No.

Nepal Electricity Authority
Nepal

UPGRADING FEASIBILITY STUDY ON UPPER SETI (DAMAULI) STORAGE HYDROELECTRIC PROJECT IN NEPAL

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS (ESC) REPORT

June 2007

JAPAN INTERNATIONAL COOPERATION AGENCY

ELECTRIC POWER DEVELOPMENT CO., LTD.
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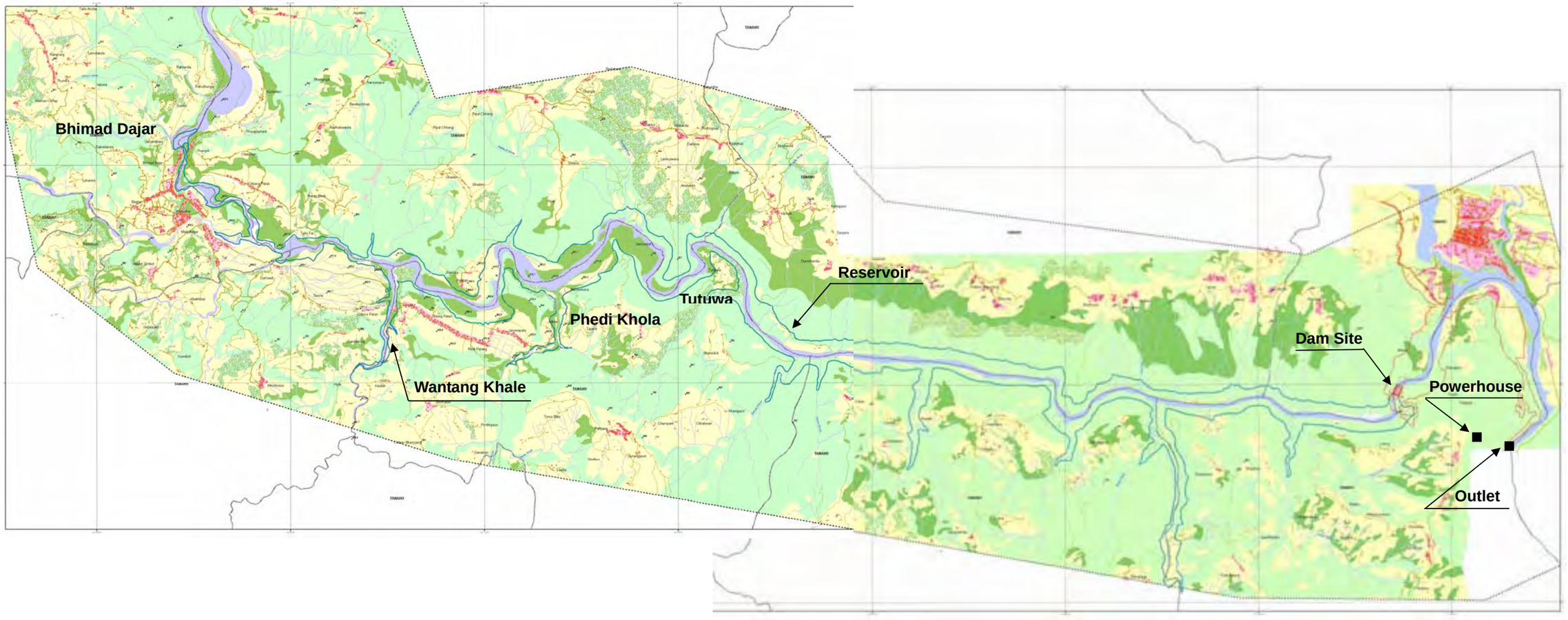
Location Map



River Corridor Study Region

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ABBREVIATIONS

Organizations	
ADB	Asian Development Bank
BFRS	Begnas Fisheries Research Station
CBO	Community-Based Organization
CBS	Central Bureau of Statistics
CDO	Chief District Officer
DANIDA	Danish International Development Agency
DDC	District Development Committee
DFO	District Forestry Office
DHM	Department of Hydrology and Meteorology
DOED	Department of Electricity Development
FINIDA	Finish International Development Agency
INGO	International Non-Governmental Organization
IUCN	International Union for Conservation of Nature and Natural Resources
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt fur Wiederaufbau
KMTNC	King Mahendra Trust for Nature Conservation
LDC	Load Dispatch Center
LDO	Local Development Officer
MOEST	Ministry of Environment, Science and Technology
MOF	Ministry of Finance
MOFSC	Ministry of Forest and Soil Conservation
MOWR	Ministry of Water Resources
NEA	Nepal Electricity Authority
NGO	Non-Governmental Organization
NRCT	Nepal River Conservation Trust
VDC	Village Development Committee
UNDP	United Nations Development Programme
USBR	United States Bureau of Reclamation
WB	World Bank

General and technical terms	
AFC	Automatic Frequency Control
AGC	Automatic Generation Control

AIDS	Acquired Immunodeficiency Syndrome
ASTM	American Society for Testing and Materials
B/C	Benefit-Cost Ratio
BOD	Biological Oxygen Demand
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COD	Chemical Oxygen Demand
CPI	Consumer Price Index
D/D	Detailed Design
DEM	Digital Elevation Model
EIA	Environmental Impact Assessment
EIRR	Economic Internal Ratio of Return
EL.	Elevation
EMP	Environmental Management Plan
FC	Foreign Currency
FIRR	Financial Internal Ratio of Return
FSL	Full Supply Level
F/S	Feasibility Study
FY	Fiscal Year
GDP	Gross Domestic Product
GIS	Geographic Information System
GIS	Gas Insulated Switchgear
HEP	Hydroelectric Project
HIV	Human Immunodeficiency Virus
IEE	Initial Environmental Evaluation
IPP	Independent Power Producer
IRR	Internal Ratio of Return
INPS	Integrated Nepal Power System
JIS	Japanese Industrial Standards
LAN	Local Area Network
LC	Local Currency
LOLP	Loss of Load Probability
MOL	Minimum Operation Level
NPV	Net Present Value
O & M	Operation and Maintenance
ODA	Official Development Assistance
PMF	Probable Maximum Flood

PMP	Probable Maximum Precipitation
PPA	Power Purchase Agreement
PROR	Peaking Run-off-River
PRSP	Poverty Reduction Strategy Paper
RAP	Resettlement Action Plan
ROE	Return on Equity
ROI	Return on Investment
ROR	Run-off-River
SAP	Social Action Plan
SCADA	Supervisory Control and Data Acquisition
VAT	Value Added Tax
WPI	Wholesale Price Index

Units

A	Ampere
ha	Hect Are
Hz	Hertz (Cycles per second)
JRT	Japan tone of refrigiration
Lu	Lugeon Value
MCM	Million Cubic Meter
MVar	Megavar
m mol/L	Mili-mol per liter
m^3/s	Cubic meter per second
ppm	Parts per million
V	Volt
kV	Kilovolt = 10^3 V
VA	Volt Ampere
kVA	Kilovolt Ampere = 10^3 VA
MVA	Megavolt Ampere = 10^6 VA
W	Watt
kW	Kilowatt = 10^3 W
MW	Megawatt = 10^6 W
Wh	Watt Hour
kWh	Kilowatt Hour = 10^3 Wh
MWh	Megawatt Hour = 10^6 Wh
GWh	Gigawatt Hour = 10^9 Wh
NRs	Nepalese Rupees

US$	US Dollar
USc	US Cent

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS (ESC) REPORT

PART A

ALTERNATIVE STUDY

PART A ALTERNATIVE STUDY

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CHAPTER 1 ALTERNATIVE STUDY

1.1 Introduction

Alternative layouts in which facilities of the Project were located in different places are prepared, and the comparison study on candidate development plans with FSL alternatives for each alternative layout is carried out in the Study, to select the optimum development plan as described in Chapter 10 of Final Report.

For the comparison, Cost (C) for each candidate development plan is estimated as the annual cost by using construction cost and operation and maintenance (O&M) cost, and Benefit (B) for the candidate is estimated as generation cost by the alternative thermal power plant of the equivalent scale to the Project. After the Benefit-Cost ratio, B/C, for each candidate is calculated, the candidate plan with the maximum B/C is selected as the optimum development plan.

1.2 Layout Alternatives

Following reviews of the existing study reports prepared by the NEA in 2001 and 2004 respectively, collection of topographical survey maps, site reconnaissance, and discussions with NEA, the five (5) alternatives for the comparison study were prepared. Due to the topographic conditions and site reconnaissance results, the dam axis is set at the same location as that of NEA for all alternatives, and only the waterway layouts are reviewed.

Each alternative layout is shown below:

(1) Option I

Option I is the alternative in which the powerhouse will be located immediately downstream of the dam. This option has the shortest waterway of the 5 alternative layouts, but the crest length of the dam shall be longer, by the width of the powerhouse, than that of the other alternatives. The General plan and waterway section of Option I are shown in **Fig. 1.2-1** and in **Fig. 1.2-2**, respectively.

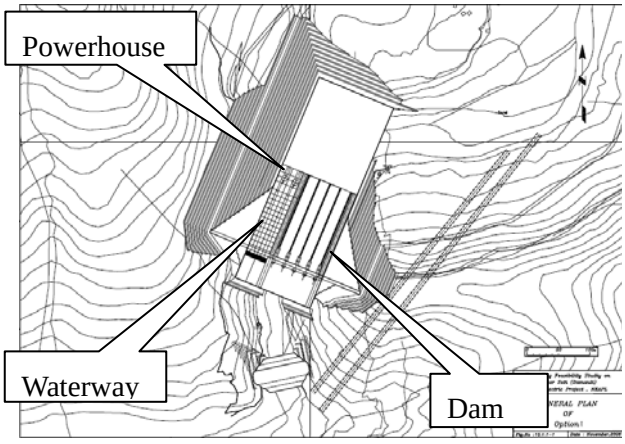

Figure 1.2-1 Option I General Plan

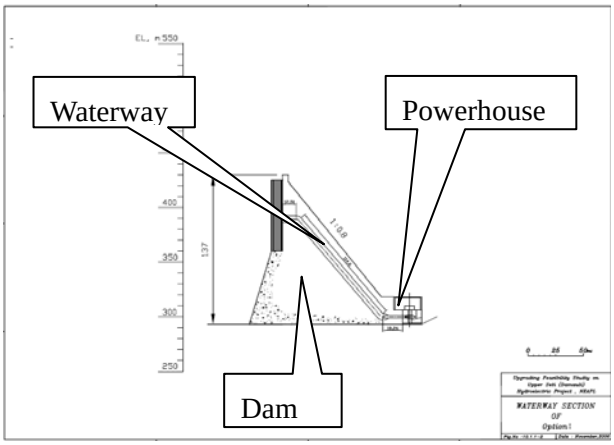

Figure 1.2-2 Option I Waterway section

(2) Option II

In Option II, the intake structure will be constructed just upstream of the dam on the right abutment. Water will go downstream, traversing a headrace tunnel, penstocks, an underground type powerhouse, and a tailrace tunnel. Because the dam is independent of the waterway, the dam crest length will be shorter than that of Option I (see **Fig. 1.2-3** and **Fig. 1.2-4**).

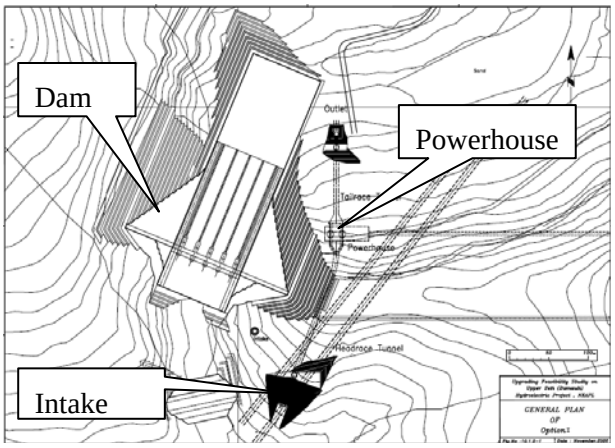

Figure 1.2-3 Option II General Plan

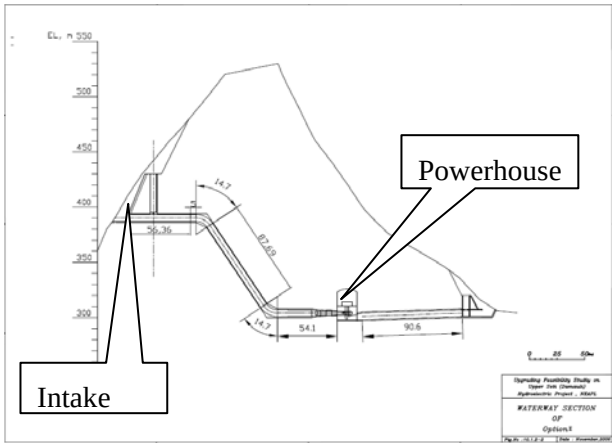

Figure 1.2-4 Option II Waterway Section

(3) Option IIIa

The intake will be located at the same place as that of Option II, and water will be channeled through the headrace tunnel, penstock, underground powerhouse and tailrace located 6 km downstream of the dam axis. In comparison with Option II, this alternative involves a much longer tailrace tunnel, but generates more energy because of the increased head for generation. Option IIIa includes the same waterway route between the intake and powerhouse as Option II, and a detoured tailrace tunnel (see **Fig. 1.2-5** and **Fig. 1.2-6**).

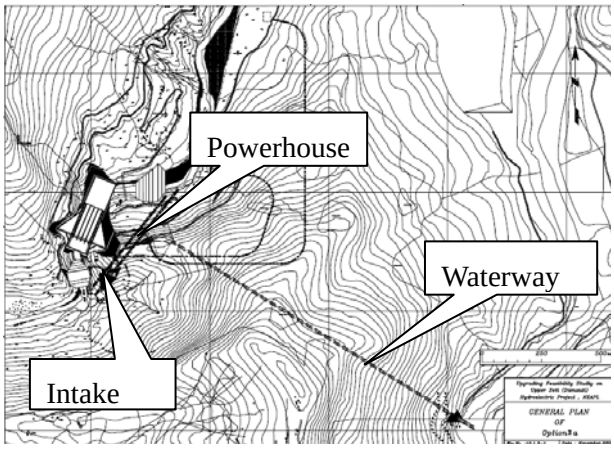

Figure 1.2-5 Option IIIa General Plan

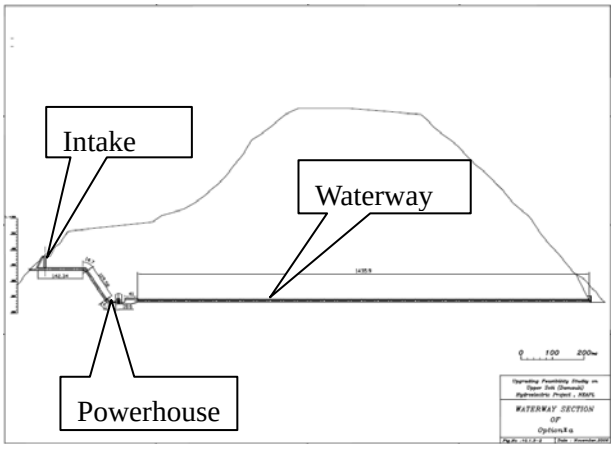

Figure 1.2-6 Option IIIa Waterway Section

(4) Option IIIb

This alternative is the one with the shortest waterway length to the tailrace by shifting the intake

structure upstream, in comparison with Option IIIa (see **Fig. 1.2-7** and **Fig. 1.2-8**).

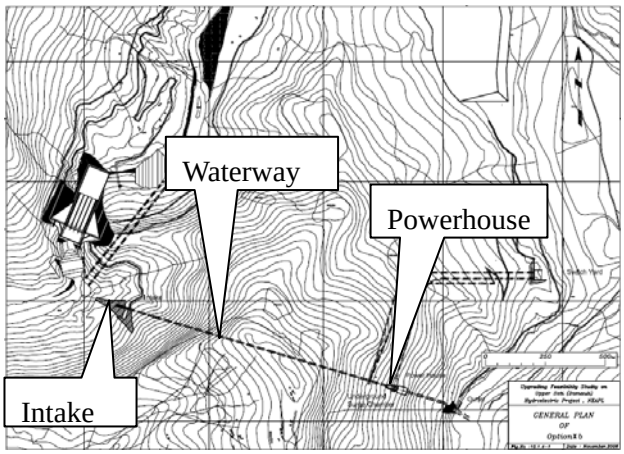

Figure 1.2-7 Option IIIb General Plan

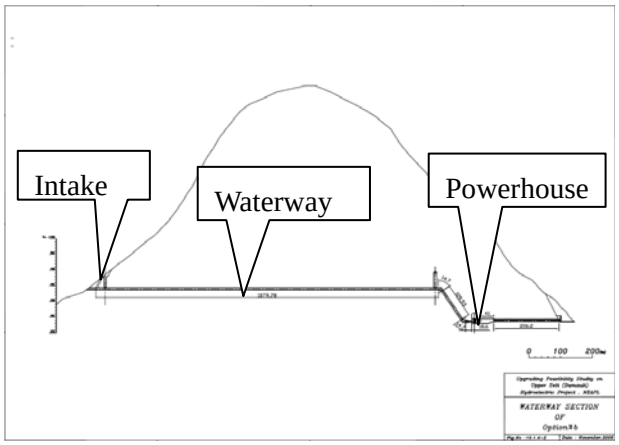

Figure 1.2-8 Option IIIb Waterway Section

(5) Option IV

Through discussions with NEA, this alternative, featuring the construction of an underground type powerhouse in the left abutment of the river, was prepared (see **Fig. 1.2-9** and **Fig. 1.2-10**).

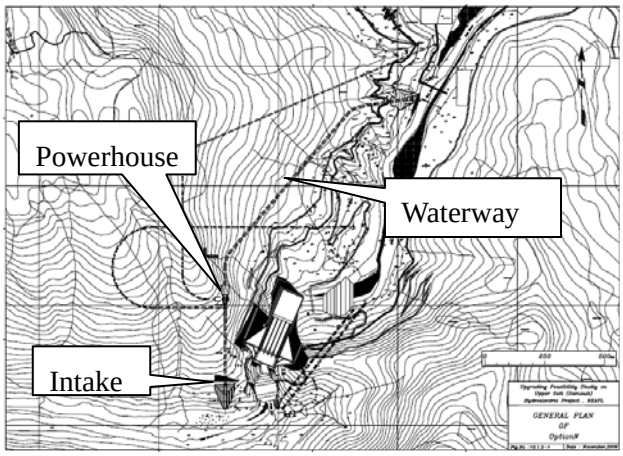

Figure 1.2-9 Option IV General Plan

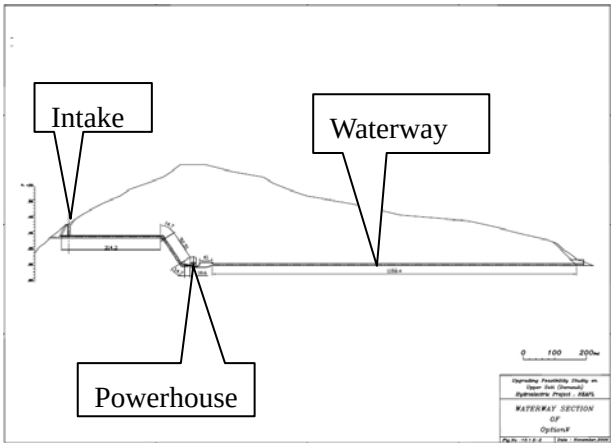

Figure 1.2-10 Option IV Waterway Section

1.3 FSL Alternatives

The range of the FSL alternatives was assumed between EL. 375 m to EL. 435 m in the preliminary investigation stage of the Study.

1.4 Estimate Methods for Environmental Cost

The cost (construction cost and O & M cost) for each candidate development plan is necessary to be estimated quantitatively for the comparison study. In the previous similar studies, compensation cost, acquisition cost for houses and assets, environmental mitigation cost, and monitoring cost (referred to as environmental cost) were generally estimated as a percentage of the civil works cost or total project

cost.

This method is not applied to the Study. In the Study the environmental cost is estimated as follows, in order to incorporate the environmental impacts into the cost for the project as precisely as possible:

a. To conduct survey on quantities of households, forest, etc. to be resettled, for each alternative layout and each FSL alternative as a part of the supplemental environmental survey by Study Team,

b. To estimate compensation cost, acquisition cost for houses and assets, environmental mitigation cost, and monitoring cost based on the above quantitative survey.

Because the location of the dam in the five layout alternatives is the same, the quantity of houses, forest, cultivated land, etc. to be inundated due to the construction of the reservoir will be the same with the same FSL. On the other hand, the same areas are to be used for the project facility for Options I, II, and IV, because the areas depend on route of access roads and an area of spoil banks. The affected area of the project facility for Options IIIa and IIIb will increase by forests of only 15 ha between the spoil bank and the tailrace. For this reason, the affects due to the project facility is regarded as the same among the five layout alternatives.

In light of the above, the environmental cost depends on FSL and is estimated at 10 m interval of FSL, following the quantitative survey on the houses, forests, cultivated lands, etc. to be affected.

It is noted that the environmental impact assessment is carried out on the condition that the impacts among the five layout alternatives will be the same with the same FSL.

1.5 Environmental and Social Conditions under Various FSLs

1.5.1 Physical Environment

(1) Land Use in the Project Area

The land use conditions in the Project area under the nominated FSLs are as shown in **Table 1.5.1-1**.

Table 1.5.1-1 Land Use in Reservoir Area

SN	Land Use Types	Land Use under Nominated FSLs (ha)						
		435	**425**	**415**	**405**	**395**	**385**	**375**
1	Cultivation	223.22	108.89	69.36	51.72	37.45	28.77	16.41
2	Built up	2.19	1.34	0.85	0.38	0	0	0
Total cultivation/built up		**225.41**	**110.23**	**70.21**	**52.1**	**37.45**	**28.77**	**16.41**
3.1	Grazing Land	125.21	102.56	84.59	70.03	47.87	32.25	17.62
3.2	Shrubs	34.53	28.18	17.94	11.07	4.84	2.64	0.82
Total grazing/shrub		**159.74**	**130.74**	**102.53**	**81.1**	**52.71**	**34.89**	**18.44**
3.3	Hill Sal Forest	64.32	43.64	29.46	20.40	11.75	7.29	3.17
3.4	Khair/Sissoo Forest	69.88	60.97	52.62	44.46	36.70	29.12	20.52
3.5	Mixed Open Forest	338.25	304.87	271.81	239.82	206.73	175.79	138.08
Total Forest		**472.45**	**409.48**	**353.89**	**304.68**	**255.18**	**212.2**	**161.77**
4	Barren Land	5.05	1.43	0.28	0.01	0.03	0	0
5	Escarpment	13.17	8.70	5.38	2.14	0.07	0	0
6	River	109.74	98.45	91.44	87.49	81.50	75.31	65.39

SN	Land Use Types	Land Use under Nominated FSLs (ha)						
		435	**425**	**415**	**405**	**395**	**385**	**375**
7	Sand	164.58	128.54	111.74	101.19	92.57	82.85	69.12
	Grand Total	**1150.14**	**887.57**	**735.41**	**628.71**	**519.51**	**434.02**	**331.13**

Source: GIS Land Use Map, JICA Study Team

1.5.2 Biological Environment

(1) Forest Area by Type

The relative distribution of the classified composition of the forest types is described and their distribution at different reservoir levels presented in T**able 1.5.2-1**.

Table 1.5.2-1 Forest Types in the Reservoir area under various FSL

SN	Types of Forests	Reservoir Area (ha)						
		435	**425**	**415**	**405**	**395**	**385**	**375**
1	Hardwood Sal Forest (Hill Sal Forest)	64.32	43.64	29.46	20.40	11.75	7.29	3.17
2	Hardwood Mixed Forest (Mixed Open Forest)	338.25	304.87	271.81	239.82	206.73	175.79	138.08
3	Kahir /Sisoo Forest	69.88	60.97	52.62	44.46	36.70	29.12	20.53
Total		**472.45**	***409.48***	***353.89***	***304.68***	***255.18***	***212.2***	***161.78***

Source: Field Survey 2006, Supplemental EIA Survey, 2006, JICA Study Team

(2) Forest Area by Management Types

The distribution and responsibility for Forest Management are illustrated in **Tables 1.5.2-2** and there is an increasing trend towards additional areas of Community Forests, with nine affected with a total area of 88.8 ha and about 5.3 ha of Private Forest affected at Full Supply Level of 415 m.

Table 1.5.2-2 Forest Area by Management Types in the Reservoir at Various FSLs

SN	Management Types	Forest Areas (ha)						
		435	**425**	**415**	**405**	**395**	**385**	**375**
1	National Forest (Protection Forest)	332.29	295.46	259.84	226.74	192.24	161.98	121.91
2	Community Forest	129.85	107.36	88.77	73.34	58.94	46.75	36.71
3	Private Forest	10.31	*6.67*	*5.29*	*4.62*	*4*	*3.47*	*3.16*
Total		**472.45**	**409.48**	**353.89**	**304.7**	**255.18**	**212.2**	**161.78**

Source: Field Survey 2006, Supplemental EIA Survey, 2006, JICA Study Team

(3) Summary of Biological Environmental Costs

The total costs for the biological environment as associated with the various reservoir levels is estimated in **Table 1.5.2-3**. This table shows the importance of the forestry and fish aspects to the overall cost for the biological component of the Project.

