

Department of Electricity Development  
Pancheshwar Multipurpose Project

# DETAILED ENVIRONMENTAL MANAGEMENT PLAN

Shah Consult International (P.) Ltd.  
Kathmandu, Nepal

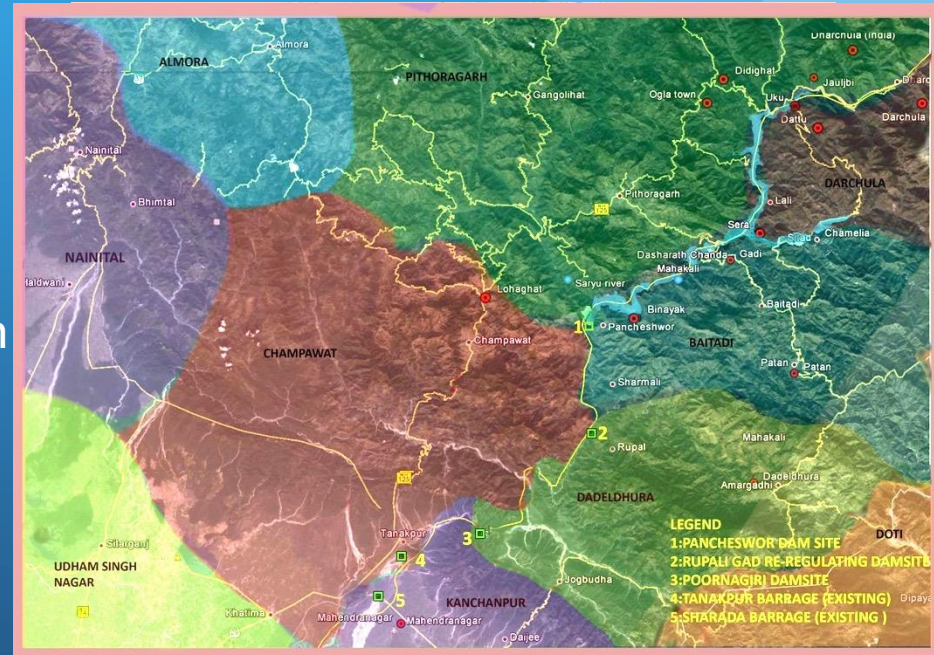
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# Introduction

# Pancheshwar Multipurpose Project

- Indo-Nepal undertaking on Mahakali River
- Principal components:
  - Pancheshwar High Dam
  - Rupali Gad Re-regulating Dam
  - Poornagiri Re-regulating Dam
- Identified by CWPC in 1956
- DPR completed in 1995
- PDA formed in November 2010



# Need for DEMP

- EIA for PMP approved in 2013
  - Baseline conditions, impact assessment and mitigation measures
  - Environmental Management Plans (EMP)
- Need for DEMP
  - PMP: one of the largest proposed projects in the world
  - Large-scale environmental impacts during construction & operation
  - Most sensitive impact: involuntary displacement of 22,765 people from 2,926 households
  - Proper implementation, monitoring and auditing of EMPs needed to ensure benefits up to grass root levels
  - Further detailing and elaboration of EIA-level EMP

# Scope & Objectives

- Scope: Pancheshwar High Dam (PHD) only
- Objectives:
  - Confirm Direct & Indirect Impact Zones (DIZ & IIZ) of PHD
  - Confirm/update potential impacts of PHD
  - Confirm, update & detail mitigation measures and enhancement plans during construction & operation
  - Prepare detailed environmental monitoring & auditing plans
  - Identify aspirations, interests & needs of local people

# Project Details

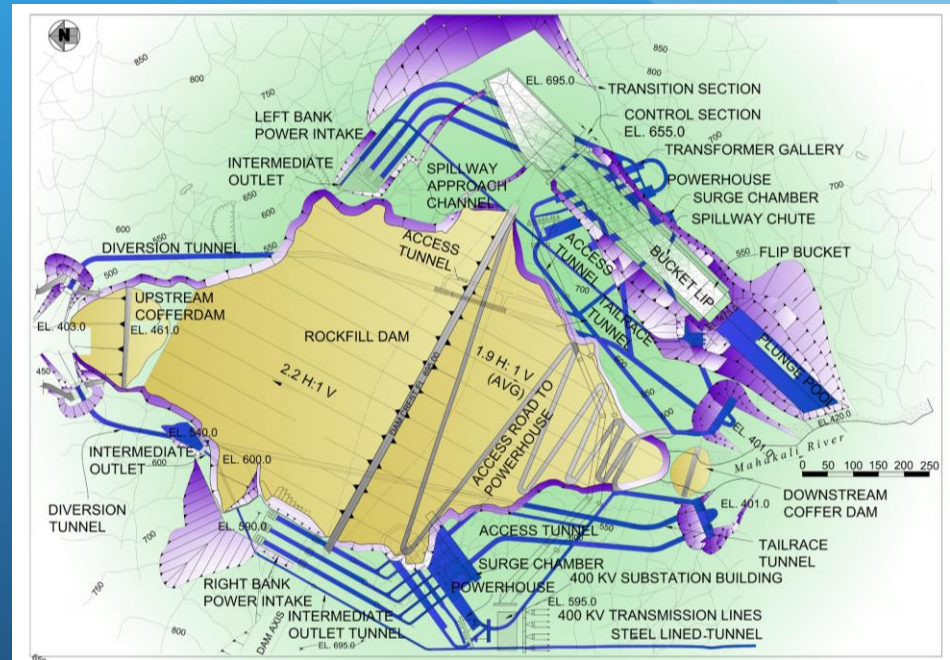
# Pancheshwar High Dam

- Major component of PMP
- Second tallest dams in the world, second only to 355 m high Rogun Dam under construction in Tazikistan
- Dam height: 315 m
- Reservoir: 65 km long
- Installed capacity: 6,480 MW
- Annual energy: 10,671 GWh

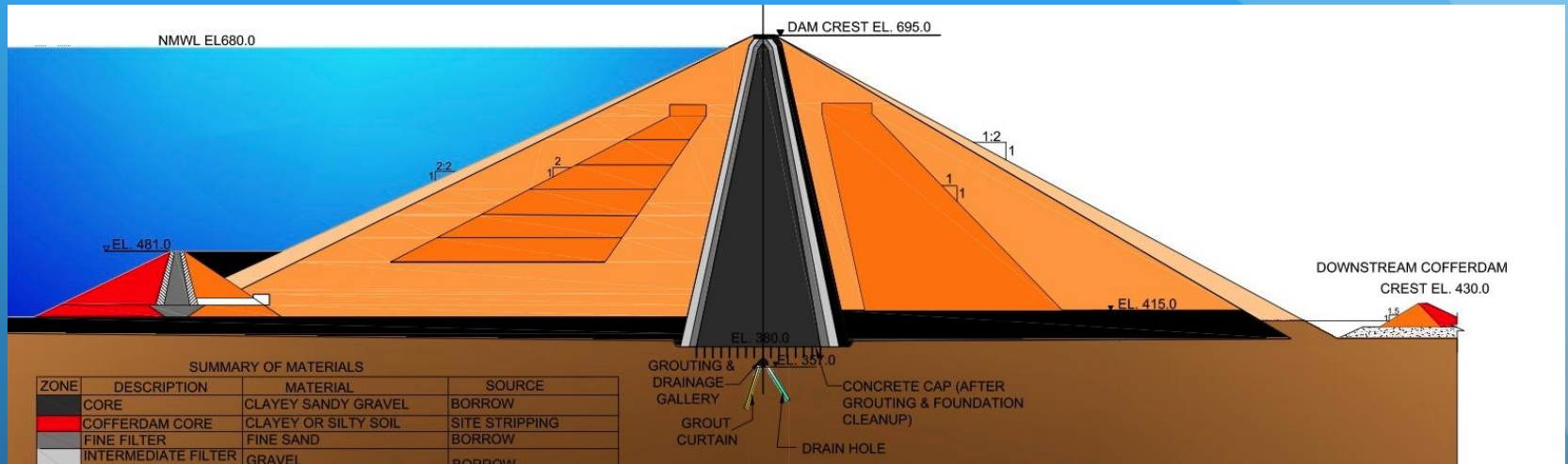


# Project Layout

- Based on 1995 DPR
- Main components
  - Rock-filled zoned dam
  - Six power intakes
  - Six 10 m  $\phi$  concrete-lined tunnels, 8 m  $\phi$  steel-lined vertical shafts and short, high-pressure tunnels
  - Two power stations
  - Spillway on left bank

