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

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IWMI International Water Management Institute

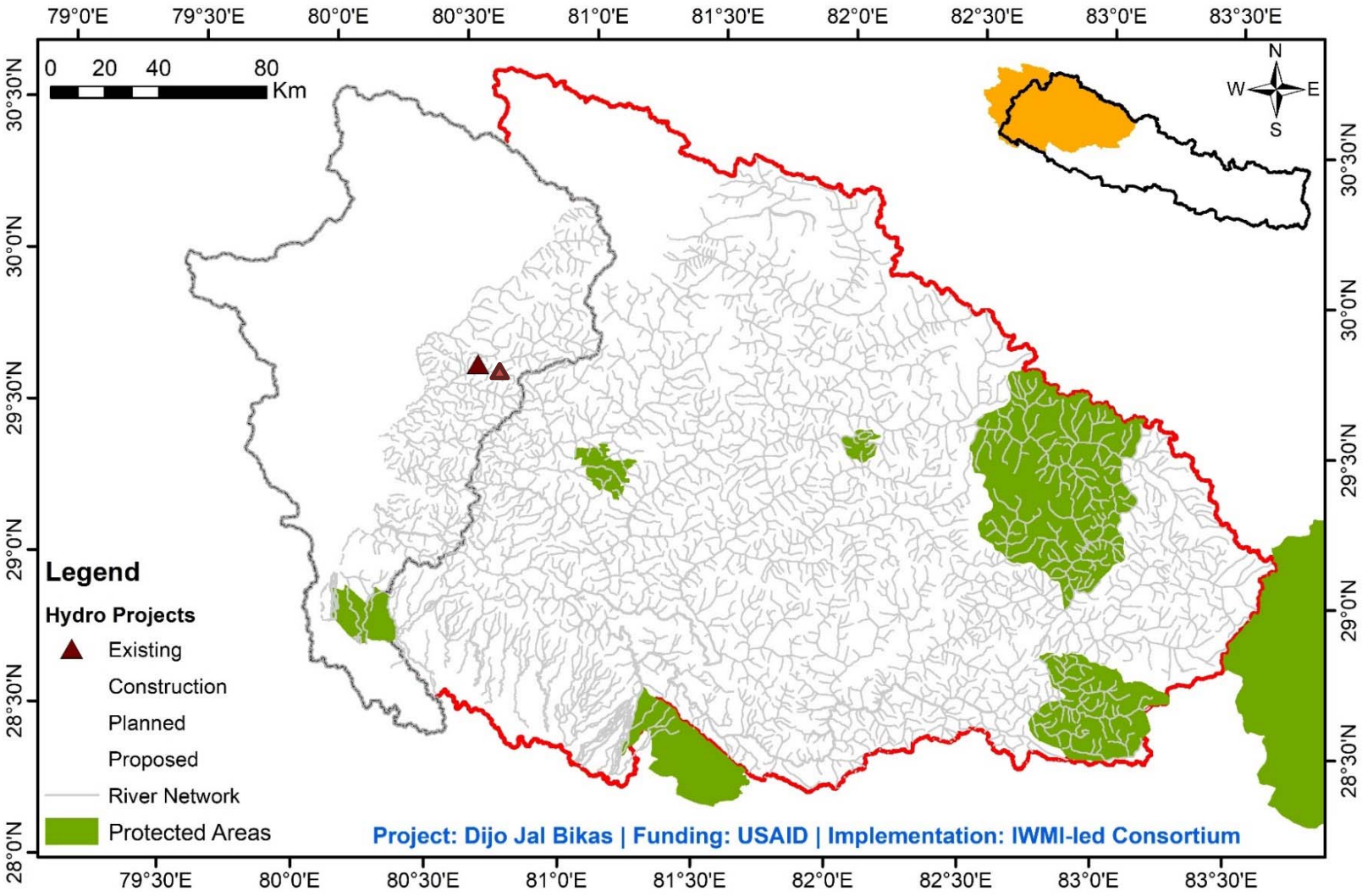
Duke UNIVERSITY

Nepal: The Water Context

- Water resources (WR) remain under-developed
  - Less than 7% of available WR are managed for socio-economic purposes (WECS, 2010)
  - 2.5 % of economically feasible hydropower potential (42000 MW) harnessed (NEA, 2018)
  - 30% of arable land is irrigated (CBS, 2012)
  - 22% of groundwater utilized in Terai (Shrestha et al., 2018)
  - Crop productivity is significantly lower than rest of South Asia (Bartett et al., 2010)