Table 1.5.2-3 Biological Environmental Costs

SN	Particulars	Biological Environmental Costs (Million NRs.)						
	Reservoir FSL	**435**	**425**	**415**	**405**	**395**	**385**	**375**
1.	Cost for Clearing the Vegetation in the Reservoir under Various FSL	4.96	4.30	3.72	3.2	2.68	2.23	1.7
2.	Capture and release of the two reptile species of the reservoir area,	0.5	0.5	0.5	0.5	0.5	0.5	0.5
3.	Support program for Kali Gandaki A Fish Hatchery	73.5	73.5	73.5	73.5	73.5	73.5	73.5
4.	Fish monitoring during construction phase	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Sub-total construction	**79.96**	**79.3**	**78.72**	**78.2**	**77.68**	**77.23**	**76.7**
5.	Compensation to the Annual Losses of Forest and Vegetation Resources, Reservoir Area (cost for 20 years)	390	340.8	287.8	261.6	225.2	194.5	170.2
6.	Wildlife monitor in the reservoir area & surrounds	0.5	0.5	0.5	0.5	0.5	0.5	0.5
7.	Annual release of indigenous fish fingerlings reservoir area & downstream areas (for 20 years)	50	50	50	50	50	50	50
8.	Annual release of indigenous fish fingerlings in Seti River upstream (for 20 years)	30	30	30	30	30	30	30
9.	Monitoring of wildlife habitat and wildlife protection (for 20 years)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
10.	Fish monitoring during opeartion phase (for 20 years)	3	3	3	3	3	3	3
11.	Fish extension program for 10 years	10	10	10	10	10	10	10
	Sub-total Operation	**484.7**	**435.5**	**382.5**	**356.3**	**319.9**	**289.2**	**264.9**
	Grand Total - NRs	**564.56**	**514.8**	**461.22**	**434.5**	**397.58**	**366.43**	**341.6**

1.5.3 Resettlement Impacts and Alternative Analysis

This section summarizes the results of comparison of resettlement impacts under different reservoir FSL scenarios between 375 m and 435 m. As shown in **Table 1.5.3-1**, the overall resettlement effects will be dramatically increased if the FSL changes from 415 m to 425 m. The FSL above 425 m including 10 m vertical height as risk zones will result in an increased land acquisition such as 265 ha for cultivated land and 1160 metric ton of loss of agricultural production, and an increment in relocation of 160 people.

Table 1.5.3-1 Resettlement Effects with Different Reservoir FSL

Reservoir FSL + risk zone 10m	435 +10m*	425 + 10m	415 + 10m	405 + 10m	395 + 10m	385 + 10m	375 + 10m
Cultivated Land (ha)	499.92	265.55	151.22	111.69	94.05	79.78	71.1
Built up Area (ha)	3.93	2.545	1.7	1.205	0.74	0.355	0.36
Forest Land (ha)	615.71	543.06	480.09	424.5	375.31	325.79	282.81
Loss of Agricultural Production (MT)	2184.45	1160.35	660.77	488.04	410.96	348.61	310.68
Number of Affected Private Structure	920	515	313	250	217	215	210
Number of Affected Community Structure	32	15	7	5	4	4	4
Number of Affected Private Land Owners	1943	1276	838	734	647	589	584
Number of Affected Structure Owners	335	199	110	88	79	77	73
Number of Residential Structure Owners =Relocatee	274	160	86	65	63	59	59

*Note: *Since Field Survey including inventory structure survey covered the areas below FSL 435, each particular for 435+10m was estimated based on the incremental value from FSL 425 to FSL 435.*

Source: GIS Map, 2006, Field Survey of Supplemental EIA Survey, 2006, JICA Study Team

The more resettlement impacts will be resulted from the project, the more social and environmental costs for mitigation of these effects are needed. The comparison of resettlement and relocation costs is presented in **Table 1.5.3-2**. It is apparent that the compensation costs for private land, structures and loss of agriculture production will increase to large extent with the FSL above 425 m.

Table 1.5.3-2 Resettlement Cost with Different Reservoir FSL

Particular	Million NRs						
Reservoir FSL + risk zone 10m	435 +10m*	425 + 10m	415 + 10m	405 + 10m	395 + 10m	385 + 10m	375 + 10m
Cost Estimation for the Private Land (cultivated and built up)	2755.7	1602.16	999.51	801.83	712.82	640.82	598.15
Cost Estimation for the Structure	210.38	77.05	33.97	23.88	22.81	20.78	20.44
Cost Estimation for Agriculture Production Equivalent to one year production	2.16	1.17	0.65	0.49	0.42	0.35	0.31
Other Rehabilitation Compensation to Relocatee	105.66	67.43	44.95	37.91	37.24	35.89	35.89
Transportation Allowance to affected Structure owners other than the affected residential structure owners	1.67	0.97	0.56	0.50	0.36	0.40	0.32
Monitoring for 10 years	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Grand Total	3077.4	1750.6	1081.4	866.4	775.5	700.0	656.9

Note: The details of the basis for each mitigation cost is described in Chapter 4, Section 4.11 in Part D of the ESC Report.

1.5.4 Social Program Cost under different FSLs

Table 1.5.4-1 shows the costs for social program under different FSLs.

Table 1.5.4-1 Cost for Social Program under different FSLs

Reservoir FSL	435	425	415	405	395	385	375
Social Action Program (Million NRs)	409.8	322.8	236.1	211.9	210.8	207.9	188.8

1.6 Optimization Study

The cost and benefit for each candidate development plan are estimated. Regarding the cost, estimation method is shown below:

a. Construction cost is estimated as the total of civil works cost, hydromechanical equipment cost, electromechanical equipment cost, transmission line cost, environmental cost, NEA's administration cost and engineering fee for consultants, physical contingency, and interest during construction

b. O & M cost is estimated as 1 % of the construction cost

The annual cost for 50 years of the project life is estimated by using the above construction cost and O & M cost, and is defined as the cost (C) for the comparison.

Regarding Benefit (B), it is estimated in the form of benefit generated by an alternative thermal power plant of equivalent scale to the Project.

As the result, the alternative with FSL of EL. 425 m in Option IIIb is selected as the optimal plan (see Section 10.3 of Final Report).

NEA gave the following comments on the above optimal plan to the JICA Team during discussion on the Interim Report:

- It was agreed that the Layout alternative of Option IIIb, which would use an additional head of 20 m and which was the optimal choice in the comparison study, should be adopted for the project.
- The minimum operation level (MOL) should be lowered in order to reduce environmental affects due to the reservoir and to utilize water in the reservoir effectively.

Based on these comments, reconsideration of the MOL for the layout alternative of Option IIIb is executed. To lowering MOL, intake structure is reconsidered. A comparison study on lower MOL is carried out (see Section 10.4 of Final Report).

Consequently, the development plan with FSL at EL. 415 m is selected as the optimal plan (see Section 10.4 of Final Report). Several economic parameters are compared between the former and later plans, and the later is selected as the optimal plan of the project (see Section 10.5 of Final Report). Following that, the optimal rated intake water level is determined for the selected plan. The main features of the optimal plan is shown in **Table 1.6-1**.

Table 1.6-1 Main Features of Selected Development Plan in Chapter 10[1]

FSL	415	m
MOL	387.2	m
Effective Storage Capacity	167	MCM
Maximum Discharge	127.4	m^3/s
Rated Intake Water Level	405	m
Rated Tailrace Water Level	289.2	m
Effective Head	113	m
Installed Capacity	128	MW

[1] The installed capacity is calculated as 127 MW after the design of the waterway in Chapter 11 of Final Report.

CHAPTER 2 ALTERNATIVE WITHOUT PROJECT

In this chapter, the alternative without the project is examined.

2.1 Impact on alternative without the Project

Due to the alternative without the project, the project is to be canceled in the NEA's generation expansion plan (see **Table 5.2.1-1** in Chapter 5 of Final Report). The demand and supply balance based on the cancellation is shown in the **Table 2.1.-1**.

Table 2.1-1 Demand & Supply balance without Project

FY	Peak Deamnd (MW) A	Peaking Cap. (1) (MW) B1	Reserve Margin (1) (MW) C1 (=B1-A)	Peaking Cap. (2) (MW) B2	Reserve Margin (2) (MW) C2 (=B2-A)
05/06	603.28	532.74	-70.54	532.74	-70.54
06/07	642.20	536.57	-105.63	536.57	-105.63
07/08	695.30	609.44	-85.86	609.44	-85.86
08/09	759.90	618.54	-141.36	618.54	-141.36
09/10	819.80	662.84	-156.96	662.84	-156.96
10/11	890.60	723.24	-167.36	723.24	-167.36
11/12	971.00	767.24	-203.76	767.24	-203.76
12/13	1,057.00	1,076.24	19.24	1,076.24	19.24
13/14	1,148.00	1,294.24	146.24	1,219.24	71.24
14/15	1,245.60	1,369.24	123.64	1,341.24	95.64
15/16	1,336.10	1,369.24	33.14	1,341.24	5.14
16/17	1,445.10	1,369.24	-75.86	1,341.24	-103.86
17/18	1,561.10	1,369.24	-191.86	1,341.24	-219.86
18/19	1,678.50	1,542.24	-136.26	1,514.24	-164.26
19/20	1,804.00	1,842.24	38.24	1,814.24	10.24

Note: 1. Peaking Cap.(2) means supply capacity without those of the projects for power import to India
2 The shadowed year indicates the commissioning year in the generation expansion plan.
3. Power imported from India is not excluding.

The above demand and supply situation will further lower supply capacity, and give more serious affect on people's living and economic activities in the country. Hence, the alternative without the project is not considered as appropriate one.

From the viewpoint of demand-side-management, NEA has been carried out as shown below:

a. NEA introduced peak/off-peak tariff system to middle and high voltage consumers in 1998 and to increase the tariff during peak hours,

b. NEA proposed the Government to apply seasonal tariff system to all consumers and to apply peak/off-peak tariff system to domestic consumers, but the proposal was not approved by the Government, and

c. NEA established the committee and commenced a study on demand-side-management in Kathmandu Valley and a study on a pilot project to enhance fluorescent lamps and high efficiency heaters.

The proposal in Item b seems to be impossible to be implemented. Regarding the studies in Item c, it

will take more time to result in energy saving, because NEA has just started the studies. Hence, it is not appropriate in the present to expect effects on demand reduction due to demand-side-management.

2.2 Estimation on Reduction of CO_2 Emission due to Implementation of Project

NEA will be able to replace operation of the thermal power plants during peak hours with that of the Project, and CO_2 emission will be reduced by the replacement. The amount of CO_2 emission is estimated by using fuel consumption per kWh (see 4.5.2 (2) in Final Report) and generation records of NEA's thermal power plants as shown below:

Table 2.2-1 Estimation on Reduction of CO_2 Emission

Thermal Power Plant	Installed Capacity (MW)	Generating Energy* (GWh)	Fuel	Specific Gravity	Fuel Consumption		CO_2 Emission**	Annual CO_2 Emission
					(g/kWh)	(liter/kWh)	(kg-CO_2/liter)	(ton-CO_2/year)
Multifuel Plants	39	13.089	Furnace Oil	1.01	265	0.262	2.698	9,264
Diesel Plants	16	1.391	Light Diesel Oil	0.83	237	0.286	2.644	1,050
Total	55	14.4798						10,314

Note: * Generating energy shows average from FY 2001/02 to FY 2005/06 by NEA's thermal power plants
** Source: Ministry of Environment, Japan

In light of the above, around 10,300 tons per annum of CO_2 emission can be reduced in Nepal by implementing the Project.

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS (ESC) REPORT

PART B

PHYSICAL ENVIRONMENTAL ASSESSMENT

PART B PHYSICAL ENVIRONMENTAL ASSESSMENT

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CHAPTER 1 PHYSICAL ENVIROMENT IN THE PROJECT AREA

1.1 Baseline Data

(1) Topography

The project site is located in the upper part of the Seti River, which is one of the major tributaries of the Trisuli River is originates at the Annapurna (7,555 m height above sea level) of the Himalaya Mountains and is joined by the Madi River 3km downstream from the dam site. The total catchment, including the High Himalayas and the Lesser Himalayas, of the Seti River basin down to the dam site is 1,502 km^2 of which about 50 km^2 are barren, rocky and covered with snow. According to the satellite photo, only small-scale glacier lakes (less than 100 m in diameter) are identified in this basin.

The general condition of the Tanahu District's watershed is listed by the International Centre for Integrated Mountain Development (ICIMOD) as 'moderate.' Although the Seti River's watershed is relatively stable around the dam and powerhouse sites and reservoir, in some places around the upper reservoir area erosion processes are expected, especially during the monsoon season.

From the environmental view point, it is useful to conceptualize the project area as divided into four separate zones:

1) **"The Project Facility Sites"** including dam site, powerhouse, construction facilities such as access road, borrow areas, batching plant and spoil banks centered on the rural lands, communities located on both sides at the confluence between the Seti and Madi River.

2) **"The Lower Reservoir"** (downstream part of the reservoir), an approximately 15 km Seti River stretch from dam site to Geruwater, that has limited habitation, forested, narrow gorges, and

3) **"The Upper Reservoir"** (upstream part of the reservoir), an approximately 12 km Seti River stretch from Geruwater to Bhimad Bajar, that is relatively flat and spread out, with fertile *Tar* (*Nepali* = highly fertile stream alluvial areas, usually located at a higher level than Nepal's main rivers at the terminus of subsidiary smaller rivers and streams and used for rice paddy), scattered settlements and, at its far end, the semi-urban Bhimad Bajar community

4) **"Downstream Zone"** of the Seti River, consisting of the river course and its various gravel bars, gorge sections and elevated tars used for agricultural purposes to the river's confluence with the Trisuli River to the East.

(2) Climate

The Seti River catchment experiences mild winters but is a subtropical to temperate climate, with an average maximum temperature in the Project Area ranging from 21 to 33 degrees centigrade and the average minimum temperature from 8 to 24 degrees in centigrade. The average annual precipitation at the Project Area has been computed at 2,973 mm. The Project Area is influenced by the monsoon

rain, which normally starts in mid-June and ends in October. The region receives approximately 80 percent of the annual rainfall during this period.

(3) Land Use in the Project Area

The land use conditions in the Project area are as shown in T**able 1.1-1** and **Table 1.1-2**.

Table 1.1-1 Land Use Reservoir Area

SN	Land Use Types	Land Use under Nominated FSLs (ha)						
		435	**425**	**415**	**405**	**395**	**385**	**375**
1	Cultivation	223.22	108.89	69.36	51.72	37.45	28.77	16.41
2	Built up	2.19	1.34	0.85	0.38	0	0	0
Total cultivation/built up		**225.41**	**110.23**	**70.21**	**52.1**	**37.45**	**28.77**	**16.41**
3.1	Grazing Land	125.21	102.56	84.59	70.03	47.87	32.25	17.62
3.2	Shrubs	34.53	28.18	17.94	11.07	4.84	2.64	0.82
Total grazing/shrub		**159.74**	**130.74**	**102.53**	**81.1**	**52.71**	**34.89**	**18.44**
3.3	Hill Sal Forest	64.32	43.64	29.46	20.40	11.75	7.29	3.17
3.4	Khair/Sissoo Forest	69.88	60.97	52.62	44.46	36.70	29.12	20.52
3.5	Mixed Open Forest	338.25	304.87	271.81	239.82	206.73	175.79	138.08
Total Forest		**472.45**	**409.48**	**353.89**	**304.68**	**255.18**	**212.2**	**161.77**
4	Barren Land	5.05	1.43	0.28	0.01	0.03	0	0
5	Escarpment	13.17	8.70	5.38	2.14	0.07	0	0
6	River	109.74	98.45	91.44	87.49	81.50	75.31	65.39
7	Sand	164.58	128.54	111.74	101.19	92.57	82.85	69.12
	Grand Total	**1150.14**	**887.57**	**735.41**	**628.71**	**519.51**	**434.02**	**331.13**

Source: GIS Land Use Map, JICA Study Team

Table 1.1-2 Land Use Project Facility Sites

SN	Land Use Types	Land Use in Project facility sites - ha
1.	Cultivation	35.28
2.	Hill Sal Forest	44.46
3.	Khair/Sissoo Forest	0
4.	Mixed Open Forest	24.24
5.	Barren Land	0
6.	Built up Areas	0.245
7.	Escarpment	0
8.	Grazing Land	7.35
9.	River	7.01
10.	Sand	9.28
11.	Shrubs	4.67
	Grand Total	**132.54**

Source: GIS Land Use Map, JICA Study Team, 2006

More than 50% of the land use in the reservoir area under various Full Supply Levels is forest land use (including shrub and grassland). The proportion of forest land use increases with the decrease in the reservoir Full Supply Level, while the proportion of the built-up area decreases. The proportion of agricultural land in the reservoir varies between 20 to 4% at lower full supply levels, with the higher reservoir levels showing a higher proportion of agricultural land being inundated. riverine areas (wet

channel and river flood plain) constitute 9 to 19% of the inundation area under various reservoir FSLs, that is the higher the reservoir FSL the lower the riverine area in proportion to the total area inundated.

There are an additional 13.4 ha required for securing the risk zones in erosion prone areas associated with the nominated reservoir of FSL 415 m in places such as near the Wantang Khola, the Pedhi Khola and Tittuwa. This is made up mainly of cultivation (6.5ha), grazing land (2.2 ha), shrubs (2.3 ha) and Sal forest (2.3ha); accounting for over 90%.

In the project facility sites, nearly 64% of the area lies in the forest land (including shrub land and grass land). The cultivated land occupies about 46% of the total land required.

(4) Water Quality

Water quality was sampled at four locations in the reservoir area in June and October. Parameters necessary for projecting reservoir eutrophication such as Dissolved Phosphate and Total Phosphate were measured for the first time. It is to be noted in **Table 1.1-3** that there is variation from the end of the dry season (June) to wet season (October) with respect to factors such as Turbidity, Total Suspended Solids and Settleble Solid.

Table 1.1-3 Water Quality Analysis Report of Main Parameters

SN.	Parameters	Observed Values			
		Range 04-06-06		Range 09-10-06	
		Low	High	Low	High
1.	Water Temperature	20	24	20	22
2.	pH at 25^{o}C	8.1	8.1	8.1	8.2
3.	Turbidity, (NTU)	120	230	19	34
4.	Total Dissolved Solids, (mg/l)	131	175	104	162
5.	Total Suspended Solids, (mg/l)	206	501	33.6	66.8
6.	Settleble Solids, (mg/l)	206	497	33.3	65.9
7.	Non Settleble Solids, (mg/l)	<1	3.7	0.34	0.94
8.	Total Hardness as $CaCO_3$, (mg/l)	135	149	90	160
9.	Total Alkalinity as $CaCO_3$, (mg/l)	133	144	89	160
10.	Total Acidity, (mg/l)	2.6	7.7	2.6	2.6
11.	Chloride, (mg/l)	1.5	3.0	2.0	3.5
12.	Ammonia, (mg/l)	0.10	0.14	<0.05	<0.05
13.	Sulphate, (mg/l)	14.8	18.5	9.1	16.9
14.	Dissolved Phosphate,(mg/l)	0.02	0.047	0.02	0.03
15.	Total Phosphate, (mg/l)	0.21	0.36	0.07	0.13
16.	Calcium, (mg/l)	35.3	37.7	22.4	38.1
17.	Magnesium, (mg/l)	9.7	14.8	8.3	15.1
18.	Iron, (mg/l)	2.31	6.07	0.78	1.0
19.	Sodium, (mg/l)	1.93	2.14	2.21	2.99
20.	Potassium, (mg/l)	2.02	2.14	2.13	2.73
21.	Dissolved Oxygen at 15^{o}C, (mg/l)	8.6	8.8	7.3	7.8
22.	Chemical Oxygen Demand, (mg/l)	2.0	3.5	1.5	4.5
23.	BOD_5, (mg/l)	0.42	0.78	0.75	0.91

Note : Sample – 1 : Upstream Dam site Sample – 2 : Downstream, Bhimad
Sample – 3 :Upstream, Bhimad Sample – 4 : Seti-Madi Confluence

From the results of the water quality test, toxic material was not found in the river water. With regards to biological oxygen demand and chemical oxygen demand values the river water is in the state of self cleaning status. The low BOD/COD rating shows that the water is in the state of least contamination by other organic pollutants. The Ammonia values ranges from 0.04 mg/l to maximum of 0.12 mg/l at upstream dam site, which are low.

There are no specific Water Quality Standards for river or other sources of water in Nepal, the only standards being applied to the streams as "receiving waters of industrial releases". A comparison of the sampled water quality with Standards adopted from the Department of Water Supply and Sewage is presented in **Table 1.1-4** which shows that the samples exceeded the criteria for turbidity and Iron.

Table 1.1-4 Comparison with Drinking Water Quality Standards

S.N.	Parameters	Desirable Limits	Water Quality Sample	
			Highest	Lowest
1	Turbidity (NTU, Max)	5[1] (10)	230	19
2	Total Dissolved Solids (mg/l, Max)	500 (1500)	175	104
3	pH value	6.5 – 8.5 (5.5-9.0)	8.2	8.1
4	Total Hardness (as $CaCO_3$) (mg/l, Max)	250	160	90
5	Magnesium (as Mg) (mg/l, Max)	30	15.1	8.3
6	Iron (as Fe) (mg/l, Max)	0.3	6.07	0.78
7	Chlorides (as Cl) (mg/l, Max)	250	3.5	1.5
8	Sulphate, (as SO_4) (mg/l, Max)	150[2]	18.5	9.1
9	Ammonia (mg/l, Max)	1.5	0.14	<0.05

Source: Standards adopted from Department of Water Supply & Sewerage

Presently the local populations in the reservoir surrounding areas make limited use of the Seti River waters for domestic uses, preferring to use the tributary streams in the dry season and local runoff in the wet season. This is shown in **Table 1.1-5**. As the reservoir impacts only marginally on these sources and they will be changed for the Resettlement Plan as its impact will be minimal. Also in the downstream zones there will be no impacts as similar use is made of the Seti River; not used for domestic sources but used for bathing, washing and stock watering only.

Table 1.1-5 Water Sources Impacted by the Project

SN	Group	Source Type	Source Name	Location	Beneficiary Household
1	Chhang 4 Chokre	Pond/Pokhari	Chokre Pokhari	Just below Chokre village	39
2	Chhang 5 Furbari Ghaeri	Pond/Pokhari	Chokre	Chokre	20
		Pipe water	Pipale	Pipale	15
3	Chhang 7 Jhakash Furbari	Pipe water	Chitung Khola	Jhakash-Fulbari	23
4	Bhimad-1, Khanaltar	-	-	-	-
5	Rani Pokhari-9 Rising Patan	Spring /Mulpani	Kumalpani	Rising Patan	50
		Spring /Mulpani	Amalapani	Rising Patan	50
		Spring /Mulpani	Dulegaunda	Rising Patan	40
		Spring /Mulpani	Dhunge Pandhero	Rising Patan	200

[1] Value for turbidity is 5 in FAR(for mineral water), PFA, BS, WHO
[2] Value for Sulphate BS:200, FAR(for mineral water) and PFA:250

SN	Group	Source Type	Source Name	Location	Beneficiary Household
		Spring /Mulpani	Tarebhir	Rising Patan	70
6	Rani Pokari-9 Rishing Patan-Kharakhare	Stream	Bokse Chhahra	Sanutari	16
7	Kotdarbar-1 Median Swarna	Spring /Mulpani	Risini Khola	Ward-3	35
8	Kahun Sivapur-3 Bakle	Kuwa	Bakle Kuwa	Bansbot	4
		Kuwa	Sarki Kuwa	Kahun	50
		Pipe Water	Kheradi	Kahun Basti	20
		Kuwa	Gidha	Ranibari Gidha	5
9	Kahun Sivapur-1 Beltar	-	-	-	-
10	Vyas 7 Tallo Patan	-	-	-	-
11	Vyas-7 Beni Patan	Spring /Mulpani	Linde Dhara	Near School	25
		Water Tank	Dharakholsi and Asagurikholsi	Asaguri	45
		Pipe Water	Dharakholsi	Asaguri Puchhar	1
12	Vyas-7 Beteni	-	-	-	-
13	Vyas-5 Baireni-Botegauni	-	-	-	-
	Totals Sources - All Non Seti River Sources		**13 VDCs & 19 Sources**		**708 HHs**

1.2 Impact on Physical Environment

1.2.1 Construction Phase

(1) Land Use and Topography

Most sever impact in the reservoir type project inundation of the land. Avoiding land use changes completely is not possible given the project requirements. However, selection of lower reservoir Full Supply Level could minimize existing land use changes drastically.

Construction activities of various types in the dam site and project facility sites involving excavations, drilling, blasting and material removals are potential to generate new sets of land instabilities, particularly at Betini, tailrace area and dam site. As most of these areas will be occupied by the project, the immediate consequences to the communities are very low.

(2) Air Quality

Dust is likely to be generated from excavation, filling, stockpiling and construction vehicle movements associated with the construction of the various surface and sub-surface structures and transportation of the spoil materials to the spoil bank.

(3) Noise Quality

Noise will be generated from cut-and-cover activities, excavation, back filling and construction of above ground structures and transportation of the construction vehicle. Vibration will be generated from and drill & blast activities in the dam, tunnel and powerhouse. It is not expected to effect communities living away from source. However, impacts to wild life are expected.

(4) Water Quality

Poor sanitation facilities to construction workforce at the construction camps and construction areas may promote the use of the adjacent river bed areas for open defecation dislodging of solid waste and other sanitation uses. Such uses of the river area, especially in the dry season, may substantially degrade the water quality in the Seti River due to discharges of organic load. The implications will be on the increment in the BOD load, increase in total suspended solids, total dissolved solids, total phosphorous and Ammonia and decrease in the dissolved oxygen.

Excavation works are expected to increase the turbidity and total suspended solids in the flowing water. Besides, accidental oil spills of the operating equipment will be released to the flowing water. And also, discharge of concrete plants, aggregate washing plants etc. also provide huge amount of fine sediment to the receiving water bodies making the water bodies unsuitable for aquatic fauna and flora.

Though the construction activities may be short lived has potential to cause short period degradation of water quality.

1.2.2 Operation Phase

(1) Land Use and Topography

a) Reservoir Area

In the upper reservoir area, the soil slides associated with the terrace materials are prevalent, while in the lower reservoir area, soil slides associated with colluvial material are dominant. However, the landslides in the lower reservoir area are small scale and observed above the full supply level. Thus, the risk of the slope instability due to the reservoir operation should be considered in the upper reservoir area.

The failure at the terrace breaks are mostly associated with the toe cutting by the stream, caving and overhanging. Toe cutting of the terrace breaks is remarkable at Bhimad Bajar, Sanutar, Jhakas, Wantan Khola and Pedhi Khola. In the colluvial materials below Tittuwa, It is reported that slow creeping phenomenon is observed in the colluvial material on the valley slope below Tittuwa, which is requited to confirm.

b) Flood Water Level

The originally proposed Full Supply Level was at 425 m, annual flushing was not proposed in the original feasibility study by NEA. Considering the new full supply level and flushing operation, the backwater effects of the reservoir have been confirmed by the JICA Team. Investigations have confirmed that:

- The annual flushing of the reservoir at FSL 415 m will effectively control any sedimentation.
- In the case that nominated Full Supply Level is 415 m, the sedimentation will not happen around the Bhimad Bajar.

