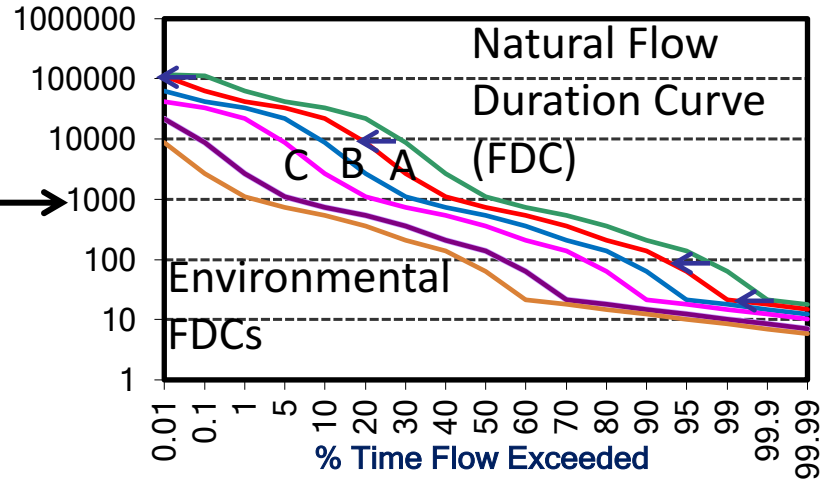
Environmental Management Classes

A	Minor modifications	Protected rivers
B	Slightly modified	Water supply/irrigation development allowed
C	Habitat, biota disturbed, but basic functions intact	Dams, diversions, reduced water quality
D	Large changes in habitat, biota and basic functions	Significant, clearly visible disturbances by regulation
E	Habitat diversity declined. Only tolerant species exist	High population density and extensive development
F	Total loss of natural habitat and biota	Unacceptable status

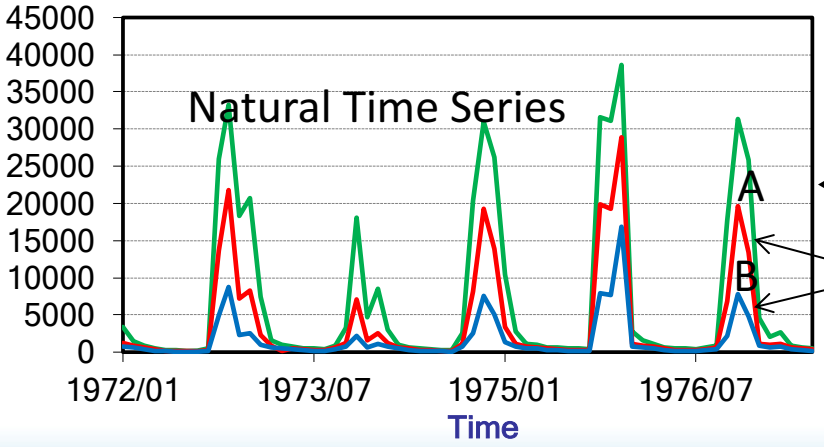
ESTIMATION METHOD

Developed by Smakhtin and Anputhas (2006)