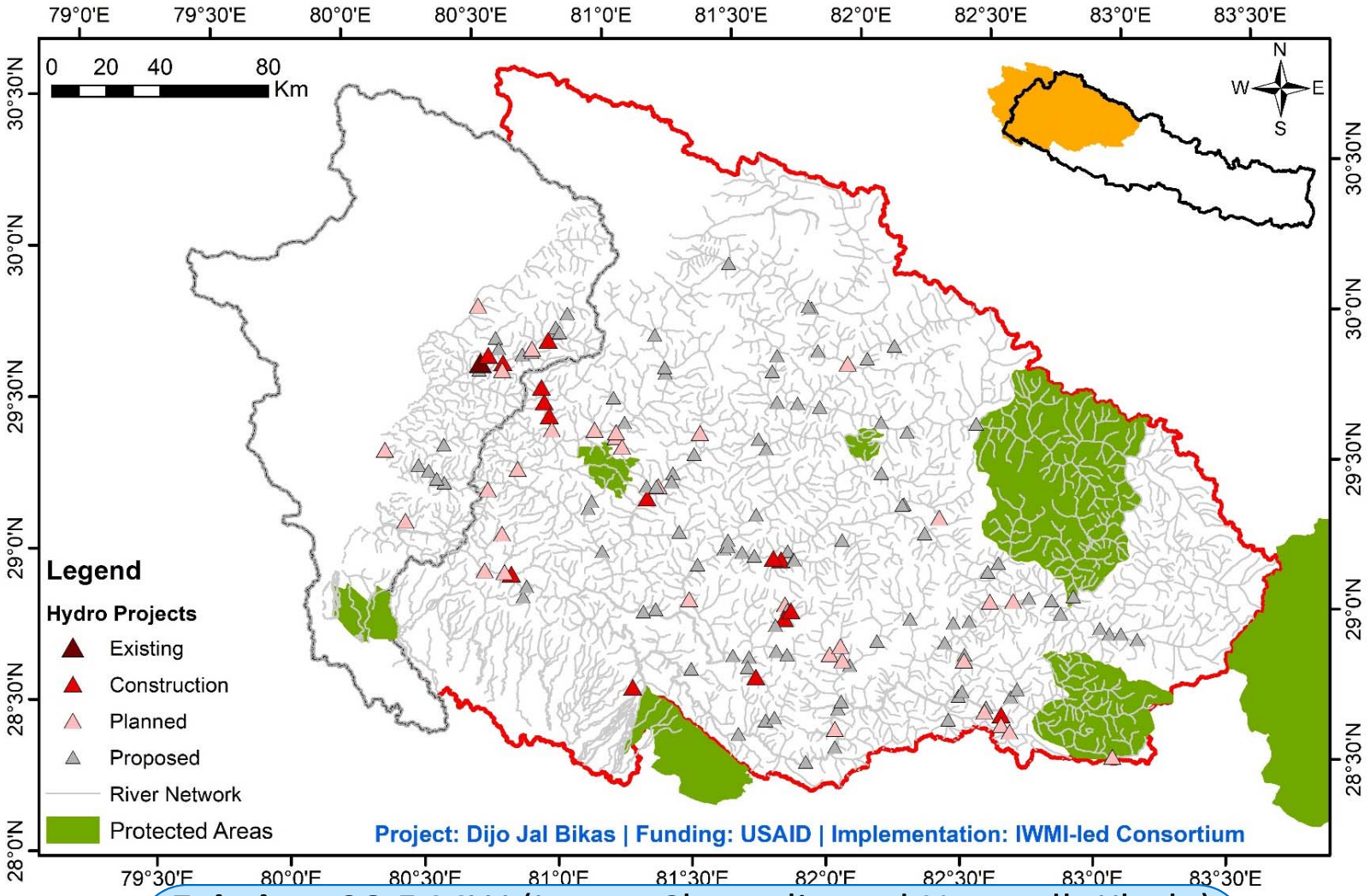
If water resource is properly harnessed, it would be the **ticket out of poverty** through economic **growth mainly in the hydropower and agriculture sectors**.

Hydropower Projects: Current



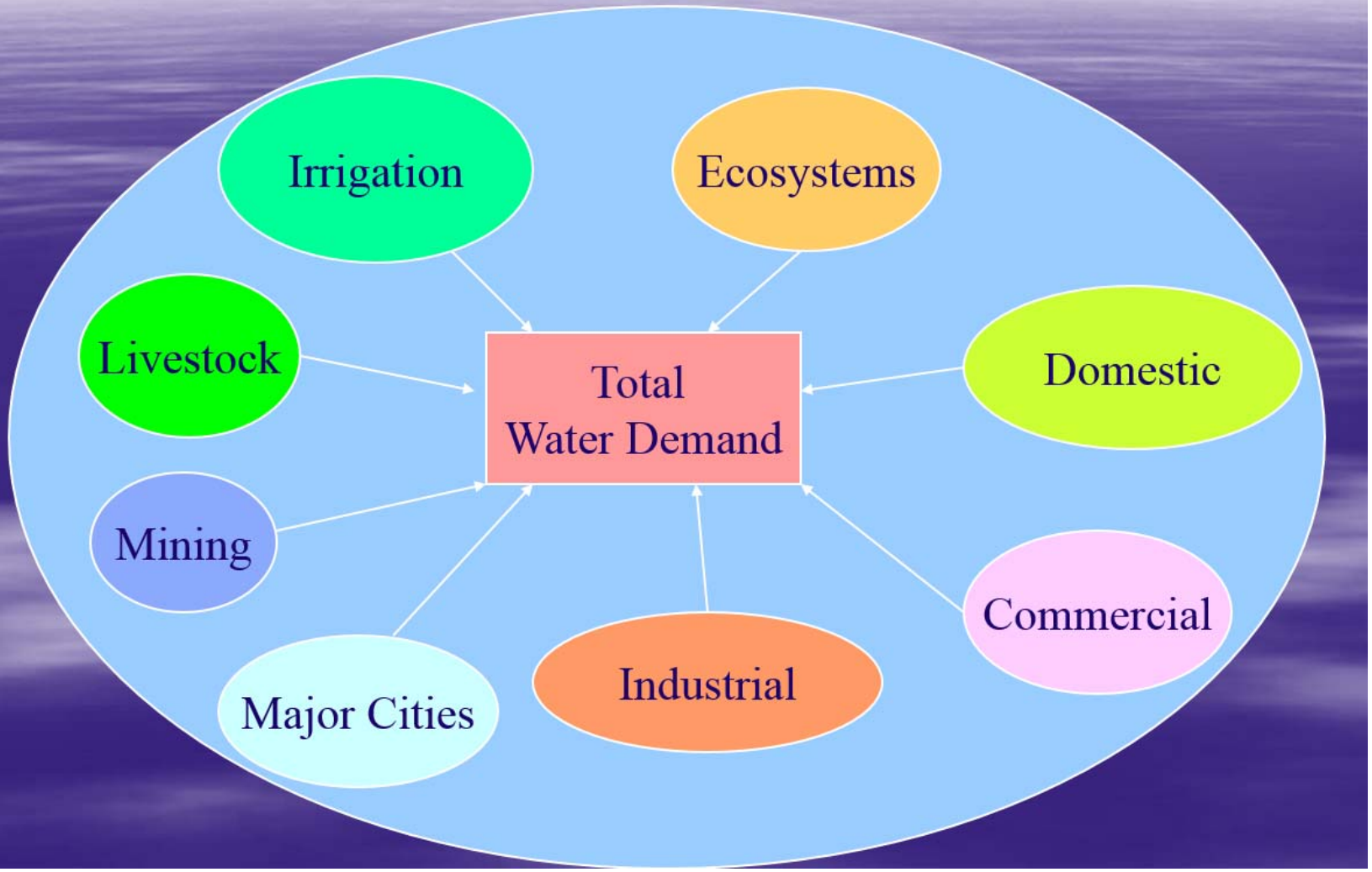
Existing: 38.5 MW (Lower Chamelia and Naugadh Khola)