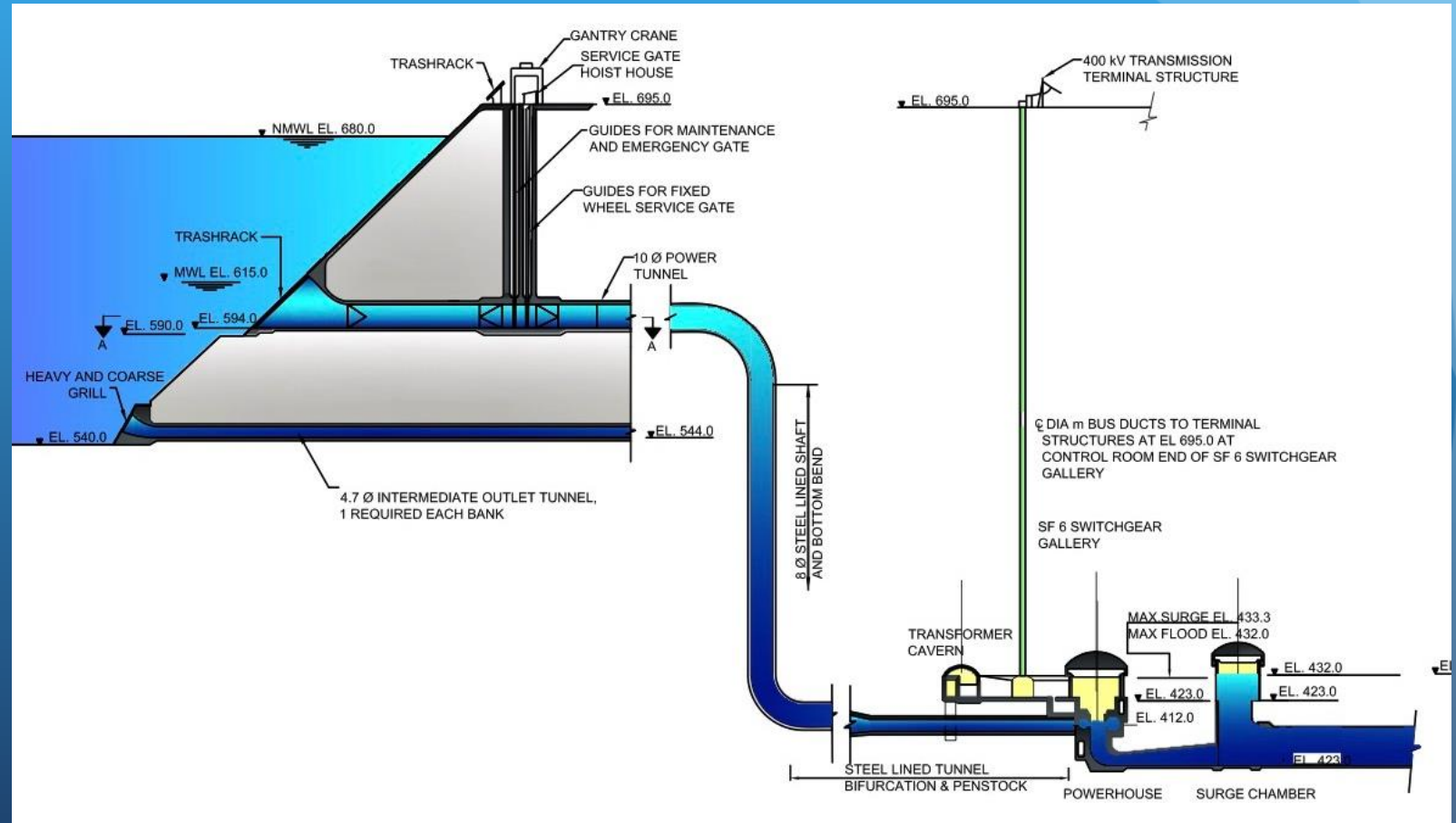


# Dam



- 315 m high, rock-filled zoned dam with central clay core
- Crest level: 695 m
- Normal Maximum Water Level: 680 m
- Minimum Operation Level: 615 m amsl

# Power Station Complex



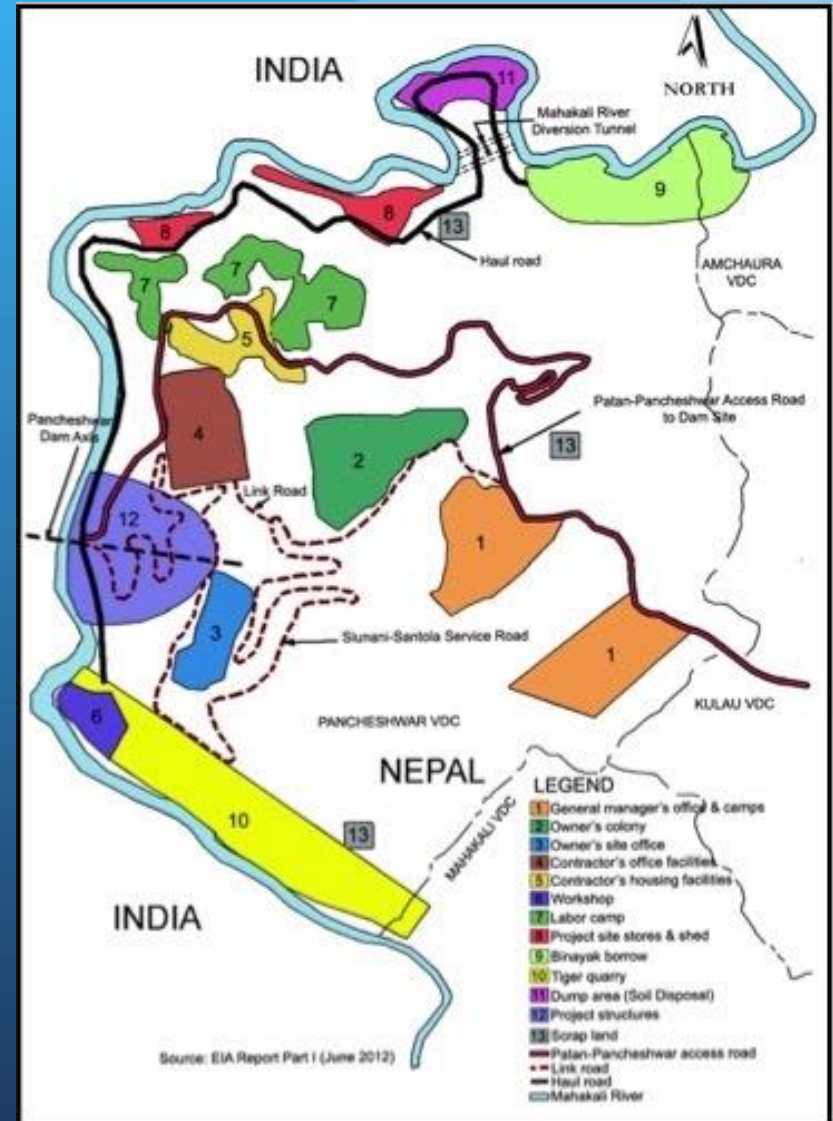
# PHD Reservoir

- Total storage: 12.26 billion m<sup>3</sup>
- Live storage: 6.56 billion m<sup>3</sup>
- Annual depletion depth: 65 m
- Surface area of 13,400 ha, with 3,850 ha in Nepal



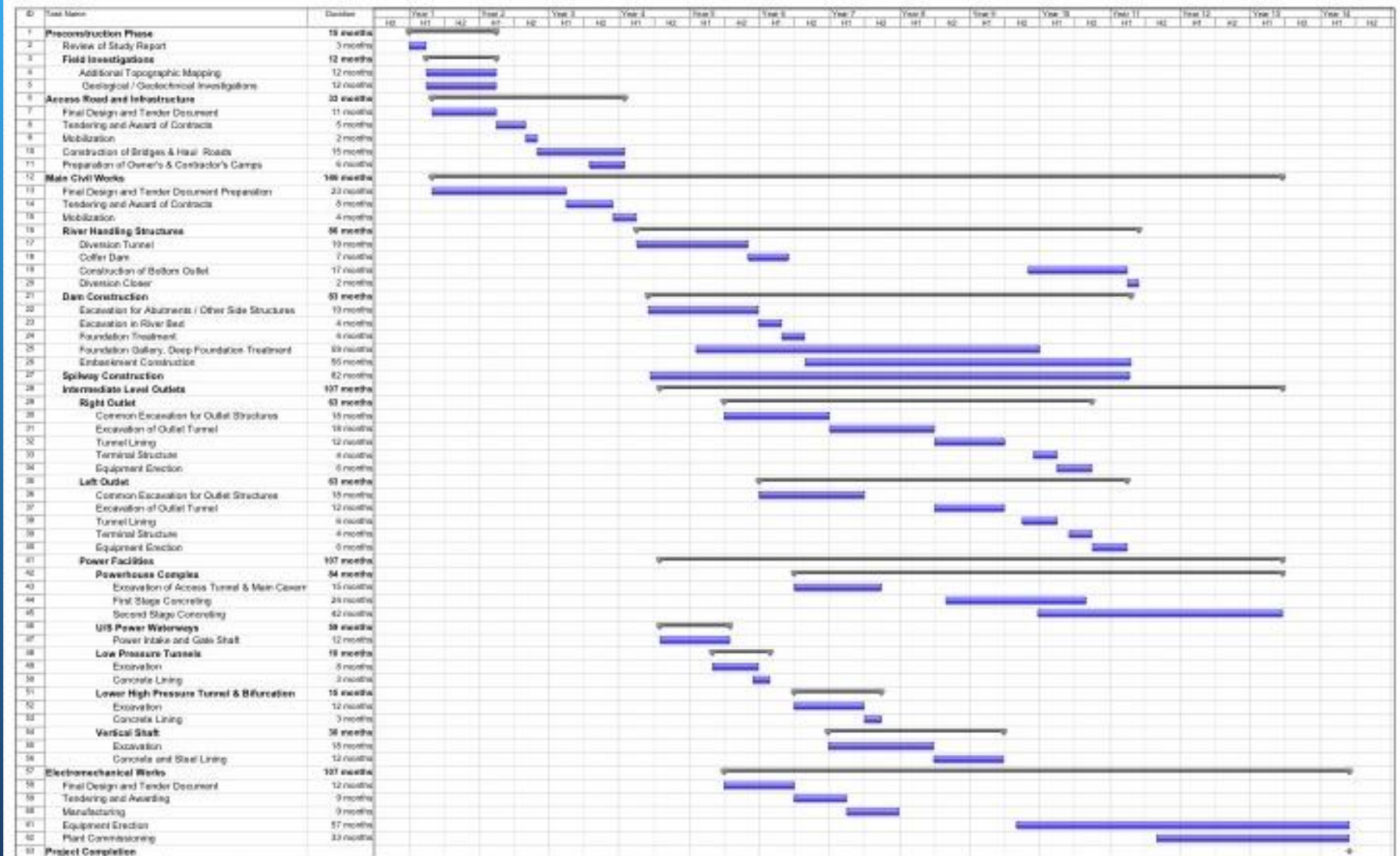
# Construction Infrastructure

1. General Manager's office & camps
2. Owner's Colony
3. Owner's site office
4. Contractor's office facilities
5. Contractor's housing facilities
6. Workshop
7. Labor camp
8. Project site stores and shed
9. Binayak borrow
10. Tiger quarry
11. Dump area (Soil disposal)
12. Project structures
13. Scrap land





