


River Basin Management
Watershed Management and Hydropower
Cumulative Impact Assessment and Management
Overview

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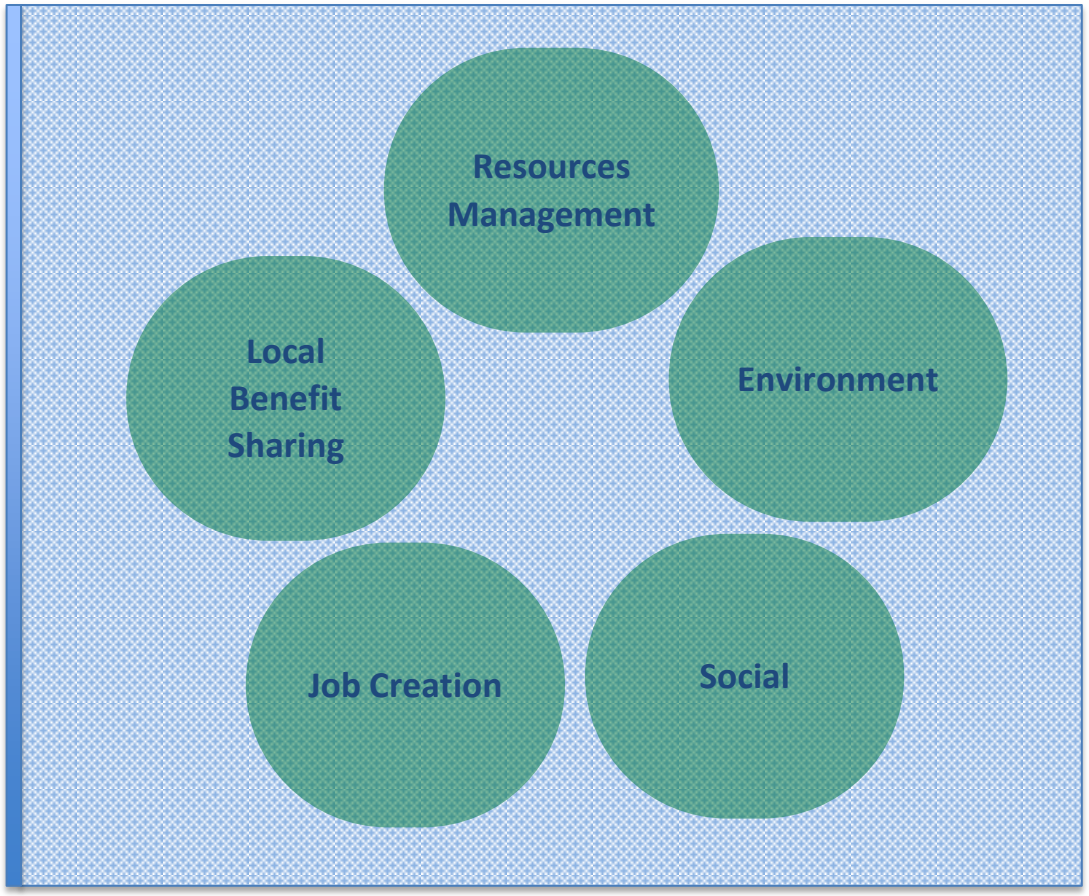
IFC
International Finance Corporation
World Bank Group

Hydropower Development = Regional Development

- Economic Benefits
- Power
- Foreign Investment/ Financial return
- Ancillary Infrastructure



But if it is not sustainable, it is not development at all…..

Challenges to Addressing E&S Risks and Impacts Hydropower Project in Myanmar

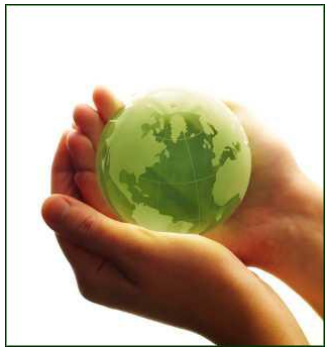
- Untapped resources located in:
  - pristine or underdeveloped watershed / natural habitats
    - Approximately 132 Key Biodiversity Areas (KBA) have been identified in Myanmar.
  - remote areas, generally located near rural communities, with diverse levels of vulnerabilities, ethnicities and languages; and land tenure uncertainties;
  - difficult access, limited services including transmission to evacuate energy generated or electric distribution to communities in the area of impact.
- E&S institutional and regulatory capacity is still emerging;
- Streamlined stakeholder engagement and consultation process is not standard practice;
- Concession process is not linked to an environmental and social assessment / criteria.
  - Limited watershed level / strategic resources management / cumulative impact assessment.