- The backwater effect after the sedimentation is minor.

c) Impact in the Downstream of the Dam

The Project is planned to deliver the water diverted at the dam to the underground powerhouse through the 1-km long of headrace tunnel for generation and release the water used for the generation from a tailrace outlet to the Seti River. The tailrace outlet is located at approximately 5.5 km downstream of the dam and 3.3 km downstream of the confluence with the Madi River. Selection of this option means that high sediment deposit at the sediment flush operation and river scouring at the normal operation will be experienced in the Seti River section immediately below the dam.

The agricultural land on the left bank appears to be high enough that it would not be affected. The agricultural land on the right bank will be acquired for the construction. The permanent river protection work will not be required in this section.

However, it is difficult to estimate the erosion and sediment due to the difficulty of the analysis considering the annual flushing of the reservoir and sediments flow from the Madi River. Therefore, it is proposed that the monitoring of sedimentation patterns should be undertaken in this zone for at least 10 km below the outlet.

(2) Climate

The Project will not alter the climate or meteorology of the area other than by causing dust during construction and causing induced local fog patterns due to the presence of the reservoir during operational phase.

(3) Water Quality

a) Thermal Stratification of the Reservoir

Since the density of the water is maximized at 3.98^{o}C, circulation pattern in the reservoir is different due to the climate condition. According to the meteorological record from 1987 to 2004, the temperature in the project area is ranged from 3 to 38^{o}C. The water temperature could be kept above 4^{o}C through a year. In this case, summer stratification forms in the summer season and circulation in the whole layer is caused by natural convection effect from the post monsoon season to winter season. Thermal stratification in such process forms simple structure in the natural lakes and marshes. However, the formation of the thermal stratification in the reservoir is more complicate due to factor of the inflow and outflow of the reservoir in addition to the climate condition.

The possibility and features of the thermal stratification in the reservoir can be classified approximately as shown in the table below based on the “Run-over rate” defined by the following equation.

$$\left[\alpha : \text{Run - over rate}(1/\text{year})\right] = \frac{\left[Q_0 : \text{Annual Inflow Volume } (m^3/\text{year})\right]}{\left[V_0 : \text{Gross Reservoir Volume } (m^3)\right]}$$

$$\left[\alpha_8 : \text{Run - over rate in August (1/year)}\right] = \frac{\left[Q_0 : \text{Inflow Volume in August } (m^3/\text{year})\right]}{\left[V_0 : \text{Gross Reservoir Volume } (m^3)\right]}$$

Run-over rate (1/year)	α	α_8
Enough possibility to cause the thermal stratification	< 10	< 1
Some possibility to cause the thermal stratification	10～30	1～5
Little possibility to cause thermal stratification	30 <	5 <

Run-over rate (1/year)	α
To form the stable thermal stratification（Stratification Type）	< 10
To temporarily form the thermal stratification temporarily, which will disappear by the turbulence of the flood and wind（Medium Type）	10～20
To hardly form the thermal stratification (Mixing type)	20 <

Since Run-over rate is calculated at $\alpha = 12$, $\alpha_8 = 3$ for reservoir of the Upper Seti Project, the possibility and the features of the thermal stratification is categorized into “Some possibility to cause the thermal stratification” and “Medium Type”. Though it has possibility to form the weak thermal stratification, the stratification could be disturbed by the flood in the monsoon season from June to October.

Furthermore, before heat receiving period, for which the thermal stratification is developed, reservoir water is completely evacuated and recreate the natural river flow condition by the sediment flushing operation. Consequently, cold water cannot be retained in the reservoir and it is expected that the sever thermocline could not form in the reservoir.

b) Eutrophication of the Reservoir

Eutrophication can be defined as excessive organic production within a reservoir due to nutrient input. Increasing the inflow of nutrient, in particular phosphorus or nitrogen, by the human activity such as sewage and agriculture is considered as one of the cause of the algae bloom.

An occurrence of the above phenomena relates with various factors, not only the nutrient concentration flowing into the reservoir but also hydraulic condition such as retention period of the reservoir water, meteorological conditions and so on. Even though the concentration of nutrition in the water becomes higher, the problem of eutrophication could not appear in the area where the retention time is short like river since the nutrient is flow down before increasing phytoplankton.

To confirm the possibility of the eutrophication, *Vollenweider Model* (*1976*) is applied for the analysis, which is commonly used for initial estimation of the eutrophication in the world.

$$L(P) = \left[\bar{P}\right]\lambda \cdot \left(V_p + H \cdot \alpha\right)$$

L(P) : Load of total phosphorus (g/m^2 / year)

$\left[\bar{P}\right]\lambda$: Annual average concentration of total phosphorus (mg/l)

V_p : Setting velocity of the phodphorus (10m/year)

H : Average water depth (40.65m)

α : Run - over rate (12 times/year)

The average concentration of the total phosphorus on the sampling data is 0.186 mg/l. The total phosphorous level is much greater than 0.03 mg/l. **Figure 1.2-1** presents the results of analysis for the average of total phosphorus on the sample date. Although the data used in this study is limited to water quality analysis in June and October, the average phosphorous concentration values of sampling data reveal that the reservoir will be eutrophic even in the present day loadings of phosphorous from the Seti watershed.

The Pokhara, Lekha Nath Municipalities of Kaski district are expanding at fast pace and are expected to expand in the years to come. Considering the future land use potentials of the watershed i.e. urbanization in the Seti watershed and use trends of agrochemicals in the agricultural lands, the phosphorous loading in the Seti River from the urban and agricultural area is expected to increase.

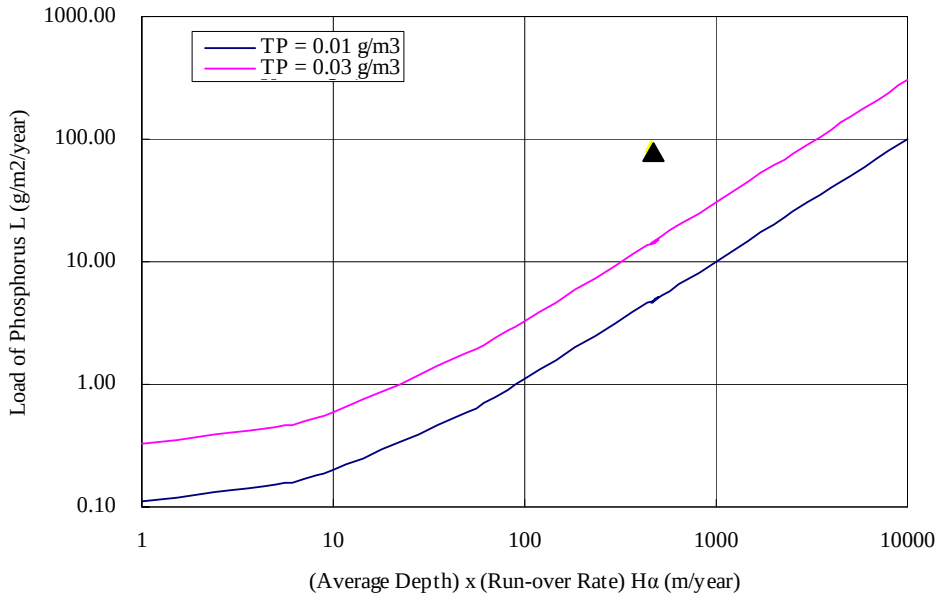


Figure 1.2-1 Results of Vollenweider Model Analysis

c) Sediment Flushing Operation

In the case of the Dashidaira Dam in Japan, highly deteriorated water by sediment flushing operation of the reservoir has worsen the downstream water quality and caused significant damage to the downstream aquatic ecology since the sediment deposit with organic matter such as fallen leaves accumulated and deteriorated for six years in the reservoir was flushed in the winter period with low discharge in the river. Based on the lesson, method of the sediment flushing operation was changed into once a year in flooding season between June and August with high volume of water

flow and high turbidity under natural condition, since it was concluded that frequent sediment flushing operation was better not to cause the downstream water pollution.

In addition, the sediment flushing operation is required every year from viewpoint of maintenance of the reservoir function, which means the sediment flushing operation with every several years makes life of the reservoir shorten compared to that with every year since it hasten increase of sediment deposit volume in the reservoir according to the study.

For the above reasons, the sediment flushing operation for the project should be conducted once a year between June and July by emptying the reservoir in the beginning of the rainy season, and then flushing the sediment from flushing gate, installed in the dam body, with flooding flow in the rainy season.

In addition, the following should be implemented to prevent water quality deterioration as possible.

1) Before starting full operation of the sediment flushing, the flushing gate should be opened partially to lead fresh water with high oxygen content from the surface into the bottom of the reservoir to make better water quality in the lower layer of reservoir.

2) In addition to the regular sediment flushing operation, the sediment flushing operation without lowering water level of the reservoir should be conducted by using surplus water in the flood season between August and September, to prevent sediment deposit in the reservoir and downstream riverbed degradation as well as to improve water quality in the bottom of the reservoir.

By implementing the above operation, significant downstream water deterioration will be prevented according to the past cases. In addition, it is expected that environmental impact will be alleviated further since the flushed water will be merged with flow of the Madi River, which has similar watershed area, in the immediate downstream of the dam.

Further examination should be conducted in the detailed design stage. During the sediment flushing operation, downstream water quality monitoring should be conducted with establishing criteria to stop the sediment flushing operation in terms of the river water environment conservation. In the case where the monitored water quality data exceeds the criteria, the sediment flushing operation should be stopped immediately. After the sediment flushing operation, degree of the impact to the downstream environment should be verified through the water quality, bottom sediment, and biological surveys to have feedback to improve method of the sediment flushing operation with minimum environmental impact.

1.3 Mitigation Measures for Physical Environment Impact

1.3.1 Construction Phase

(1) Land Use

Avoiding land use changes completely is not possible on the condition of the storage type hydropower project. However, selection of lower reservoir Full Supply Level could minimize existing land use changes. The higher is the reservoir Full Supply Level, larger is the area of land use changes. The project design engineers are advised to select the optimum reservoir Full Supply Level based on the trade of between the incurred losses and the project benefits to avoid land use changes not more than the required (refer to Chapter 10 "Optimization of the Development Plan" in Final Report).

The impact on the land use in the Project Facility Area can be mitigated by selecting the layout of the project facilities such as the alignment of the access road. To minimize the impact, the JICA Study Team examined the layout of the project facilities, especially the construction facilities, based on the GIS Map and discussed it with NEA at site. The layout of the construction facilities are determined considering the following aspects to minimize the impacts on the communities of Beni Patan and Shivapur, which included:

- Locating the access road route under the Vyas- Shivapur footbridge rather than through the village, with associated benefits of traffic separation
- Shifting the spoil bank to the river side to reduce the affected area
- Locating the permanent NEA camp at the southern end of the flat area and closer t the power station – it is not recommended to build a bridge across the Seti River at this location
- Shifting the main access road to uphill from the present road so that Project traffic is separated from schools and shops along the existing road in Beni Patan.

(2) Air Quality

Various dust suppression measures are proposed to minimize environmental impacts in the construction phase.

- On-site vehicle speed restrictions and vehicle washing before leaving the site;
- Frequent watering of the road in the dry season ensuring that the road surface does not generate dust; and
- Frequent watering of the dusty barren areas or spoil disposal areas.

(3) Water Quality

Following mitigation measures to protect water quality in and around the project facility sites will be implemented.

- Establishment of good water supply and sanitation facilities in the construction work camps, at actual construction sites;
- Establishment of effective solid waste collection facilities in the construction work camps;
- Discharge of batching plant, aggregate washing plant, and tunnel seepage waters only after appropriate treatment (sedimentation facility) to the natural water bodies;
- Public awareness program to the construction workforce and the construction on good health and sanitation practices; and
- Disposal of construction related spoils only into defined and well protected spoil disposal sites approved by concerned authorities.

(4) Noise Quality

A package of following mitigation measures will be implemented to control construction noise impacts.

- Care in the placement and orientation of noisy plants away from sensitive receivers;
- Use and correct fitting of silencers, mufflers and acoustic shields;
- Regular maintenance of plant and equipment; and
- Awareness programs and information shearing with the communities on the noise related issues

(5) Construction Spoils

Spoil bank will be constructed along with the right bank of the Seti River. To control potential erosion of the deposited spoil following measures will be implemented.

- Construction of a dry stone gabion structure at the toe of the spoil bank
- Construction of a water collection system for the spoil bank to avoid free flow of the run off from the mountain slope over the spoil material;
- Proper grading of the spoil surface with adequate drainage provisions after the closure of spoil disposal at the site; and
- Afforestation and bioengineering of the spoil area after proper grading and drainage management.

1.3.2 Operation Phase

(1) Reservoir Shoreline Failure

It is likely that the reservoir Full Supply Level of 415 m and at higher elevation would aggravate the local landslides present throughout the upper reservoir area. It is proposed that the area requiring protection would be delineated during the detailed design. In the meantime it is estimated that the following actions should be undertaken:

- Completion of protection embankment works with concrete blocks cover in the vicinity of Bhimad Bajar
- Land acquisition program and stabilization of erosion prone in the risk zone area from Full Supply Level to 10-m high above
- Selective planting of ground cover and trees at the base of areas susceptible to erosion in tributary stream leading into the Seti River
- Land acquisition program and stabilization of erosion prone areas with suitable tree species in the vicinity of the Wantang Khola, the Pedhi Khola and Tittuwa

Due to the lack of the detail geological data in the reservoir area, it is difficult to estimate the risk of the slope failure and the measures for them. The situation of landslides and their treatment needs a comprehensive study by the qualified expertise in soil and watershed management techniques in the next stage.

(2) Environmental Flow

The NEA EIA recommended an annual environmental flow of 2.4 m^3/s, which was determined from the 10% of the minimum monthly average flow with reference to the method applied in the Kaligandaki A Project. Regarding the environmental flow, new water policy was issued in Nepal in 2005. However, it is not formulated in the appropriate laws and regulations. According to the New Policy, the required environmental flow should be defined as 10% of the minimum monthly average flow in respective month. A comparison between require environmental flow based on the NEA EIA method and that proposed by the new Water Policy case is given in **Table 1.3-1**.

Table 1.3-1 Comparison of Unregulated and Regulated Flows in the Seti & Madi River

Month	Unregulated Monthly Average Flows (m^3/s)			NEA Riparian Releases Monthly Averages (m^3/s)		Water Resource Policy Monthly Averages (m^3/s)
	Madi River 1978-1999	Seti River 1966-1999	Total	Environmental Flow in NEA-EIA	Total Residual Flow in D/S of Confluence	Total Residual flow in the Downstream of Confluence
January	23.00	27.02	50.02	2.4	11.48	1.96
February	19.47	23.69	43.16	2.4	10.69	1.85
March	20.88	23.99	44.87	2.4	12.19	2.10
April	23.80	27.41	51.21	2.4	12.86	2.23
May	37.96	41.02	73.98	2.4	24.42	5.21
June	101.72	113.52	215.24	2.4	54.04	12.07
July	261.83	286.84	548.67	2.4	165.30	34.38
August	276.22	320.62	596.84	2.4	168.93	36.20
September	190.37	224.32	414.69	2.4	123.26	26.43
October	86.57	112.40	198.97	2.4	33.78	7.05
November	43.49	51.98	95.47	2.4	17.56	3.30
December	29.28	34.22	63.50	2.4	13.52	2.41

This shows that the Madi Khola effectively mitigates the mainstream Seti River flows in a reduced total quantity but in overall seasonal patterns. Judging from the following aspects, it is considered that

the magnitude of this mitigation is approximately the same for both the Existing NEA EIA and the Water Policy criteria for environmental releases.

- The length of the dewatering area is only 2 km between dam site and the confluence with the Madi River.
- The Project lay down in the Seti River watershed and is a high dam project which severely affected the aquatic and fishery resources. There is no need to reproduce wet season pulse type flows to induce fish to migration up the Seti River because the river is blocked by the high dam.
- No religious and consumptive use in the community is made of the Seti River flows.
- The expected annual complete flushing of the reservoir over a one month period which will result in extensive sedimentation in that the section of the Seti River between the dam and the confluence with the Madi River
- The mitigating effects of joining the Madi River downstream which has a flow regime equivalent to 75% of the Seti River flows.

In the Japanese Guidelines, the environmental flow is required in the case that dewatering section is more than 10 km. Required discharge is defined as 0.1 to 0.3 m^3/s per 100 km^2 of the catchment area. The catchment area of the Seti River is 1,502 km^2 in the upstream of the dam. According to the Japanese Guideline, the required environmental flow is estimated as 1.5 m^3/s to 4.5 m^3/s. The environmental flow proposed by NEA is likely to be reasonable range in comparison with the Japanese Guideline.

However, impacts on the river's aquatic ecology and fish resources are unavoidable in the section of the Seti River immediately downstream of the dam and must be mitigated to the fullest extent possible. These mitigation measures are outlined in Part B, Chapter 2 "Fish and Aquatic Life".

(3) Measures for Eutrophication

As a result of water quality test, the concentration of the nutrient input from the upstream of the reservoir is high and the there is high possibility of the reservoir eutrophication in future. Reduction of nutrient input from the upstream area is the most effective measures for the eutrophication. However, implementation of such measures will be difficult from the view point of the limitation of the scope of Project and related agencies. Thus, the measures for the eutrophication in the reservoir are examined in this section. Though the further detail investigation is required to establish the concrete measures, the following alternatives are considered as the conceivable measures in the reservoir at this moment.

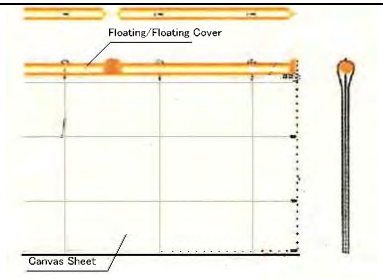
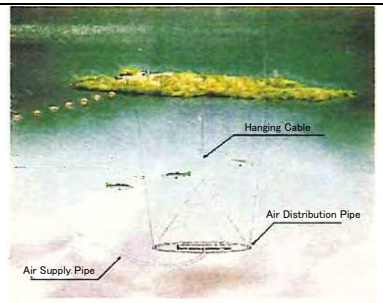
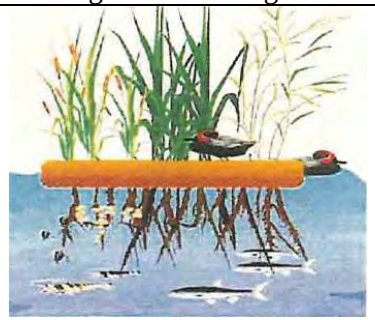
- Installation of the Fraction Fence
- Installation of the Aerator
- Installation of Vegetated Floating Inland
- Input Minerals

Table 1.3-2 shows the comparison study for the above alternatives. As a result of comparison study, it

is proposed that the installation of the fraction fence is most attractive measures from the view point of the low cost and easy maintenance. This method has been introduced in the some dams in Japan and the effectiveness is confirmed. The fraction fence is composed of the impervious sheet to connect with float. Its purpose is to lead the inflow of nutrient to the deep layer of the reservoir by changing the flow downward by fence. Consequently, it is expected to decrease the breeding of the phytoplankton by controlling the photosynthesis. Especially, since the transparency of Seti River is low, fraction fence is expected to work effectively. Furthermore, it is expected to evacuate the nutrient salt with the daily generating operation by leading the water flow to the medium layer providing intake of waterway.

Fraction fence is the effective measures for the river flow containing the nutrient salt for the phytoplankton. On the other hand, it should be considered to elute from the bottom of the reservoir. To avoid the accumulation of the nutrient salt in the reservoir, sediment flush operation should be carried out once a year. The nutrient salt setting in the reservoir will be evacuated with sediment by the operation.

Table 1.3-2 Comparison of the Measures for the Eutrophication in the Reservoir

	Fraction Fence	Aeration	Vegetated Floating Inland	Input Minerals
Image				
Purpose	Restrict the photosynthesis of phytoplankton by nutrient salt flowing downward	Make circulation flow in the reservoir by supplying the air bubble. In addition to prevention of algae bloom, it is expected that DO in the reservoir will be improved.	Plants absorb the nutrient salt from the reservoir water. Furthermore, algae bloom is controlled since the floating inland shade the sun light on the surface of the reservoir.	Change the reservoir water into weak alkali condition by input the mineral. In the alkali condition, microbes actively resolve the organic material.
Specification	Float: Foam Polystyrene covered with rubber sheet Curtain: High strength polyester	Deep aeration system Shallow aeration system Total aeration system	Inside: Palm fiber Outside: Synthetic resin foundation with protection net	Main Ingredient: Magnesium Hydroxide
Features	• The effects appear soon • To removal easily • No maintenance • Durability 5 to 8 years	• To improve DO • Large system is required.	• More than 10% of reservoir surface should be covered. • No maintenance • Impossible to provide in the fast flow area	• Deodorizing effect is expected. • To prevent elution of the phosphorus from the bottom of the reservoir • In the case that the reservoir volume and river discharge is large, large quantity of the minerals is required
Initial Cost	Low	Medium	High	High
Running Cost	No	Operation and maintenance costs are required.	No	Depend on the reservoir water condition
Total Estimation	Recommendable	Difficult	Impossible	Difficult

1.4 Mitigation Costs

1.4.1 Construction Phase

Most of the mitigation measures proposed for implementation rely on best practice management and do not require additional costs and may be considered as Contractors' costs. The main items which may require additional mitigation costs and have to be specified in the Contracts for civil construction costs are presented in the **Table 1.4-1**. Costs for the bio-engineering works in the spoil bank site are included in the Biological Environmental Section.

Table 1.4-1 Mitigation Cost for Physical Environment/Construction Phase

Environmental Impact	Mitigation Measures	Million NRs.
Air Quality	Suppression of fugitive dusts by water sprinkling (2 tankers /day/245 days a year/5 year	4.9
	Dust masks to workers , twice a year (lump sum)/5 year	0.7
Water quality	Sanitation (toilet provisions) at all work and campsites (lump sum, about 100 toilets)	4.5
	Camp Solid waste collection management system and disposal facilities	2.8
	Sedimentation tank for batching discharges, tunnel discharges and aggregate crushing discharges and spoil disposal area	10.0
Land Instabilities and erosion	Bio-engineering of the cut batter slopes of the access roads (lump sum)	2.0
Construction Spoil Drainage	Dry gabion wall approximately 1300 m (1.5m high and 1 m wide)	5.0
	Run off catch drainage of mountain slope (approximately 900m)	3.2
Accidental costs	Vibration effects to houses, natural springs, and other unforeseen impacts	10.0
	Total	**43.1**

1.4.2 Operation Phase

The mitigation costs for the reservoir shoreline failure, as mentioned in the impact section, are very difficult to assess, because of the nature of the risk. The worst erosion prone areas (Bhimad Bajar) should be provides embankments with concrete block cover to protect the private land, houses and property from the flood water. The slope failure protection is designed in the Project Design as explained in Chapter 11 and these costs are included in the civil work.

The 10-m height from the reservoir shoreline, as was done in the existing NEA EIA, is considered as the risk zone and the bioengineering protection will be provided in this area. In addition to the above, the steep slope area in the vicinity of the Wantang Khola, the Pedi Khola and Tittuwa is considered as the risk zone. These areas will be also compensated and protected by the bio-engineering works. These compensation costs for land acquisition are estimated in the social environment part and the costs for the bio-engineering works are included in the biological environmental cost.

Table 1.4-2 presents the costs to protect the downstream communities and the costs for the prevention of accidents due to sudden surge of water twice a day in the Seti River immediately downstream and with flushing flows in the sector downstream of the dam. The actual locations of these sirens are yet to

be established but their need is obvious.

Table 1.4-2 Mitigation Costs for the Downstream Effects to Communities

Environmental Impact	Mitigation Measure	Million NRs.
Downstream impacts to community activities	Siren network along the Seti downstream tailrace (lump sum)	3.5
	Awareness training on the safety measures to downstream areas (lump sum)	0.3
	Total	**3.8**

1.5 Environmental Monitoring and Costs

1.5.1 Environmental Monitoring

(1) Air Quality

It is recommended that the monitoring of dust concentration (TSP/PM10) should be carried out at the Jhaputar and Damauli (close to the District Public Health Office), at least, three times a year (November, February, and May) in the dry season during the construction period. The baseline monitoring shall be carried out prior to the initiation of the construction works in the dry season (April/May).

Compliance monitoring will observe on the implementation of mitigation measures as shown in **Table 1.5-1**.

Table 1.5-1 Compliance Monitoring Indicators and Frequency on Air Pollution

Monitoring Indicator	Monitoring Frequency
Gravelling of road and its maintenance	Once every three months
Control on vehicle speed	Once a day
Watering of roads	Once a day
Careful handling the contaminant or dumping of dusty materials	Once a week
Covering of exposed areas and site restoration	Once a week
Provision and use of PSG against dust	Once a week
Provision of dust mask to drivers and workers	Once a week

(2) Water Quality

It is recommended to conduct monitoring of for 4 seasons (November, March, June and September) during the construction. The parameters for monitoring are recommended to include: Flow Velocity, Discharge, Water Temperature, pH, Conductivity, Total Suspended Solids (TSS), Total Phosphorous (T-P), Total Kjeldahl Nitrogen (TKN), Ammonia (NH_3), Nitrate, Nitrite, Dissolved Oxygen (DO) and BOD_5. The water sample should be obtained from 1) the upstream of the reservoir, 2) the reservoir area, 3) the confluence with the Madi River and 4) the immediate downstream of the tailrace.

During the operation, water quality monitoring above mentioned should continue. They should include the water sampling before and after sand flushing operation.

Compliance monitoring will observe on the implementation of mitigation measures as shown in **Table 1.5-2**.