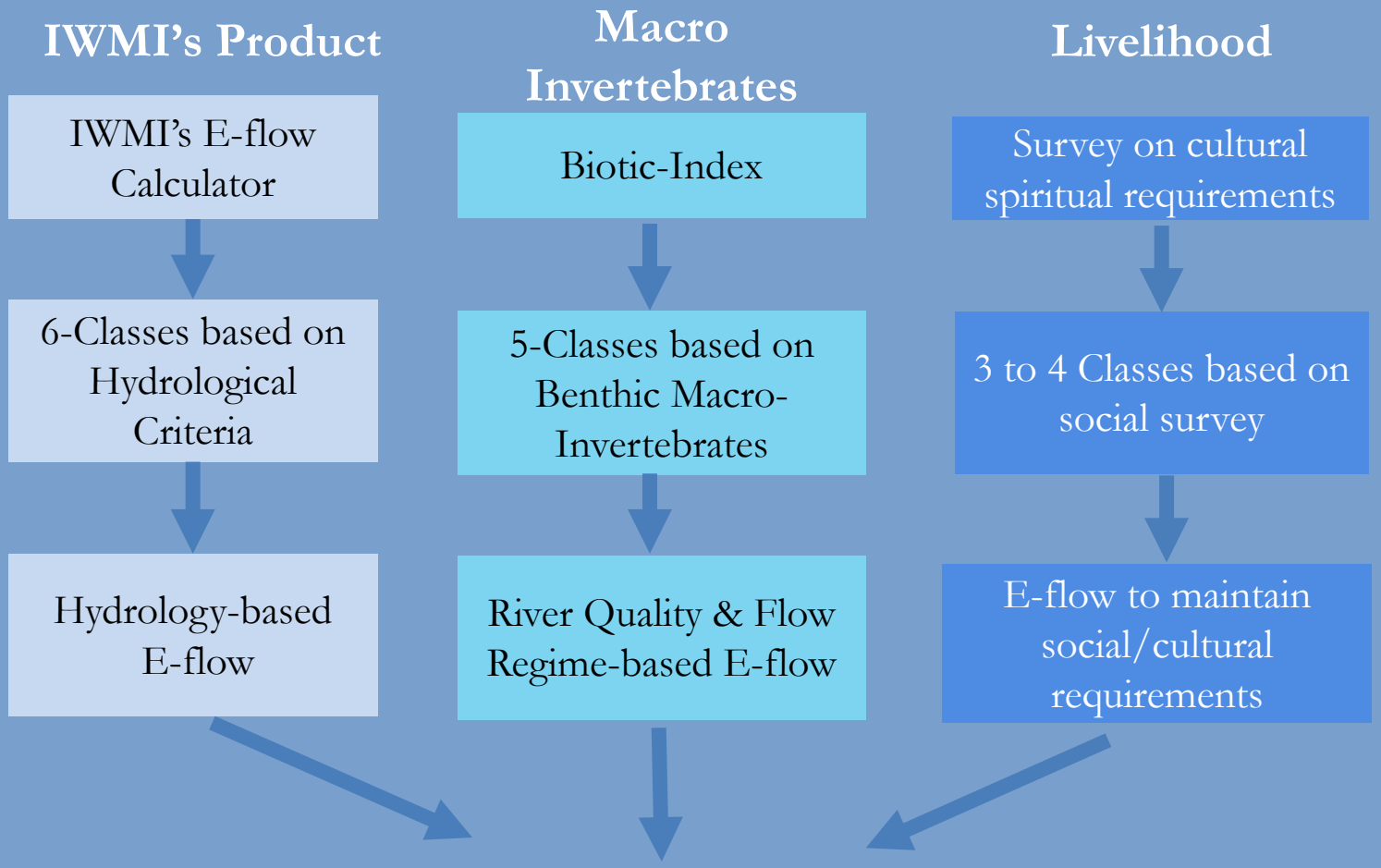


Spatial Interpolation (Hughes and Smakhtin 1996)



Environmental Flow Time Series

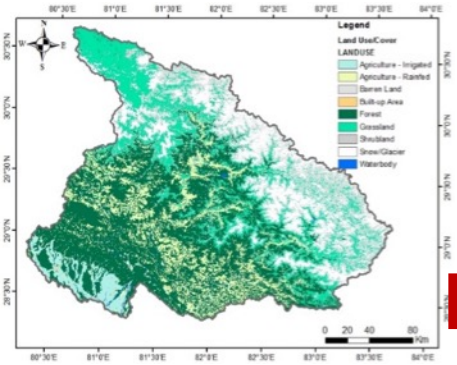
WP2: Consideration for E-Flow

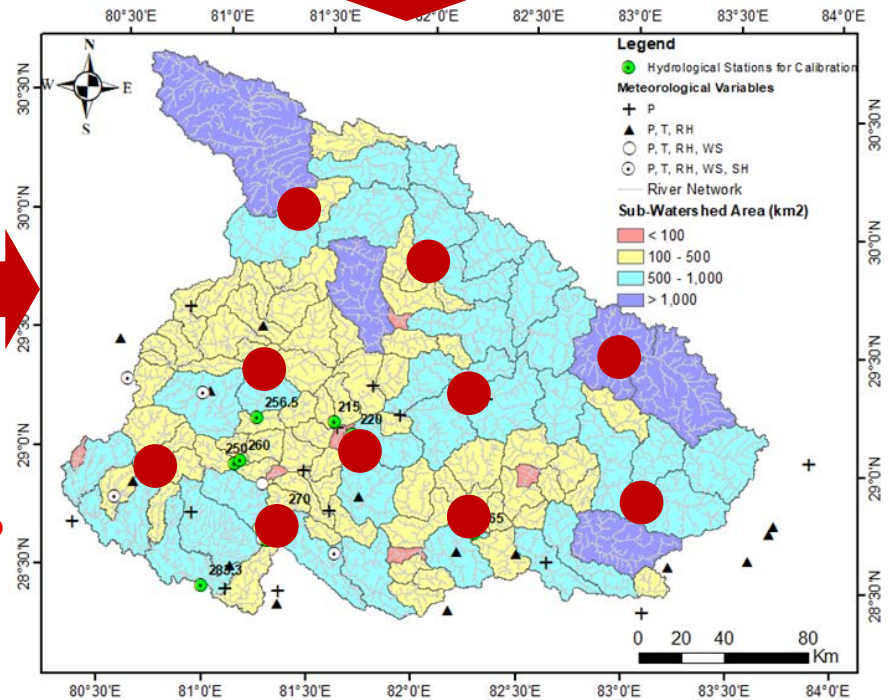


WP 3:Basin Development pathways- Hydro-economic modelling

Impact of Water Infrastructures

- **Hydropower Projects?**
- **Irrigation Projects?**





IMPACT OF Management Practices (POLICIES) ?

Impact of Climate Change

- **Rainfall Change?**
- **Temperature Change?**

Inflow at SELECTED points as input for HE model

Visions of Development in Western Nepal

- Development pathways in Western Nepal include **infrastructure-led development**, **small-scale/locally managed development**, and **environmentally sustainable development**
- Stakeholders cite agriculture/irrigation, municipal water access, energy production, and transportation as crucial for development in Western Nepal
- Visions vary at National and district levels
- Trade-offs in water resource use demand further analysis