Need to Think Strategically

- Strategic Watershed Planning / Strategic Environmental Assessment – Broader Context
  - For example WBG – Ayeyarwady Project
    - Development of an Integrated River Basin Master Plan

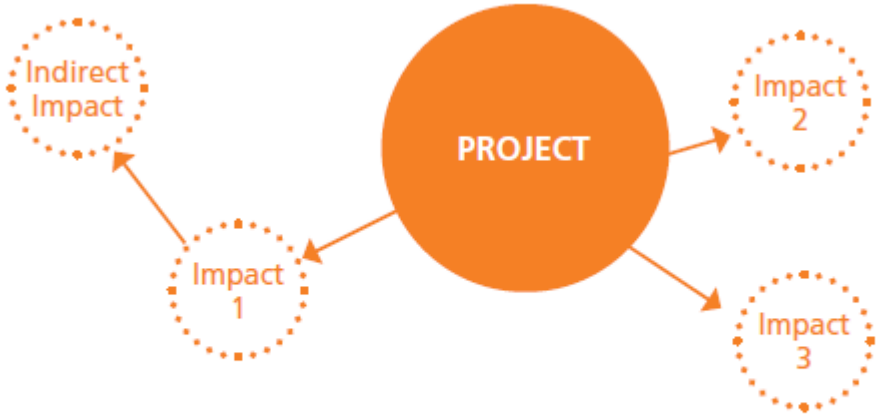
- Operationalized with Cumulative Impact Assessment and Management.
  - Stakeholder Engagement
  - Identification and agreement on Valued Environmental and Social Components (VEC)
  - Design management strategies to protect VEC.

"The environmental and social impacts that result from the incremental impacts of one action/activity when added to past, present, and reasonably foreseeable future actions/activities."

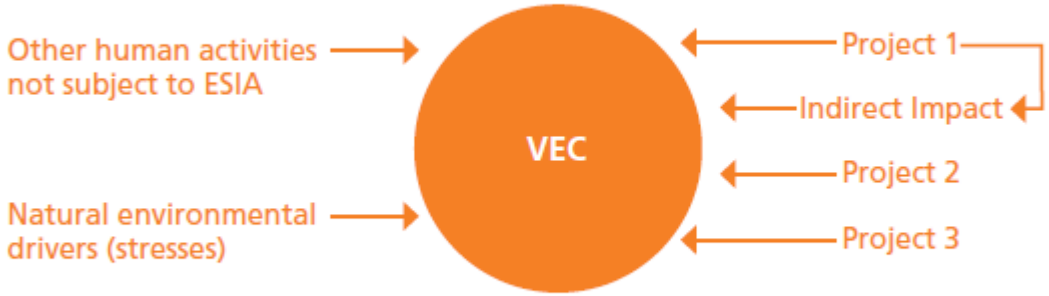


Focus: Project Centered vs VEC Centered

ESIA



CIA



Valued Environmental and Social Components (VECs)

Sensitive environmental or social receptors, affected resource, ecosystem, or human community:

- *Air shed.*
- *Watershed.*
- *Forest resource.*
- *Resident wildlife.*
- *Migratory wildlife.*
- *Fisheries resource.*
- *Historic / Socio-cultural resource.*
- *Land use.*
- *Community Structure.*
- *Coastal zone.*
- *Recreational.*