Table 1.5-2 Compliance Monitoring Indicators and Frequency on Water Pollution

Monitoring Indicator	Monitoring Frequency
Adequacy and operation of water supply and sanitation facilities at engineers camps, construction camps and construction sites	Before project and every 3 month
Collection of solid waste and safe disposal practices at engineers camps, construction camps and construction sites	Once a week
Awareness program on health and sanitation	Once every six months
Prohibition on open defecation and solid waste disposal	Once a week
Storage facilities for fuel, lubricants, spent oils, and toxic chemicals	Before project and every three months
Treatment facilities for waste water of batching plant, aggregate washing and tunnel seepages and its effective operation	Before project and every three months
Water quality test for discharge of treated wastewater from batching plant aggregate washing plant, and tunnel discharges	Once every three months
Disposal of construction spoils only in designated areas	Once a day

(3) Noise Quality

It is recommended that the baseline noise levels should be measured at three locations at Jhaputar, Damauli (close to Public health Office) and Beltar (near the school) before the construction works.

Compliance monitoring will observe on the implementation of mitigation measures as shown in **Table 1.5-3**.

Table 1.5-3 Compliance Monitoring Indicators and Frequency on Noise

Monitoring Indicator	Monitoring Frequency
Placement of noise arresting equipment	Once before construction
Correct fitting of silencers, mufflers and acoustic shields	Once every three months
Maintenance of plant and equipment	Once every three months
Blasting restriction provisions as negotiated	Once a day
Awareness program and shearing of information	Once every three months
Blasting design and follow ups	Once a week

(4) Vibration

It is recommended that the pre-construction survey is carried out for all the structures located in the vicinity of the affected area to generate database on the present conditions of structures. Photo records of all the structures will be documented and archived for future use, if so required.

(5) Land Instability and Erosion

Photo records of all the construction sites will be documented and archived for baseline records of the area before the start of the construction works.

For compliance monitoring, the indicators listed in **Table 1.5-4** will be monitored regularly as stipulated in the table.

Table 1.5-4 Compliance Monitoring Indicators and Frequency on Vibration

Monitoring Indicator	Monitoring Frequency
Vegetation clearance only to required limits	Once a month
Excavation works only to required limit by the design	Once a week
Side casting of excavated earth	Once day
Management of spoil in the designated area only	Once a day
Maintenance of toe protection structure, and drainage structure at spoil disposal; and sedimentation tank at batching yard, spoil disposal area and tunnel discharge areas	Once a month
Civil and bio-engineering protection works and their maintenance (including side drains) at access roads	Once a month

After starting the operation, the sedimentation and erosion features in the downstream of the dam and the tailrace will be monitored establishing topographic reference points twice a year.

1.5.2 Monitoring Cost

The monitoring costs related to the physical environment are summarized in the table below.

Table 1.5-5 Monitoring Costs for the Physical Environment

SN	Particulars	Million NRs.
Construction Phase		
1.	Monitoring (air, water, noise, spoil management land erosion etc)	5.32
2.	Measures for Downstream effect	3.8
Operation Phase		
3.	Monitoring of water quality for 20 years	3
4.	Monitoring of river bed sedimentation and erosion for 20 years	2
	Grand Total	**14.12**

Note: Environmental impacts in the downstream area have uncertain, wide, and long term aspects. In addition, there is no experience and relevant monitoring data for similar project in Nepal. In these senses, the monitoring period for 20 years was proposed, though there is no designated monitoring period as per any norm in Nepal.

1.6 Conclusion and Recommendations

Among the physical environmental impacts to be potentially caused by the Project, there are various uncertain factors on the sediment flushing operation and its downstream impacts. While this issue should be further examined in the detailed design stage by conducting field investigation such as downstream river topographic survey, environmental monitoring on water quality, bottom sediment, and aquatic lives should be well planned and conducted with setting criteria to judge whether sediment flushing operation be stopped in case where monitoring results exceed the criteria.

CHAPTER 2 WATERSHED MANAGEMENT

2.1 Baseline Data

(1) Geology

As shown in **Figure 2.1-1** the watershed in the upstream of the proposed dam site lies in the Higher Himalaya Zone and Lesser Himalaya Zone. The total catchment area is estimated at 1,502 km^2. The high mountains lie in the northern part whereas the middle mountains occupy the southern portion of the Seti watershed. The altitude is changed from 7,555 m at Mt Annapurna to about 310 m at the gorge of proposed dam site.

A generalized rock and soil map is depicted in **Figure 2.1-2**. The main soil types in the Seti watershed can be grouped into the alluvial deposits, colluvial deposits, and the residual soils.

The alluvial soil is mainly distributed along the river banks of the Harpan River, the Phusre River, the Bhunge River, and the Saraundi Khola. The alluvial deposits can be classified into the old river terraces, new river terraces, recent riverbeds, and alluvial fans.

The alluvial deposits of the old river terraces are well cemented and compact. Thick alluvial deposits are found around Ghachok, Lachok, Puranchaur, and Batulechaur especially in old river terraces. The old river terrace of the Seti River between Cbhorepatan and Mahatgaunda forms the thickest alluvial deposit of the area. It is about 60 m thick at Mahatgaunda.

The new river terraces are generally shallow and are seen in the Bijaipur River, Kali River, and the Bhalam River. They are loose and composed of silty sand and gravel. The alluvial fans, developed along the banks of the Phusre River and the Harpan River, are the sources of alluvial deposits.

The colluvial soil is found mostly on the south facing gentle slopes. The soil is usually very thick (5-10 m) on gently sloping hills of Haprak, Archalbot, Thulibini, Kalabang, Kabre, and Dhaba. Similar colluvial soil is also observed at Sidhane and Tamage. The colluvial soil is mainly composed of angular rock fragments and sandy clay. It is very loose and highly susceptible to failure and gully erosion.

The residual soil is distributed in Kaphaighari, Nawaldanda, Lamdanda, Mohoria, Antighari, Dandagaon, Armala, Chhaharepani, Harpak, and Riban. Most of residual soil is less than 3 m deep, except at Lamdanda, Nawalpur, and Chhaharepani. The soil is consolidated to semi-consolidated and colour varies from reddish brown to brown. The residual soil is generally found on the upper parts of flat to gentle south-facing hill slopes of the area. The residual soil is composed of silt and silty sand.

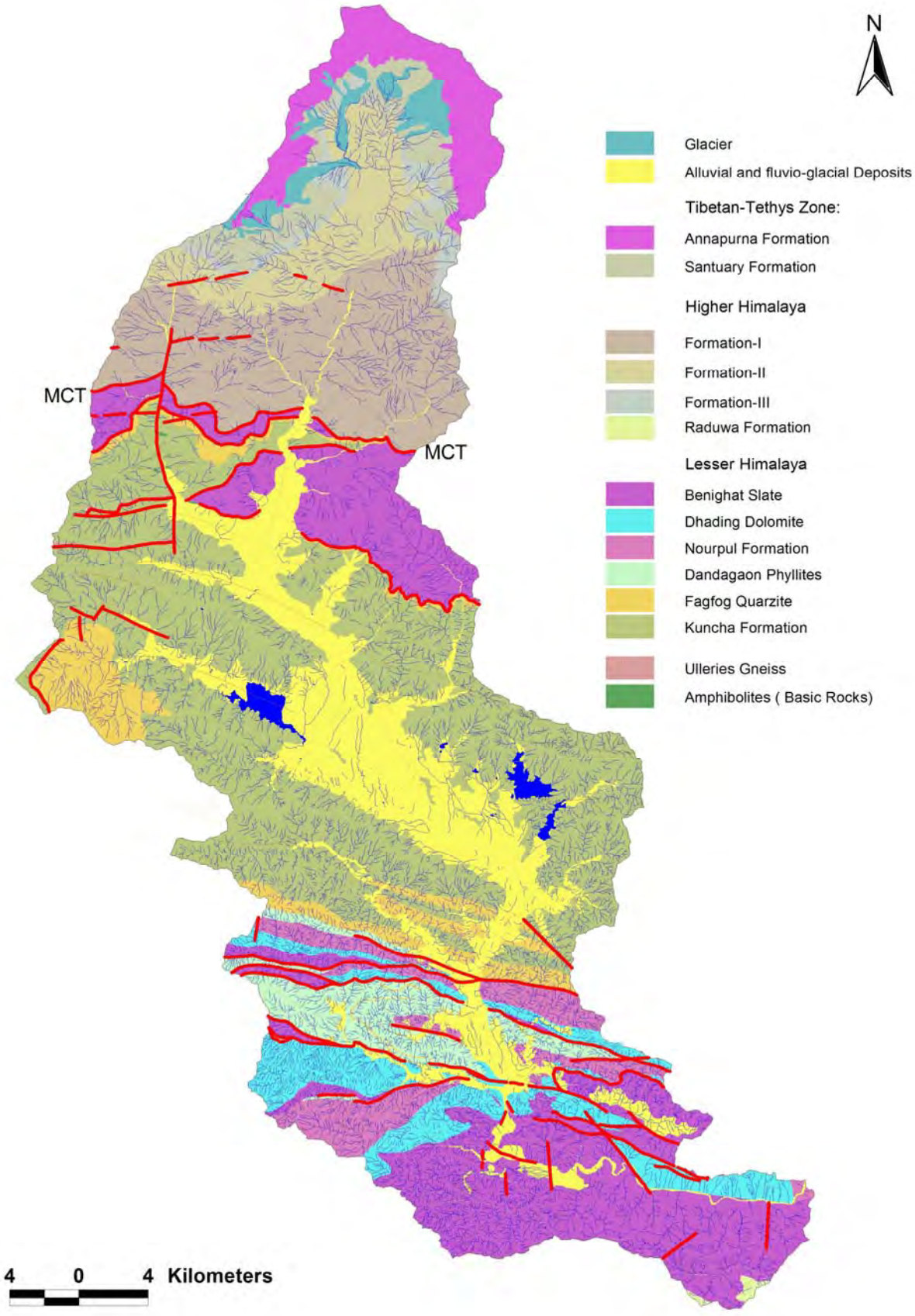


Figure 2.1-1 Regional Geological Map of the Seti Watershed

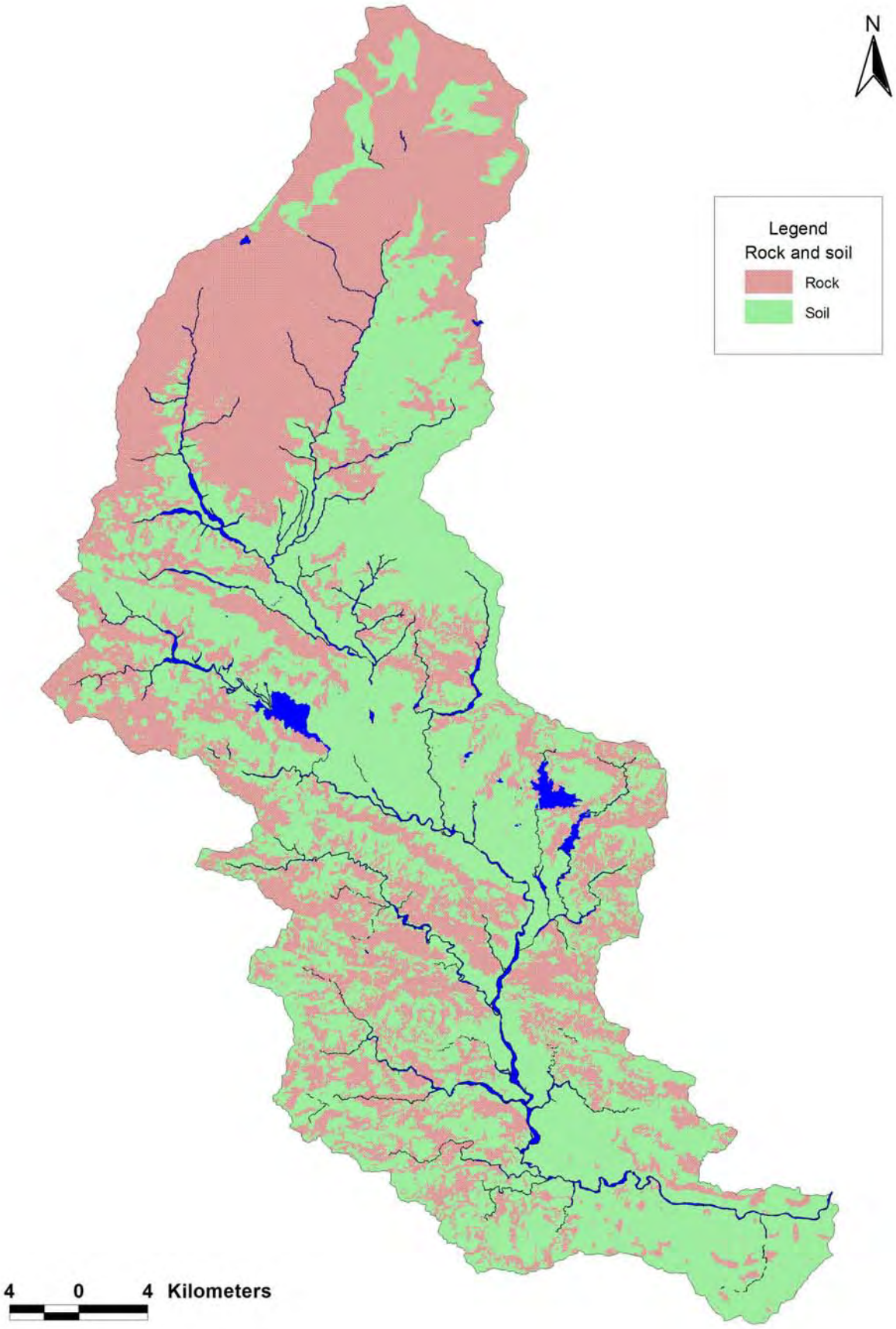


Figure 2.1-2 Rock and Soil Map of the Seti Watershed

(2) Land Use

Land use map of the watershed is given in **Figure 2.1-3**. Forestland, cultivated land and Barren and snow covered land with peripheral grassland occupy most of the watershed area. **Table 2.1-1** presents the land use of the Seti watershed.

Table 2.1-1 Land Use of the Seti Watershed

Land Use Types	Area (km^2)	Percentage (%)
Forest	600.23	40.84
Bush	42.76	2.91
Rock cliff	0.96	0.07
Pond	9.13	0.62
Cultivation	572.11	38.93
River water body	8.86	0.60
Swamp	1.38	0.09
Orchard	0.27	0.02
Built up	0.17	0.01
Barren and others	233.80	15.91
Total	**1469.66**	**100.00**

Source: GIS Maps, JICA Study Team, 2006

(3) Erosion and Sediment Source

As shown in **Figure 2.1-4**, instabilities are distributed mainly in the middle and upper reaches of the watershed. Bank erosion is observed almost in all the large stream and river of the middle and lower reaches. It is one of the prominent sources of sediment.

Figure 2.1-5 depicts the slope gradient map of the Seti watershed. This map is prepared from the DEM developed by the contours and spot heights.

From the above information on the watershed, the sediment source map is prepared as shown in **Figure 2.1-6** by using the bivariate statistical method. Unstable cliffs, river cut banks, loosely cemented blocks in the riverbed, gullies, and landslides are the major sediment sources in the watershed.