# Project Schedule



# Approach & Methodology

# Approach

- DEMP developed based on two basic platforms
  - Technical basis: PMP DPR prepared in 1995
  - Environmental platform: PMP EIA report approved in 2013
- No additional technical analyses performed
- Additional desk studies and field investigations conducted to validate, update and augment EIA findings

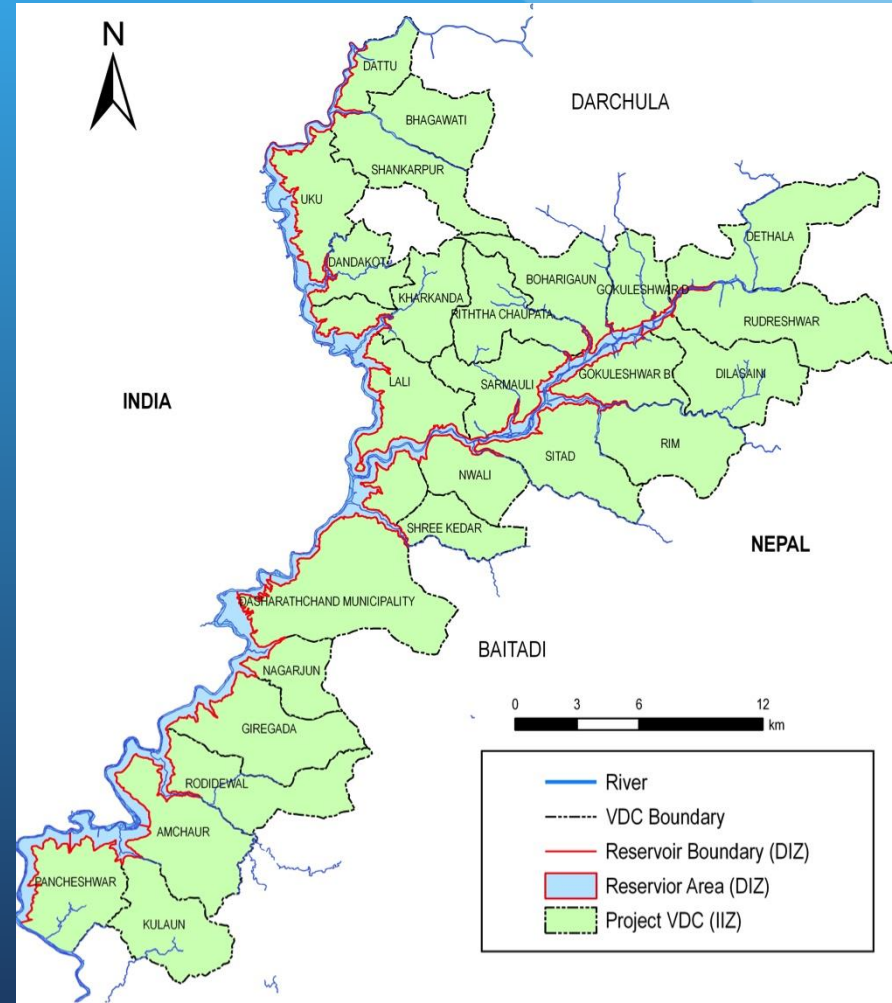


# Methodology

- Literature review
- Additional desk and field studies
- Public consultations during field investigations
- Updating of baseline conditions
- Reassessment of impacts
- Reassessment/ elaboration of environmental protection measures
- Preparation of DEMP (monitoring, auditing and reporting plans, implementation mechanisms, cost estimate, etc.)
- Stakeholder consultations

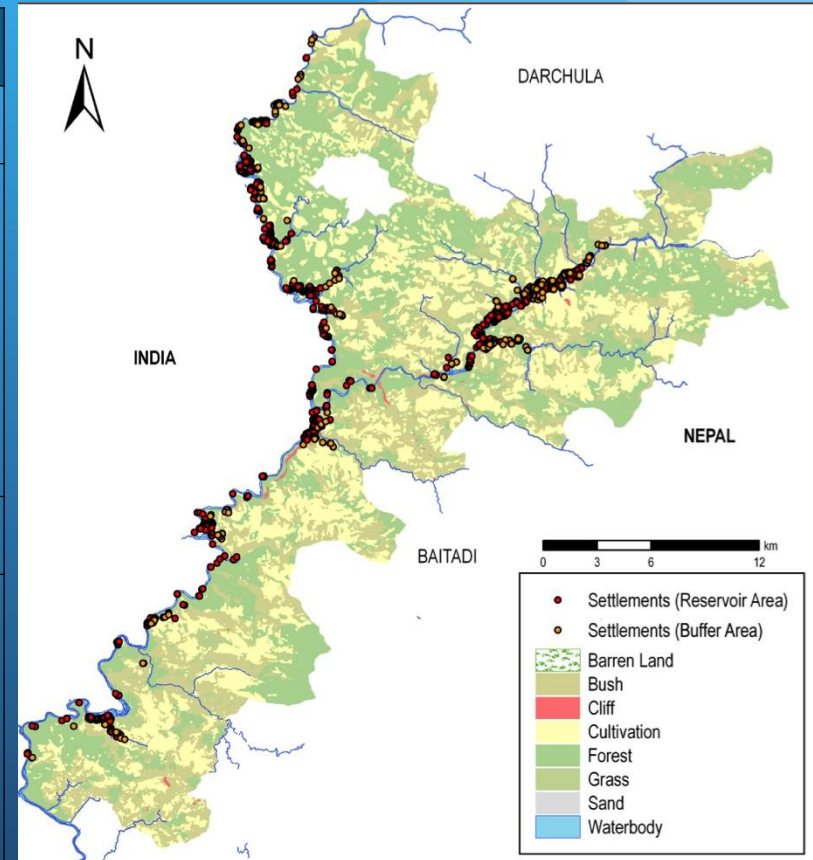
# Project-affected Areas

Project area	VDCs/municipalities affected by PHD reservoir and project structures
Direct Impact Zone	Project areas subject to dislocation of people and subsequent resettlement and rehabilitation
Indirect Impact Zone	Project areas where people could partially lose their lands, houses and other assets/properties temporarily or permanently and require compensation



# Project Area Settlements

Municipality/ VDC	Current GP/NP	DIZ	IIZ
Darchula (9)	4		
Dattu, Uku, Dandakot, Lali, Kharkada, Sarmauli, Rithachaupata, Bohorigaun, Gokuleshwar	Shailyashikhar NP, Lekum GP, Malikarjun GP, Mahakali NP	51	3
Baitadi (9)	4	59	13
Gokuleshwar, Dilasaini, Sittad, Nwali, Dasarathchand Nagarpalika, Giregada, Aamchaura, Pancheshwar	Pancheshwar GP, Darshrathchand NP, Dogadakedar GP, Dilasaini GP		
Total (18)	8	110	16



# Environmental Management Plans

# Environmental Management Plans

SN	Plan
1	Construction Impact Management Plan
2	Immediate Catchment Area Management Plan
3	Pollution Management Plan
4	Forest Conservation and Management Plan
5	Wildlife Conservation and Management Plan
6	Fishery Management Plan
7	Medicinal Plant Management Plan
8	Agricultural Support Plan
9	Pancheshwar Support Plan
10	Tourism Development Plan

# Construction Impact Management Plan

- Major impacts
  - Influx of about 8,000 migrants into core construction area
  - Peak resident population about 4,400
  - Manifold increase in demand for housing, food and basic services
  - Social, cultural and ethnic tensions between migrants and local communities
  - Deterioration of law and order
  - Introduction of social evils

# Construction Impact Management Plan

SN	Sub-plans	Objective
1	Contractor Camp Management Plan	Ensure proper development/operation of CC camps
2	Site Clearing and Salvage Plan	Minimize vegetation loss; facilitate salvage benefits
3	Quarry/ Borrow Area Management Plan	Properly manage quarrying and borrowing
4	Spoil Bank Management Plan	Ensure proper disposal & treatment of spoil
5	Erosion and Sediment Control Plan	Prevent soil erosion & land instabilities; control sedimentation in water bodies
6	Traffic and Access Control Plan	Proper traffic/access management at site
7	Community Relations and Safety Plan	Ensure community safety; promote harmonious relations with local community