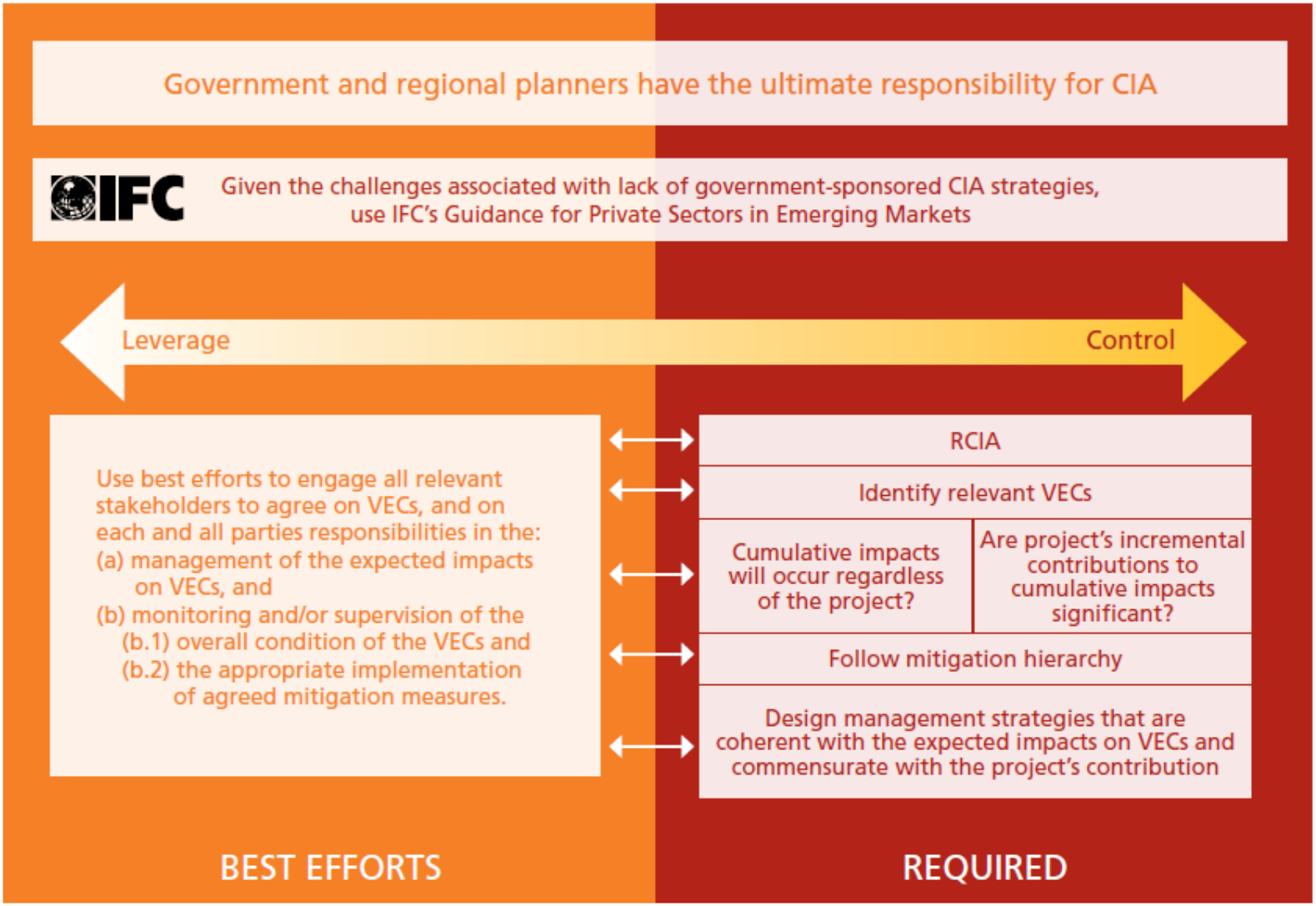
VEC	Cumulative Effect / Change of condition
Air	•Health hazard, poor visibility from elevated levels of ozone or particulates.
Surface Water	•Water quality degradation from multiple point-source discharges. •Water shortages from uses that exceed capacity
Ground Water	•Aquifer depletion
Land and Soil	•Diminished land fertility / productivity
Wetlands	•Diminished flood control capacity