Hydropower Projects: Current and Future



Existing: 38.5 MW (Lower Chamelia and Naugadh Khola)
Construction: 183.7 MW (15 projects)
Planned: 9691.8 MW (32 projects)
Proposed: 11,122.8 (102 projects)

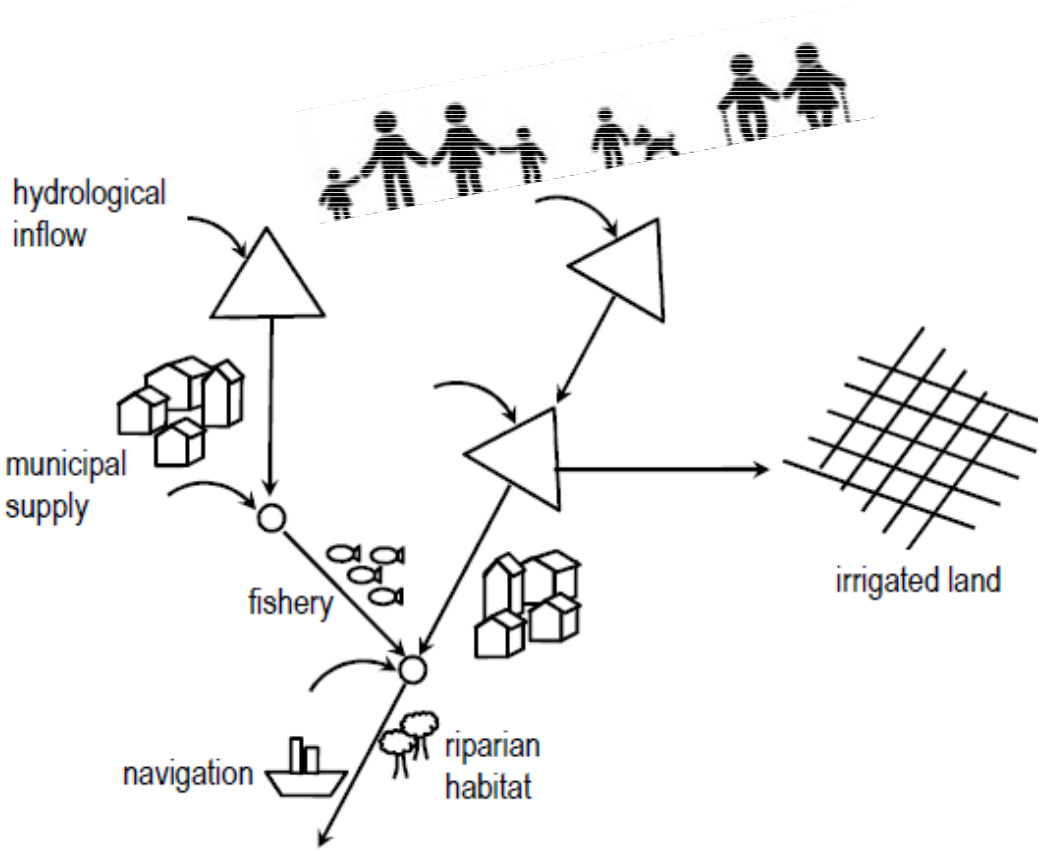
Sectoral Water Demands



Water Resource Planning

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

- **Main Challenge:**
  - A shared vision to develop a basin/country that is robust and balanced



Adapted from: Harou, 2014

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Goal: Promote sustainable WRD in Western Nepal through **balancing future vision, economic growth, social justice and healthy & resilient ecosystems**

OBJECTIVES

- Construction of Sound **Knowledgebase**
- Development & Applications of Tools, Models & **Approaches**
- Support the Development of **Integrated Policy** & Management