Table 1: Sectoral Importance for Development

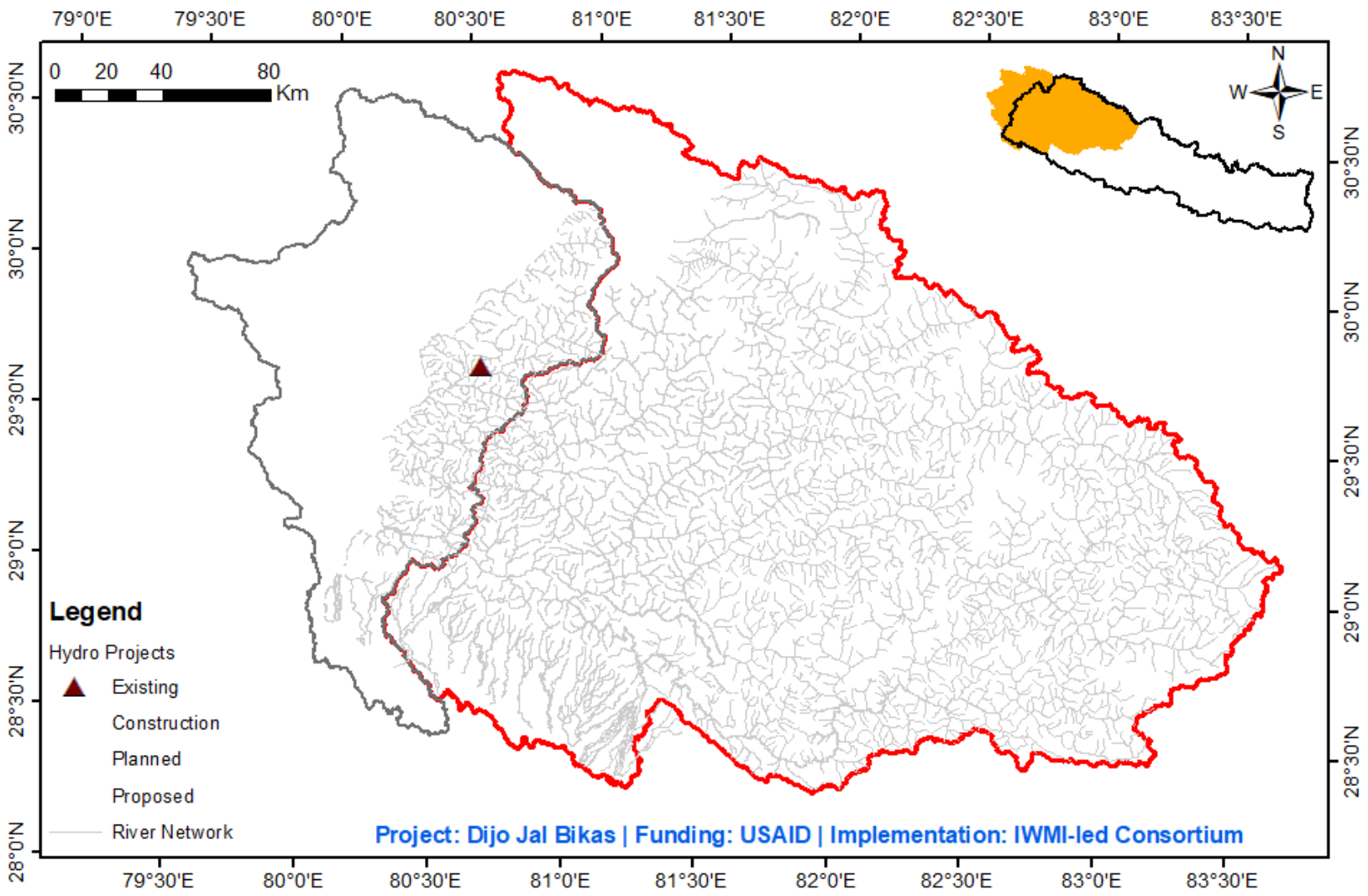
Sector	National	Local	Total
Agriculture/Irrigation	4.3	4.5	4.4
Drinking Water	4.3	4.7	4.4
Energy	4.4	4.3	4.4
Environment	4.0	4.0	4.0
Fisheries	3.1	2.9	3.0
Forestry	3.7	3.6	3.6
Health	4.4	4.4	4.3
Hydropower	4.0	4.4	4.2
Municipal	3.8	4.2	3.9
Tourism	3.8	4.2	4.0
Transportation	4.4	4.6	4.4
Watershed	4.1	4.1	4.1
Observations	23	16	40

Source: Authors' calculations from preference ranking survey among stakeholders at August 1, 2017 Trade-off Arena Workshop in Kathmandu, Nepal.