Ecosystems	•Habitat fragmentation •Loss of fish and wildlife populations
Socioeconomics	•Overburden services •Unstable labor markets
Community structure	•Changes in community dynamics as a result of displacement of critical community members.
Cultural Resource	•Cultural site degradation / vandalism •Fragmentation of historic district

Cumulative Impacts and Hydropower

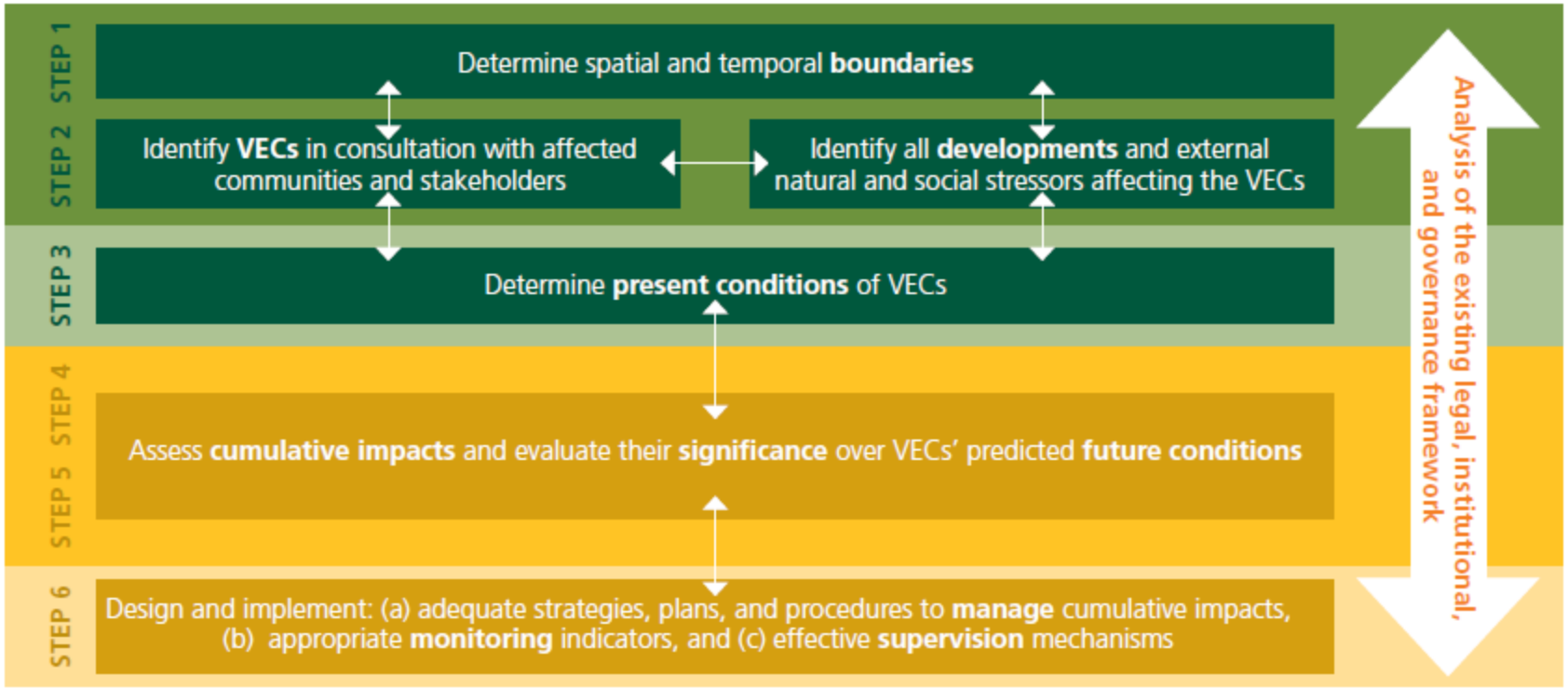
"death by a thousand cuts"