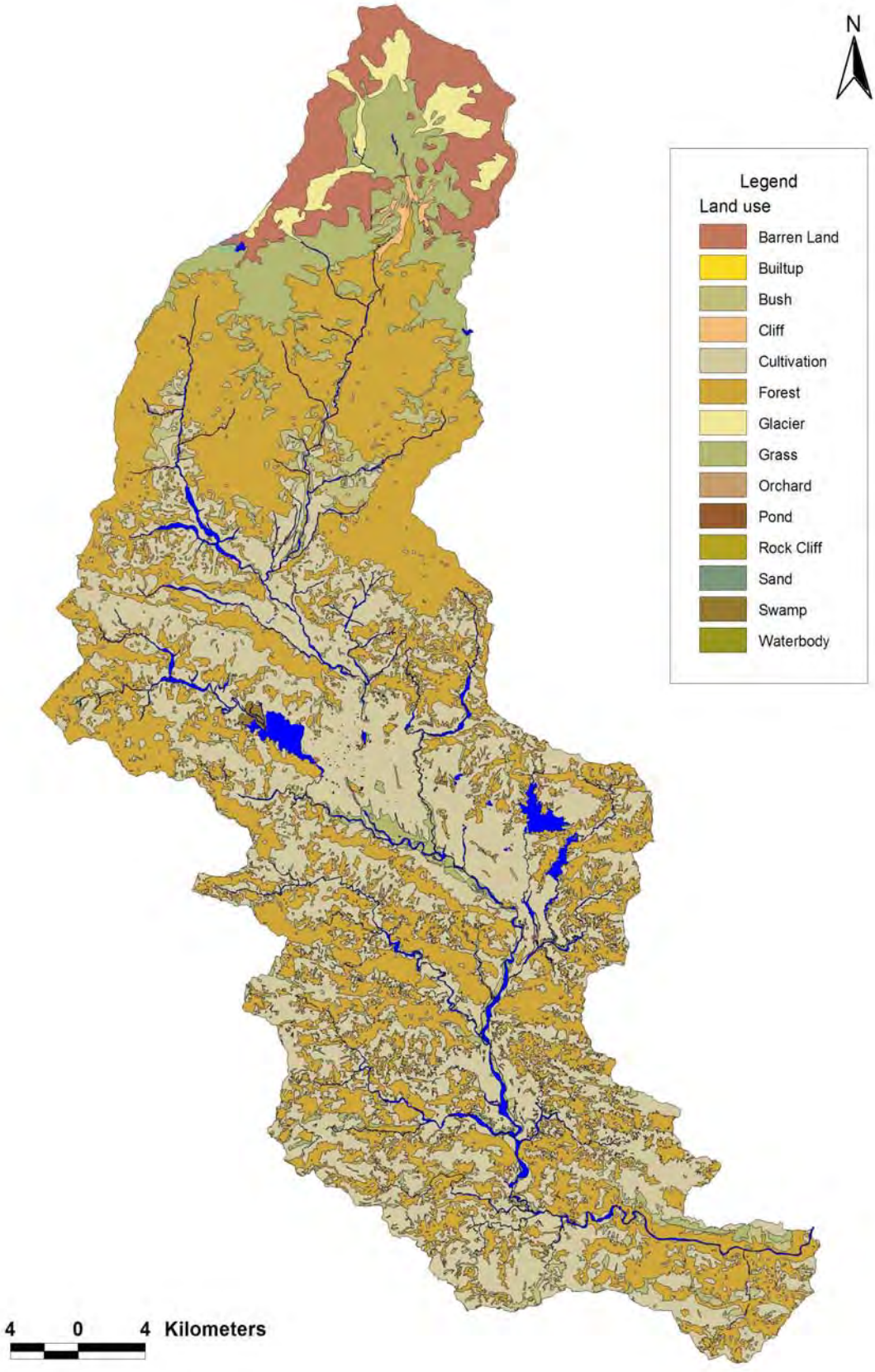


Figure 2.1-3 Land Use Map of the Seti Watershed

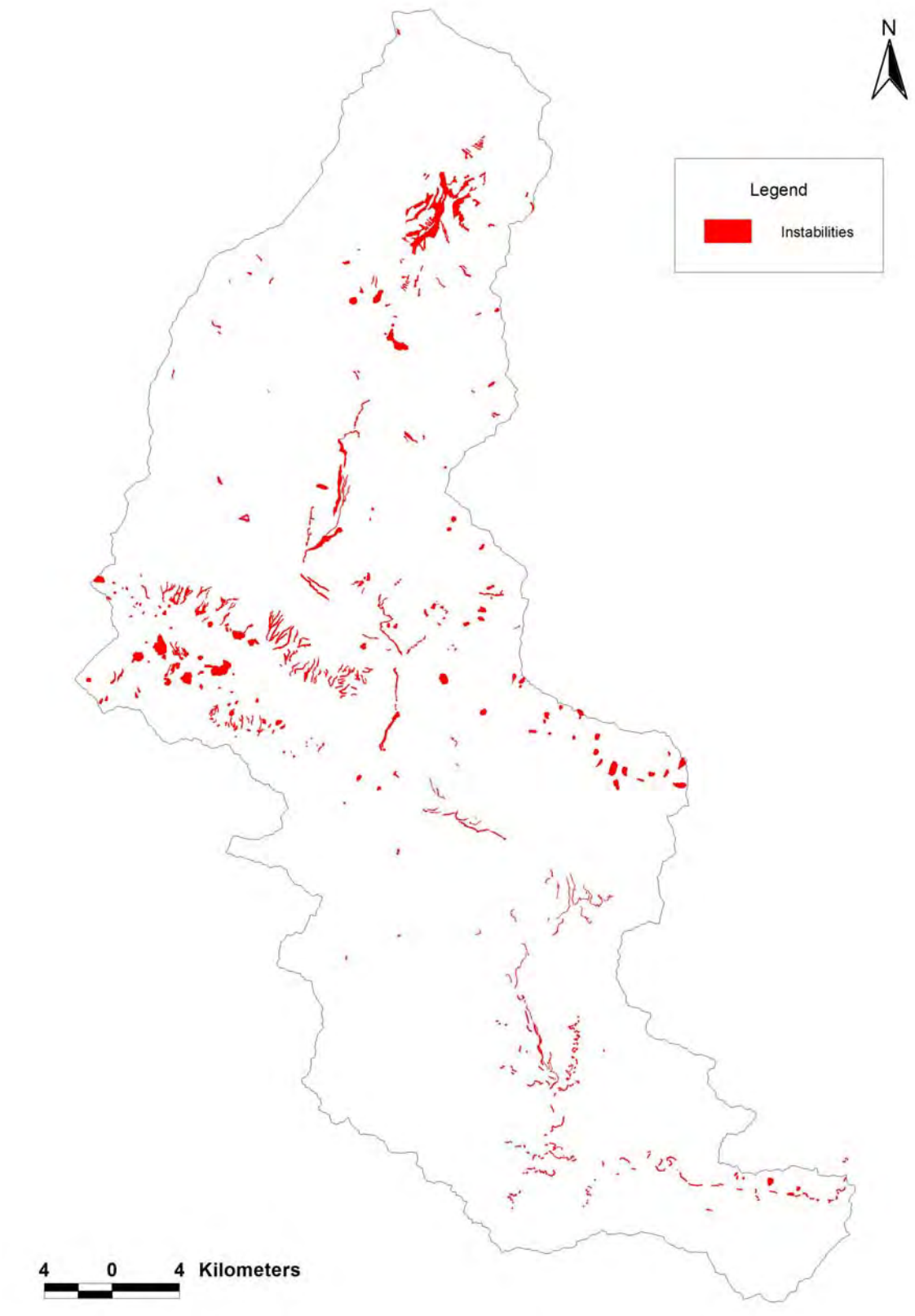


Figure 2.1-4 Distribution of Instabilities in the Seti Watershed

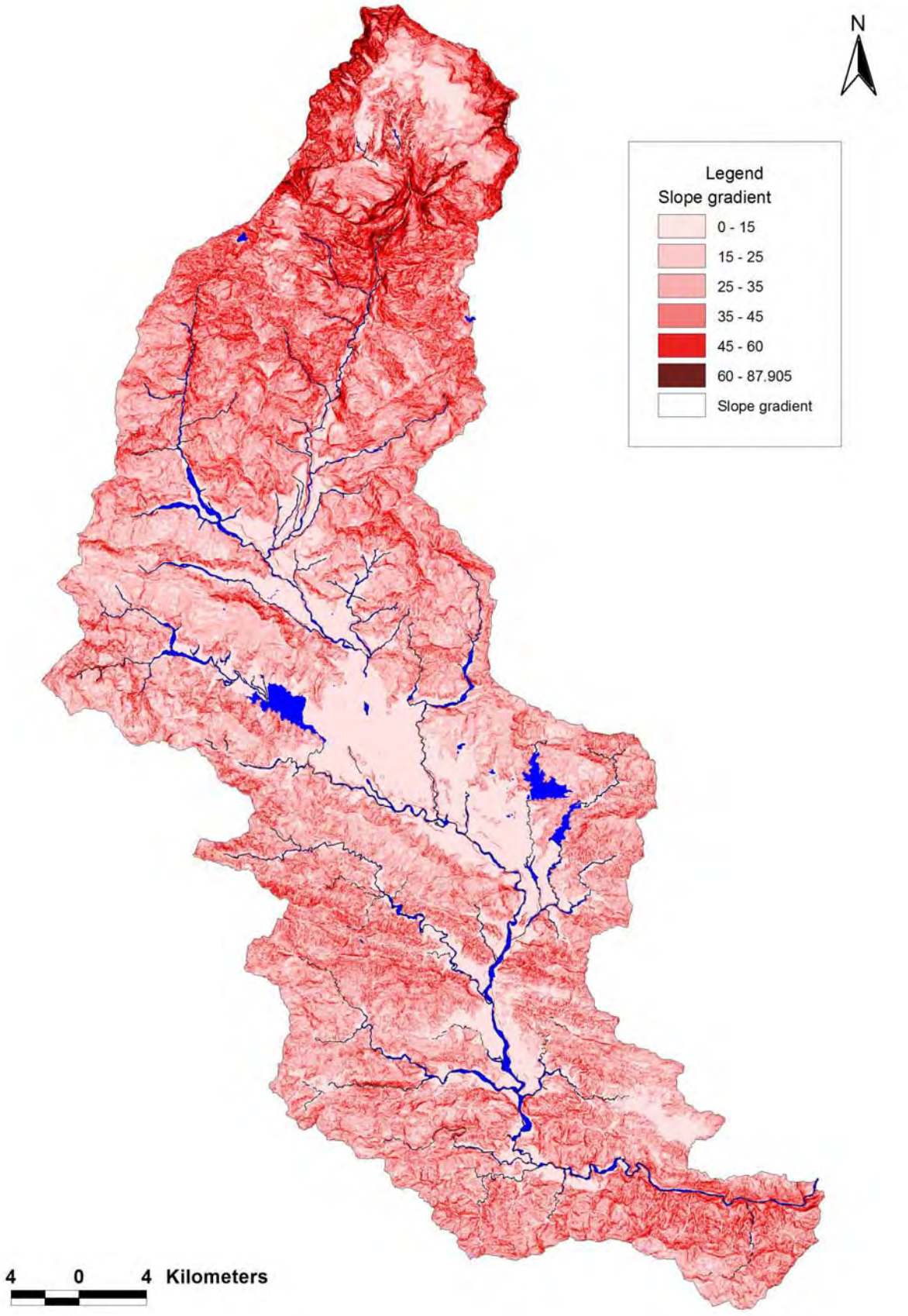


Figure 2.1-5 Slope gradient Map of the Seti Watershed

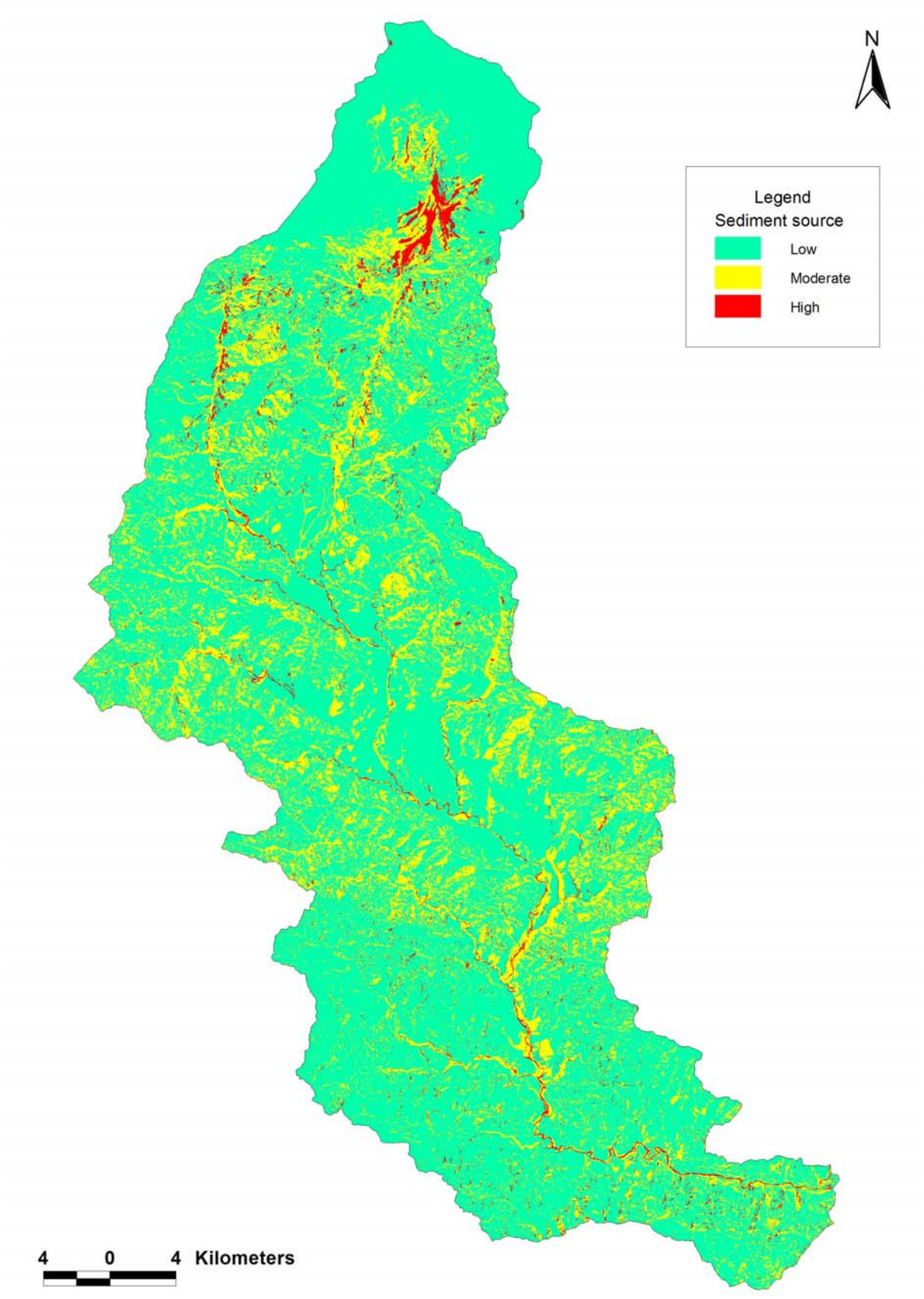


Figure 2.1-6 Sediment Source Map of the Seti Watershed

2.2 Effort to the Seti Watershed Management

Watershed management at the Seti watershed level is not in practice. There are programs for watershed management of various types at the sub-watershed levels from the District Forest Offices and District Soil Conservation and Watershed Management Offices of Kaski and Tanahu districts. Besides, in the upper catchments of Seti, north of Pokhara, Annapurna Conservation Area Project has launched diverse sets of programs for the watershed management of the northern Seti River watershed.

(1) District Forest Office Programs

The programs of the district forest office comprise two components: Community forest component and district forest management component. Under the community forest component, the Community Forest User Groups are prepared, trained and handed over a part of the Government Managed National Forest for sustainable production management and conservation of the forest resources and areas as per the approved Community Forest Management Plan. The prime objective of the program is the protection of watershed through community participation while meeting the community needs of the forest resources from the community forest areas and sharing the benefit of the forest resources between the communities and the Forest Office. This program is quite successful in the hills of Nepal in general and in the Seti watershed in particular.

Kaski district has handed over 407 community forests occupying an area of 14,092.82 ha. Nearly one third of the community forest area lies within the Seti watershed. In Tanahu district 330 community forests occupying an area of 19,995.78 ha are handed over to the Community Forest User Groups Nearly half of the community forest lies within the Seti watershed.

Rests of the Forests (except private and religious forests) are managed by the District Forest Offices through their Range Post Offices. The forest resources of the Government Managed National Forests could not be used without the permission of the District Forest Office. The forests areas with the slope steeper than 45 degree are declared as protected forest, where forest resources are prohibited the extraction. District Forest Offices of Kaski and Tanahu are launching Hill Conservation Forestry Programs with the technical and financial assistance of DANIDA within the districts.

(2) District Soil Conservation and Watershed Management Office

Within the Seti watershed in the Kaski district, the District Soil Conservation Office has been launching various watershed programs since 1973. The Phewa Tal Watershed Conservation Project under the technical and financial assistance of FINIDA/UNDP took up conservation works of the Phewa Lake watershed area till 1995. The Begnas Tal/Rupa Tal Conservation Project executed by Care Nepal was operational till 1995 for the conservation of the Beganas Lake and the Rupa Lake watershed. Similarly JICA assisted program “Community Development and Forest/ Watershed Conservation Project” Phase I and II in 11 VDCs of Seti watershed was operational from 1994 to 2005.

At present, the district Soil Conservation Office, Kaski has no intensive watershed management programs within the watershed. Limited soil conservation programs are launched within the watershed based on the demands of the community under community participation programs. Bio-engineering, landslides stabilization, river training, gully protection, and water resource protection programs are launched regularly within the framework of the district allocated budget.

In the Tanahu district, watershed management works were initiated since 1991. From 1991 to 1996, some soil conservation and watershed managements works were carried out under the loan assistance of Asian Development Bank (ADB). Since 1997, under the Natural Resources management Sector Assistance Program (NARMSAP), Government of Denmark is assisting District Soil Conservation Office of Tanahu. Thirty-eight sub-water basins have been identified as the priority basins for watershed management. Out of the 38 sub-basins, only 6 sub-basins are supported for watershed management works. The Syngdi/Jamdi Khola sub-basin of the Seti watershed in the upstream of the dam site is one of the sub-basin where watershed management works under the program are underway. Besides, above donor sponsored programs, District Soil Conservation Office of Tanahu is undertaking discrete conservation works on the community demand, which includes land use development planning, integrated community watershed management programs (land productivity conservation, infrastructure protection, natural hazard protection and community soil conservation extension), group mobilization and empowerment programs, Nursery establishment and sapling production programs.

(3) Annapurna Conservation Area Project

Operated and managed by the King Mahendra Trust for Nature Conservation, it encompasses area on the high mountains of the Seti watershed north of Pokhara. It operates community based programs on Natural resource conservation, Women development, Agriculture development, Tourism development, Infrastructure/tourism development, Conservation education extension, Alternative energy, Nursery development, NTFP promotion, Soil conservation and Wildlife and biodiversity. All of these programs, in one or the other forms, help restore and enhance the watershed conditions; however, there is lack of focused integrated watershed management programs covering the upper Seti watershed.

A number of NGOs and INGOs groups are also working within the watershed basin of Seti. One of the objectives of all the working groups is watershed conservation; however, their works are not integrated with each other.

2.3 Framework of Watershed Management Plan

To minimize the risks of sedimentation and its implication on the reservoir dead and live storage capacity, watershed management programs targeting on the reduction of erosion rates in the Seti watershed upstream reservoir dam is necessary.

The sediment source study in the Seti watershed of upstream dam indicates high sediment source areas in the northern part of the Seti watershed, more than 40-50 km away from the reservoir. Because this

area is located far from the reservoir, only fine sediment loads conveyed by the flow in the river network. to the reservoir. There is little possibility that glacial lake outburst flood may carry a lot of sediment to the reservoir at once because these lakes are small and located far from the reservoir.

It is considered that the sediment sources most affected for the reservoir are loose alluvial deposit area (*Tar* in Nepal) with ramifications of gullies extended along the Seti River and its tributaries in the downstream of Pokhara. There are also landslides along some tributaries of the Seti River.

Consequently, it is proposed to provide small-scale civil engineering and bio-engineering measures of slope protection in the areas upstream from Bhimad to Pokhara. The bio-engineering measures for slope protection are listed in **Table 2.3-1**.

Table 2.3-1 Proposed Bio-engineering Measures for Soil Erosion Control

System	Applications and site requirements	Time to maturity
Grass planting	Wet condition, cut slope, S lope <45°	2 seasons
Grass seeding	Consolidated debris slopes, Slope <45°	3 seasons
Palisades	Small size and narrow galley, Slope <30°-45°, dry, erodible and consolidated debris	2 seasons
Brush layering	Wet condition, Rocky Slope, Slope <30°-45°	One season if planted early and watered
Fascines	Small Stream, Gully, Slope <45°	3 seasons
Shrub planting	Any slopes, Slope < 45°.	At least 4 seasons
Tree planting	Any debris slopes, Gully, Grazing land, Bad lands in the community or public area, Landslide area, Slope <45°	At least 5 seasons
Bamboo planting	Steep bank slope Gully, Base of slope, Slope <30°-45°	At least 5 seasons

For the control of active gullies and streams bringing a lot of bed load, check dams should be constructed. Gabion check dams will be suitable for small gullies and streams, whereas stone masonry check dams should be constructed in large streams and gullies.

As most of the bed load is generated from landslides and bank failures, special attention should be paid to protect them. The banks of the Seti River are extremely vulnerable. Though it is difficult to control such a process, some river training works together with surface and subsurface water management could be effective.

Debris flows and landslides are the other major source of sediment. The construction of retaining walls, surface and subsurface drains, and galleries will be proposed as landslides control works

If the landslide movement is related to a short-term rainfall, surface water should be drained out immediately. Shallow subsurface drainage is often used along with open surface drainage. The horizontal drainage boring is effective for decreasing the ground water level, if it applied in suitable location.

The river bed erosion in the downstream of tailrace outlet does not have significant impact on the socio-economy of the area since the river course forms narrow steep gorge.

2.4 Cost for Watershed Management

Precise costing of the mitigation (watershed Management Plan) proposed is very difficult at this stage. Further on site field studies are required for such costing. However, cost for watershed management is tentatively proposed on broad headings. Mitigation costs for the watershed management are summarized in the table below.

Table 2.4-1 Mitigation Costs for Watershed Management

SN	Measures	Million NRs.
1	Studies and planning	1.5
2	Bio-engineering measures for soil erosion control	25
3	Afforestation programs in the watershed	15
4	River training works	25
5	Landslide stabilisation measures	10
6	Check dams in the tributary streams (draining to reservoir)	35
	Total	**111.5**

2.5 Conservation for River Water Quality

To prevent degradation of the reservoir water quality such as eutrophication, the basin management for the inflow of the pollution load is important as well as the measures in the reservoir. However, it will be difficult to carry out the basin management for the river water quality in this project because it requires large budget and extends to the manifold executing and the administrative agency. Thus, the basin management plan for the conservation of the water quality should be prepared by the related central government agencies cooperating with NEA, local government and related communities in future. It should be comprehensively studied considering the characteristic of the basin and merit and demerit of the measures explained below.

Dumping Disposal Waste in the Phewa Lake

(1) Sewerage system

It is recommended that the river basin around the urban area such as Pokhara City having about 200,000 of population should be provided the appropriate sewerage system in future.

Implementation of the sewerage system is expected to securely improve the water quality by dealing with the sewage in the urban area. On the other hand, it will take long time to implementation due to the construction of a sewage disposal plant and a sewer.

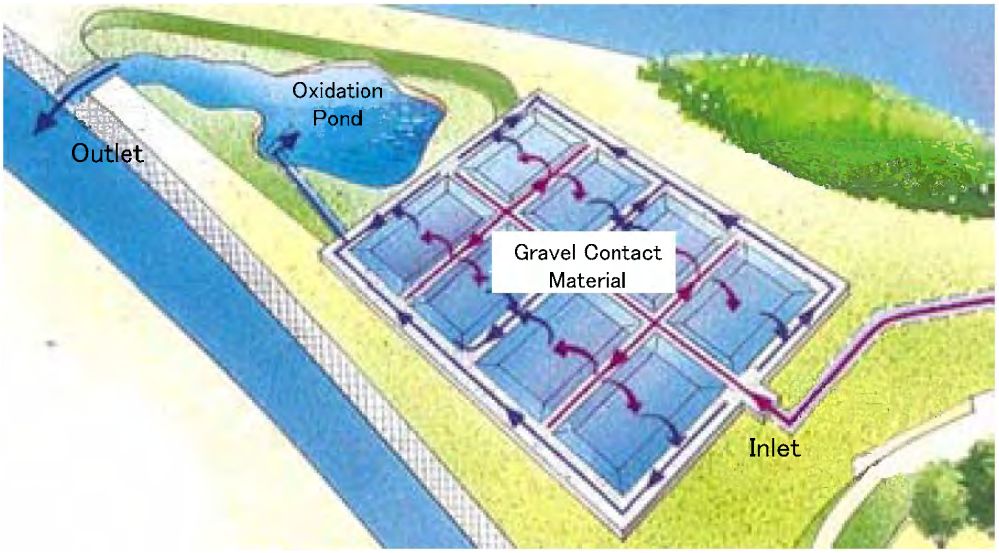
(2) Community Wastewater Treatment Plant

Installation of the community wastewater treatment plant is considered as the measures for the domestic sewage in the area where it is not expected to develop the sewerage system in the near future.

The community wastewater treatment plant is efficient to improve the water quality in the area where houses are sparse. Installed period of the plant per one unit is generally short. It is noted that the treatment plant should be maintained appropriately by user.

(3) River Flow Purification Measures

It is expected that the water quality can be improved by the river flow purification measures in the remarkably polluted river, where the appropriate sewerage system and the community wastewater treatment will not be provided in the near future. “Gravel contact oxidation method”, “Vegetation method” and “Use of rapids and deep pool method” are considered as the viable measures. In the case that the particular polluted river is identified in the basin, it is expected that the water quality can be improved by the above measures in a relatively short time. However, when water quality is improved with the progress of the sewerage system, the efficiency of river flow purification facilities becomes lower since the inflow of the pollution load decreases.



Sketch of the Gravel Contact Oxidation Method

(4) Effort of the Community and Related Agency in the River Basin

From the point of view mentioned below, it is important to promote the active effort to the conservation for the water quality by the enhancement of the awareness on the water quality in the communities and related agencies

- Prevention of the dumping the disposal waste in the river by enhancement of the community people
- The measures for first flush by cleaning of the ditch etc.
- Appropriate management for the domestic sewage treatment apparatus

- Reinforcement and extension of the solid waste management conducted in the Pokhara city

Waste Transporting Vehicle in Pokhara City

Pokhara Sanitary Landfill Site
at the Seti and Phurse River Confluence

(5) Measures for the Area Source Such as the Agricultural Land and Stockbreeding

Area source such as the agricultural land, forest and stockbreeding should be investigated. If necessary, the appropriate measures for the eliminating the pollution load should be considered.

ANNEX B

Annex B-1: Water Quality Analysis Report

NS Accreditation No. Pra. 01/053-54

Entry No. : NCL – 114(W) (4) - 06 - 2006
Sample : River Water (Seti River)
Client : Upper Seti Hydroelectric Project.

Date Received : 04 - 06 - 2006
Date Completed : 09 - 06 - 2006
Sampled By : NESS
Sampling Date : 02 – 06 - 2006

S. N.	Parameters	Observed Values			
		Sample - 1	Sample - 2	Sample - 3	Sample - 4
1.	Temperature ^{o}C	22	20	20	24
2.	pH at 25^{o}C	8.1	8.1	8.1	8.1
3.	Turbidity, (NTU)	230	200	130	120
4.	Total Dissolved Solids, (mg/l)	131	163	175	169
5.	Total Suspended Solids, (mg/l)	501	312	248	206
6.	Settleble Solids, (mg/l)	497.3	309.8	248	206
7.	Non Settleble Solids, (mg/l)	3.7	2.2	<1	<1
8.	Total Hardness as $CaCO_3$, (mg/l)	134	135	144	149
9.	Total Alkalinity as $CaCO_3$, (mg/l)	163.4	136.1	146	133.7
10.	Total Acidity, (mg/l)	2.6	2.6	7.7	7.7
11.	Chloride, (mg/l)	1.5	2.0	3.0	3.0
12.	Ammonia, (mg/l)	0.14	0.11	0.10	0.10
13.	Sulphate, (mg/l)	17.3	14.8	18.1	18.5
14.	Dissolved Phosphate,(mg/l)	0.047	0.02	0.03	0.02
15.	Total Phosphate, (mg/l)	0.36	0.28	0.26	0.21
16.	Calcium, (mg/l)	37.7	34.9	35.7	35.3
17.	Magnesium, (mg/l)	9.7	11.7	13.4	14.8
18.	Iron, (mg/l)	6.07	3.70	2.46	2.31
19.	Sodium, (mg/l)	1.93	2.03	2.12	2.14
20.	Potassium, (mg/l)	2.02	2.10	2.06	2.14
21.	Dissolved Oxygen at 15^{o}C, (mg/l)	8.7	8.6	8.7	8.8
22.	Chemical Oxygen Demand, (mg/l)	3.5	2.4	2.0	2.6
23.	BOD_5, (mg/l)	0.78	0.64	0.42	0.78

Note : Sample – 1 : Upstream Damsite Sample – 2 : Downstream, Bhimad (Upstream Wantang Confluence)
Sample – 3 :Upstream, Bhimad Sample – 4 : Downstream Seti-Madi Confluence

NS Accreditation No. Pra. 01/053-54

Entry No. : NCL – 229(W) (4) - 10 - 2006
Sample : River Water (Seti River)
Client : Upper Seti Hydroelectric Project.

Date Received : 09 - 10 - 2006
Date Completed : 16 - 10 - 2006
Sampled By : NESS
Sampling Date : 09 – 10 - 2006

S. N.	Parameters	Observed Values			
		Sample - 1	Sample - 2	Sample - 3	Sample - 4
1.	Temperature ^{o}C	21	21	20	22
2.	pH at 25^{o}C	8.2	8.1	8.2	8.1
3.	Turbidity, (NTU)	34	26	28	19
4.	Total Dissolved Solids, (mg/l)	150	162	140	104
5.	Total Suspended Solids, (mg/l)	66.8	58.4	49.2	33.6
6.	Settleble Solids, (mg/l)	65.86	58.04	48.52	33.26
7.	Non Settleble Solids, (mg/l)	0.94	0.35	0.68	0.34
8.	Total Hardness as $CaCO_3$, (mg/l)	141	160	137	90
9.	Total Alkalinity as $CaCO_3$, (mg/l)	139.6	159.9	134.5	88.8
10.	Total Acidity, (mg/l)	2.6	2.6	2.6	2.6
11.	Chloride, (mg/l)	3.5	2.0	2.5	2.0
12.	Ammonia, (mg/l)	<0.05	<0.05	<0.05	<0.05
13.	Sulphate, (mg/l)	21.4	16.9	16.5	9.1
14.	Dissolved Phosphate,(mg/l)	0.03	0.03	0.02	0.02
15.	Total Phosphate, (mg/l)	0.10	0.13	0.08	0.07
16.	Calcium, (mg/l)	38.1	39.3	34.1	22.4
17.	Magnesium, (mg/l)	11.2	15.1	12.6	8.3
18.	Iron, (mg/l)	0.95	0.97	1.0	0.78
19.	Sodium, (mg/l)	2.35	2.99	2.83	2.21
20.	Potassium, (mg/l)	2.22	2.73	2.43	2.13
21.	Dissolved Oxygen at 20^{o}C, (mg/l)	7.6	7.3	7.8	7.7
22.	Chemical Oxygen Demand, (mg/l)	4.5	3.0	3.5	1.5
23.	BOD_5, (mg/l)	0.75	0.80	0.91	0.91

Note : Sample – 1 : Upstream Damsite Sample – 2 : Downstream, Bhimad (Upstream Wantang Confluence)
Sample – 3 :Upstream, Bhimad Sample – 4 : Downstream Seti-Madi Confluence

Annex B-2: Detailed Field Observations Land Instabilities - Reservoir Area

Observation Point LS1

Bhimad Bazaar is situated on the river terrace deposits (Plate 1).The vertical elevated Tar is about 30 m high. It is composed of gravel containing pebbles to cobbles of limestone and calcareous shale with light brown silt, fine sand and a little clay matrix. The terrace deposit is loose and soft.

The terrace deposit of Bhimad Bazaar extends between the Jyagdi Khola and Seti River and forms a vertical soil cliff. In the past, there used to be a moderately gentle slope, but due to toe cutting by the Seti River, the terrace became vertical and is very prone to collapses.

The deposit has three distinct sequences. The top 2 m of it is composed of rounded to subrounded boulders and pebbles of limestone, gneiss, quartzite and other metamorphic and sedimentary rocks. At the bottom of this sequence there is an erosional surface. This sequence consists of fine light brown sand and clay matrix. It is and fining-upward sequence with boulders up to 70 cm in diameter. The second sequence is light grey to dark grey gravel containing dominantly fine pebble with some cobbles of calcareous shale and limestone. The lowermost sequence is light brown in colour. It is rather loose with dominantly subrounded fine pebbles of grey calcareous shale and limestone with light brown sand and silt.

Plate 1: Soil slide on the river terrace at Bhimad Bazaar

At Bhimad Bazaar, there is a single level terrace undergoing active erosion, but at Chhang Patan, on the left bank of the Seti River and opposite Bhimad Bazaar, there are two levels of terraces. Here, the lower terrace is about 20 m height and the upper terrace is about 10 m higher than the lower one. It is covered by grass and at present does not show erosion activity.

Similar types of deposits are distributed at Bagtar, Khanaltar, Male Bagar, Budhuwa Phant, Chhang Patan, and Tallo Tar.

Since 2003, the Seti River Control and Bhimad Bazaar Management Committee is working for the management of Bhimad Bazaar and carrying out river training works to protect the Bhimad Bazaar from bank erosion and undercutting. The Committee has constructed about 150 m long gabion embankment, 3 spurs (about 40 m long, 2 m high and 2 m wide) to protect the steep cliff from toe cutting (Plates 2 and 3). As a result, presently the cliff is protected and the Seti River is undercutting its left bank.

Plate 2: Terrace cliff east of Bhimad Bazaar

Plate 3: River training works to protect the bank cutting

Dark grey to black coloured thin- to medium-bedded slate (Plate 4) is exposed on both banks of the Seti River, over which there is a truss bridge (span = 55 m) and an antique suspension bridge made by local people using local resources during the ruling period of Juddha Shamsher. The black slate is dipping towards the south with dip amount less than 45^{o}. Very gently dipping synclinal fold is observed just below the truss bridge. A narrow gorge is formed at this place.

The rock exposure is about 20 m in high and 35 m in wide. There are two prominent joint sets, which are filled with silt and clay. The exposure is damp but no water is seeping through it.

Plate 4: Rock exposure (black slate) on the right bank of The Seti River at the bridge

The next similar rock out crop is located about 150 m down stream from the bridge. It is on the right bank of the Seti River and is represented by black slates. The attitudes of the bedding and joints at this exposure are:

Bedding: 109/47 SW; Joints J1: 25/60 SE, J2: 138/35 SW

LS2

About 300 m downstream from Bhimad bazaar, on the left bank, there is about 20 high and 15 m wide plane rockslide (Plate 5). It is a dip slope and there are two perpendicular joint sets intersecting the cleavage plane. On the right bank, opposite the rockslide, a soil slide is seen on the terrace. Rills and gully are well developed in it and intense erosion is taking place.

Plate 5: Rockslide on the left bank of The Seti River near Bhimad Bazaar

LS3

Another rock exposure is observed on both banks of the Seti River just upstream from the suspension bridge near the Jana Adarsa Campus. The bridge joins Khanaltar and Chhang Patan. The area is composed of slightly weathered, light brownish grey coloured, thickly laminated to medium-bedded slate. A plane failure on the slate is seen on the left bank, but the opposite bank is stable. The river terrace is also seen on the right foundation of the bridge. The gravel and cobble clasts are slightly loose and flat to subrounded in shape. They are composed of limestone, gneiss, quartzite, and phyllite with reddish brown coloured matrix. Good pebble imbrication is observed, which show the palaeocurrent to SE.

A plane rockslide is seen about 350 m downstream from the suspension bridge on the left bank of the river (Plate 6). The exposure height is about 35 m and width is about 120 m.

Plate 6: Plane failure at Chhang Patan

About 140 m long soil slide is observed about 175 m downstream from the rockslide on the cut bank near Chhang Patan. Here, intense rills and gullies are developed, and the slide is sparsely covered by grass.

LS4

The Jyagdi Khola is flowing between Khanaltar and Male Bagar. Its both banks are severely eroded with badland topographic features such as pinnacles (Plate 7). The river terrace is also seen on the right abutment of the bridge. Gravel to boulder size clasts are loosely cemented and flat to subrounded in shape. They are composed of limestone, gneiss, quartzite, and phyllite with reddish brown matrix. The pebble imbrication indicates SE flow direction.