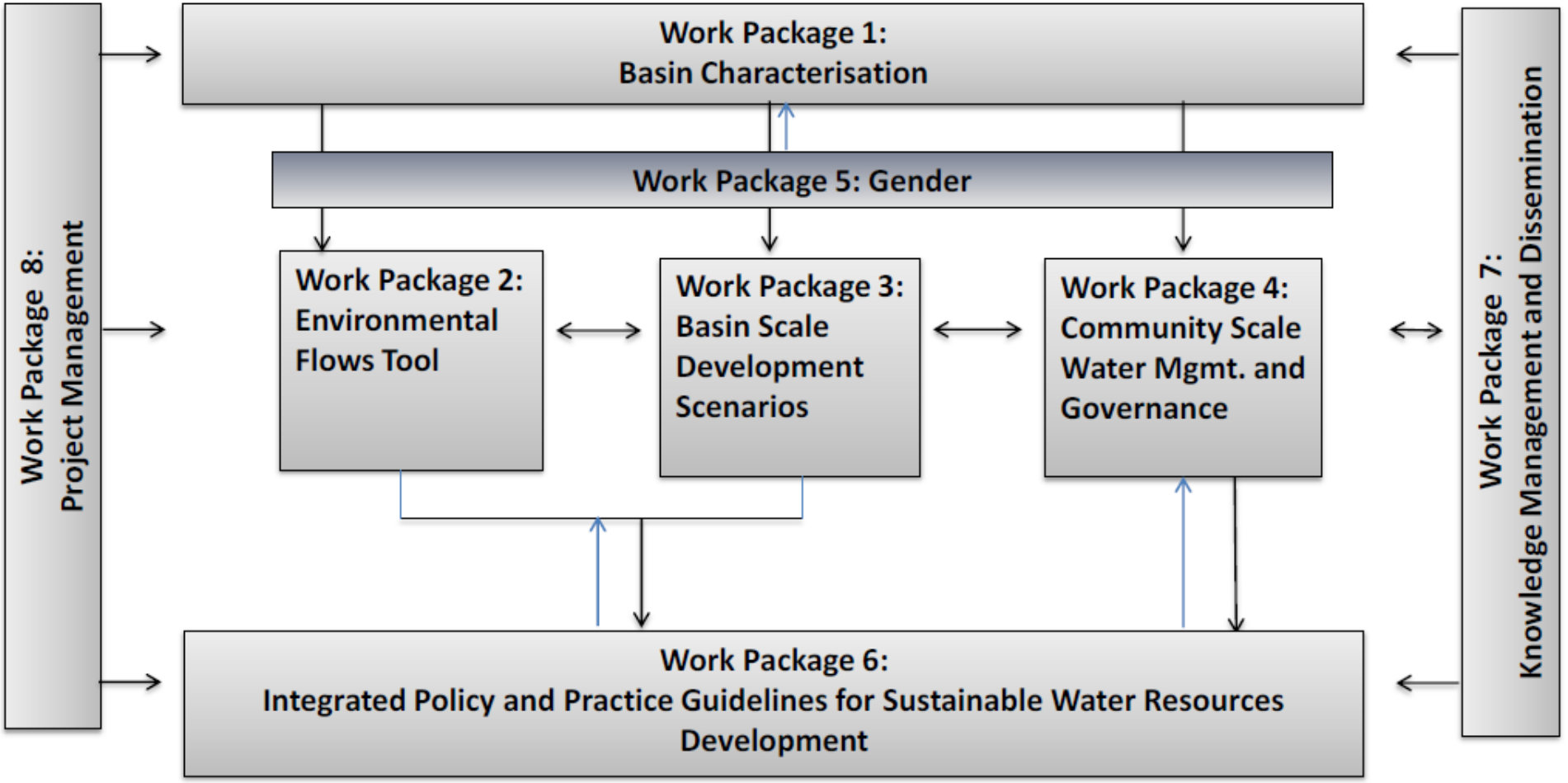
TEAM

Lead: IWMI

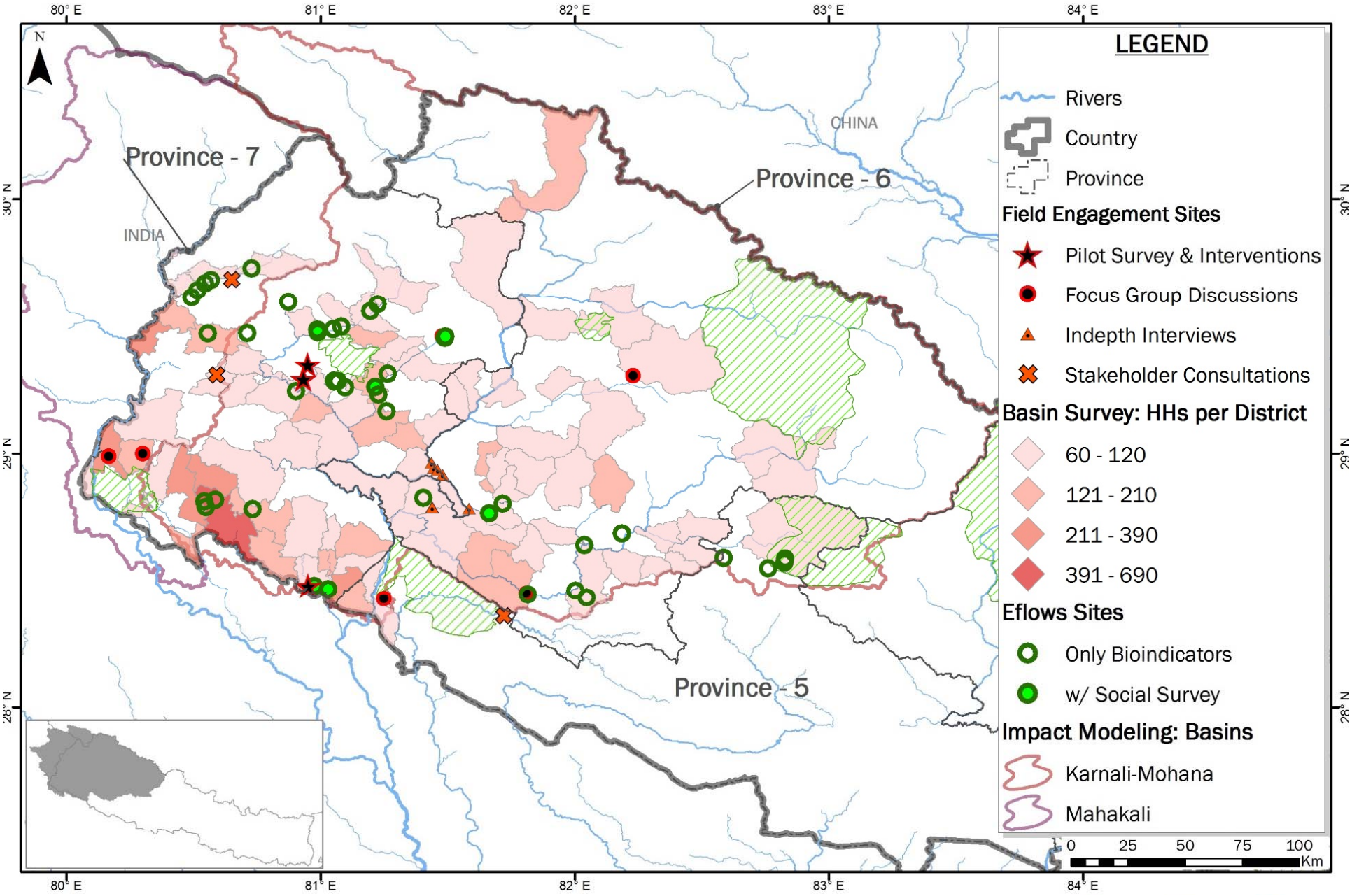
Collaborators:

Kathmandu University
NWCF
Duke University

Digo Jal Bikas: Operational Framework



Project Footprint in Western Nepal



Basin Highlights – Based on 3660 Households

- Primarily smallholder farming systems-Average landholding (**0.5** ha)
- **16%** female headed households

- **69%** engaged in NRM related groups/committees, only **22%** female membership