- Terrestrial and riparian habitat fragmentation due to reservoirs and ancillary facilities (e.g roads, transmission lines)
- Disruption of fish migratory routes upstream and downstream (e.g. barrier effect of dams or repetitive stress of fish passing through cascading turbines)
- Sediment retention / river bank erosion / modification of river morphology,
- Reduction on estuary productivity
- Alteration of water quality and availability.
- Modifications of natural flow regimes (e.g. quantity, variability, predictability, etc.)

IFC Proposed Approach

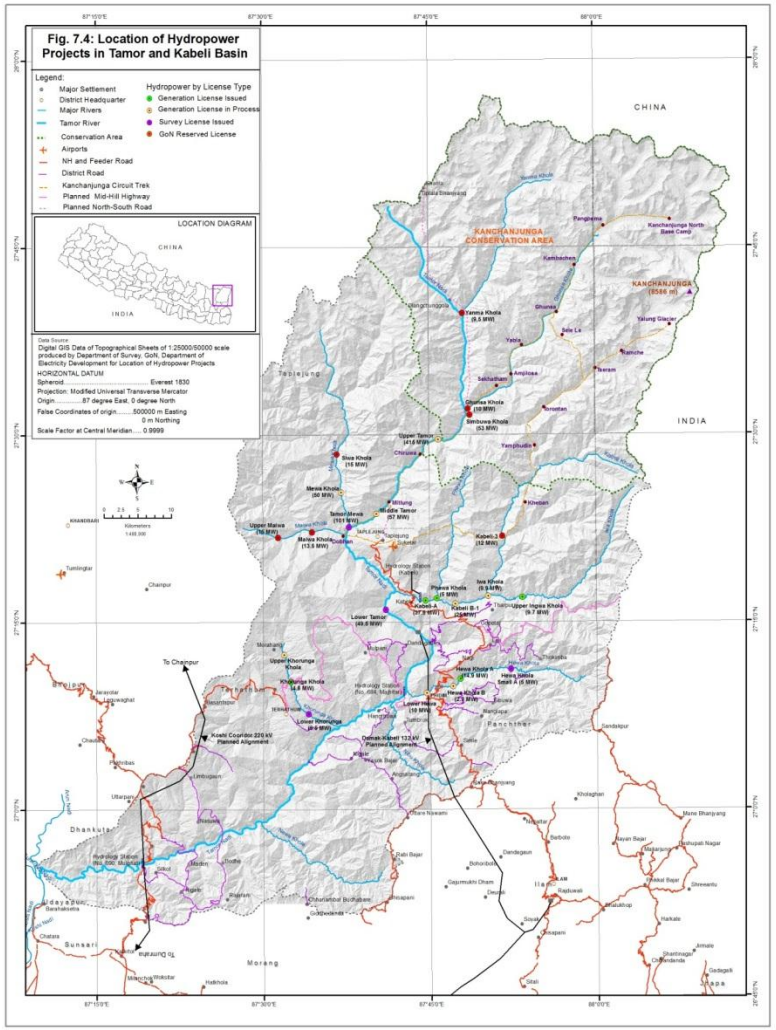


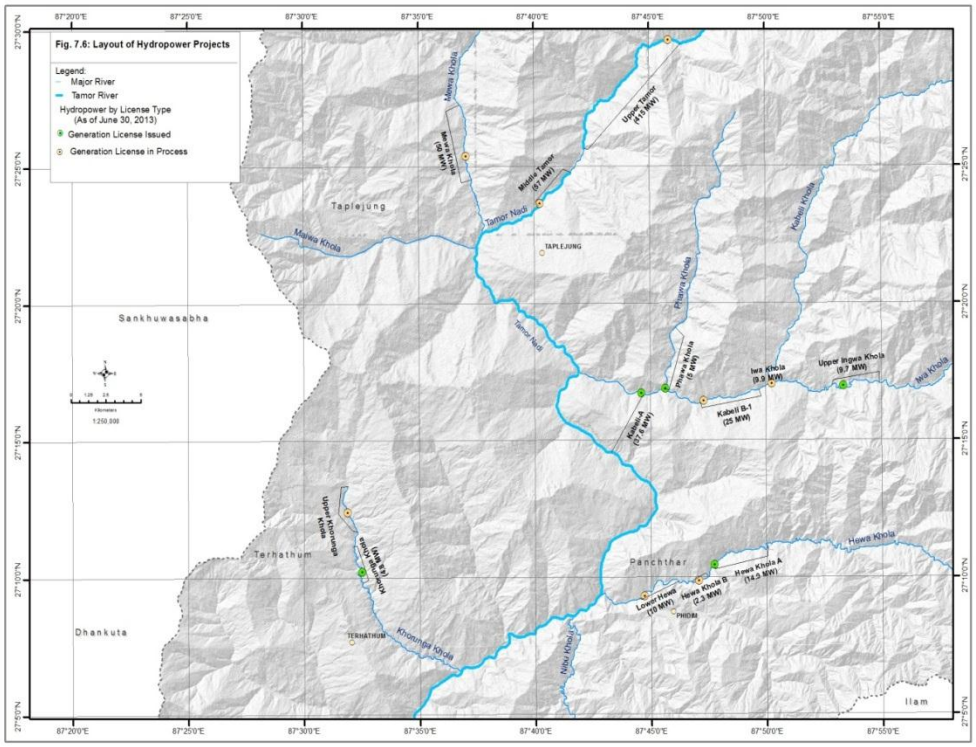
Six-Step Process



Cumulative Impacts

- Total of 24 HPP planned for the Tamor-Kabeli watershed
- Kabeli is the first one to be constructed





- Next 15 years –> 13 HPP dams/weirs
- Tamor-Kabeli contain @ 524 km of natural free flowing rivers, and approximately 12% will be dewatered (79 km).

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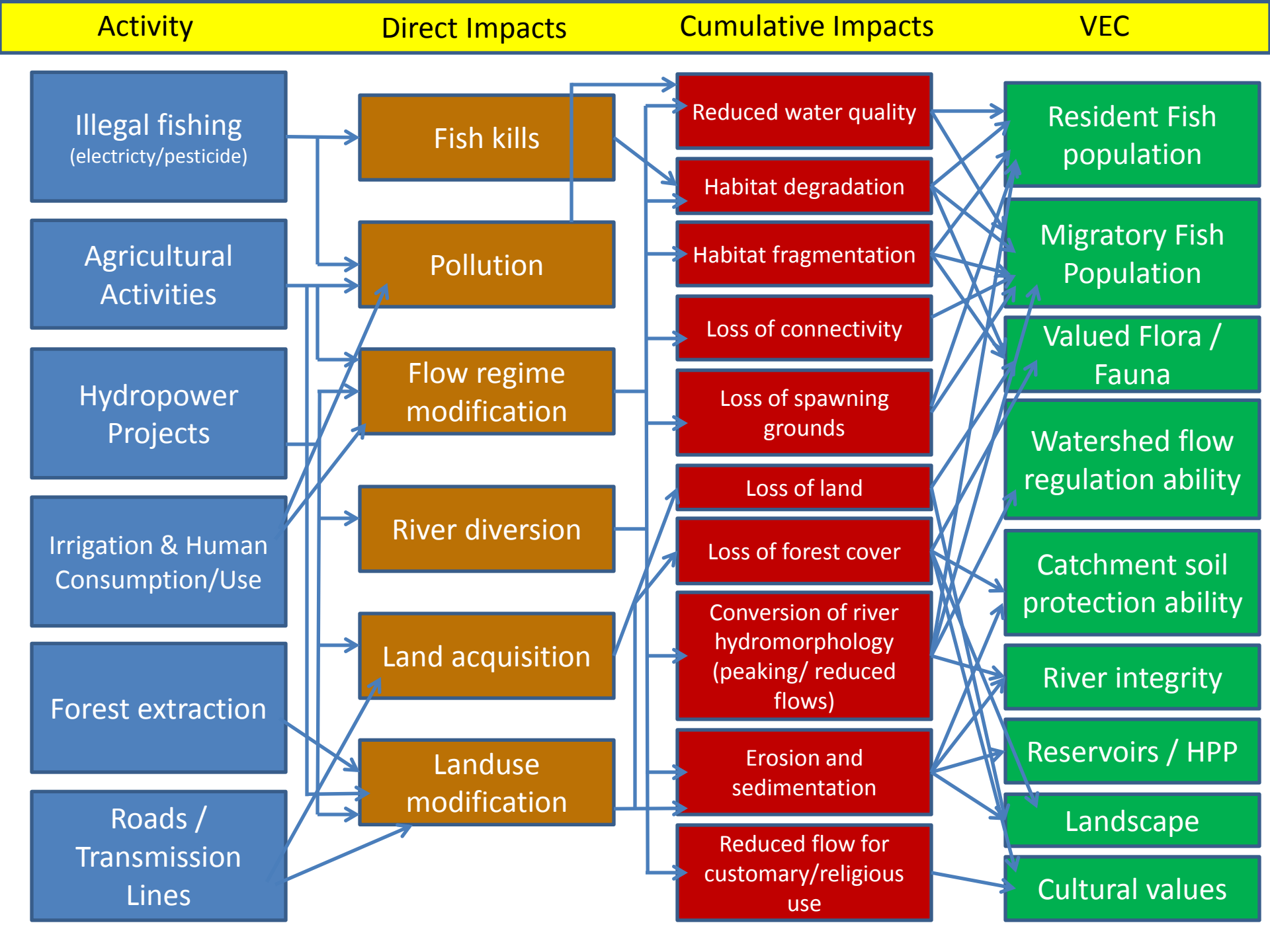