Plate 7: Intense gully erosion on the soil slide and river terrace on the right bank of Jyagdi Khola

At Budhuwa Phant, the terrace is 30 m high and composed of rounded to subrounded boulders and pebbles of limestone, gneiss, quartzite and other metamorphic and sedimentary rocks. But gravels are relatively smaller in size than at LS3. Upper part of terrace is covered by nearly 2m thick recent alluvial deposit composed of small pebble to big boulders of granite, gneiss, limestone and slate boulders. Good pebble imbrications dipping towards northwest can be seen. But on right bank of The Seti River opposite to Budhuwa Phant there is steep rock cliffs of slate covered with vegetation.

On the right bank of The Seti River at Budhuwa Phant, many rills and gullies were developed on a small soil slide.

LS5

At this location, vertical cliffs are observed on both banks of the Wantang Khola, near an earthen road. The cliffs are composed of loose fine sand and pebbles. A small soil failure is seen (Plate 8) and it is about 15 m high. The upper part of the terrace is composed gneiss, quartzite, limestone and granite boulders, which are spread at the lower reaches. An outlet of an irrigation drain is also seen (Plate 9).

Plate 8: A small soil slide in the Wantang Khola

Plate 9: Boulders in the upper part of terrace

Between the Wantang Khola and Phedi Khola there are two villages named Rising Patan (Plate 10) and Jaruwapani situated on the old river terrace. A rockslide is seen on the left bank at the confluence of a tributary. The slide is on the weathered black slate, which is covered by the grey residual soil.

Plate 10: View of Rising Patan from Amdanda

LS6

At the confluence of the Chyobri Khola and Phedi Khola, a few small soil slides are observed on the cut bank of the tributary (Plates 11). Many small soil slides and rockslides are observed along the Phedi Khola, downstream from the confluence with the Chyobri Khola. Sporadically, recent alluvial deposits are seen in the riverbed whereas mostly the riverbed is covered by steep old river terraces and at the lower part of the terrace slate is exposed.

Plate 11: A small soil slides on Phedi Khola

LS7

On the left bank of the Phedi Khola along the village foot trial, light grey, slightly weathered, thinly laminated to medium-bedded phyllite is exposed for about 100 m. On the right bank of the Phedi Khola, nearly 100 m downstream from the confluence with the Chyobri Khola, there is about 30 m high terrace at Jalbire Tar. The terrace cut slope is unstable along the Phedi Khola and many active as well as old failures are observed. Many rills and gullies are well developed and they are frequently covered by thin bushes.

A terrace deposit composed of small pebbles with a few cobbles in fine matrix is observed along the foot trail towards Bandarkuna from Jalbire. At the river bend, some small landslides are observed. There are small irrigation canals on both banks of the Phedi Khola, and they irrigate the agriculture land of Bandarkuna (Plate 12).

Plate 12: Irrigation canals to Bandarkuna

Near the confluence of the Seti River and the Phedi Khola, there is about 40 m high terrace. Phyllite is exposed near the riverbed on both banks. The rocks contain many boudinaged quartz veins. Attitudes of bedding: 65/34SE; Joint J1: 75/55, J2: 330/78, J3: 200/54SW

Near the confluence of the Phedi Khola and the Seti River on right bank of the Seti River, steep terrace of 20 m height is observed. At the bend, colluvial deposit is observed. On the right bank, there is a steep rock exposure with a possibility of rock toppling. Altitude: 370 m (MSL)

LS8

Along the riverbank, at Bandarkuna, big conglomerate boulders (up to 2.5 m in diameter) are observed. They are composed of boulders of subangular to subrounded, laminated, grey limestone, marble, laminated sandstone, and shale (Plate 13). The boulders contain a small quantity of gneiss, granite and schist gravel. Their grain size varies from 40 cm to a few cm. They have a calcareous matrix, which has cemented the clasts (Plate 14).

Plate 13: Conglomerate

Terrace deposits are observed on the way to Geruwatar. They are composed of gneiss, quartzite, limestone, and granite with a fine matrix of sand and clay (Plate 14).

Plate 14: Terrace near Geruwatar

LS9

Below the suspension bridge of Geruwatar, on the right bank, a rock cliff of thickly laminated to medium bedded black slate is observed. A gently plunging syncline with small anticline in its core is observed (Plate 15).

Plunge direction: 180. Plunge amount: 10-15

Height of exposure: 20 m, width: 65 m

Plate 15 Rock exposure at Geruwa Tar village

The rock is overlain by recent alluvial deposits forming the terrace of Geruwatar. Geruwatar is basically grassland. From Geruwatar uphill towards Amdada, the area is covered by colluvial deposits of slate. It is light grey to reddish brown. Steep grey slate cliff is observed near Geruwatar in the south part.

LS10

Highly folded and fractured slate is seen on the left bank of the Seti River, opposite the Geruwatar village (Plate 16). Its crown is about 25 m above the riverbed.

Plate 16: Shear zone

LS11

On the right bank, near a hut made by Bhainsekilo Aama Samuha, towards Tuttwa downstream from Geruwatar, mainly colluvial deposits and rock exposures are observed. Down slope from the Tuttwa village near the suspension bridge, the outcrop of slate is exposed with folded quartz vein on the left bank of The Seti River. The rock is highly fractured and due to the overburden mass and rock dipping opposite to slope, there is a possibility of rock toppling. On the left bank, the terrain is mostly covered by colluvial deposits whereas on the right bank alluvial deposits are observed.

Old soil slide is observed at the Dying Khola near the right bank of the suspension bridge, which is covered by vegetation (Plate 17).

About 400 m downstream from the Tuttwa suspension bridge, on the right bank, an old soil slide is observed, which is covered by vegetation.

Plate 17: An old soil slide covered by shrubs at the Dying Khola near the right abutment of suspension bridge

LS12

On the left bank of the Seti River, about 1.5 km downstream towards the Chhap bridge from the Tuttwa suspension bridge, on the foot trial, near the spring, the colluvial deposits of dolomite is observed with crosscutting quartz veins. The boulders of dolomite (up to 6 m) are observed. The colluvial deposits are covered by vegetation. Altitude = 390 m.

LS13

Near the confluence of the Lima Khola, near a suspension bridge, on the left bank of the Lima Khola about 30 m to the Seti River, an exposure of light grey to greenish grey coloured thickly laminated to medium bedded slate is observed. The slate bed is slightly undulated. The slate is highly fractured and there are two prominent joint sets. About 1 m thick calcareous bed is interbedded with the slate bed. A landslide of 25 m height and 20 m width is observed. The landslide consists of small angular fragments of slate and fine soil with lots of small gullies. At some places there is possibility of rock toppling. There are lots of quartz veins with some quartz vein having thickness up to 30 cm.

Attitude: Slate: 92/56 SW, 91/51 SW; Dolomite: 97/58 SW

LS14

On the left bank of the Seti River, about 10 m to the Lima suspension bridge, an outcrop of highly fractured cream coloured to bluish grey dolomite beds is observed. Altitude = 360 m

About 1 km downstream from the Lima suspension bridge, on the left bank of the Seti River, near the Bagar village, a rockslide is observed. The rockslide is due to the block failure in dolomite.

LS15

On the left bank of the Seti River, about 1.5 km towards Beteni at a spring of Deurali, about 5 m thick alluvial deposit with fining-upward sequence is observed consisting of boulders up to 1 m size (Plate 18). The boulders are basically of quartzite, dolomite, gneiss and shale with sand and silty clayey fine matrix. Altitude = 330 m.

Plate 18: River terrace overlain by colluvial soil

Most of the terrain is covered by colluvial deposits containing clasts of dolomite. The clasts in the colluvium vary from fines to boulders (about 5 m), and the matrix is of the same material.

LS16

At the proposed dam site of hydropower, there are steep cliffs of dolomite on both banks of the river making a deep and narrow gorge. On the left bank, attitude of bedding = 40/40 SE; joint: J1 30/41 SE; joint: J2 350/45 NW; natural slope: 310/74 SW.

Drilling works are being conducted at this area. There are four drilling points at various heights. Three drilling points are on the right bank (D1=50m, D2=90m, D3=100m) and one drilling point is on the left bank (D4=50m).

On the left bank, small caverns are present with 1 m x 2 m openings and beautiful stalactites and stalagmites (Plate 19). From the small caverns water is flowing out. Besides that on the right bank cliff also up to 20 height from riverbed small holes are present, which are tufa, and are most vulnerable to dam site seepage. Some geophysical survey is required to map out the seepage area

(Plate 20). The dolomite is thickly laminated to very thickly bedded (>2m). Due to the unfavourable jointing pattern, there is a possibility of rock fall.

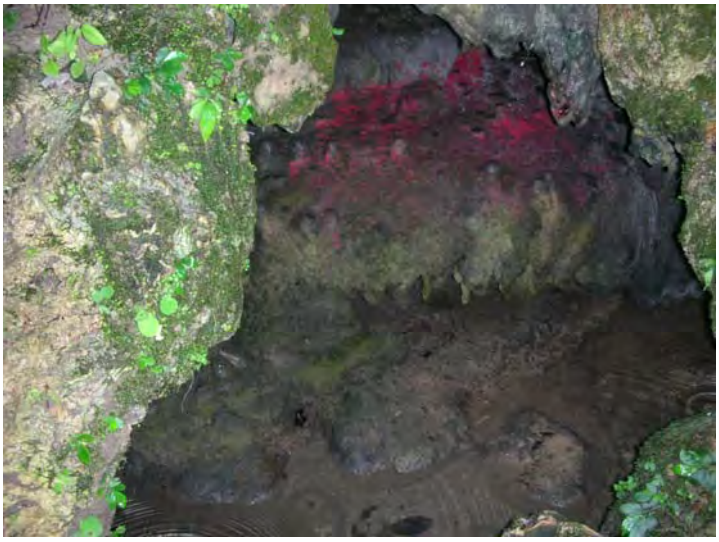


Plate 19: Leakage through the cavern near proposed dam axis on the left bank of the Seti River

Plate 20: Proposed dam axis on the right bank of the Seti River

LS17

On the right bank, there is about 40 m high and 25 m wide rockslide.

Annex B-3: Water Sources Impacted by the Project

a. Name and the sources of drinking water being used and impacted by the project.

Group No.	Source Type	Source Name	Location	Beneficiary Household
1. V D C- Chhang-4, Chokre				
	Pond/Pokhari	Chokre Pokhari	Just below Chokre village	39
2. V D C- Chhang- 5, Fulbari Ghaderi				
	Pond/Pokhari	Chokre	Chokre	20
	Pipe water	Pipale	Pipale	15
3. V D C- Chhang-7, Jhakash Fulbari				
	Pipe water	Chitung Khola	Jhakash-Fulbari	23
4. V D C- Bhimad - 1, Khanaltar				
	-	-	-	-
5. V D C- Rani Pokhari - 9, Rising Patan				
	Spring /Mulpani	Kumalpani	Rising Patan	50
	Spring /Mulpani	Amalapani	Rising Patan	50
	Spring /Mulpani	Dulegaunda	Rising Patan	40
	Spring /Mulpani	Dhunge Pandhero	Rising Patan	200
	Spring /Mulpani	Tarebhir	Rising Patan	70
6. V D C- Rani Pokhari - 9, Rising Patan - Kharkhare				
	Stream	Bokse Chhahra	Sanutari	16
7. V D C- Kotdarbar - 1, Maidan Swanra				
	Spring /Mulpani	Risini Khola	Ward-3	35
8. V D C- Kahun Shivapur - 3, Bakle				
	Kuwa	Bakle Kuwa	Bansbot	4
	Kuwa	Sarki Kuwa	Kahun	50
	Pipe Water	Kheradi	Kahun Basti	20
	Kuwa	Gidha	Ranibari Gidha	5
9. V D C- Kahun Shivapur - 1, Beltar				
	-	-	-	-
10. Vyas Municipality - 7, Tallo Patan				
	-	-	-	-
11. Vyas Municipality - 7, Beni Patan				
	Spring /Mulpani	Linde Dhara	Near School	25
	Water Tank	Dharakholsi and Asagurikholsi	Asaguri	45
	Pipe Water	Dharakholsi	Asaguri Puchhar	1
12. Vyas Municipality - 7, Beteni				
	-	-	-	-
13.Vyas Municipality - 5, Baireni-Botegaun				
	-	-	-	-

b. Name of irrigation scheme and source being used and impacted by the project.

Group No.	Source Type	Ssheme Name	Location	Beneficiary Household
1. V D C- Chhang-4, Chokre				
	Stream/Khola	Dumre Khola Kulo	Duwan	7
2. V D C- Chhang- 5, Fulbari Ghaderi				
	Stream/Khola	Chokre Canal	Chokre	35
3. V D C- Chhang-7, Jhakash Fulbari				
	Stream/Khola	Huti Khola Kulo	Chokretar	18
4. V D C- Bhimad - 1, Khanaltar				
	Stream/Khola	Birta Nahar		40
	Stream/Khola	Mathillo Kulo		40
5. V D C- Rani Pokhari - 9, Rising Patan				
	-	-	-	-
6. V D C- Rani Pokhari - 9, Rising Patan - Kharkhare				
	Stream/Khola	Bandarkuna Kulo	Bandarkuna	45
	Stream/Khola	Jhakash Kulo	Sankhar,Jhakash	8
	Stream/Khola	Sankhar Kulo	Sankhar	6
	Stream/Khola	Tarebhir Kulo	Tarebhir khet	6
7. V D C- Kotdarbar - 1, Maidan Swanra				
	Stream/Khola	Odare Kulo	Shivapur	3
	Stream/Khola	Chhabise Kulo	Kotdarbar	6
	Stream/Khola	Wasebagar-1	Kotdarbar	3
	Stream/Khola	Wasebagar-2	Kotdarbar	2
	Stream/Khola	Dhap Kulo	Kotdarbar	3
	Stream/Khola	Manpure Khola Kulo	Kotdarbar	1
	Stream/Khola	Khahare Khola Kulo	Kahun Shivapur	2
8. V D C- Kahun Shivapur - 3, Bakle				
	Stream/Khola	Mathillo Kulo	Ranguwa	20
	Stream/Khola	Barala Tharamuni	Tharamuni	3
	Stream/Khola	Phordi Khola Muhan	Lima Khola	2
	Stream/Khola	Khare Khola kulo	Khahare	3
9. V D C- Kahun Shivapur - 1, Beltar				
	-	-	-	-
10. Vyas Municipality - 7, Tallo Patan				
	-	-	-	-
11. Vyas Municipality - 7, Beni Patan				
	Stream/Khola	Asaguri Kulo	Asaguri Danda	3
12. Vyas Municipality - 7, Beteni				
	-	-	-	-
13.Vyas Municipality - 5, Baireni-Botegaun				
	-	-	-	-

c. Ghatta (traditional water mill), water turbine (pani mill) impacted by the project.

-	NA	NA	NA	NA

Source: based on Focus Group Discussions at various project locations,

ENVIRONMENTAL AND SOCIAL CONSIDERATION (ESC) REPORT

PART C

BIOLOGICAL ENVIRONMENTAL ASSESSMENT

PART C BIOLOGICAL ENVIRONMENTAL ASSESSMENT

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CHAPTER 1 FORESTRY AND VEGETATION

1.1 Baseline Data

1.1.1 Composition of Vegetation

The physiography of the project area comprises Mahabharat range and Midland covering entirely the tropical flora. Hills less than 1,000 m run along west to east with different patches of vegetation composition in different aspects at both side of Seti River. Aspect has an important influence on the vegetation which particularly prominent at the lower altitudes. In general moisture is retained much on north and west facing slopes and south and east faces remain drier due to longer exposure to sun. Except shrub and cultivated area at the hill tops the both sides of river show virgin and undisturbed vegetation in its steep and inaccessible slopes particularly between Dam site to Geruwatar at the Seti gorge.

Typical riverine open mixed forest in the Reservoir area

There are not remarkable changes in the vegetation and its composition in both sides of river. Due to steep slopes, vegetation is undisturbed along the right bank of river from Huksetar through purposed dam site, Limukhola, Toonipul, Tittuwa, Geruwatar. Geographic structure is more or less same but the left bank is comparatively disturbed due to recent encroachment of the forest land for farming by the rural people at the side of river as in Betini, Seti Bhagar and Belbot. From Geruwater forest is very sparse along right bank up to Bhimad, while forest is conserved up to Jhakkas in the left bank.

The right river bank has higher biodiversity value than the left bank due to the presence of threatened plants such as wild varieties of banana (*Ensete glaucum*) and Screw pine (*Pandanus nepalensis*). These species are also occasionally found at the steep slope of left bank too.

There is not any clear cut difference in the vegetation composition of forest in the project area along the Seti River. The proposal area is a part of Central Nepalese Biogeographic region (Dobremez, 1976). Though the area, from altitudinal consideration, is a part of Upper Tropical Eco-Zone (300 to 1000 m), have forests vegetation characteristics of Lower Tropical Eco-Zone (70 to 300 m) in the deeply entrenched river gorge of Seti. The Hill Sal Forest, a component of Upper Tropical Eco-Zone is well developed in the higher elevations of the Seti gorge (above 100 m from the valley floor), whereas in the river bottom and on the gorge flanks Mixed Open Forest with patches of Khair (*Acacia catechu*) forests develop which has characteristics of Lower Tropical Eco-Zone. Three types of vegetation structure can be described based on small forest patches seen at different aspects of the hills at the both side of the river. **Tables 1.1-1** and **1.1-2** presents the coverage of different forest types in the reservoir area and in the project facility sites.

All together twenty seven plots (25 m X 25 m) were inventoried in the Project area and represent eleven from planted forest (Plot 1 to 11) and rest from natural forests (Plot 12 to 27). **Figure 1.1-1** presents the location of the study plots.

Eleven plots in planted forest include all the plantation sites of Damauli, Huksetar, Patan, Geruwatar, Risingpatan and Bhimad. Sisoo and Khayar are the major planted species. Wood volume is highest in the bamboo plantation of Plot No. 1, located on the right bank of Seti River near its confluence with the Madi River, and the Plot No.3 located near the bridge to Jhaputar at Damauli, with both areas since discarded from potential facility sites location.

For the study, forest area can be classified into the following three types:

Hill Sal forest

Shorea robusta (Hill Sal) is dominant species, which is normally observed above EL.400 m. The associates of this forest are *Schima wallichii* (Chilaune), *Lagerstroemia parviflora* (Botdhyero), *Bauhinia vahlii* (Bhorla) and *Desmodium oojeinense* (Sadan) etc.

Mixed Open Forest

This forest type is spread along the river belt. Representative species are different depending upon the aspect of the hill. *Terminalia alata* (Saj), *Mallotus philippensis* (Sindhure), *Albizia chinensis*, *Albizia lebbeck*, *Sapium insigne* (Khirro), *Bamboo spp*., *Lagerstroemia parviflora* (Botdhyero), *Bauhinia vahlii* (Bhorla) and *Desmodium oojeinense* (sadan) are commonly found in this forest area. Other associates are *Murraya koenigii*, *Leea macrophylla* and *Dioscorea bulbifera*.

Khair/Sisso Forest

Acacia catechu (Khair) is the representative species of this forest area. It is mostly found just at the side of the rich alluvial deposits of along the Seti River. The associate species of this forest is *Bombax ceiba* (Simal), *Dalbergia sisoo* (Sisoo), *Sapium insigne* (Khirro), *Murraya koenigii* and so on. The Khair forest is threatened due to fewer seedlings in the area as well as high interest in the usage. *Dalbergia sisoo* (Sisoo) is mostly planted associated with wild Khair.

The relative distribution of the classified composition of the forest types is described and their distribution at different reservoir levels presented in **Table 1.1-1** and for the Project facility area in **Table 1.1-2**.

Table 1.1-1 Forest Types in the Reservoir area under various FSL

SN	Types of forest	Area (ha)
1	Hardwood Sal Forest (Hill Sal Forest)	29.46
2	Hardwood Mixed Forest (Mixed Open Forest)	271.81
3	Kahir /Sisoo Forest	52.62
Total		**353.89**

Source: Supplemental EIA Survey, JICA Study Team, 2006

Table 1.1-2 Forest Types in the Project Facility Sites

SN	Types of Forests	Area (ha)
1	Hardwood Sal Forest (Hill Sal Forest)	51.91
2	Hardwood Mixed Forest (Mixed Open Forest)	16.79
3	Khair/Sisso Forest	0
Total		**68.7**

Source: Supplemental EIA Survey, JICA Study Team, 2006

1.1.2 Plant Biodiversity

Due to difficulty of access and complex geography, the forests on the steep slope along the Seti River are disturbed very little and maintain the rich biodiversity, especially, in the lower reservoir area. Floristic exploration in the Project area reveals 209 wild flowering plant species. Present survey enumerated herbs in highest number (69 spp.) followed by tree (62 spp.), shrubs (53 spp.) and climbers (25 spp.). Annex C.1.1.3 presents the detailed lists of the wild flowering plants found in the Seti River gorge between Damauli and Bhimad.

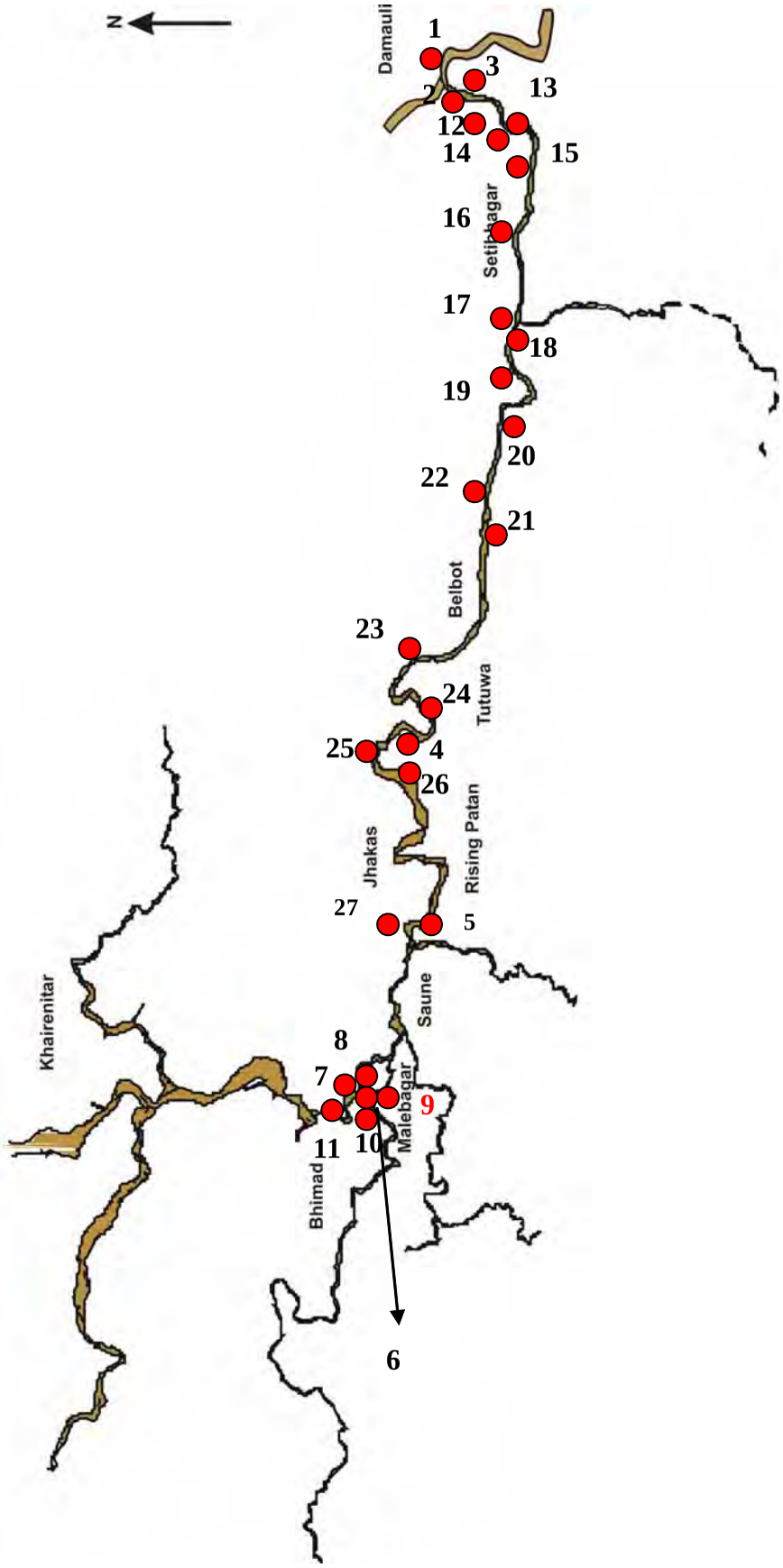

Figure 1.1-1 Vegetation Study Plots Location

1.1.3 Conservation Status of Plants

Nepal government has enforced regulations on the collection, trade and export of selective plants under Forest Act 1993. Similarly, The World Conservation Union (IUCN) has developed conservation statue of globally important plants. Based on thorough study on their habitat and population dynamics, 60 Nepalese plants are listed under IUCN threat categories. Furthermore, Nepal is a member of Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) since 1993. CITES list includes 15 plants under its different categories (Appendix I, II and III).

Out of total record of 209 wild plants in the project area three plants fall under Nepal Government conservation categories, six (including four orchids) under CITES conservation categories and six plant species are under IUCN conservation categories. Plants found inside project area which fall into different conservation categories are shown in the **Table 1.1-3**.

Among the government protected species "Khair" (*Aciasia catechu*) is found in tropical riverine area which is often associated with Sisso (*Dalbergia sisso*) and thus they are localized in small patches in a limited habitat. Other plants such as Champ (*Michelia champaca*) are getting rarer due to heavy commercial exploitation and are banned for transportation, export and felling. The "Sal" is abundantly found at the vicinity of Chitwan area as well as east and west Nepal, has been protected because of its strong and durable timber value. It is noted that Sal is decreasing in last three decades by 30%. Other threatened plants such as *Rauvolfia serpentine, Dioscorea deltoidea* are observed in the project area and also in the similar bio-climatic conditions in other parts of Nepal. These are the small plant which can be easily transplanted and protected at the suitable places in the project site.