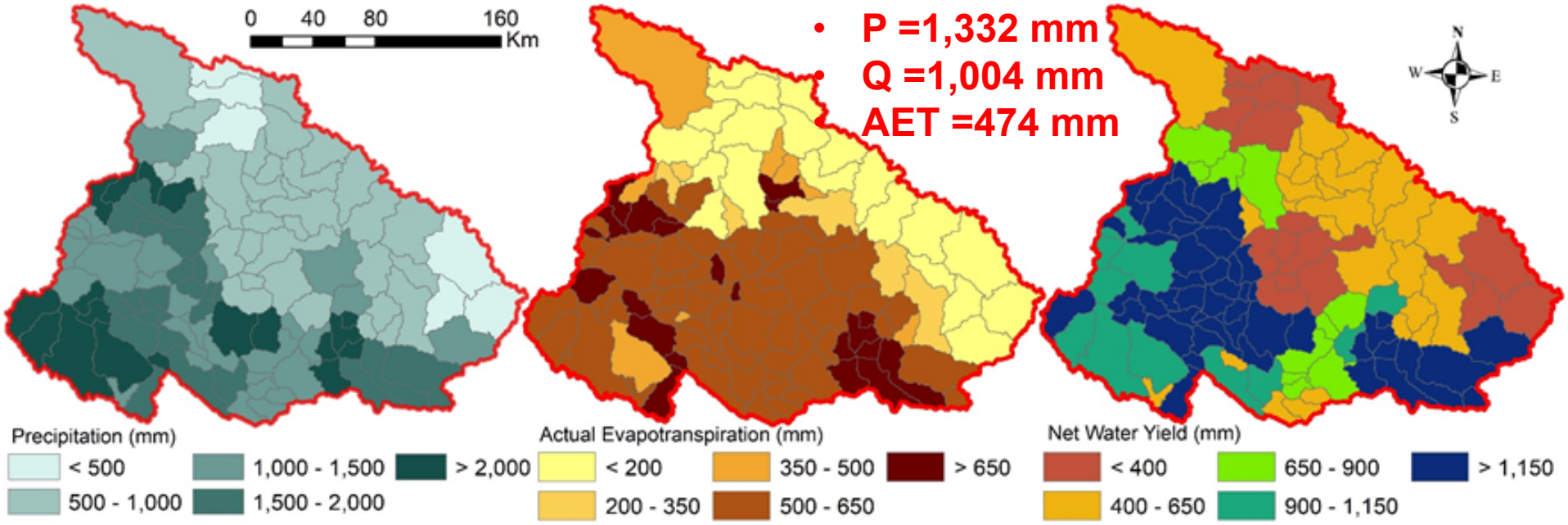
- **61% rain-fed agriculture**
- **5.8%** own improved ag technical equipment

- Average annual income is **NPR 93,531**

- Women primarily (**62%**) responsible for water collection
- **47%** have access to piped water systems

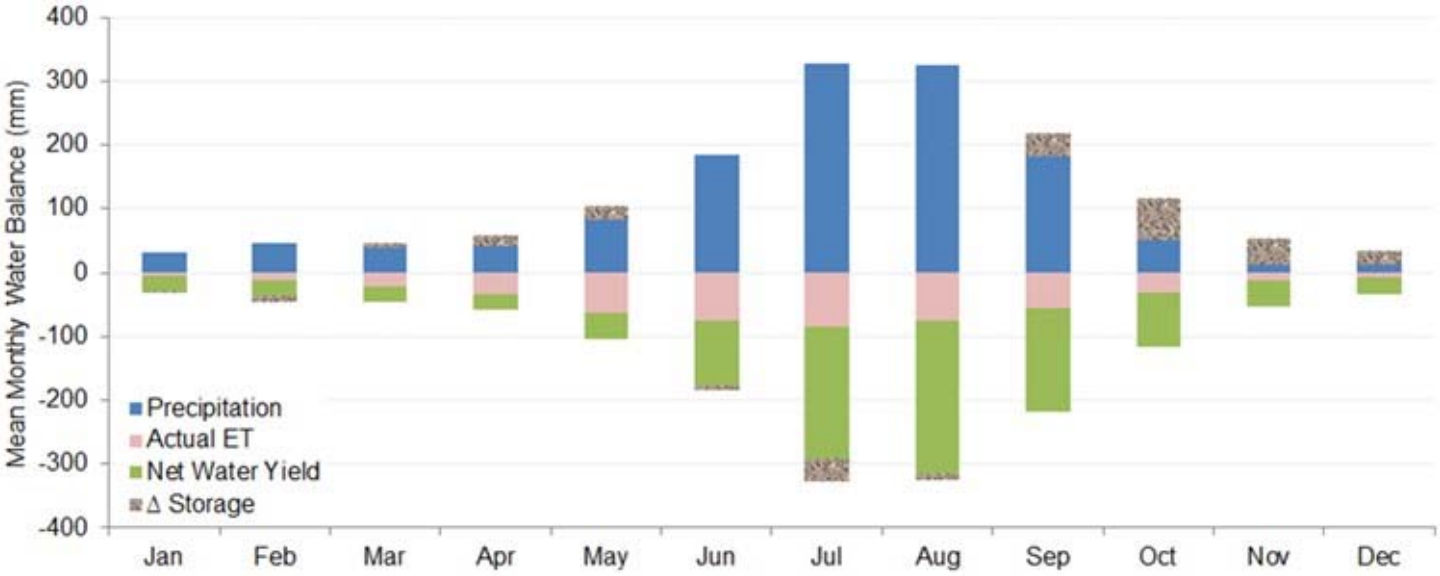
- Over **50%** reported drought, followed by hailstorm, untimely rain
- Only **3.3%** reported support services following climate induced disasters