# Construction Impact Management Plan

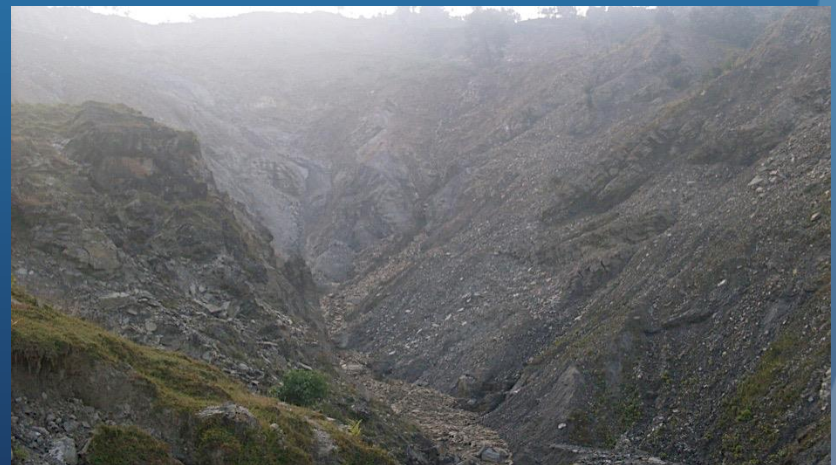
SN	Sub-plans	Objective
8	Hazard Management Plan	Reduce work place hazards from flooding, fire, etc. Protect human life and property
9	Landscaping and Restoration Plan	Restore landscape and landform to original state
10	Site Rehabilitation Plan	Rehabilitate construction and camp sites at decommissioning or demobilization
11	Worker Health Safety Plan	Protect construction workers and public from occupational health and safety hazards



# Intermediate Catchment Area Management Plan

## Baseline Conditions

- Watershed conditions poor and deteriorating
- Gully erosion and riverbank erosion common
- 35 landslides recorded along Mahakali and Chameliya
- Most of reservoir rim: very high to high hazard (85%)



# Intermediate Catchment Area Management Plan



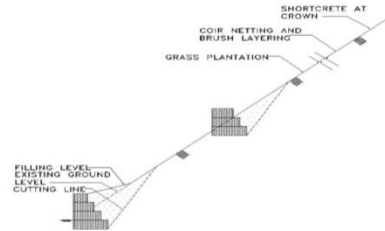
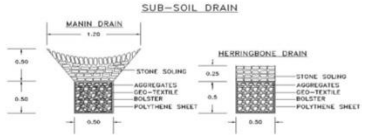
## Impacts




- Soil erosion and landslides during construction
- Slope instability at borrow and quarry sites
- Increased soil erosion & land instabilities due to reservoir filling
- Soil erosion & land instabilities due to reservoir fluctuations
- Riverbank instabilities downstream of PHD




## Actions

- Reduce soil erosion on hill slopes
- Control reactivation of existing landslides
- Prevent occurrence of new landslides during construction & reservoir filling
- Prevent occurrence of new landslides during reservoir operation
- Control downstream bank erosion
- Civil engineering/ bioengineering techniques

# Intermediate Catchment Area Management Plan

<b>LANDSLIDE 10</b>	
<b>Location</b>	
Bangabagar, Left bank of Chameliya River	
<b>Easting</b>	453147
<b>Northing</b>	3280720
<b>Elevation</b>	716 m
	
<b>Characteristics of slide</b>	
<b>Size (m<sup>2</sup>)</b>	300 × 600
<b>Geomorphology</b>	Moderate to steep slope
<b>Geology</b>	Highly crushed weak and fragile rock masses
<b>Formation</b>	Banku
<b>Hydrology</b>	Flowing water
<b>Failure type</b>	Debris flow
<b>Scale</b>	Large
<b>Nature</b>	Debris
<b>Dominant mechanism</b>	Crushed rock mass, poor drainage
<b>Hazard rating</b>	High
	
<b>Remedial measures</b>	
<b>Description of work</b>	
Site Clearance Earthwork in excavation Backfilling Slope trimming Gabion works Installation of sub-soil drain Geotextile GI wire netting Grass plantation Shot-crete works	
	
<b>Total estimated cost of remedial measures is NRs. Three hundred thirty three million and Twenty five thousand.</b>	
	

S N	Mitigation measures	Description / Purpose	Photos
Slope Geometry Modification			
1	Hand/ Mechanical Scaling	Used to remove loose soils and rocks from unstable slopes via hand tools and/or mechanical equipment. Commonly used in conjunction with other stabilization methods.	
2	Trim Blasting	Used to remove overhanging rocky faces and protruding knobs and to modify the slope angle to improve rock fall trajectory and slope stability.	
Reinforcement			
Internal Stabilization			
3	Rock Bolts	Tensioned steel bars used to increase the normal force friction and shear resistance along discontinuities and potential failure surfaces of rock mass. Applied in a pattern or in a specific block.	

SN	Mitigation measures	Description/ Purpose	Figure/Sketch
1	Branch Packing	Branch packing is used to repair small, localized slumps and holes in stream banks. It consists of alternating layers of live branches and compacted backfill. Branches trap sediment that refills the localized slump or hole, while roots spread throughout the backfill and into the surrounding earth to form a unified mass.	
2	Brush Layering	Brush layering is the technique of laying cuttings on horizontal benches that follow the contour of either an existing or filled bank (slope). Branches serve as tensile inclusions or earth-reinforcing units to provide shallow stability of slopes.	
3	Brush Mattress	A brush mattress is a layer of dormant branches laid on and secured to a bank surface. It offers immediate bank coverage. This technique is also effective on lakeshores. Typically, it is combined with a toe stabilizing technique such as rock, root wads, live siltation, fascines, coconut fiber logs, or tree revetments. In this example, a fascine will be used with the mattress.	

# Pollution Management Plan

SN	Sub-plans	Objective
1	Air Quality Management Plan	Maintain ambient air quality
2	Water Quality Management Plan	Maintain river water quality during construction Manage reservoir water quality during operation
3	Noise Management Plan	Maintain noise levels at workplace, camps and project vicinity
4	Solid Waste Management Plan	Reduce and manage solid waste Reduce impacts of waste on receiving environments.

# Pollution Management Plan

## Baseline Conditions

- Air quality: generally pristine
- Water quality
  - Generally clear, high turbidity in summers/monsoon
  - River waters highly contaminated near settlements
- Noise levels: pristine
- Solid waste:
  - Mostly animal waste and household organic waste
  - Waste management poor



# Pollution Management Plan

## Impacts

- Deterioration of air quality, odor, health hazards
- Deterioration of water quality in river & reservoir, contamination
- Increase in noise levels, disturbance, health hazards
- Increase in solid wastes, waste water
- Construction and biomedical wastes



# Pollution Management Plan

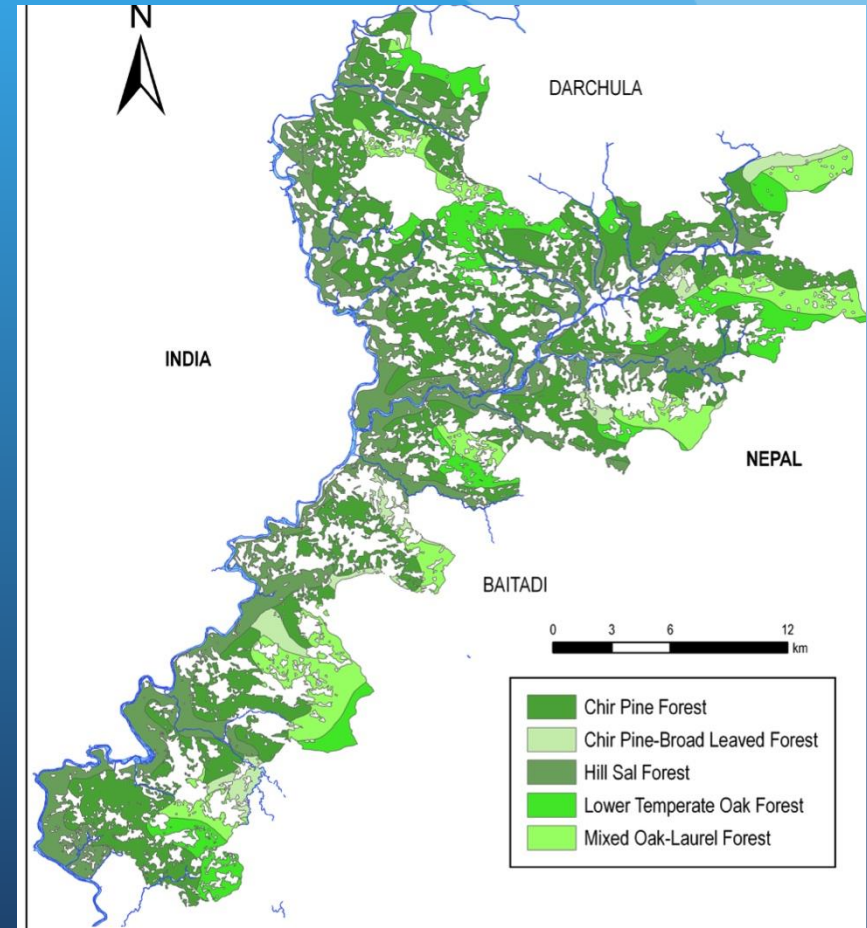
## Sub-plans

Air Quality MP	<ul style="list-style-type: none"><li>• Control dust generation, engine emissions</li><li>• Maintain air quality in underground structures</li><li>• Prevent odor production</li><li>• Preventive measures against health hazards</li></ul>
Water Quality MP	<ul style="list-style-type: none"><li>• Control sediment entry into rivers/water bodies</li><li>• Manage runoffs/discharges from construction sites</li><li>• Manage waste and hazardous materials</li><li>• Prevent water contamination</li><li>• Control entry of sediments &amp; nutrients into reservoir</li><li>• Control thermal stratification of reservoir</li><li>• Prevent spillage of hazardous substances into reservoir</li></ul>
Noise MP	<ul style="list-style-type: none"><li>• Minimize noise generation from construction activities, Implement preventive measures against health hazards</li></ul>
Solid Waste MP	<ul style="list-style-type: none"><li>• Manage municipal wastes, wastewater, construction wastes &amp; biomedical wastes</li><li>• Provide toilet facilities to prevent open defecation</li></ul>