Activity
Direct Impacts
Cumulative Impacts
VEC
Illegal fishing (electricty/pesticide)
Agricultural Activities
Hydropower Projects
Irrigation & Human Consumption/Use
Forest extraction
Roads / Transmission Lines
Fish kills
Pollution
Flow regime modification
River diversion
Land acquisition
Landuse modification
Reduced water quality
Habitat degradation
Habitat fragmentation
Loss of connectivity
Loss of spawning grounds
Loss of land
Loss of forest cover
Conversion of river hydromorphology (peaking/ reduced flows)
Erosion and sedimentation
Reduced flow for customary/religious use
Resident Fish population
Migratory Fish Population
Valued Flora / Fauna
Watershed flow regulation ability
Catchment soil protection ability
River integrity
Reservoirs / HPP
Landscape
Cultural values

Selected VECs

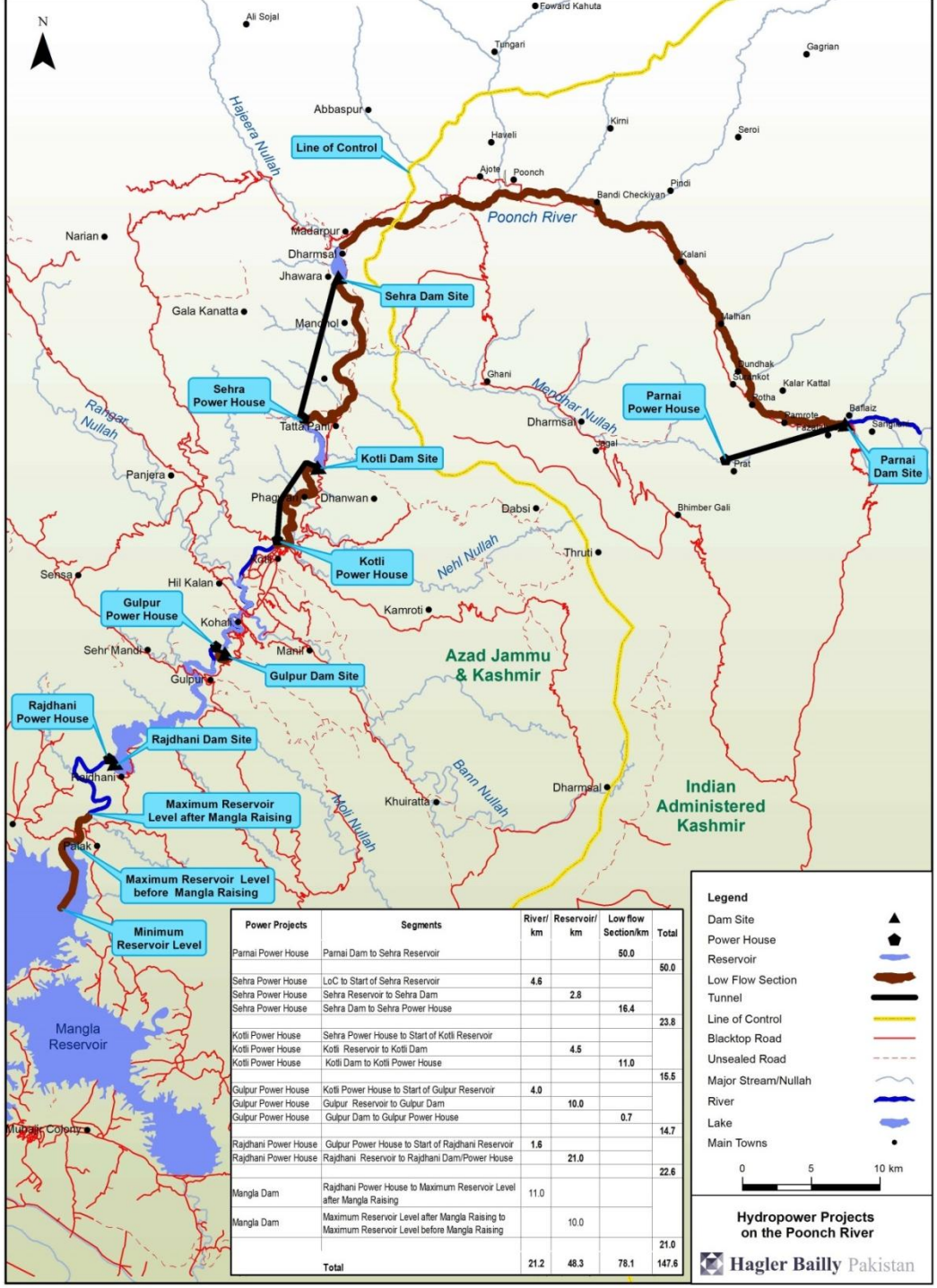
Feature	VEC	Valued feature to focus management strategies
Physical Environment	Surface Water Quality and Quantity	• Ecosystem and environmental services integrity: long-term temperature (T°C), Dissolved Oxygen (DO), Total Suspended Solids (TSS), microbiology, natural patterns should remain within acceptable limits. • Enough quantity/quality of water to satisfy present and future consumptive human uses (e.g. domestic, irrigation, others)
	Landslide/erosion and sedimentation	• Erosion Control: watershed sediment load retention/ regulation capacity should not be degraded; and ideally, it should be improved.
Biological Environment	Resident and Migratory Fish Population	• Basin-wide aquatic connectivity: fish upstream and downstream migration should not be impaired. • Suitable habitat availability: foraging, spawning and cover habitat for indicator fish species should be maintained.
Socio-economic and Cultural Environment	Spiritual and Religious	• Riparian flow regime: adequate quantity, quality, depth and velocity of river flow should be maintained to avoid disruption of existing cultural, spiritual and/or religious practices by local people.
	Landscape	• Landscape/ habitat fragmentation due to multiple and overlapping access roads and transmission lines should be avoided.