Table 1.1-3 Plants of Project Sites under Different Conservation Categories

SN	Species	Conservation categories		
		GON	CITES	IUCN
1	*Acacia catechu (L.f.) Willd.*	+		Threatened
2	*Alstonia scholaris (L.) R. Br.*			Rare
3	*Coelogyne sp.*		Appendix II	
4	*Dendrobium sp.*		Appendix II	
5	*Dioscorea deltoidea Wall. Ex Grises*		Appendix II	Threatened
6	*Habenaria sp.*		Appendix II	
7	*Oroxylum indicum (L.) Kurz.*			Vulnerable
8	*Pandanus nepalensis St. John*			(Locally) Threatened
9	*Rauvolfia serpentina (L.) Benth.*	+	Appendix II	Endangered
10	*Shorea robusta Gaertn.*	+		
11	*Vanda teres Lindl.*		Appendix II	

Eleven species of plants having conservation importance will be affected by the project. These plants are widely distributed in Nepal, particularly in Annapurna region and have multiplied there in recent years. As from distribution point of view, these plants of conservation value are thinly distributed in reservoir area which is already impacted by human activities. Therefore, loss of these species in local, regional and national scale is minimal and the project will only have moderate impact which is less

significant. However, attempt should be made to transplant these plants whenever natural habitats exist in the project area and need to protect them.

1.1.4 Ethnobotany

Ethnobotanical survey reveals that the Magar people who lived in the local community in the study area have rich indigenous knowledge of wild plants. They utilize the plants in various purposes such as medicine, food, timber, fermentation material, fish poisoning etc. Total 101 plants of ethno-botanical value are recorded. Out of them 58 plants are recorded for their medicinal value, followed by 29 plants of food value, 17 plants are used as timber, 9 plants are preferred fodder; 7 plant are used to brew local wine, 5 plants are preferred by local people to make farming implements, 4 plants are used in religious ceremonies, 4 plants are recorded as fiber yielding, 3 plants used as fish poisoning, and 2 plants each used for fencing and roof thatching (**Figure 1.1-2**).

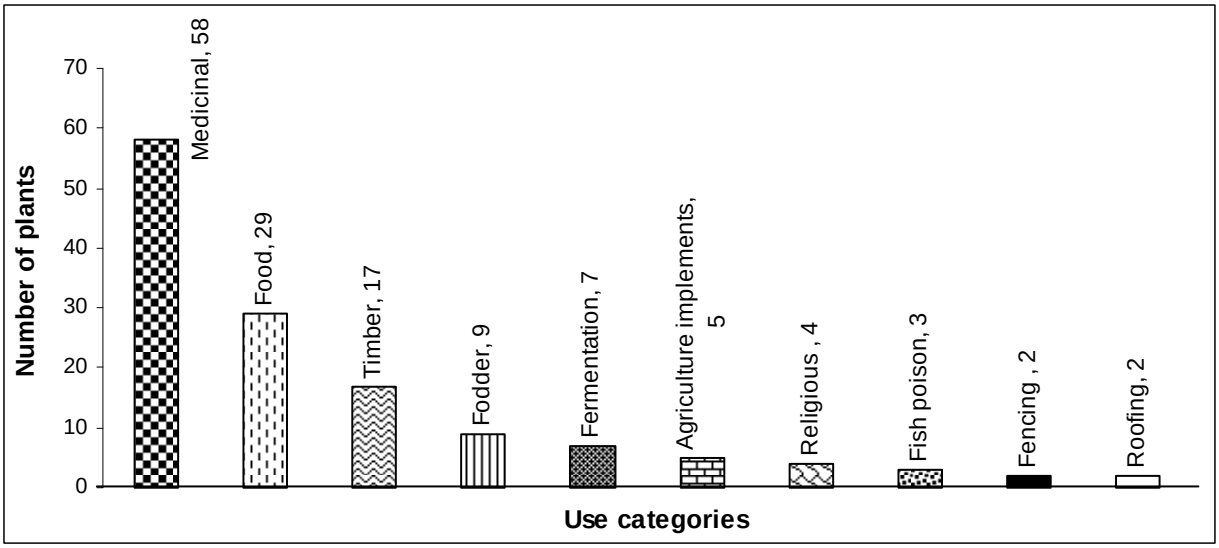

Figure 1.1-2 Number of Plants with Different Use Values Recorded in Project Area

Forests in Nepal are divided into two categories from the management viewpoint. Those are 1) Protected forests or the National Parks, 2) Wildlife Reserves and 3) National Forests. The National Parks and Wildlife Reserves are managed by the Department of National Parks and Wildlife Reserves. Development activities are prohibited in the National Parks and Wildlife Reserves as these forest areas are protected for nature conservation. The forest of the project area lies outside such National Parks and Wildlife Reserves.

The National Forest under the regulating preview of the Department of Forest is managed by the Department of Forest under the Ministry and its line offices at the District levels. The National Forests are categorized into five types of forests and given management purposes by "Forest Act 1993" as follows.

- *Protection Forest* – Special environmental, scientific, cultural or other importance, managed by the District Forest Office as per the approved forest management plan,
- *Community Forest* –Managed by the Community Forest Users' Group (CFUG) of the area as per the approved forest management plan within the defined area,
- *Leasehold Forest* – Managed by the lessee (enterprises, user groups, disadvantageous groups and individuals) for the development of forest and forest products only as per the approved forest management plan within the defined area.
- *Religious Forest* – Managed by the religious groups, communities or organization as per the approved forest management plan around the religious or cultural sites.
- *Private Forest* –Managed by the individual owners in his officially registered private land.

The forest of the project area lie under the government managed National Forest. As for sub categories listed above, three types of forests, those are protection forest, community forest and private forest extend in the project area.

The area and distribution and responsibility for Forest Management are illustrated in **Tables 1.1-4** and **1.1-5** and there is an increasing trend towards additional areas of Community Forests, with nine affected with a total area of 88.8 ha and about 5.3 ha of Private Forest affected at Full Supply Level of 415m. Also it is to be noted that much of the reservoir and the area affected by the works area and access roads to the Project are National Forest, (75%) and this will require negotiation with the Ministry of Agriculture and Forests.

Table 1.1-4 Forest Area Affected at FSL 415 m in the Reservoir Area

SN	Types of forest	Area (ha)
1	National Forest (Protection Forest)	259.83
2	Community Forest	88.77
3	Private Forest	5.29
	Total	**353.89**

Source: Supplemental EIA Survey, JICA Study Team, 2006

Table 1.1-5 Forest Area in the Project Facility Site

SN	Management Types	Areas (ha)
1	National Forest (Protection Forest)	51.91
2	Community Forest	16.79
3	Private Forest	0.0
	Total	**68.7**

Source: Supplemental EIA Survey, JICA Study Team, 2006

Tanahu district has a total forest land of 62,654 ha. Out of it, 20,292 ha of forest are transferred to 320 Community Forest User Groups by 2004. A total of 31,313 households with a population of 182,504 are directly involved in the community forest management.

The profiles of community forests affected in the reservoir area are presented in **Table 1.1-6**. In the project area nine groups are found to manage their forests. Among them seven groups' forests will be affected by inundation due to the construction of reservoir.

Table 1.1-6 Profiles of Community Forests Affected by the Reservoir at FSL 415 m

S N	Name of Community forest	Total User HHs and Population	Total area CF (ha)	Location	Total Affected Area (ha)
1.	Sisneri Tapu CF	96 (294)	8.75	Bhimad VDC	0
2.	Banchare Danda CF	86 (457)	18.78	Chhnag VDC	1.12
3.	Sangu Pokhara CF	24 (154)	20.3	Chhang VDC	0.19
4.	Bhadaure Danda CF	110 (848)	83.5	Rising Ranipokhari VDC	0
5.	Ghumaune Danda CF	59 (269)	53.95	Risisng Ranipokhari VDC, Ward 9	10.37
6.	Shidhabatasan CF	125	104	Jamune VDC, Ward 6	25.84
7.	Bansghari CF	218 (1488)	63.75	Rising Ranipokhari VDC, Ward 1 and 2	6.2
8.	Bajar Thumki CF	95 (859)	80	Kot Durbar VDC, ward 7	1.32
9.	Salbas CF	248 (1626)	65.5	Kahun Shivapur VDC, Ward 1	29.11
Total			**498.53**		**74.15**

Source: District Forest Office Tanahu (2004) and Supplemental EIA Survey, JICA Study Team, 2006

Private forests are also found in the project site. The planted Sisso (*Dalbergia sisoo*) and Khair (*Acacia catechu*) forests are observed along the Seti River between Bhimad and Banderkuna in the upper reservoir area. Private forests affected by the reservoir are presented in **Table 1.1-7**. Eleven owners are living in the project site. Among them seven private forests will be affected by inundation.

Table 1.1-7 Private Forests in the Reservoir Area

S N	Location	Name of owner	Tree species	Area (ha)	Total Affected Area (ha)
1.	Chhang (left bank of Seti) Thandiphant	Shiva Kumar Hirachan	Sisso	0.5	0
2.	Chhang (Left bank of Seti) south of Bhimad Bridge	Bhim Bahdur Lalchan	Sisso	0.5	0
3.	Bhimad (Right bank of Seti) Khanaltar	Janajyoti Higher secondary School	Sisso and Khair	4.5	1.35
4.	Chhang (Left bank Seti River) below Chhang Patan	NI	Sisso and Khair	0.25	0
5.	Bhimad (Right bank of Seti) below Khanaltar	Resting place (temple)	Sisso	0.25	0
6.	Wantan Khola (Right bank of Seti)	NI	Sal Chilaune	0.5	0.5
7.	Rising Patan (Right bank of Seti) Lower terrace	NI	Sisso / Khair	0.5	0.28
8.	Jhakas (Left bank of Seti)	NI	Sisso / Khair	0.5	0.5
9.	Jalbire	NI	Sal /Chilaune	1	0.5
10.	Bandarkuna	NI	Khair	0.25	0.25
11.	Upstream Dam (Left bank of Seti)	K.B. Gurung	Bamboo (75 clumps)	3.15	3.15
Total				**11.9**	**6.53**

NI = Not identified (these are unregistered government lands but being used by locals)
Source: Supplemental EIA Survey, JICA Study Team, 2006

1.2 Potential Environmental Impact on Vegetation and Forestry

(1) Construction Phase

A large number of construction workforces and their families will flow into and settle in the various construction sites. Tea stalls and restaurants to cater the needs of construction workforces will be constructed in the adjoining areas of construction sites. As for the source of energy to the workforces and other people concerned for their daily uses, it will be necessary to restrict the cutting of trees in the forest for fire wood and to provide the alternative energy such as kerosene.

(2) Operation Phase

As shown in **Tables 1.2-1** and **1.2-2**, the project impacts most severely on the Hardwood Mixed Open Forest with total of 296.05 ha affected with FSL of 415 m, followed by 73.92 ha of Hill Sal Forest and 52.62 ha of Khair/ Sisso Forest at the same FSL.

Table 1.2-1 Loss of Forest/Shrub/Grasslands under Reservoir FSL 415m

S N	Forest Land	Area (ha)
1.	Grazing Land	84.59
2.	Shrubs Land	17.94
	Total grazing/shrub	**102.53**
3.	Hardwood Sal Forest Land	29.46
4.	Mixed Open Forest Land	271.81
5.	Khair/Sisso Forest Land	52.62
	Total Forest	**353.89**

Source: Supplemental EIA Survey, JICA Study Team, 2006

Table 1.2-2 Loss of Forest/Shrub/Grasslands in the Project Facility Sites

S N	Forest Land	Area (ha)
1.	Grazing land	7.35
2.	Shrub land	4.67
	Total Grazing and Shrub	**12.02**
3.	Hardwood Sal Forest Land	44.46
4.	Hardwood Mixed Forest land	24.24
5.	Khair/Sisso Forest Land	0.00
	Total Forest land	**68.7**

Source: Supplemental EIA Survey, JICA Study Team, 2006

Tables 1.2-3 and **1.2-4** present the tree species and its number found in the three types of forests in the reservoir area and project facility sites.

Table 1.2-3 Estimated Number of Timber Tree Species in the Reservoir Area at FSL 415m

SN	Name of Species	Types of forest		
		National Forest (Protection Forest)	Community Forest	Private Forest
1.	*Acacia catechu*	14,291	4,882	919
2.	*Adina cordifolia*	2,598	888	0
3.	*Aegle marmelos*	1,559	533	0
4.	*Albizia lebbeck*	2,598	888	0
5.	*Albizia lucidior*	3,378	1,154	0
6.	*Bombax ceiba*	3,378	1,154	54

SN	Name of Species	Types of forest		
		National Forest (Protection Forest)	**Community Forest**	**Private Forest**
7.	*Castanopsis indica*	1,039	355	21
8.	*Dalbergia sisoo Roxb.*	0	0	1,342
9.	*Garuga pinnata*	260	89	0
10.	*Lagerstroemia parviflora*	2,858	976	0
11.	*Mallotus philippensis*	4,157	1,420	0
12.	*Melia azederach L.*	0	0	98
13.	*Pterospermum lanceaefolium*	3,638	1,243	0
14.	*Sapium insigne*	4,677	1,598	0
15.	*Schima wallichii*	4,677	1,598	9
16.	*Shorea robusta*	31,960	10,910	0
17.	*Syzygium cumini*	260	89	0
18.	*Terminalia alata*	8,315	2,841	0
	Total	**89,643**	**30,618**	**2,443**

Source: Supplemental EIA Survey, JICA Study Team, 2006

Table 1.2-4 Estimated Number of Timber Tree Species in the Project Facility Sites[1]

S N	Management Types	Number of trees
National Forest		
1.	*Shorea robusta*	25,743
2.	*Schima wallichii*	3,174
3.	*Acacia catechu*	1,858
4.	*Lagerstroemia parviflora*	150
5.	*Ligustrum confusum*	1,806
6.	*Mallotus philippensis*	602
7.	*Pterospermum lanceaefolium*	1,806
8.	*Sapium insigne*	1,505
	Total National Forest	**36,644**
Community		
1.	*Dalbergia sisoo Roxb.*	2,407
	Total Community Forest	**2,407**
Private Forest		
1.	*Dalbergia sisoo Roxb.*	212
	Total Private Forest	**212**
	Grand Total	**39,263**

Source: Supplemental EIA Survey, JICA Study Team, 2006

The local people are highly dependent on forest resources such as fodder and fuel wood in their daily lives. The inundation of forests in the project area will bring about negative impacts on the communities. The annual production losses incurred by the loss of the forest area and vegetation are presented in **Table 1.2-5** and the losses in monetary terms are presented in **Table 1.2-6**.

[1] Since the project facility sites were redesigned after the completion of the Field Survey, these estimates shall be revised.

Table 1.2-5 Annual Forest Resource Production Losses in the Project Area[1]

Forest Resource	Reservoir Area FSL 415m	Project Facility Site	Total
National Forest			
Annual Timber Production Loss (m^3)	1,868	512	2,380
Annual Fuel Wood production Loss (m^3)	1,233	338	1,571
Annual Feed Resource Production Loss (LU)	6,756	489	7,245
Community forest			
Annual Timber Production Loss (m^3)	666	46	712
Annual Fuel Wood production Loss (m^3)	439	30	469
Annual Feed Resource Production Loss (LU)	2,308	133	2,441
Private Forest			
Annual Timber Production Loss (m^3)	27	4	31
Annual Fuel Wood production Loss (m^3)	18	3	21
Annual Feed Resource Production Loss (LU)	138	12	150
Grassland			
Annual Feed Resource Production Loss (LU)	60	5	65
Shrub land			
Annual Feed Resource Production Loss (LU)	466	121	587

Note: Annual Timber harvest is calculated estimating 5% of standing crops
Annual Fuel Wood harvest is calculated estimating 3.3% of standing crops
Annual feed resource harvest from grass land is calculated 0.7 LU/ha
Annual feed resource harvest from shrub land is calculated 26 LU/ha
Annual feed resource harvest from forest land is calculated 26 LU/ha

Table 1.2-6 Annual Forest Resource Production Losses in Monetary terms in the Project Area[1]

(Unit: million NRs.)

Forest Resource	Reservoir Area FSL 415m	Project Facility Site	Total
National Forest			
Annual Timber Production Loss	10.27	2.82	13.09
Annual Fuel Wood Production Loss	3.27	0.90	4.17
Annual Feed Resource Production Loss	3.38	0.24	3.62
Community forest			
Annual Timber Production Loss	3.66	0.25	3.91
Annual Fuel Wood Production Loss	1.16	0.08	1.24
Annual Feed Resource Production Loss	1.15	0.07	1.22
Private Forest			
Annual Timber Production Loss	0.15	0.02	0.17
Annual Fuel Wood Production Loss	0.05	0.01	0.06
Annual Feed Resource Production Loss	0.07	0.01	0.08
Grassland			
Annual Feed Resource Production Loss	0.03	0.0025	0.033
Shrub land			
Annual Feed Resource Production Loss	0.23	0.06	0.29

Note:Timber round wood = NRs. 5500/m^3 Averaged from the costs of forest timber Forest Regulation 1995
Fuel wood = NRs. 2650/m^3 Averaged from the costs small sized forest products, Forest Regulation 1995
Feed Resource loss = NRs. 500/LU

[1] Since the project facility sites were redesigned after the completion of the Field Survey, these estimates need to be revised.

1.3 Mitigation Measures and Costs

1.3.1 Mitigation Measures

As mentioned in 1.1.1, several types of forest vegetations distribute not only in the study area but also widely in the vicinity of the area, which means the possibility of tree species extinction as an environmental impact by the dam and reservoir construction is low. Therefore, the mitigation measures for the affected forests and vegetation are mainly on the compensational planting and payment of indemnity for lost firewood and fodder resources. The measures are proposed for construction and operation phases respectively.

(1) Construction Phase

To avoid the felling of the trees in the adjoining forest of the construction sites by inflow of the construction workforce and related activities, following measures should be implemented:

- Prohibition on the use of firewood in the construction camps and labor camps for cooking purpose. The contractor shall have responsibility for the provision of the alternative fuel in the construction camps and labor camps.
- Prohibition on the felling of the trees in the adjoining forest areas by the construction workforce. The contractor shall have responsibility for the management.

(2) Operation Phase

The estimating of forest values for compensation payment was discussed with NEA in some detail. It was agreed that the forestry compensation estimate should be based on the policy paper titled as *"Guideline for utilization of forest land and other land use"* issued in 2006 by the Forest Department to regulate the ratio of lost : planted tree is 1:25. According to this, the total estimated number of trees affected is about 160,000 the replacement trees are required equals almost 4 million trees with Full Supply Level of 415 m. This quantity is likely to alter when the District Department undertakes a more detailed survey of the actual areas affected and the types and volumes of trees to be compensated.

The replacement plantation aims to restore the forest originally grown in its location and to maintain its economic value as well as biodiversity in the area. Accordingly, mixed planting of several indigenous species is applied as a technical norm for the plantation. For example the indigenous trees such as *Terminalia alata* (Saj) and fast growing species e.g. *Albizia cinensis* shall be planted to restore the mixed open forest. For Hill Sal forest, *Schima wallichii* (Chilaune), *Bauhinia vahlii* (Bhorla) and *Desmodium oojeinense* (Sadan) shall be planted. For Khair/Sisoo forest, *Dalbergia sisoo* (Sisoo), *Acacia catechu* (Khair), *Bombax ceiba* (Simal), *Sapium insigne* (Khirro) shall be planted for compensational plantation. The amount of trees planted, areas of plantation required, its costs, etc. are shown in **Table 1.3-2**.

It is indicated that the actual volumes of trees will be compensated for the Private Forest, as the owners of such areas is permitted to log all the trees for timber, poles or fuel wood. In addition, the compensation is estimated based on the fuel wood volumes and grazing lands for the Community

Forest, which is more special case, as these are multiple use areas administered by local Forest User Groups (FUG). Most of the community forests are located in the Seti River at lower elevations which would be affected also by the project. It is indicated that at least seven (7) Community Forests are affected to varying degrees with a total of over 400 ha and involving some 900 members of FUGs at Full Supply Level of 415 m. Compensation for the fuel woods and fodders shall be done based on the norms regulated by the Department of Forestry as shown in **Table 1.3-2**.

1.3.2 Mitigation Cost

(1) Construction Phase

Clearing costs of the forested areas of the reservoir with FSL 415 m is presented in **Table 1.3-1**.

Table 1.3-1 Cost for Clearing the Vegetation in the Reservoir at FSL 415m

S N	Management Types	Million NRs.
1.	National Forest (Protection Forest)	2.73
2.	Community Forest	0.93
3.	Private Forest	0.06
Total		**3.72**

Note: The cost calculation is based on Forest Norms, 2003 for area delineation, resource accounting and clearing activities.

(2) Operation Phase

The compensation for the trees in the National Forest area is composed of the cost required for the plantation in accordance with the policy of Forest Department that the ratio of replacement of trees at 25:1. For the Private Forest area, the volumes of trees will be compensated. In addition, the compensation includes fuel wood volumes and grazing lands for the Community Forest area. The cost estimation above is summarized in **Table 1.3-2**.

Table 1.3-2 Estimate of Forestry Loss due to Reservoir at FSL 415 m and Associated Compensation

	Commercial Trees & Other Assets	Replacement at 1:25 Trees MOAF	Project Area Losses-ha (Area required for plantation 1:25, ha)	Reservoir Compensation NRs '000	Current Estimate Based on:
1. National Forest					- NRs 280,000/ha of Replacement Trees as per average of NESS Supplementary EIA & Sindhuli Roads Construction Project (SRCP) Agreement with Department of Forestry (DoF) - NRs 5,500/m^3 of timber (DoF Reg'n) - NRs 2,650/ m^3 of fuel wood (DoF Reg'n) - NRs 500 per Livestock Unit (LU) - There is a need to consider Fuel wood & Fodder Resources in Community Forests - Production loss for 5 years will be compensated.
Timber – Tree Numbers	126,287	3,157,175	311.5 (717.5)	198,900	
Fuel Wood – m^3	-	-		-	
Fodder Resources -LU	-	-		-	
2. Community Forest					
Timber –Tree Numbers	33,025	825,625	105.6 (187.6)	52,014	
Timber Volume m^3	712	-		19,580	
Fuel Wood - m^3	469	-		6,214	
Fodder Resources-LU	2,441	-		6,103	
3. Private Forest					
Timber – Tree Numbers	2,665	-	5.29	-	
Timber – Volume – m^3	623	-	-	3,427	
Fuel Wood – m^3	-	-	-	-	
4. Grass & Shrubland-LU	652	-	102.5	1,630	
5. Totals of All Lands					
Timber – Tree Numbers	161,967	3,982,800		250,914	
Timber – Volume –m^3	1,335	-		23,007	
Fuel Wood – m^3	469	-		6,214	
Fodder Resources - LU	3,093	-		7,733	
Total Forest Land Losses				**287,868**	
6. TOTAL FOREST LANDS			**422.39 (905.1)**		

1.4 Conclusion and Recommendation

Through implementing the mitigation measures mentioned above, the loss of forests could recover to some extent in and around the project area. But it is inevitable to lose some plant species and vegetation which appear in the conservation list. For these losses which can not be avoided, it is considered as follows.

Although 11 species included in the conservation lists of IUCN, CITES and Government of Nepal were found in the study area, it is actually not very rich in terms of biodiversity. The flora in the project area is already disturbed and impacted by the human activities, such as farming, cutting of trees, hunting and trapping, collecting various forest products, etc. Only residual populations of plants colonize near the human habitation zone and reservoir area. No permanent core colony of endangered and rare plant species is found in it. Furthermore, the habitat for those species are not limited in the project area but similar conditions for the habitats of those species widely extend in the vicinity of the study area such as Madi River and Turisli River watersheds and other regions in the country. Therefore, loss of these species in local, regional and national scale is minimal and project will have moderate impact which will be of lesser significance.

CHAPTER 2 WILDLIFE

2.1 Baseline Data

2.1.1 Mammal

This is an area in which the existing EIA was lacking and efforts were made to fill the information gaps. Consequently, more comprehensive species lists have been compiled for mammals, reptiles and amphibians, birds and butterflies. A number of protected species according to CITES, IUCN and Government of Nepal classifications are present in the areas affected by the Project. This includes the Bengal Tiger, Sloth Bear, Himalayan Black Bear, Common Otters and a number of smaller cats, as shown in **Table 2.1-1**. There is some doubt as to the presence of larger species of cats such as tigers as there are not frequent reports and they were seen in the upland hill area above projected reservoir levels. Several other species are also listed as "Rare" or "Threatened" in IUCN documents. Many of the smaller cats, civets, otters, monkeys, squirrels and ground–based mammals will have difficulty in coping with the reservoir filling and probably warrant a rescue program during this short phase. The likelihood of the presence of these animals needs to be verified and explained in more detail at the final Stakeholders' Meetings.

Table 2.1-1 Mammals of the Project Area

SN.	Common Names	Scientific Names	Local Name	Conservation Status		
				CITES Annex	IUCN	GON
1	Rhesus monkey	*Macaca mulatta*	Bandar	2	LR/nt	
2	Assamese monkey	*Macaca assamensis*	Asami Bandar	2	VU	P
3	Jungle cat	*Felis chaus*	Ban Biralo	2	LR/lc	
4	Common leopard	*Panthera pardus*	Chituwa	1	LR/lc	
5	Golden Jackal	*Canies aureus*	Syal	3		
6	Clouded leopard	*Neofelis nebulosa*	Dhwanse Chituwa	1	VU	P
7	Rabbit	*Lepus nigricollis.*	Kharayo			
8	Porcupine	*Hystrix indica*	Dumsi			
9	Barking deer	*Muntiacus muntjak*	Ratuwa Mirga			
10	Sloth bear	*Melursus ursinus*	Kathe Bhalu	1	VU	
11	Royal Bengal tiger	*Panthera tigris*	Bagh	1	EN	P
12	Mongoose	*Herpestes edwarsid*	Nyauri Musa			
13	Yellow throated martin	*Martes flavigula*	Malsapro	3		
14	Common rat	*Rattus rattus*	Musa			
15.	Squirrel	*Funambulus sp.*	Lokharke			
16.	Bats	NA	Chamera			
17	Common Otter	*Lutra lutra*	Ontt	1	VU	
18	Langur Monkey	*Semnopithecus entellus* *Syn. Presbytis entellus*	Langur (Kalo bander)	1	LR/nt	
19	Bengal Fox	*Vulpes bengalensis*	Fauro	3	DD	
20	Wild boar	*Sus scrofa*	Bandel			
21	Himalayan black bear	*Selenaractos thibetanus*	Kalo bhalu	1	VU	
22	Wolf	*Canis lupus**	Byanso	I	Lr/ic	
23	Palm civet cat	*Pagume larvata*	Bharse			
25	Red fox*	*Vulpes vulpes*	Rato Fyauro	3	LR/ic	
26	Flying squirrel*	*Petaurista sp.*	Udne lokharke			
27	Leopard cat*	*Felis bengalensis*	Chari bagh	1	LR/ic	P

Note: EN = Endangered, VU = Vulnerable, LR/lc = Lower Risk/ least concern, LR/nt= Lower Risk/near threatened, P = Protected by law
Most species confirmed by several Discussion Groups * Reported but presence is doubtful
NA = Name not available

2.1.2 Reptiles and Amphibians

As shown in **Table 2.1-2**, a total of 17 reptiles and amphibian species are reported in the Project area and all were forded from the lower reservoir area. While, in the upper reservoir and the Project facility site, only House Lizard, Garden Lizard, Frog, Toad, Green or Bamboo Pit Viper, and Rat Snake are found. Out of 17 reported species, Golden Monitor Lizard and Rat Snake is respectively categorized in "Lower Risk/Near Threatened" and "Lower Risk/Least Concerned" in IUCN Red List. These two species are legally protected in Nepal. In addition, the two species are listed in the CITES Annex I and three species in the CITES Annex III. Again a rescue program during reservoir filling to trans-located stranded reptiles and amphibians is recommended.