# Forest Conservation & Management Plan

## Baseline

- Sub-tropical forests at lower elevations, temperate forests at higher altitudes
- Forests quality: medium to high
- Several rare & threatened species
- Forest resources important for livelihood of locals
- Community, leasehold, religious and some private forests





# Forest Conservation & Management Plan

## Impacts

- Loss of forest & vegetation cover
- Impacts on forest types, major species, total stock & standing volume
- Loss of community, private, leasehold & religious forests
- Forest degradation
- Climate change

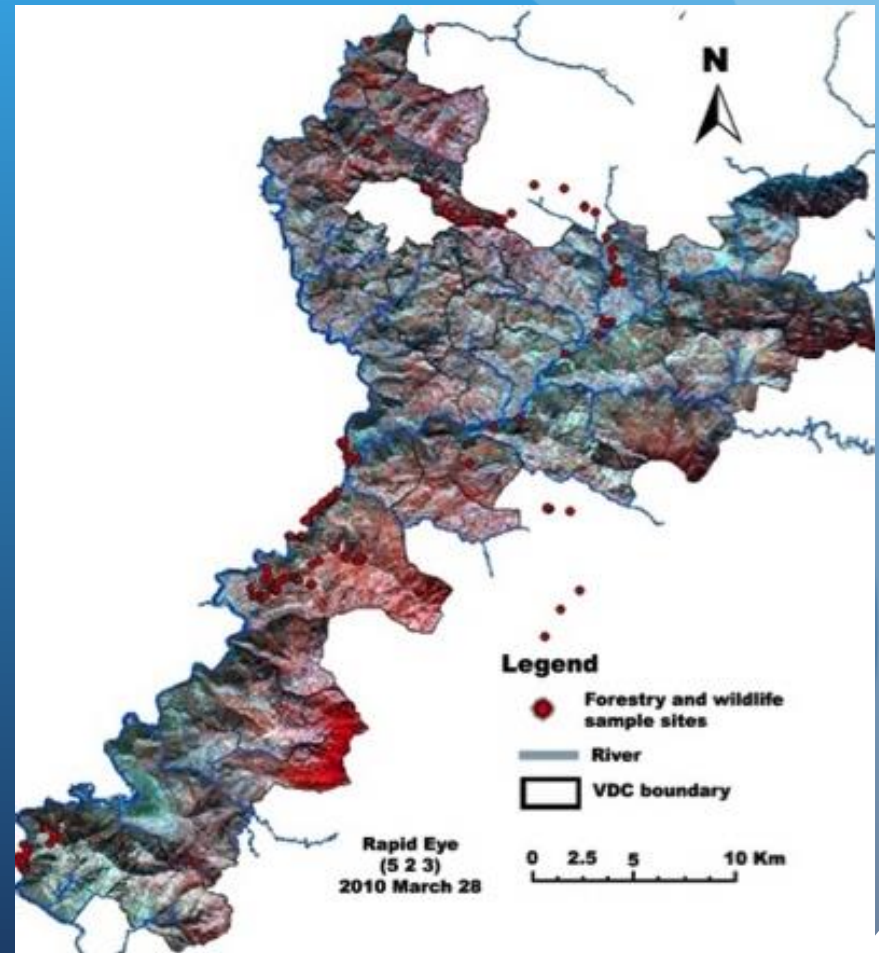
## Actions

- Protect & enhance forests
- Establish species conservation & research programs
- Compensatory afforestation
- Enhance capacity of DFOs, staff & key stakeholders
- Support CFUGs, LFUGs, private forest owners & key stakeholders

# Wildlife Conservation & Management Plan

## Baseline

- 24 species of mammals, 122 species of birds, 23 species of fishes & 21 species of herpeto-fauna
- Several species globally important
- Several rare & endangered species
- Several species share habitats across the border
- Limited wildlife poaching
- Human-wildlife conflicts: loss of crops & livestock depredation
- No protected areas in project area



# Wildlife Conservation & Management Plan

## Impacts

- Loss & degradation of wildlife habitat
- Impact on wildlife movement
- Disturbance to wildlife
- Threat of invasive species
- Modification of animal behavior
- Wildlife poaching & trade
- Human - wildlife conflict

## Actions

- Monitor impacts on wildlife
- Maintain wildlife habitats & corridors
- Set up conservation & research programs
- Control wildlife poaching & trade
- Establish trans-boundary coordination
- Enhance capacity of key stakeholders
- Enhance biodiversity conservation awareness

# Fisheries Management Plan

## Baseline

- Diverse fish species & aquatic life
- Four major spawning and rearing sites
- 23 species of fish under three orders and six families in project area
- Four long-distance and six short-to mid-distance migratory species, 13 resident species
- All trout species threatened
- Fishing practiced by limited households



# Fisheries Management Plan

## Impacts during Construction

- Disturbance to fish habitats
- Endangering of fish/aquatic life from water pollution
- Depletion of fish species due to construction and influx of people
- Temporary disturbance/hindrance to fish migration

## Actions during construction

- Control/manage entry of sediments & contaminants into river waters
- Control illegal fishing
- Manage use of explosives
- Control obstructions to fish migration
- Maintain breeding/ spawning grounds upstream of Mahakali confluences

# Fisheries Management Plan

## Impacts during Operation

- Obstruction to fish migration & loss of species
- Species loss from loss of habitats, breeding & rearing grounds
- Species loss from change in aquatic ecology/biodiversity
- Fish mortality due to thermal stratification
- Reduction in fish diversity due to eutrophication
- Loss of annual income
- Increased fish productivity & enriched fish biodiversity

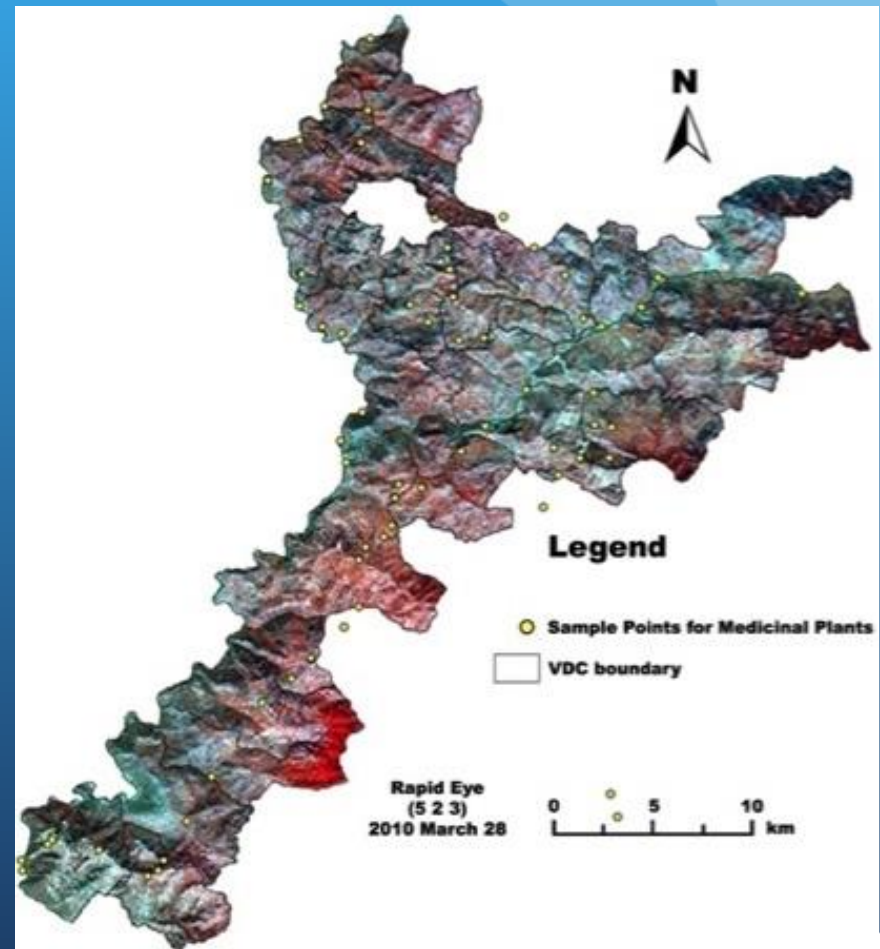
## Actions during Operation

- Control/manage entry of sediments & contaminants into reservoir
- Reduce fish mortality due to thermal stratification
- Maintain fish diversity in reservoir through habitat enhancement
- Establish hatchery for migratory & resident species
- Open water stocking in reservoir
- Reservoir fishery through cage culture
- Warm-water hatchery for aquaculture
- Organize community-based fish farming
- Develop infrastructure/ marketing facilities