Potential Trade-Offs and Tensions

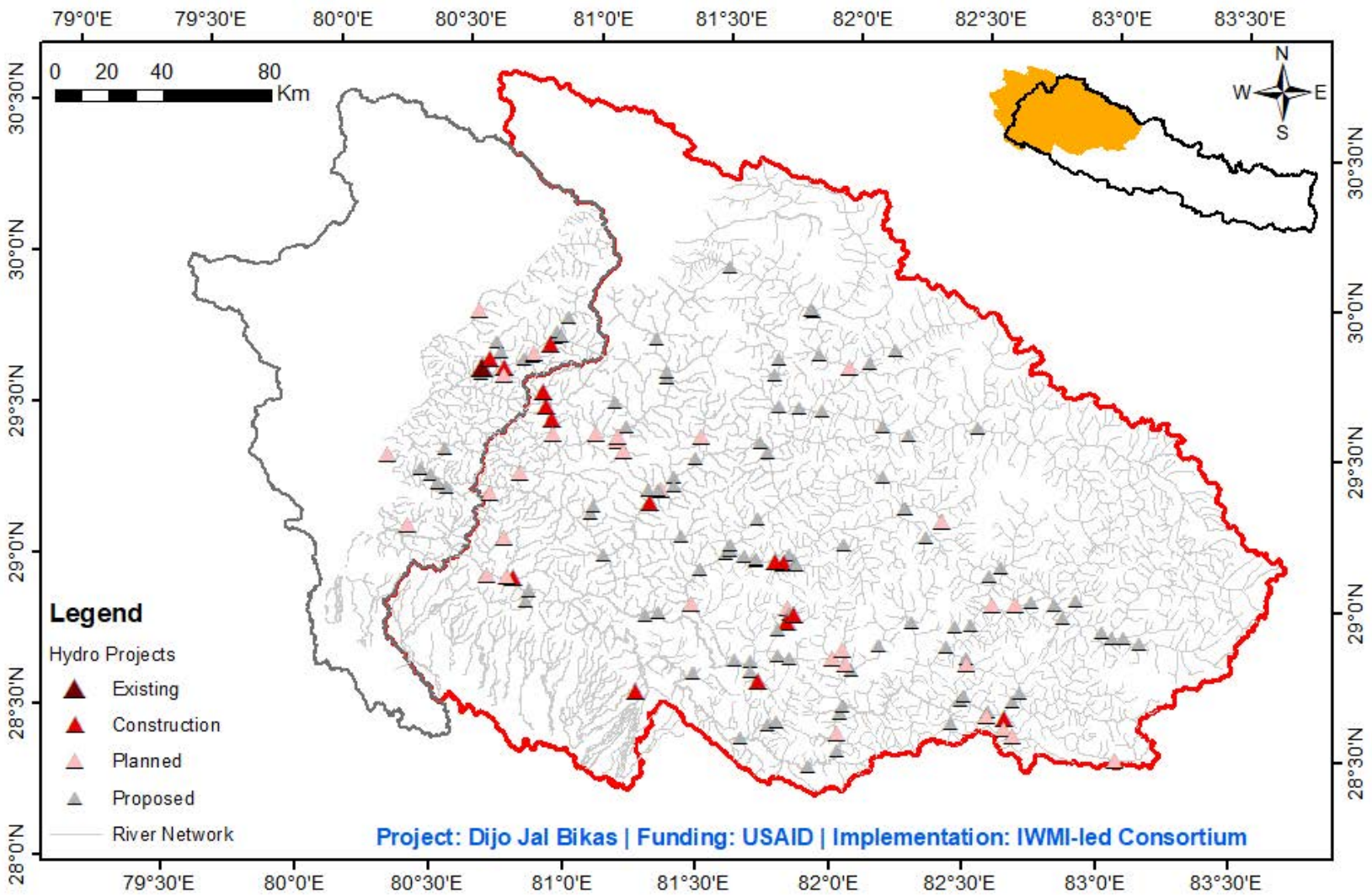
- Land Use
  - Storage hydropower vs. agriculture, homes, forested area, roads/infrastructure, areas of cultural significance
- Water Use
  - Upstream vs. downstream water demands
- Energy Generation
  - Large-scale/storage plants for export vs. small plants for domestic demand and rural electrification
- Institutional
  - Financing demands of different projects
  - Central vs. local management and project scale
- Environmental
  - Environmental conservation vs. natural resource use
  - Environment schemes vs. storage reservoirs to reduce disasters

Existing Hydropower Projects



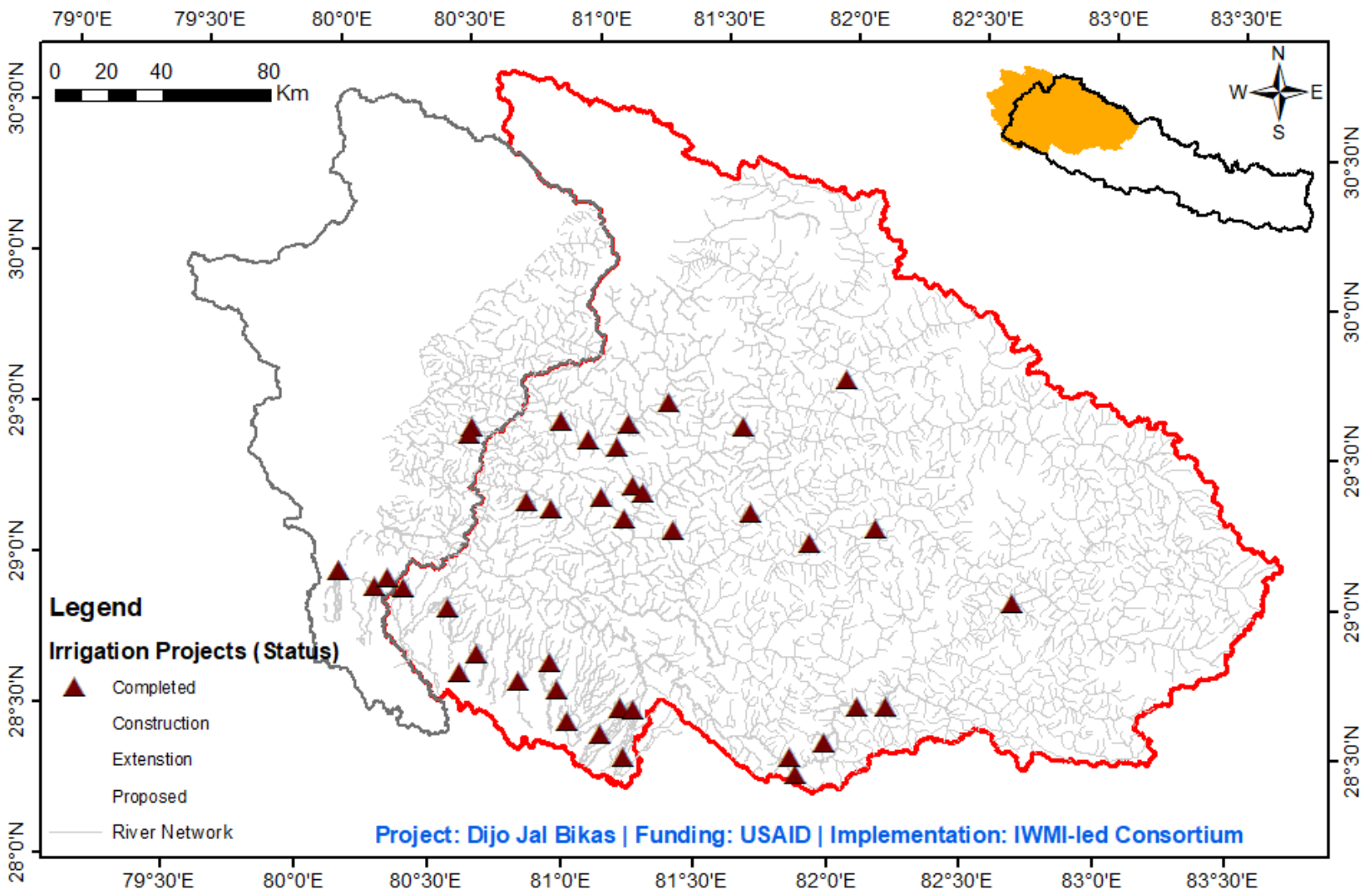
- Existing: 8.5 MW (Naugadh Khola)