Water Availability Assessment | Outputs



- P =1,332 mm
- Q =1,004 mm
- AET =474 mm

Water Balance Variation Across Physiographic Regions



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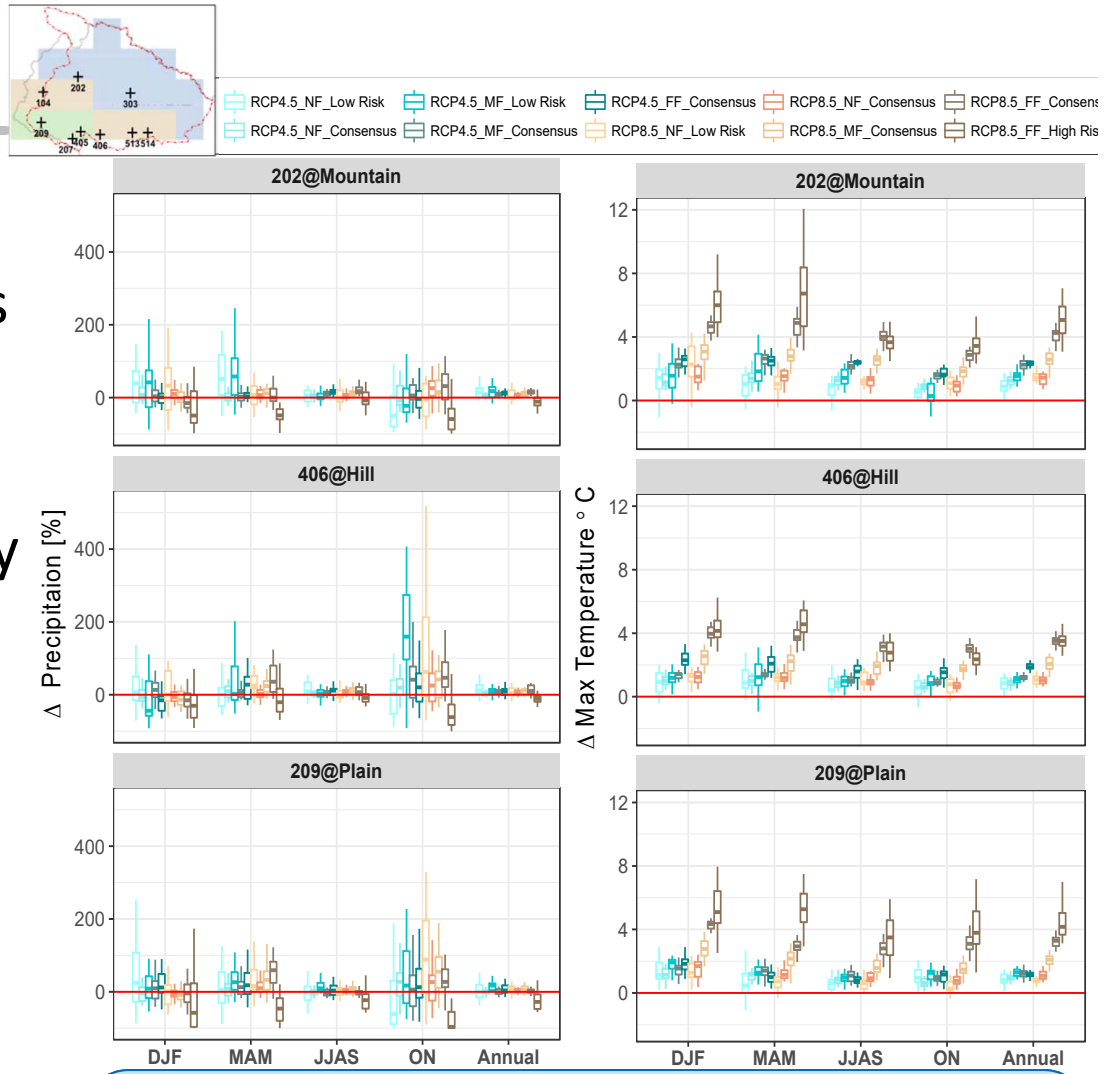
Future Projections

- Trends noticed:
  - Temperature increases consistently
  - Increase in precipitation variability



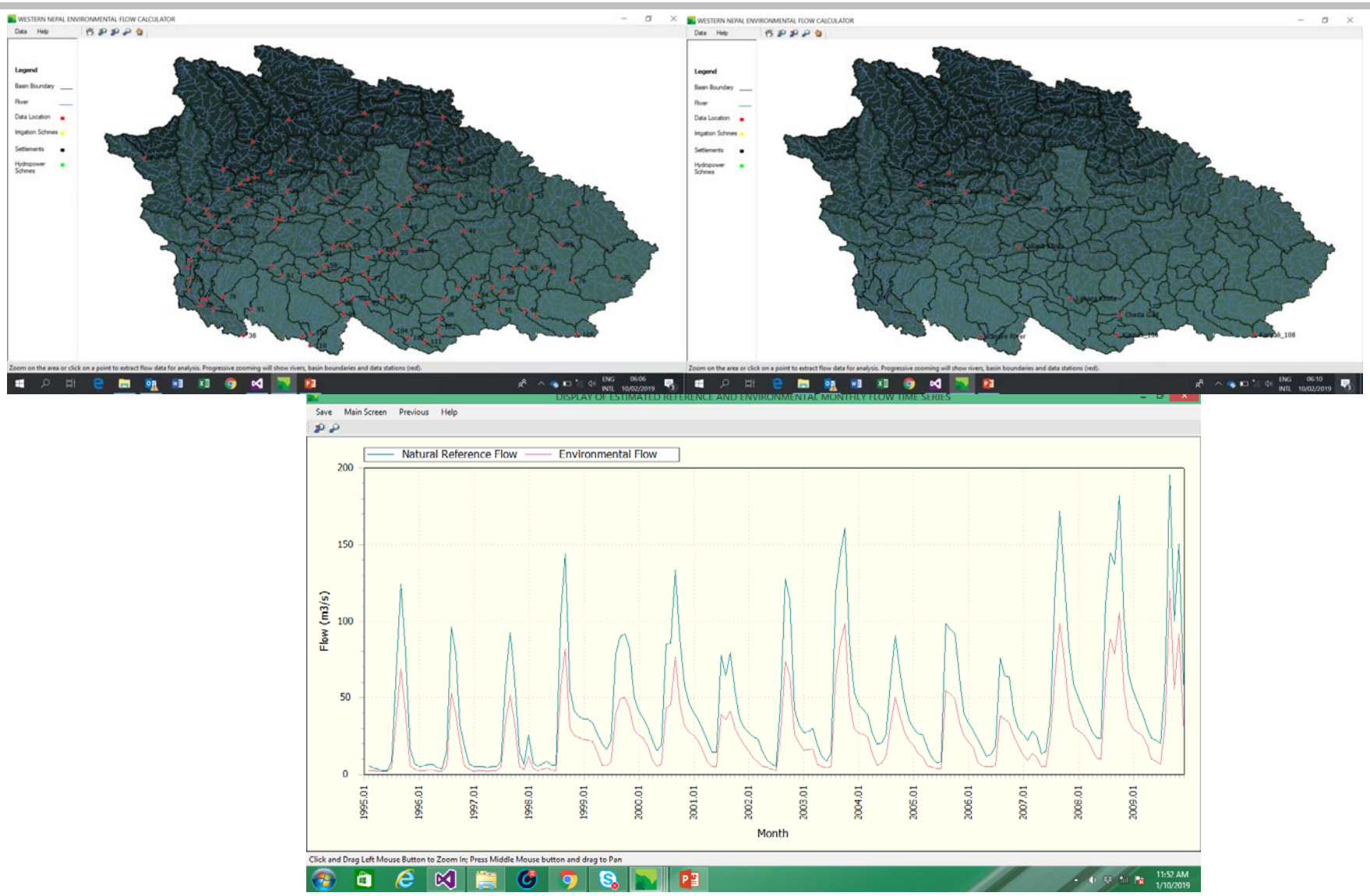
Higher temperatures, prolonged monsoon and sporadic rain events even in drier months are projected