# Medicinal Plant Management Plan

## Baseline Conditions

- Project area very rich in medicinal plants
- 351 species identified during field studies
- 34 species commercially important
- Production, harvesting, usage and trade of medicinal plants in project area underdeveloped






# Medicinal Plant Management Plan


## Plant number: MP 8

Name	Scientific/English/ Sanskrit			Withania somnifera		
	Local			Ashwagandha		
Location	Shree Jawolpur Higher Secondary School, Amchoura VDC, Sailodo Village, Baitadi					
	E	435019	N	3257052	El. (m)	1,552
Climate	Tropical and temperate zones.					
Altitude range (m)	1,000 – 2,100					
Soil type	Dry soil					
Medical value	Muscular disease, paralysis, pain relief					



## Plant number: MP 78

Name	Scientific/English/ Sanskrit			<i>Ganoderma applanatum</i>		
	Local			Rato chyau/ Ganoderma		
Location	Barmude – lekam – Gwani – 8, Darchula					
	E	455309	N	3290788	El. (m)	2,087
Climate	Tropical and temperate zones.					
Altitude range (m)	1,000 – 3,000					
Soil type	General soil					
Medical value	Source of nutrients, maintain lever, kidney, heart					







# Medicinal Plant Management Plan

## Impacts

- Permanent loss of 51 species of medicinal plants growing within reservoir area
- Degradation of medicinal plant forests & plantations

## Actions

- Improve awareness among medicinal plant collectors & general people
- Promote and develop entrepreneurship in medicinal plants, esp. Tejpat, Timur, Sarpagandha, Chiraito & Lothsallo
- Conserve endangered, rare & important medicinal plants
- Establish sustainable management of medicinal plants

# Agriculture Support Plan

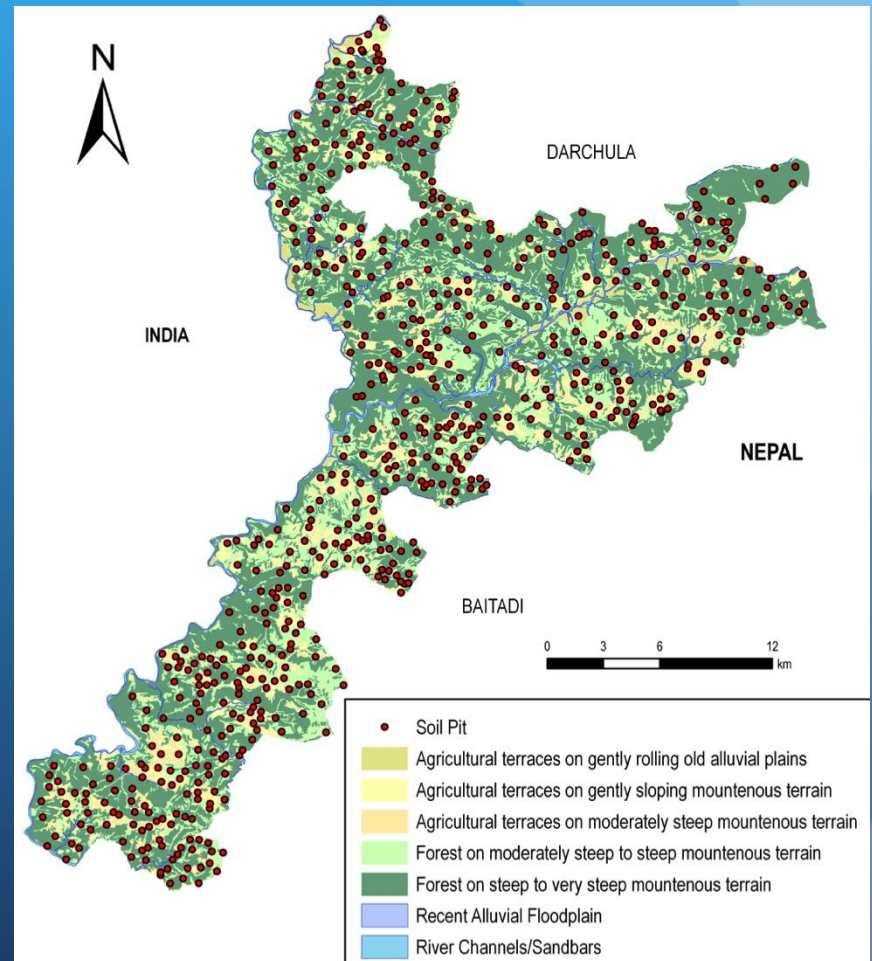
## Baseline Conditions

- Agriculture: main livelihood of project area residents
- Agricultural productivity low
- Agricultural system: integrated crop-livestock production system
- Major cereal crops: paddy, wheat & maize
- Few cash crops grown in limited quantities
- Limited seasonal & off-seasonal vegetable farming, but high potential
- Fruit production limited but has high potential
- Floriculture almost non-existent
- Livestock and poultry: integral part of subsistence farming system
- Limited basic extension services for farmers available

# Agriculture Support Plan

## Soil Studies

- To determine distribution & characteristics of soils
- Extensive soil investigation and laboratory tests
  - 262 soil profile samples (P)
  - 424 soil surface samples (S)
  - Total: 1,193 samples
- Preparation of soil maps



# Agriculture Support Plan

## Impacts

- Loss of 143 ha of agricultural land for PHD structures
- Submergence of 994 ha of cultivated land in project-affected VDCs
- Annual loss of 153 MT of agricultural produce
- Loss of approx.150,000 fruit & fodder trees by submergence
- Loss of grazing land & livestock food resources
- Decrease in availability of farm labors
- Loss of basic extension services to farmers
- Loss of livelihood of DIZ & IIZ population
- Increased pressure on local food and commodity markets

# Agriculture Support Plan

## Actions

- Rehabilitate/strengthen resource/service centers
- Construct agriculture-related community infrastructures
- Support farmers in
  - Improving agricultural productivity
  - Improving vegetable & vegetable seed production
  - Improving apiculture & initiating floriculture
  - Improving fruit production
  - Livestock & poultry development
- Community organization & mobilization
- Develop institutional capacity of farmers' organizations/networks

# Pancheshwar Support Program

SN	Sub-plans	Objective
1	Public Health & Sanitation Management Plan	<ul style="list-style-type: none"><li>• Improve/upgrade existing health &amp; sanitation facilities</li><li>• Improve health &amp; sanitation outcomes by strengthening health services &amp; sanitation</li></ul>
2	Education & Cultural Support Plan	<ul style="list-style-type: none"><li>• Improve literacy of local population by strengthening educational services</li><li>• Preserve archaeologically &amp; culturally important sites, beliefs &amp; practices</li></ul>
3	Income Generation & Livelihood Support Plan	<ul style="list-style-type: none"><li>• Develop alternate, sustainable means of income generation &amp; livelihood support for project-affected people</li><li>• Improve living standards of local people</li></ul>

# Pancheshwar Support Program

SN	Sub-plans	Objective
4	Community Service Development Plan	<ul style="list-style-type: none"><li>• Improve &amp; strengthen local community services</li><li>• Contribute to general development of the area prepare communities for some of PHD impacts</li></ul>
5	Rural Infrastructure Development Plan	<ul style="list-style-type: none"><li>• Rehabilitate/ relocate existing rural infrastructure based on need assessment</li><li>• Develop additional infrastructures in project area to meet growing needs &amp; aspirations of local residents, particularly project-affected families</li></ul>

# Public Health & Sanitation Management Plan

## Baseline

- District-level hospitals & several secondary health facilities available, offer very basic medical services
- Air, water & vector borne diseases common
- High maternal & infant mortality rates
- STDs & HIV/AIDS cases reported in project districts
- Many households have toilets, but a large number defecate openly
- Drinking water has E. Coli contamination & high turbidity
- No services for sewage, excreta & solid waste collection/ disposal



# Public Health & Sanitation Management Plan

## Impacts

- Increased pressure on & loss of health facilities
- Increase in infectious & communicable diseases
- Increased pressure on & loss of existing water supply & sanitation systems
- Air borne and vector borne diseases after reservoir formation

## Actions

- Rehabilitate & upgrade health facilities
- Control infectious diseases
- Control communicable diseases, promote sound reproductive health practices
- Develop human resources for health facilities (100 in each district)
- Health monitoring & demographic surveillance
- Provide support for water treatment, good sanitation practices, health & hygiene

# Education & Cultural Support Plan

## Baseline Conditions

- Number of educational institutions
- 25% population illiterate, educational attainment low
- Diverse caste/ethnic composition
- Main religion: Hinduism
- Main language: Doteli
- Large number of temples & shrines
- Only site of archeological/historical significance: Sri Mahal
- Several *ghats* along riverbanks



# Education & Cultural Support Plan

## Impacts

- Displacement of educational institutions, increased pressure on existing facilities
- Disruption of cultural & religious traits, norms, values and practices
- Loss of cultural, religious, archaeological and historical sites
  - 109 temples & shrines, including Pancheshwar Mahadev, Malikarjun, Saipal & Jagannath temples
  - Sri Mahal
- Displacement of cremation sites
- Impact on relationship between SPAFs during operation

# Education & Cultural Support Plan

## Actions

- Rehabilitate & upgrade existing education facilities
- Conduct and promote teachers' trainings
- Promote enrolment of girls and deprived class
- Promote adult literacy
- Preserve cultural & religious traits, norms, values & practices
- Relocate important cultural, religious, archaeological, historical & cremation sites
- Establish sociocultural harmony among SPAFs & PAFs