Proposed Hydropower Projects



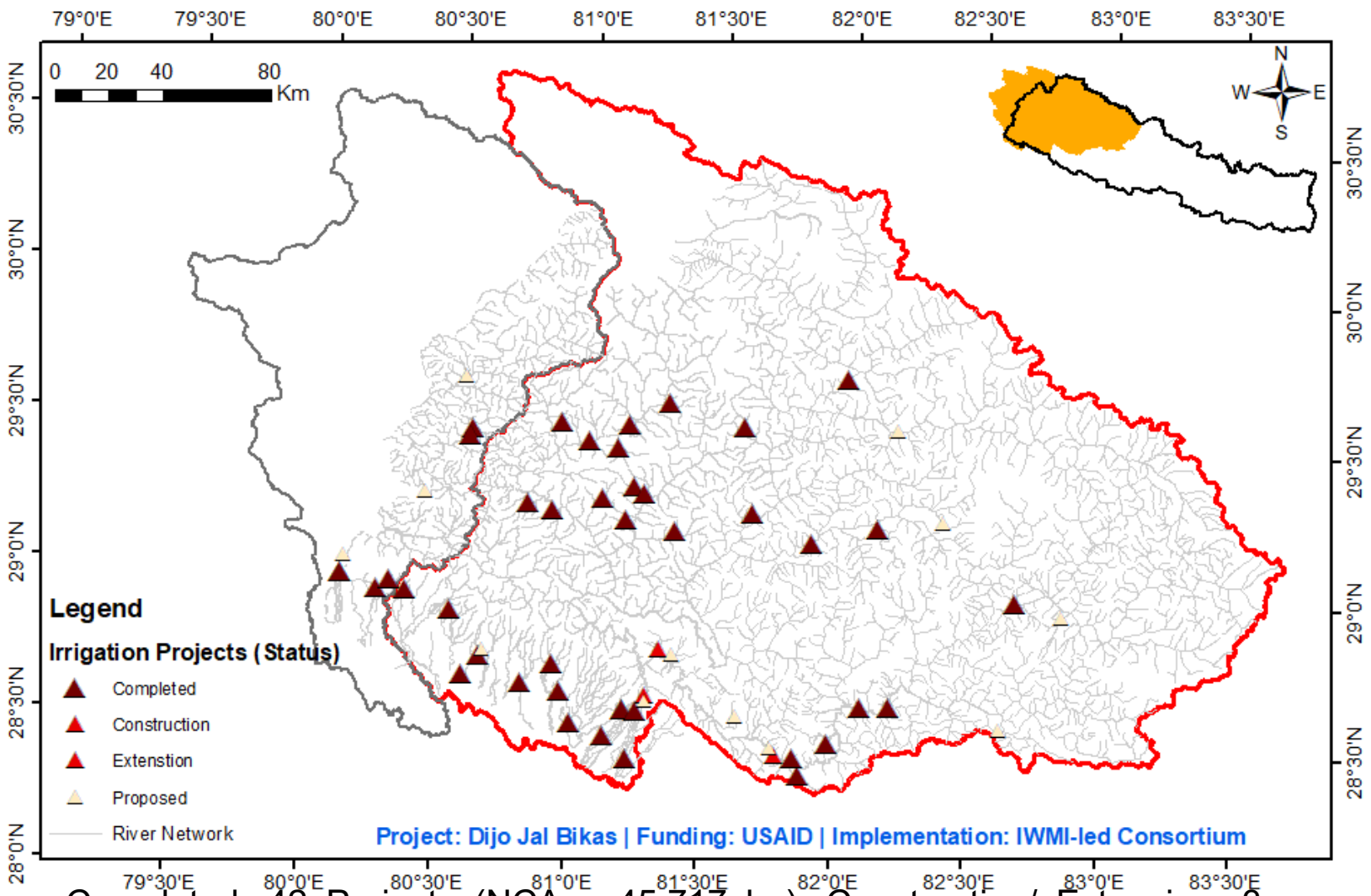
- Existing: 8.5 MW (Naugadh Khola); Construction: 183.7 MW (15 projects); Planned: 9691.8 MW (32 projects); Proposed: 11,122.8 (102 projects)