Visions for Development in Western Nepal

- State-led development
  - Development of large-scale hydropower and irrigation projects
- Local demand-driven development:
  - Priority to municipal water supply, small hydro, farmer-managed irrigation schemes
- Preserving ecosystem integrity:
  - Priority to environmental conservation and development leveraging natural assets

→ **Visions inform scenarios analysis**: Full infrastructure, limited infrastructure, and environmental development

Western Nepal Environmental Flows Calculator



Potential Trade-Offs and Tensions

Hydropower and irrigation

- Storage hydropower for vs. water for agricultural production
- **Findings:** Very little tradeoff in Nepal (Storage elevates year-round irrigation water availability)

Energy Generation

- Large-scale/storage plants for export vs. small plants for domestic demand and rural electrification
- **Findings:** Storage generates much more power and revenue

Institutional

- Energy for domestic demands or export; transboundary water flows **Findings:** Tradeoff in local vs. export consumption of energy; some tradeoff from Terai irrigation vs. flow into India

Environmental

- Impacts of environmental flow constraints
- Findings: More stringent E-flows reduces ag. and energy production

Agriculture: A conduit for socio-economic transformation

Targeting **small holder farmers** to improve **dry season irrigation** via **climate smart technology**

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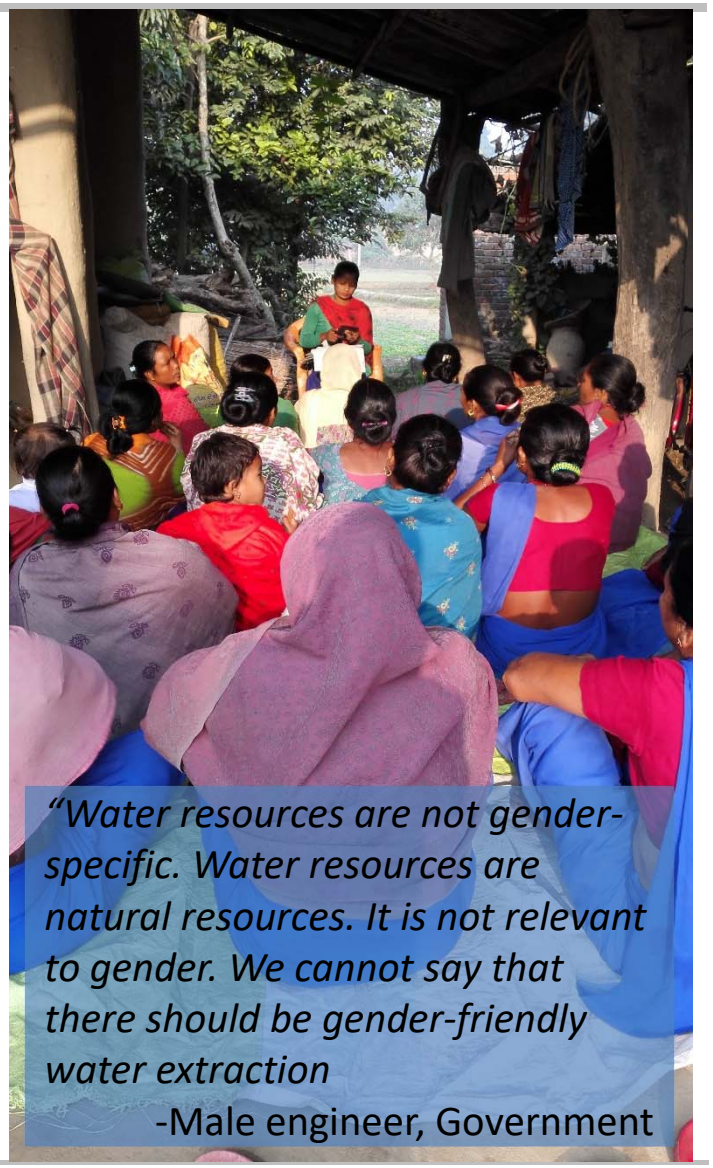
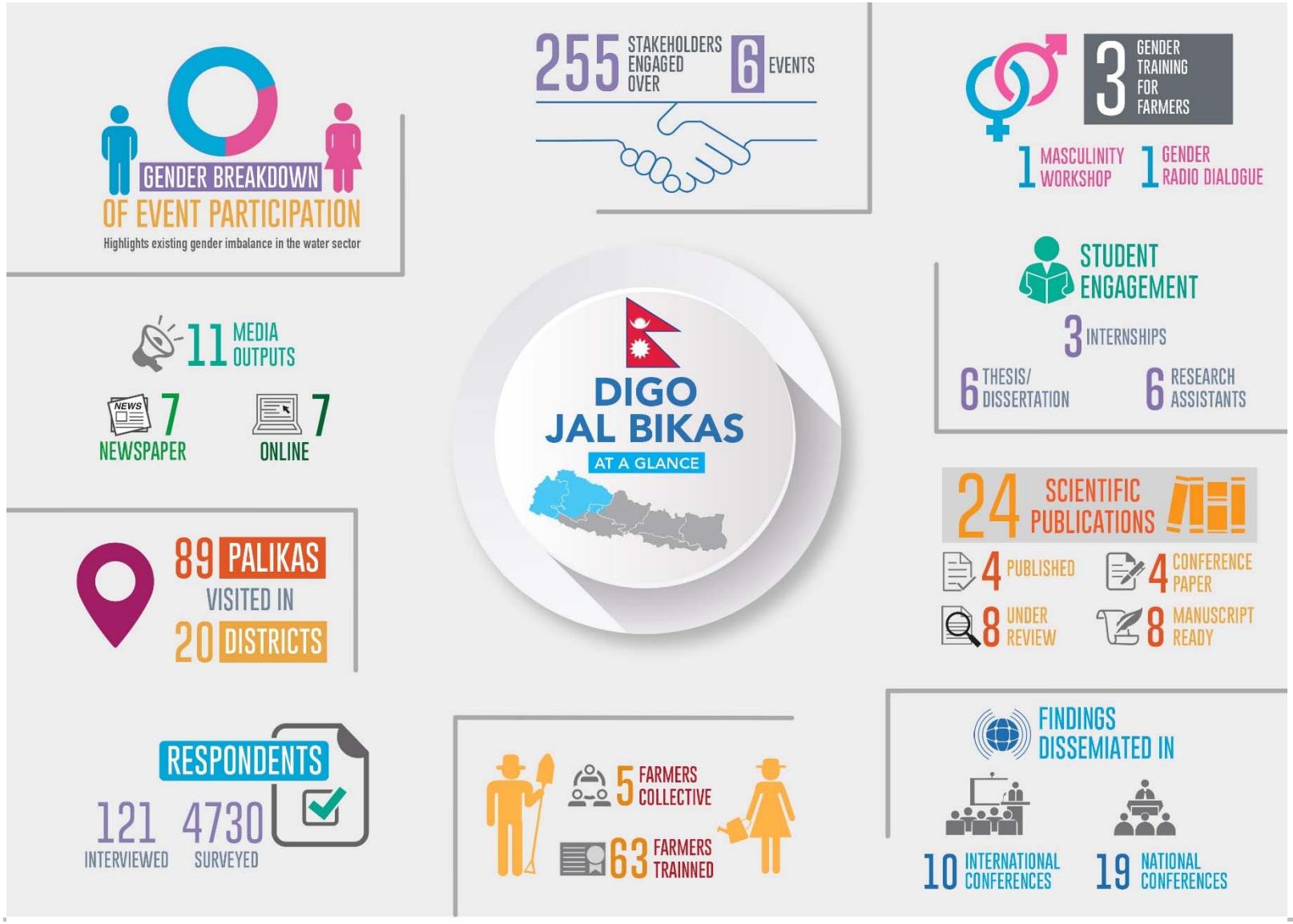
Walking the Talk