# Income Generation & Livelihood Support Plan

## Baseline Conditions

- Major sources of livelihood: subsistence farming, animal husbandry, wage employment, collection of herbs & NTFPs, remittance
- Off-farm income-generating activities: service & wage labor, trade, business, retail shops, hotels/lodges & teashops, small-scale industries, manufacturing, transport, tourism, fishing, livestock, etc.
- Major sources of income: trade & business, services, remittance, pension & agriculture-related works
- Yearly income of majority households: Rs. 150,000 to Rs. 200,000
- Large amount of household income spent on basic needs: food grains, education, clothing & medicine

# Income Generation & Livelihood Support Plan

## Impacts

- Direct or indirect impact on traditional means of livelihoods & income generation
- Creation of new means of livelihood & income generation
- Loss of livelihood & decrease in income during operation

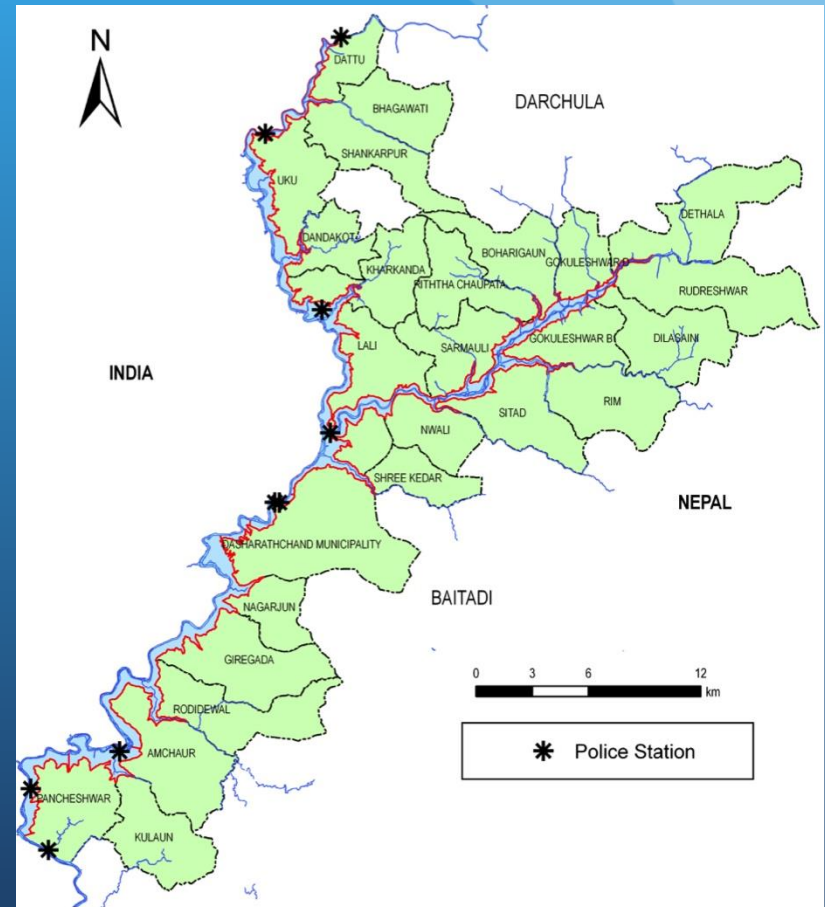
## Actions

- Skill development & entrepreneurship training
- Generate employment
- Rehabilitate/establish cooperatives
- Arrange credit flow for entrepreneurship development

# Community Services Development Plan

## Baseline Conditions

- Several government and semi-government institutions for community services
- Several financial institutions
- Small-scale private industries (oil & rice-processing mills, water mills, stone crushing facilities, etc.)
- Some retail shops, hotels, lodges and teashops



# Community Services Development Plan

## Impacts

- Submergence of government service centers
- Submergence of community infrastructure & facilities
- 

## Actions

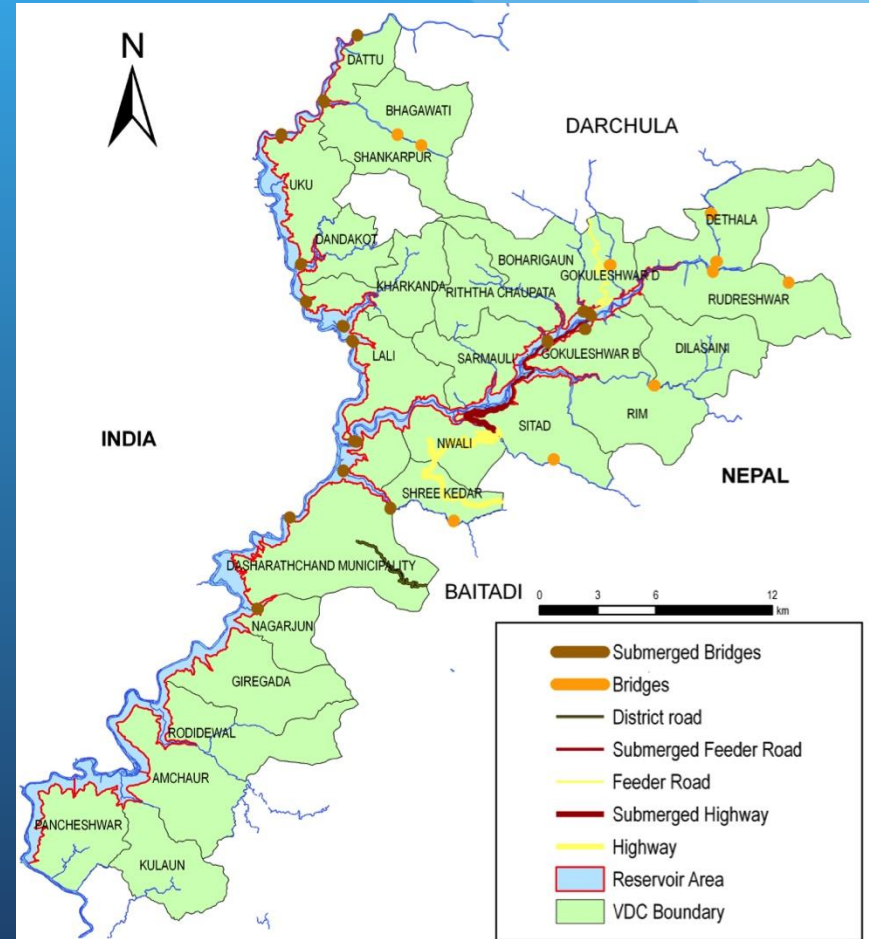
- Relocate/ rehabilitate government service centers
- Re-establish community infrastructure & facilities



# Rural Infrastructure Development Plan

## Baseline Conditions

- 42 farmer-managed & 22 agency-managed irrigation systems
- Some areas with electricity supply
- Few small & micro hydro plants
- Piped water supply schemes in some settlements
- Major access: Mahakali Highway
- Several vehicular & pedestrian bridges
- Few border crossing points (suspension bridge, boats)



# Rural Infrastructure Development Plan

## Impacts

- Loss of irrigation systems
- Submergence of rural electrification services
- Loss of drinking water schemes
- Submergence of road transport & communication facilities
  - Rural roads & tracks
  - 13 km of feeder roads
  - 10.5 km of Mahakali Highway
  - 7 vehicular bridges & several suspension bridges
  - Boat crossing points at Binayak and Rolghat

## Actions

- Construct & rehabilitate irrigation facilities
- Rural electrification
- Provide support for water supply & sanitation systems
- Construct/rehabilitate/ realign access roads/ trails
- Rehabilitate/ construct vehicular & pedestrian bridges
- Re-establish crossing on Indo-Nepal border

# Tourism Development Plan

## Baseline Conditions

- Tourism almost nonexistent due to remoteness, poor connectivity, lack of infrastructure & absence of developed tourist destinations
- Seasonal internal & regional tourism for religious, cultural & social events
- High potential for tourism development

# Tourism Development Plan

Form of tourism	Potential destinations
Religious tourism	<ul style="list-style-type: none"> <li>• Tripura Sundari, Dehmandu, Pancheshwar Mahadev, Jagannath, Hunainath, Malikarjun, Saipa, Sri Mahal</li> </ul>
Cultural tourism	<ul style="list-style-type: none"> <li>• Sri Mahal, villages/ settlements in remote areas</li> </ul>
Education/ research tourism	<ul style="list-style-type: none"> <li>• PHD structures</li> <li>• Botanical park, forest nurseries, edicinal plant demonstration farm, fish hatcheries, agro-based industries</li> </ul>
Ecotourism	<ul style="list-style-type: none"> <li>• Api Himal (7132 m)</li> <li>• Nearby protected areas- Shukla Phanta Wildlife Reserve, Khaptad National Park and Api Nampa Conservation Area</li> </ul>
Recreational tourism	<ul style="list-style-type: none"> <li>• Reservoir</li> <li>• Mahakali, Chameliya Rivers and their tributaries</li> </ul>
Sports tourism	<ul style="list-style-type: none"> <li>• Sport fishing in reservoir and rivers (e.g. for Mahaseer)</li> </ul>
Adventure tourism	<ul style="list-style-type: none"> <li>• Api Himal (7132 m)</li> <li>• Trek to Api Himal base camp</li> <li>• Bungee jumping at Jhulaghat having narrow, deep gorge</li> </ul>