Existing Irrigation Projects

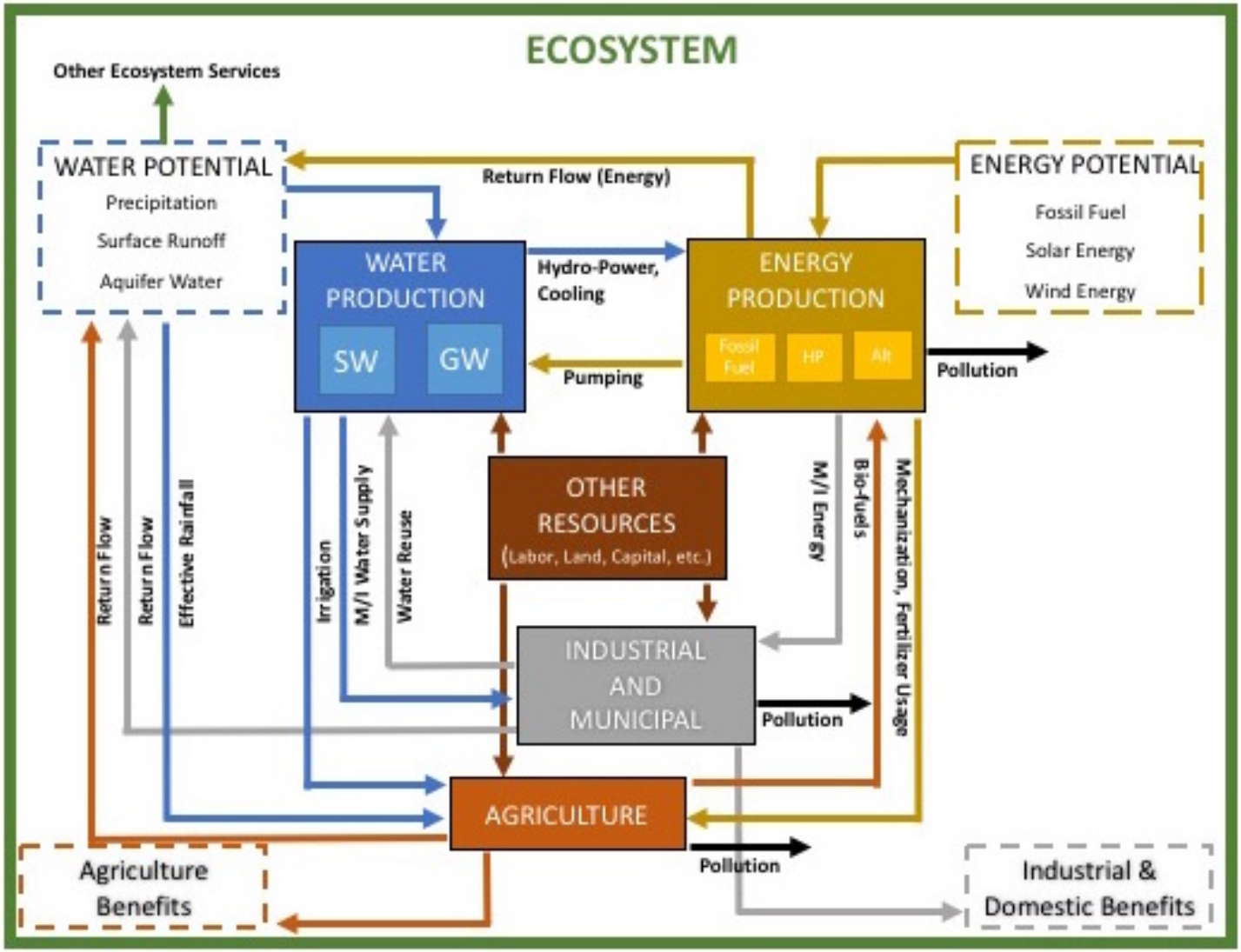


- Completed: 42 projects (NCA = 45,717 ha)

Proposed Irrigation Projects

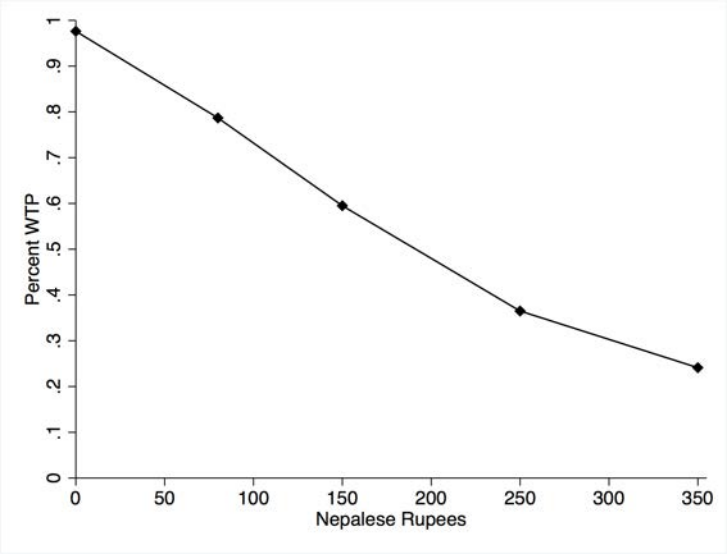


- Completed: 42 Projects (NCA = 45,717 ha); Construction/ Extension: 3 projects (NCA = 71,700 ha); Proposed: 12 projects (NCA = 138,583 ha)


ECOSYSTEM
Other Ecosystem Services
WATER POTENTIAL
Precipitation
Surface Runoff
Aquifer Water
Return Flow (Energy)
ENERGY POTENTIAL
Fossil Fuel
Solar Energy
Wind Energy
WATER PRODUCTION
SW
GW
Hydro-Power, Cooling
Pumping
ENERGY PRODUCTION
Fossil Fuel
HP
AR
Pollution
OTHER RESOURCES
(Labor, Land, Capital, etc.)
Return Flow
Return Flow
Effective Rainfall
Irrigation
M/I Water Supply
Water Reuse
M/I Energy
Bio-fuels
Mechanization, Fertilizer Usage
INDUSTRIAL AND MUNICIPAL
Pollution
AGRICULTURE
Pollution
Agriculture Benefits
Industrial & Domestic Benefits