- **GESI Framework:**
  - Gender analysis was done community and organizational level

- GESI is a fringe issue in government agenda
  - Restricted only to policy level

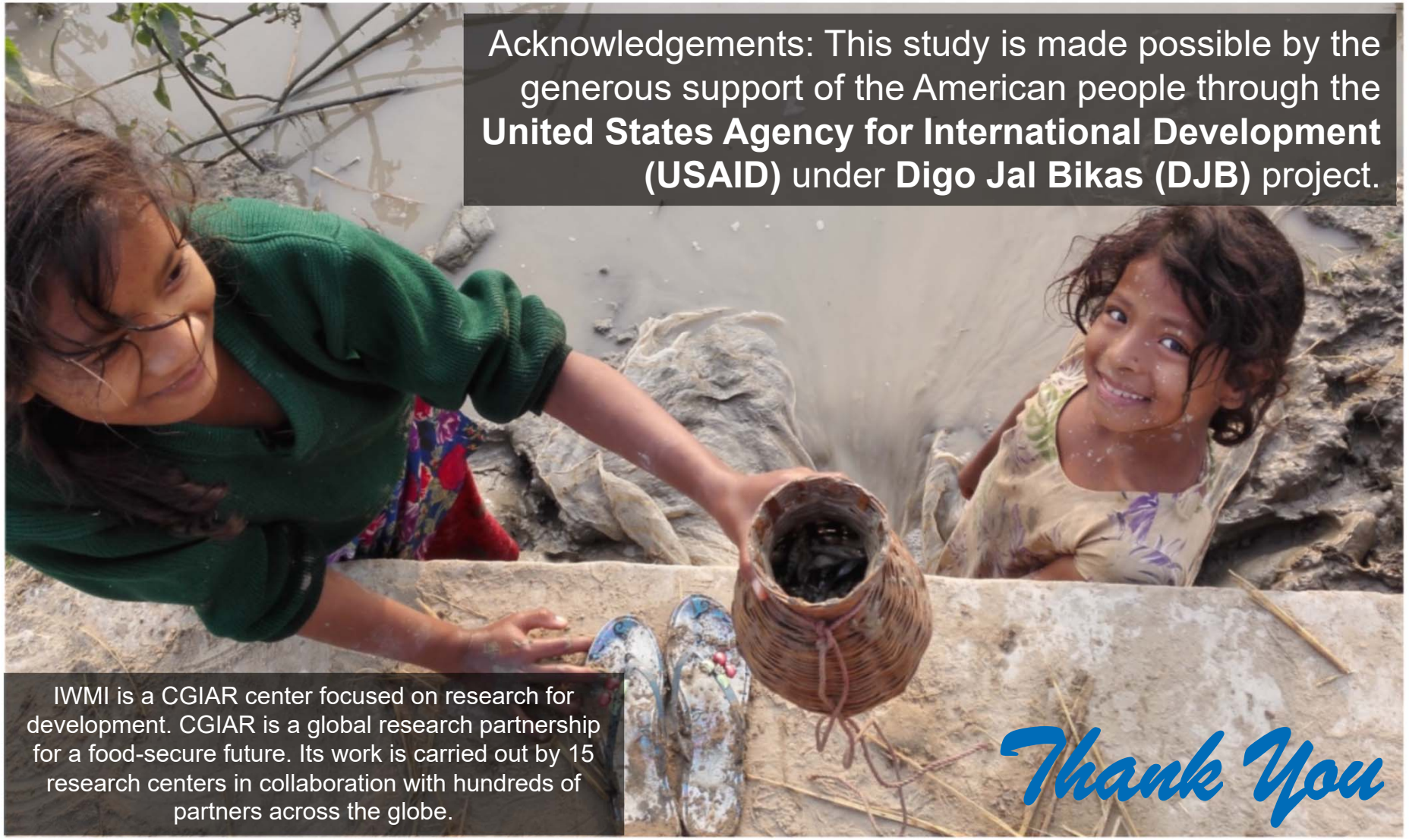


Some highlights of DJB outputs



Impact and Legacy

- Novel approaches were developed, applied- e.g.. E-flows, masculinity workshop, participatory gender training, HEM, Climate Futures analysis
- The hydrological models are being applied in the National Irrigation Master Plan
- The E-flows Assessment will also be incorporated into the Irrigation Master Plan
- All project generated data, tools, models and publications will be available through the IWMI water data portal as well as the DJB project website:
  - http://waterdata.iwmi.org/
  - http://djb.iwmi.org/



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