Proposed Management

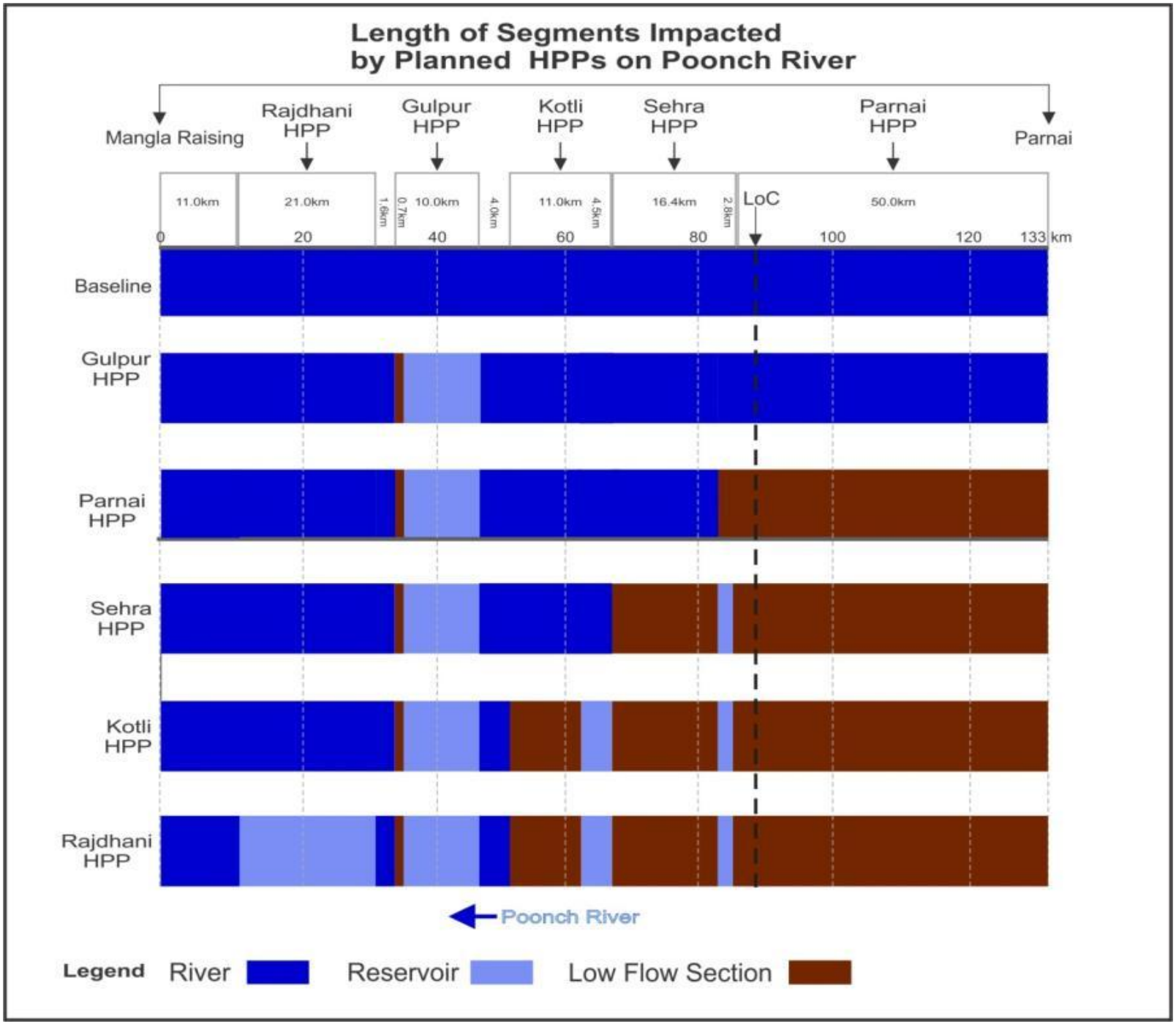
Control - EMP  Leverage - GoN

IBRD-IDA has allocated US$ 2 MM technical assistance to help the GoN develop a series of Basin-wide studies. Some mitigation measures proposed in the RCIA include:

- Enhancing availability and sharing of basin-level environmental and social data to ensure consistency and uniform access to all developers;
- Assuring the design and construction of structures that will maintaining the ecological corridor open for upstream migratory fish species and avoid entrapment at headwaters;
- Releasing downstream ecological flow regimes that would adequately maintain the aquatic ecological integrity of the rivers as well as meet the consumptive and non-consumptive uses of Affected Communities;
- Coordinate actions to implement a basin-level integrated management plan to protect and develop catchment areas aimed at minimizing erosion and sedimentation and supporting ecosystem conservation;
- Design coordinated operation and maintenance schemes that will minimize impacts and capitalize efficiencies and
- Make articulated efforts to share infrastructures whenever possible (e.g. access roads, transmission lines, etc)



Power Projects	Segments	River/ km	Reservoir/ km	Low flow Section/km	Total
Parnai Power House	Parnai Dam to Sehra Reservoir			50.0	
					50.0
Sehra Power House	LoC to Start of Sehra Reservoir	4.6			
Sehra Power House	Sehra Reservoir to Sehra Dam		2.8		
Sehra Power House	Sehra Dam to Sehra Power House			16.4	
					23.8
Kotli Power House	Sehra Power House to Start of Kotli Reservoir				
Kotli Power House	Kotli Reservoir to Kotli Dam		4.5		
Kotli Power House	Kotli Dam to Kotli Power House			11.0	
					15.5
Gulpur Power House	Kotli Power House to Start of Gulpur Reservoir	4.0			
Gulpur Power House	Gulpur Reservoir to Gulpur Dam		10.0		
Gulpur Power House	Gulpur Dam to Gulpur Power House			0.7	
					14.7
Rajdhani Power House	Gulpur Power House to Start of Rajdhani Reservoir	1.6			
Rajdhani Power House	Rajdhani Reservoir to Rajdhani Dam/Power House		21.0		
					22.6
Mangla Dam	Rajdhani Power House to Maximum Reservoir Level after Mangla Raising	11.0			
Mangla Dam	Maximum Reservoir Level after Mangla Raising to Maximum Reservoir Level before Mangla Raising		10.0		
					21.0
	Total	21.2	48.3	78.1	147.6


Length of Segments Impacted
by Planned HPPs on Poonch River
Mangla Raising
Rajdhani HPP
Gulpur HPP
Kotli HPP
Sehra HPP
Parnai HPP
Parnai
11.0km
21.0km
1.6km
0.7km
10.0km
4.0km
11.0km
4.5km
16.4km
2.8km
LoC
50.0km
0
20
40
60
80
100
120
133 km
Baseline
Gulpur HPP
Parnai HPP
Sehra HPP
Kotli HPP
Rajdhani HPP
Poonch River
Legend
River
Reservoir
Low Flow Section

DISCUSSION