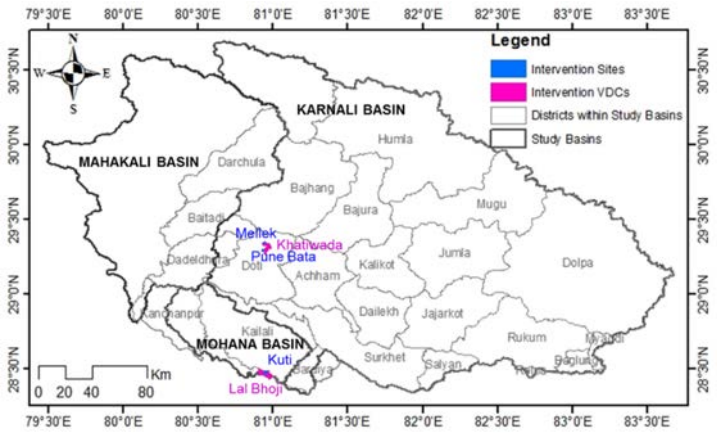
Environmental Quality Valuation

- Used contingent valuation to elicit environmental quality valuation from 3,660 households in Western Nepal
  - Monthly WTP for land conservation program in/around village
- Households rely on water and forest resources to supplement agricultural livelihoods
- Estimate average WTP at 202 Nrs (US $1.96)
- Higher educated, higher income households state higher WTP
- Households with migrant members, interactions with local NGOs state lower WTP



WP4 – Water Mgmt. & Governance @ Community

- Three villages identified as pilot intervention villages: Mellekh and Punebata villages of **Doti district**, and Kuti village of **Kailali district**, a total of 644 households
- Considered a total of 17 indicators covering three criteria to select the pilot sites: biophysical (5 indicators); socio-economic (6 indicators); and logistical (6 criteria)



Overview

- About 12.1% households were landless, the highest proportion of landless was in Kuti village
- Average landholding was 0.47 ha,– Average cultivable land was 0.44 ha
- Tenancy was common in all sites, 15.2% of households rented land for cultivation whereas 14.8% households rented out land to others
- Source of irrigation in hill/mountains are stream/springs and gw in terai
- 88.7% had access to irrigation sources but limited to monsoon/early winter

Pilot Interventions (technical Intervention)

- Sunflower pump with tubewell installation, Pond rehabilitation, on farm water management solution, improved seed distribution
- Comparative research study on a plot with similar inputs and crop with different irrigation techniques and energy sources
- Data collection on rainfall, evapotranspiration, temperature and humidity


Pilot Interventions (Social and Institutional)

Collective Farming Approach

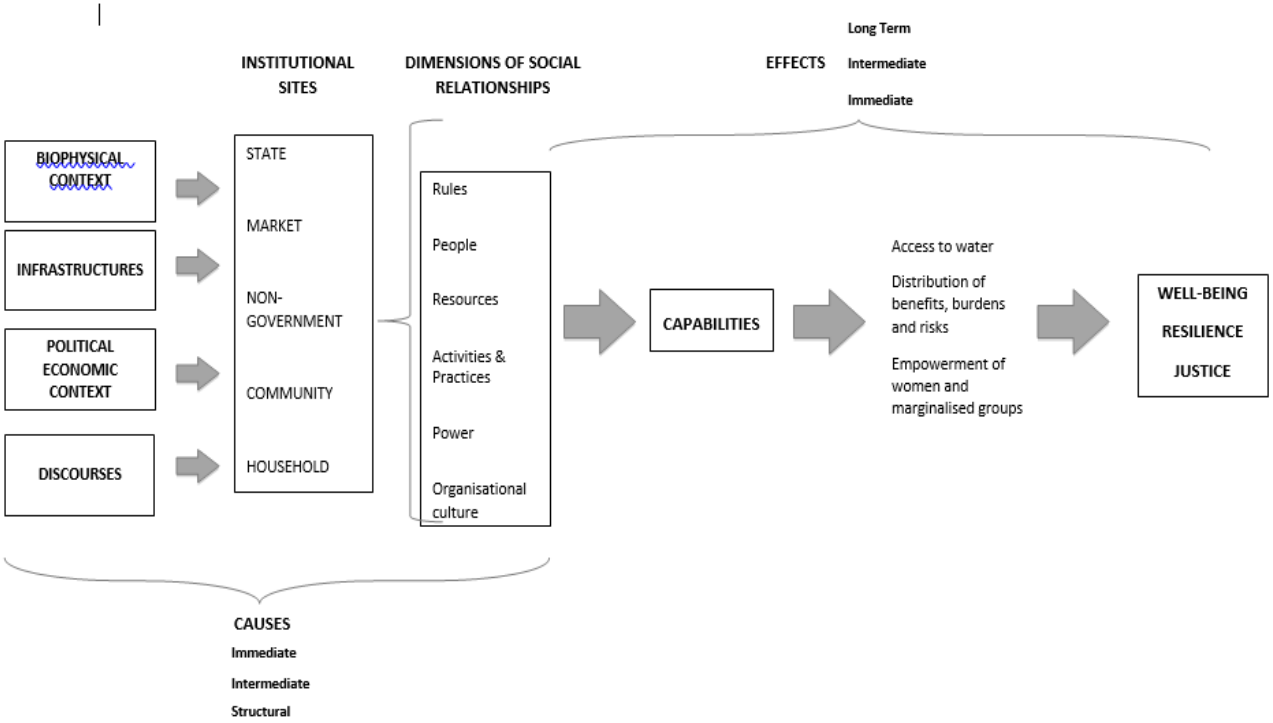
- Farmers' group comprised of 10-20 households.
- Rent land as a group or share input in their own land.
- Resources and costs are shared to reduce the burden on individual households and increase their bargaining power