# Tourism Development Plan

## Impacts

- Economic development, livelihood improvement, poverty alleviation
- Contribution to government revenue
- Protection & preservation of natural environment, culture & heritage
- Development of tourism infrastructure, facilities, resources
- Depletion of natural resources
- Increase in pollution
- Deforestation and intensified or unsustainable use of land
- Alteration of ecosystems by tourist activities

# Tourism Development Plan

## Actions

- Formulate tourism development master plan & strategic development plans
- Develop marketing & promotion plans
- Plan & develop trained human resource
- Plan & develop infrastructure & other essential requirements for tourism
- Improve quality standards in tourism industry
- Promote various forms of tourism
- Promote measures to mitigate adverse impacts

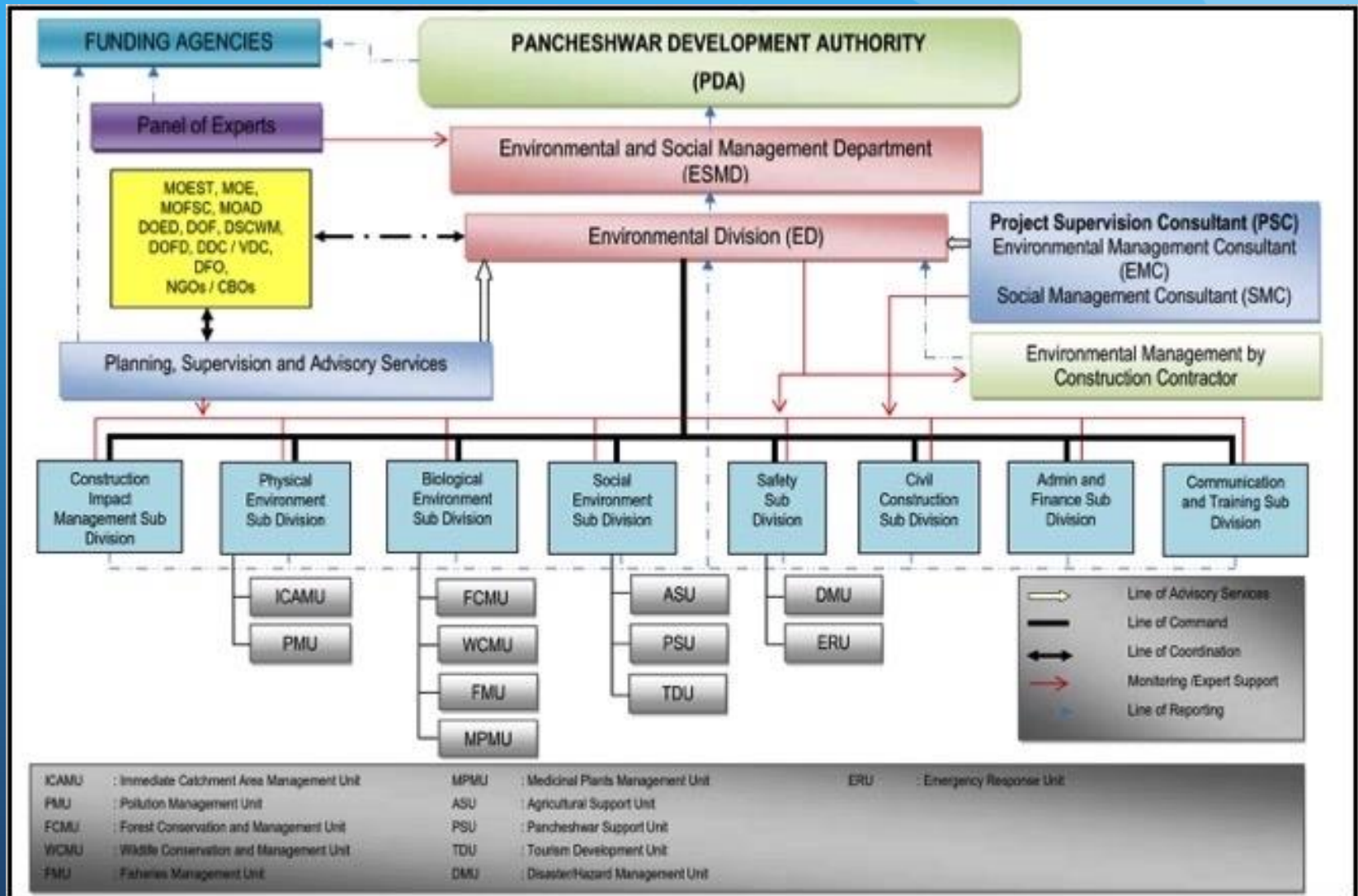
# DEMP Framework

# Implementation Responsibilities

Category	Organizations
Project owners	Pancheshwar Development Authority (PDA)
	<ul style="list-style-type: none"> <li>• Environmental and Social Management Department</li> <li>• Environmental Division, its sub-divisions and units</li> </ul>
Construction and operation supervision	Project Supervision Consultant
	<ul style="list-style-type: none"> <li>• Environmental Management Consultant</li> <li>• Social Management Consultant</li> </ul>
Contractor(s)	Construction Contractor(s)
	Other local contractors for infrastructure construction and implementing DEMP provisions
Advisory organizations	International NGOs, NGOs
Independent monitors	Panel of Experts
GoN	Ministry of Environment, Science and Technology
	Ministry of Energy



# Institutional Setup



# Complaint Handling & Grievance Redress Mechanism

- Receive & facilitate resolution of concerns, complaints & grievances from affected people on environmental and social issues
- Proactive & accessible
- Three, successively higher levels:
  - *Level 1*: Public Information Center
  - *Level 2*: ESMD to resolve unresolved grievances at Level 1
  - *Level 3*: Grievance Redress Committee (GRC) to resolve unresolved grievances at Level 2

# Supervision Framework

- *Pre-construction inspections*
  - By PDA and CC to confirm location of project sites
  - Identify site-specific construction & environmental issues
  - Identify stockpile sites and spoil and waste disposal areas
- *Construction inspections*
  - Daily, weekly & monthly inspections of construction sites
  - Monthly inspections of workforce camps
- *Pre-monsoon drainage inspection* of project sites
  - Review monsoon drainage controls
  - Identify locations & types of additional drainage/erosion/sediment controls

# Supervision Framework

- *Post-construction certification inspection* of completed sites
  - Inspect all reinstated access & local services & re-vegetation of all temporarily disturbed land
  - Certify each project site if it is in accordance with all contract & DEMP conditions
  - Provide written list of remedial actions to CC to be completed prior to certification

# Monitoring Framework

- Baseline Monitoring
  - Update baseline conditions and fill in baseline data gaps
- Impact Monitoring
  - Monitor impacts of project activities on physical, biological & socioeconomic resource base of project area
- Compliance Monitoring
  - Establish PDA's and CC's compliance with their environmental protection plans, including compliance of activities of government line agencies and other agencies involved in DEMP implementation

# Auditing Framework

- Construction Phase
  - Compliance Audit
  - External Compliance Audit
- Operation Phase
  - Compliance Audit
  - External Compliance Audit

# Reporting & Feedback Mechanism

- Daily reports by CC to PSC-EMC and ESMD, covering compliance issues related to the daily construction activities.
- Weekly reports by PSC-EMC to ESMD, dealing with the status of DEMP implementation & environmental performance of CC
- Monthly reports by CC to PSC-EMC and ESMD
- Monthly reports by ESMD for internal circulation
- Quarterly reports by ESMD to funding agencies, discussing status of environmental compliance of construction activities
- Six-monthly reports by External Auditors

# Consultations



# VDC-level Consultations

- Workshops at 17 affected VDCs in August 2017
- Major concerns
  - Inundation of fertile land
  - Employment opportunities for affected families
  - Clear, *apriori* agreement on compensation & resettlement terms for affected family
  - Delays in project implementation, blockage of development
  - Impact on current fishery practices



# District, Regional & National level Consultations

- District level at Darchula
  - Early project implementation
  - Local developments stalled due to delay in implementation
  - Conducive environment for implementation by improving coordination with locals/ win confidence of locals
  - Downstream impacts/ earthquake safety study
  - Compensation & resettlement of displaced people
  - Equality in employment
- Regional level at Baitadi
- National level at Mahendranagar



The background consists of several overlapping rounded rectangular shapes in various shades of blue, creating a layered, modern aesthetic. The colors range from a deep navy blue to a light sky blue.

# Estimated Cost

SN	Plan	Amount (million NRs.)
1	Construction Impact Management Plan	180.576
2	Immediate Catchment Management Plan	6,033.142
3	Pollution Management Plan	438.069
4	Forest Conservation and Management Plan	881.716
5	Wildlife Conservation and Management Plan	450.767
6	Fisheries Management Plan	6,360.306
7	Medicinal Plant Management Plan	225.599
8	Agriculture Support Plan	967.804
9	Pancheshwar Support Plan	2,514.380
10	Tourism Development Plan	439.406
11	Construction supervision of civil works	230.630
12	Coordination and project management	555.746
13	Communication, logistics and transport facilities	168.300
	<b>Total</b>	<b>19,446.441</b>

# Conclusion

# Conclusions & Recommendations

- DEMP has been formulated based on currently available data and information
- DEMP is a living document
- Needs to be detailed further and upgraded during construction and operation considering actual conditions

The background is a solid blue color with a gradient. It features several overlapping, rounded rectangular shapes in different shades of blue, creating a layered effect. The shapes are positioned diagonally, with the darkest blue in the bottom-left and the lightest blue in the top-right.

**Thank You!**