WP 5-An analytical framework to analyse and integrate gender across scales in the water sector

DIGO JAL BIKAS
GENDER ANALYTICAL FRAMEWORK

Floriane Clement and Gitta Shrestha

Figure 2. Analytical framework for gender analysis in Digo Jal Bikas



Policy Brief: Gender in Water Policies and Institutions in Nepal

Gender in Water Policies and Institutions in Nepal

Policy Recommendations on Gender for Nepal's Water Sector

Context

The consideration of gender in water policies and programmes in the Global South has been largely limited to attention given to women's roles and responsibilities in water management at the farm and household level. In Nepal, gender mainstreaming in water policies has focused on promoting the participation of women in formal water user associations (WUA) in both water supply and irrigation sectors through quotas for women's membership in these organisations. However, most stakeholders, including national government agencies, recognise the limited outcomes of policy provisions in supporting gender equality and women's empowerment. Overall quotas have not been met, at least in the irrigation sector. But, more importantly, even when women are members of these associations, several studies have documented that an insufficient amount of resources, legitimacy, and authority to influence decisions on water delivery and management leave women with a limited change in their own roles and responsibilities in practice.

Government agencies point to gender norms prevailing in rural Nepal as the main factor in creating the gap between policy intentions and practices.

But, many scholars emphasize the need to understand how organisations and institutions that design and implement water policies and programmes are themselves gendered. Bringing about transformative change for greater gender equality at the local level requires addressing gender inequalities and masculine professional culture within public organisations that drive policy-making and implementation. Critically reflecting on gender in organisations is particularly pertinent in the water sector, which has continued to be dominated by a technocratic and male-dominated organisational and professional culture (Zwarteveen, 2008).

Women's quotas in water user groups is not sufficient for enhancing gender equality in water supply in Nepal and in South Asia in general (Pradhan, 2015, Mandara et al., 2017). Women's quotas in water projects and activities have brought about limited success in ensuring meaningful participation and influence in decision-making related to water management. As a result, women's participation does not provide the opportunity to voice their opinions, aspirations and concerns.

Methodology

The team conducting the research in this brief consists of a female western senior researcher and a female Nepali senior scientific officer. The team first conducted a review of all relevant policies in the water sector. Primary data was collected through semi-structured interviews conducted in Kathmandu with staff from government agencies, international and national non-governmental organisations (NGOs), civil society organisations, and experts. Altogether, 21 interviews with men and women were conducted in February and March 2017. In addition, we included one NGO working on gender equality and natural resources in Nepal. Respondents represented a mix of engineers and sociologists in government agencies and GESI experts working in INGOs. The findings presented in

A woman in the Terai of Far Western Nepal holds a basket for harvesting.

IWMI International Water Management Institute USAID FROM THE AMERICAN PEOPLE

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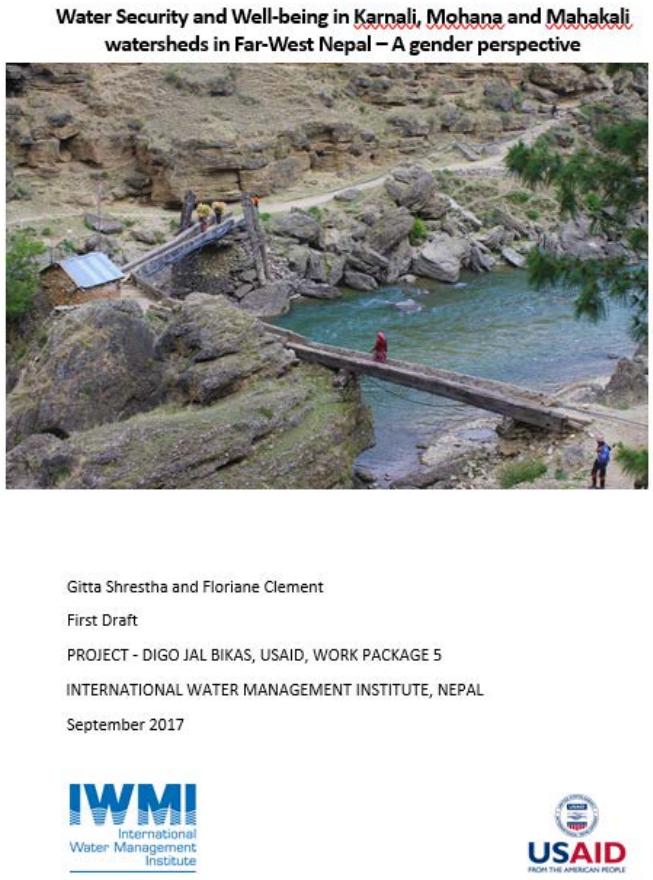
Findings:

- Current policies lack effective operational processes and mechanisms
- Policies in the water sector have reduced gender mainstreaming to fixing quotas for women's participation in water user associations
- There is also an overall lack of recognition of how gender inequality is embedded in broader social injustices in water access and decision-making as it relates to class, caste, and ethnicity.

Water Security and Well-being in Far-West Nepal: A gender perspective



Findings

- Gendered social capital weakens women's capabilities to participate effectively in local water resource governance, limits their access to water, impacts their well-being negatively and reinforce/reproduce gender and social inequalities within communities.

- This study further identifies that for effective and just management of water resources, women's social capital and capabilities must increase

Gender inclusive water dialogues

First ever town hall meeting on gender and irrigation at the local level

The first water event (trade-off workshop), where visibility of women were increased

Acknowledgements: *This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under* ***Digo Jal Bikas (DJB)*** *project.*

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THANK YOU!