Table 2.1-2 Reported Reptiles and Amphibians of the Project Area

SN	Common Names	Scientific Names	Local Name	Conservation Status		
				CITES Annex	IUCN	GON
1	House lizard	*Hemidactylus flaviviridis*	Mausuli			
2	Garden lizard	*Calotes versicolor*	Chheparo			
3	Golden Monitor Lizard	*Varanus flavescens*	Sun Gohoro	I	LR/lc	Protected
4	Bengal Monitor Lizard	*Varanus bengalensis*	Bhainse Gohoro			
5	Frog	*Haplobatrachus* (*Rana*) *tigerina*	Bhaguto	II		
6	Toad	*Bufo melanostictus*	Khasre Bhaguto			
7	Blanford's frog	*Paa.blanfordii*	Paha			
8	Water skipping frog	*Euphlyctis cyanophlyctis*	Tike paha			
9	Green pond frog	*Euphlyctis hexaductilus*	Bhyaguto			
10	Green or Bamboo pit viper	*Trimeresurus spp.*	Haryau	II		
11	Rat snake	*Ptyas mucosus*	Dhaman	I	LR/nt	Protected
12	Asiatic rock python	*Python molurus*	Ajingar	II		
13	Bioncellate cobra	*Naja naja naja*	Goman			
14	Checkered keelback	*Xenochrophis piscator*	Pani sarpa			
15	Spotted ground skink	*Sphenomorphus maculatus*	Bhanu mungre			
16	Common bronze back tree snake	*Dendrelaphis tristis*	Udne or Sirise sarpa			
17	Common blind snake	*Ramphotyphlops braminus*	Teli			

***EN** = Endangered, **LR/lc** = Lower Risk/ least concern, **LR/nt**= Lower Risk/near threatened, **VU** = Vulnerable*
Source: Supplemental EIA Survey, JICA, 2006.

2.1.3 Birds

As shown in **Table 2.1-3**, Some 62 bird species belonging to 14 orders and 34 families are recoded in the Project area. Large number of birds and many species are found in the lower reservoir area. Out of recorded species, Vulture (*Gyps sp.*) is categorized into "Globally Threatened" and Spot Billed Ducks (*Anas poecilorhyncha*) and in Appendix I and Eurasian Golden Oriole (*Oriolus oriolus*) in Appendix II

of CITES.

2.1.4 Butterfly and Moths

Butterflies were observed on six different transects set at different locations of the Project area. Transect I, II, III and IV in the project facility site, Transect V in the lower half of the reservoir area and transect VI on the upper half of the reservoir area. Habitat conditions of the transect I, II, III, IV and VI were human influenced, i.e. with limited forested areas and mostly dominated by agricultural fields and bushes, whereas transect three represented dominant forested areas with patches of pasture and shrubs.

As shown in **Table 2.1-4**, total of 44 species of butterflies and 2 species of moths are observed in the Project area. None of recorded species are listed in the CITES and IUCN Red Lists.

Table 2.1-3 Birds Recorded from the Project Area

S N	Order	Family	Name of bird	Scientific Name	Habitat	Conservation Status	Migratory Status
1.	Passeriformes	Sturnidae	Jungle Myna	*Acridotheres fuscus*	–	-	–
2.	Passeriformes	Sturnidae	Common Myna	*Acridotheres tristis*	R, Sv, AG	-	**R**
3.	Passeriformes	Nectariniidae	Crimson Sunbird	*Aethopyga sipraja*	R, AG, Sv	-	**R**
4.	Gruiformes	Raliidae	White-breasted Waterhen	*Amaurornis phoenicurus*	F, Sv	-	**R**
5.	Anseriformes	Anatidae	Mallard*	*Anas platyrhynchos*	Wa, F, Sv	-	**R**
6.	Anseriformes	Anatidae	Spot-billed Duck*	*Anas poecilorhyncha*	Wa	**CITES I**	**M (Wv)**
7.	Ciconiformes	Ardeidae	Indian Pond Heron	*Ardeola grayii*	Wa	-	**R, M (Wv)**
8.	Strigiformes	Strigidae	Spotted Owlet	*Athene brama*	Wa, Sv	-	**R**
9.	Ciconiformes	Ardeidae	Cattle Egret	*Bubulcus ibis*	AG, R	-	**R**
10	Passeriformes	Turdidae	White-capped Water Redstart	*Chaimarrornis leucocephalus*	Wa, AG, Sv	-	**R**
11.	Ciconiformes	Ciconidae	Wooly necked Stork	*Ciconia episcopus*	Wa	-	**R**
12.	Apodiformes	Apodidae	Himalayan Swiftlet	*Collocalia brevirostris*	Ag, Wa	-	**R**
13.	Columbiformes	Columbidae	Rock Pigeon	*Columba livia*	F, Sv	-	**R**
14.	Passeriformes	Turdidae	Oriental Magpie Robin	*Copsychus saularis*	R	-	**R**
15.	Passeriformes	Corvidae	Large-billed Crow	*Corvus macrorhynchos*	F, Sv, AG	-	**R**
16.	Passeriformes	Corvidae	House Crow	*Corvus splendens*	F, R, Sv	-	**R**
17.	Cuculiformes	Cuculidae	Eurasian Cuckoo	*Cuculus canorus*	R, Sv	-	**R**
18.	Cuculiformes	Cuculidae	Indian Cuckoo *	*Cuculus micropterus*	F, Sv	-	**M (Sv)**
19.	Passeriformes	Corvidae	Rufous Treepie	*Dendrocitta vagabunda*	F, Sv	-	**M (Sv)**
20.	Piciformes	Picidae	Fulvous-breasted Woodpecker	*Dendrocopos macei*	F, Sv	-	**R**
21.	Passeriformes	Dicaeidae	Fire-breasted Flowerpecker	*Dicaeum ignipectus*	F, Sv	-	**R**
22.	Passeriformes	Dicruridae	Black Drongo	*Dicrurus macrocercus*	F, Sv	-	**R**
23.	Ciconiformes	Ardeidae	Little Egret	*Egretta garzetta*	R, Sv, AG	-	**R**
24.	Cuculiformes	Cuculidae	Asian Koel	*Eudynamys scolopacea*	Wa, Sv	-	**R**
25.	Galliformes	Phasianidae	Black Francolin	*Francolinus francolinus*	F, Sv, AG	-	**R**
26.	Galliformes	Phasianidae	Red Junglefowl*	*Gallus gallus*	F, AG, Sv	-	**R**
27.	Charadriformes	Accipitridae	Vulture*	*Gyps sp.*	F, AG, Sv	**GT**	**R**
28.	Coraciformes	Alcedinidae	White-throated Kingfisher	*Halcyon smyrnensis*	F	-	**R**
29.	Cuculiformes	Cuculidae	Common Hawk Cuckoo*	*Hierococcyx varius*	Sv	-	**R**
30.	Passeriformes	Hirudinidae	Barn Swallow	*Hirundo rustica*	Wa, AG, Sv	-	**R**
31.	Passeriformes	Laniidae	Long-tailed Shrike*	*Lanius schach*	F	-	**R**
32.	Galliformes	Phasianidae	Kalij Pheasant*	*Lophura leucomelana*	R, AG, Wa	-	**R, M (Sv)**
33.	Piciformes	Capitonidae	Blue-throated Barbet	*Megalaima asiatica*	Sv, Ag, F	-	**R**
34.	**Order**	**Family**	**Name of bird**	**Scientific Name**	F	-	**R**

S N	Order	Family	Name of bird	Scientific Name	Habitat	Conservation Status	Migratory Status
35.	Piciformes	Capitonidae	Great Barbet	*Megalaima virens*	F, Sv	-	**R**
36.	Coraciformes	Meropidae	Chestnut-headed Bee-eater	*Merops leschenaultia*	F	-	**R**
37.	Charadriformes	Accipitridae	Black Kite	*Milvus migrans*	F, Wa	-	**R, M (Sv)**
38.	Passeriformes	Motacillidae	White Wagtail	*Motacilla alba*	R	-	**R, M (Wv)**
39.	Passeriformes	Motacillidae	Yellow wagtail	*Motacilla flava*	Wa	-	**R, M (Wv)**
40.	Passeriformes	Motacillidae	White browed wagtail	*Motacilla maderaspatensis*	Wa	-	**M (Wv)**
41.	Passeriformes	Turdidae	Blue Whistling Thrush	*Myophonus caeruleus*	Wa	-	**R**
42.	Charadriformes	Accipitridae	Egyptian Vulture	*Neophron percnopterus*	F, Wa	-	**R**
43.	Passeriformes	Oriolidae	Eurasian Golden Oriole	*Oriolus oriolus*	Sv, R	**CITES II**	**R**
44.	Passeriformes	Paridae	Great Tit	*Parus major*	F, Sv	-	**M (Sv)**
45.	Passeriformes	Paridae	Black-lored Tit	*Parus xanthogenys*	F	-	**R**
46.	Passeriformes	Ploceidae	House Sparrow	*Passer domesticus*	F	-	**R**
47.	Passeriformes	Ploceidae	Eurasian Tree Sparrow	*Passer montanus*	R, Sv, AG	-	**R**
48.	Passeriformes	Ploceidae	Russet Sparrow	*Passer rutilans*	R, AG, Sv	-	**R**
49.	Galliformes	Phasianidae	Indian Peafowl*	*Pavo cristatus*	F, AG, Sv	-	**R**
50.	Gruiformes	Phalacrocoracide	Little Cormorant*	*Phalacrocorax niger*	F	-	**R**
51.	Psittaciformes	Psittacidae	Rose-ringed Parakeet	*Psittacula krameri*	Wa	-	**R, M (Wv)**
52.	Passeriformes	Pycnonotidae	Red-vented Bulbul	*Pycnonotus cafer*	F, Sv, AG	-	**R**
53.	Passeriformes	Turdidae	Pied Bushchat	*Saxicola caprata*	R, Sv, AG	-	**R**
54.	Passeriformes	Turdidae	Common Stonechat	*Saxicola torquata*	Sv, AG	-	**R**
55.	Passeriformes	Sylviidae	Black-browed Warbler	*Seicercus burkii*	Sv, AG	-	**R, M (Wv)**
56.	Charadriformes	Accipitridae	Hodgson's Hawk Eagle	*Spizaetus nipalensis*	F	-	**R**
57.	Passeriformes	Timaliidae	Black-chinned Babbler	*Stachyris pyrrhops*	AG, R, F	-	**R**
58.	Columbiformes	Columbidae	Spotted Dove	*Streptopelia chinensis*	F, Sv	-	**R**
59.	Passeriformes	Sturnidae	Chestnut-tailed starling	*Sturnus malabaricus*	Sv	-	**M (Wv)**
60.	Passeriformes	Sylviidae	Lesser Whitethroat	*Sylvia curruca*	AG, R, Sv	-	**R**
61.	Upupiformes	Upupidae	Common Hoopoe*	*Upupa epops*	F	-	**R**
62.	Passeriformes	Corvidae	Red billed Blue Magpie*	*Urocissa flavirostris*	Wa	-	**R**
	Charadriformes	Charadriidae	River Lapwing	*Vanellus duvaucelii*			

Note: * Species recorded from questionnaire survey

CITES I – Listed in CITES Appendix I, CITES II – Listed in CITES Appendix II and GT – Globally Threatened

R= Residental, **M**= Migratory, **Sv**= Summer visitor, **Wv**= Winter visitor (Categorization based on Inskipp *et al.* 1991) Wa = Water, AG = Agricultural Land and Grassland, Sv = Scrubby Vegetation, R = House, F = Forest

Source: Supplemental EIA Survey, JICA Study Team, 2006

Table 2.1-4 Butterflies and Moths Recorded from the Project Area

SN	Family	Name	Scientific Name	Conservation Status	Butterfly (B) or Moth (M)	Sampling Sites						Total
						I	II	III	IV	V	VI	
1.	Papilionidae	Lime Swallowtail*	*Papilio demoleus*	-	B	+	–	+	–	–	+	3
2.	Papilionidae	Common Rose*	*Pachilopta aristolochiae*	-	B	–	–	–	–	+	+	2
3.	Papilionidae	*	*Papilio polytes*	-	B	–	–	+	+	+	+	4
4.	Pieridae	Chocolate Albatross*	*Catophaga lycida*	-	B	–	–	–	–	–	+	1
5.	Pieridae	Psyche*	*Leptosia nina*	-	B	–	–	–	–	+	–	1
6.	Pieridae	Lemon Emigrant*	*Catopsilia pomona*	-	B	+	+	–	+	–	+	4
7.	Pieridae	*	*Terias sp.*	-	B	+	+	+	+	+	+	6
8.	Lycaenidae	Flufft Tit*	*Zeltus amasa*	-	B	–	–	–	–	+	–	1
9.	Lycaenidae	Angled Pierrot	*Caleta caleta*	-	B	–	–	–	–	–	+	1
10.	Lycaenidae	Dark Grass Blue*	*Zizeeria karsandra*	-	B	+	+	+	+	+	+	6
11.	Lycaenidae	*	*Celastrina sp.*	-	B	+	+	+	+	+	+	6
12.	Lycaenidae		*Albulina sp.*	-	B	–	+	+	+	–	+	4
13.	Nemeobiidae	Mixed Punch	*Dodona ouida*	-	B	–	–	–	+	–	–	1
14.	Nemeobiidae	Dark Judy	*Abisara fylla*	-	B	–	–	–	+	+	+	3
15.	Nemeobiidae	Punchinello*	*Zemeros flegyas*	-	B	–	–	–	–	+	–	1
16.	Nymphalidae	Vagrant*	*Vagrans egista*	-	B	–	–	–	–	+	–	1
17.	Nymphalidae	Lemon Pansy*	*Precis lemonias*	-	B	+	+	–	+	+	+	5
18.	Nymphalidae	Orange Oak Leaf*	*Kallima inachus*	-	B	–	–	–	–	+	–	1
19.	Nymphalidae	Sergeant Major	*Aborta ganga*	-	B	–	–	–	+	+	–	2
20.	Nymphalidae	Himalayan Sergeant*	*Athyma opalina*	-	B	–	–	–	–	–	+	1
21.	Nymphalidae	Staff Sergeant*	*Athyma selenophora*	-	B	+	+	+	+	+	+	6
22.	Nymphalidae	Common Lascar*	*Pantoporia hordonia*	-	B	+	–	–	+	+	–	3
23.	Nymphalidae	Small Yellow Sailer	*Neptis miah*	-	B	–	+	+	–	–	–	2
24.	Nymphalidae	Common Earl	*Tanaecia julii*	-	B	–	–	+	–	+	–	2
25.	Nymphalidae	Grey Count	*Tanaecia lepidae*	-	B	–	–	+		+	–	2
26.	Nymphalidae	Common Castor*	*Ariadne merione*	-	B	–	–	+	–	–	–	1
27.	Satyridae	Bamboo Treebrown*	*Lethe europa*	-	B	–	–	+	+	–	–	2
28.	Satyridae	Banded Treebrown*	*Lethe confusa*	-	B	–	–	–	–	+	–	1
29.	Satyridae	Angled Red Forester*	*Nemetis chandica*	-	B	–	–	–	–	+	+	2
30.	Satyridae	Spotted Palmfly*	*Elymnias malelas*	-	B	–	–	+	+	+	+	4

SN	Family	Name	Scientific Name	Conservation Status	Butterfly (B) or Moth (M)	Sampling Sites						Total
						I	II	III	IV	V	VI	
31.	Satyridae	Brand Bushbrown*	*Mycalesis mineus*	-	B	–	–	–	–	+	–	1
32.	Satyridae	Moores Bushbrown*	*Mycalesis heri*	-	B	–	–	+	–	+	+	3
33.	Satyridae	Wood Mason's Bushbrown	*Mycalesis suavolens*	-	B	–	+	–	–	+	+	3
34.	Satyridae	Lepcha Bushbrown*	*Mycalesis lepcha*	-	B	–	–	–	+	+	+	3
35.	Satyridae	Junglebrown*	*Orsotrioena medus*	-	B	–	+	–	–	–	–	1
36.	Satyridae	Himalayan Fivering	*Ypthima sakra*	-	B	–	–	–	–	+	+	2
37.	Satyridae	Common Fivering*	*Ypthima baldus*	-	B	+	+	+	+	–	+	5
38.	Satyridae	Common Fourring*	*Ypthima huebneri*	-	B	–	–	+	+	–	+	3
39.	Satyridae	Hannyngton's Fivering*	*Ypthima hannyngtoni*	-	B	+	–	–	+	–	–	2
40.	Danidae	Plain Tiger*	*Danaus chrysippus*	-	B	+	+	+	+	+	+	6
41.	Danidae	Common Tiger*	*Danaus genutia*	-	B	+	+	–	–	+	+	4
42.	Danidae	Chocolate Tiger*	*Parantica melaneus*	-	B	+	+	+	+	+	–	5
43.	Danidae	*	*Eupolea sp.*	-	B	+	+	+	+	+	+	6
44.	Hesperiidae	Great Swift*	*Pelopidas assamensis*	-	B	–	–	–	+	–	–	1
45.	Noctuidae	*	*Fodina pallala*	-	M	+	–	–	–	–	–	1
46.	Euplerotidae	*	*Nisaga sp.*	-	M	–	–	–	–	+	–	1

** Species whose photograph is taken in the field*

Note : None of the species are listed under conservation lists

Source: Supplemental EIA Survey, JICA Study Team, 2006

2.1.5 Important Mammals

The field survey shows that the mammal populations favor the forested areas with the least human disturbance. Forests along the steep hill-sides of the Seti Valley are generally more continuous than the more gentle slopes on the ridge areas. Many common large mammals reported by local residents are present in the forest lower reservoir area including jungle cat, and leopards. Visual sightings or signs of otters, jackal, rhesus monkey, langur, barking deer, wild boar and small rodents were made by field survey. Many of the small mammal species were reported as seen during discussions with local residents with the lowest number of animals reported at powerhouse site.

2.1.6 Wildlife Distribution

The distribution of wildlife in the project area is not uniform. It depends upon the forest types and topographical features. The structure and composition of forest cover regulate the abundance and distribution of wild animals. The dense cover of vegetation provides a favorable habitat to varied wildlife including birds. Some animals like monkeys are arboreal in nature and spend most of their time in the forests. Many birds and mammals use the forest floor as nesting and feeding ground and many reptiles and birds inhabit the rocky cliffs. Mammals like barking deer, porcupine, monkey, squirrel, etc. are abundantly found in the project area. Some animals like jungle cat and flying bat also reported to be found in large numbers. Primates such as Rhesus and Entellus monkeys reside in the forest edge near human habitation.

2.2 Environmental Impact on Wildlife

2.2.1 Construction Phase

Construction of the project facilities will disturb wildlife habitat, particularly on the mammals and reptiles, due to the change of the topographical conditions. The clearance of the vegetation and forests also invite the habitat loss. Felling of old and large shady tree is of prime concern because these may yield key dens for mammals or roosting sites for raptors such as eagle and vultures. Impounding of the reservoir will eliminate riverine wildlife due to habitat destruction, disruption of territory. Habitat interruptions and changes will seriously influence animal behavior.

The construction work activities such as clearing, excavation, grading and filling will kill less mobile, frequently smaller species including invertebrates, frogs, lizards and small mammals. Noise and explosives, construction machinery and delivery trucks will frighten wildlife from construction sites. This is particularly important during breeding season. These will invite minor localized impact on sound populations.

2.2.2 Operation Phase

The activities in this phase are limited to the operation and maintenance around the dam site and powerhouse. However, the development of access roads may increase the poaching activities such as

hunting and trapping and competition with or inducement of these activities in the local residents.

2.3 Mitigation Measures and Costs

2.3.1 Mitigation Measures

The residual wildlife will be disturbed by traffic noise and night-time head lights. This is a minor impact compared to the indirect effects of improved access, higher levels of economic activity and the induced activities such as hunting, trapping. Indirect losses of habitat will be caused by the forest degradation and clearing, particularly in the vicinity of expanding settlements along the valley bottom. In addition, fisheries will be more heavily exploited for new markets. These are foreseen impacts and will cause slow decline of endangered species.

Constant movement of heavy vehicles on the road will produce an increase of pollutants in the area. Air pollution will damage the health of wildlife. Besides gas emission pollution, vehicles also produce noise, which will also affect the wildlife. Transmission lines also create some hazard for perching and foraging birds such as vultures, eagles and owls.

Adverse environmental impacts on wildlife by the Project can be lessened if proper attention is paid to management. Vulnerable natural areas which support diverse wildlife should be carefully protected during the construction phase. To maintain the habitat of the wildlife, cutting and felling trees during the construction phase should be minimized. The workforce should be provided alternatives of kerosene rather than fuel wood so that alternative supplies save local forests which in turn protect wildlife. Local forest management including provision of the habitat protection activities should be implemented in associated with the local communities and Forest User Groups.

It is recommended to save endangered animals by a rescue operation using boats during the filling of the reservoir and relocate them to compatible ecosystem in nearby forests. The reptiles, particularly Asiatic Rock Python and Golden Monitor Lizard, may be found during clearing vegetation. As these are slow moving creatures, may be entrapped in the reservoir water and perish. The Project authority should seek assistance from the Department of Wildlife and National Parks in this regard.

The Project's labor force should be made conscious of the intrinsic value of wildlife. Due attention should be provided to protect rare and endangered species of the Project area. Hunting and trapping of wildlife should be restricted to traditional areas and poaching should be banned. Common animals like mongoose, fox, jackal, squirrel and monkey should be protected by the local people, who should be encouraged through publicizing wildlife protection program.

2.3.2 Mitigation Costs

Mitigation cost for wildlife conservation is tabulated below.

Table 2.3-1 Mitigation Cost on Wildlife

Particulars	Total Cost Million NRs
Capture & Release of Wildlife including 2 Reptile Species	0.5

2.4 Environmental Monitoring and Costs

2.4.1 Environmental Monitoring

Environmental Monitoring will be conducted for wildlife during construction and operation phases of the project. The monitoring parameters will include impact of habitat loss & construction disturbances etc. Most of the monitoring activities will be based on the direct observation and interaction with the communities. The implementation of the proposed mitigation measures is also the part of monitoring. The details of monitoring parameters and schedule are presented in **Table 2.4-1**.

Table 2.4-1 Monitoring Parameters Schedule

Monitoring Parameter	Frequency
Habitat Loss around project sites	Every four month, construction phase
Species Occurrence around project sites	Every four month, construction phase
Construction disturbances around project sites	Weekly monitoring, construction phase
Mitigation measures compliance	Every four month, construction phase

2.4.2 Monitoring Cost

The monitoring cost required in the construction phase and operation phase are presented in the **Table 2.4-2**.

Table 2.4-2 Monitoring Cost on Wildlife

Monitoring Item	Total Cost Million NRs
Monitoring during the Construction	1
Monitoring during the Operation (for 20 years)	1.2

2.5 Conclusion and Recommendation

The project area is not very rich in terms of biodiversity. The fauna of the project area has been already disturbed and impacted by various human activities. Only residual populations of animals colonize near human habitation zone and reservoir area. No permanent core habitat of endangered and rare animal is established near the project area.

Although some species included in the conservation lists of IUCN, CITES and Government of Nepal were found in the study area, similar habitat conditions for them widely extend in the vicinity of the study area such as Madi River and Trisuli River watersheds and other regions in the country. Therefore, the extinction of those species is thought to occur little as an impact of dam and reservoir construction. Besides, it is supposed that slow moving insects, reptiles and small mammals whose living spheres are

limited may not be able to survive when the water is filled in the reservoir, while fast moving animals with medium-large size whose sphere is wider than small animals may move to the other locations above FSL (415 m) and survive when the dam is filled with water.

The Seti River is one of the tributaries of Trisuli River which meets with Gandhaki and Gandhis Rivers in the downstream. In this sense, the reservoir construction may give the impacts to the wider environments in the downstream, which can not be assessed so far during this Upgrading Feasibility Study. Therefore, international coordination and cooperation will be necessary to monitor those impacts based on the long-term perspective.

CHAPTER 3 FISH AND AQUATIC LIFE

3.1 Baseline Data

3.1.1 Composition of Fish Species

The Fish and Aquatic life was documented adequately in the NEA EIA report and further supplemental EIA survey by JICA Study team has revealed a few more species, different impacts with their degrees. Based on the findings in the survey, expanded assessment of losses, mitigation measures recommended and monitoring costs were examined.

To confirm the different habitats conditions of the Seti and Madi rivers in the high water season, sampling of fish, phytoplanktons, zooplanktons and insects at seven different sampling stations were conducted.

Of the seven sampling sites five sites were located at Seti River. Among them, one was set up at Madi-Seti confluence and another one was at Madi River. The sites were further categorized into three ecological stretches, namely run**,** riffle and pool depending upon the water flow conditions. The location of sampling sites is presented in **Figure 3.1-1**.

The Seti River still maintains its aquatic habitats for the reported 36 fish species in the river system of the project area. The high flows which induce and permit spawning and the cleansing effects of high monsoon floods function to maintain the river aquatic ecology as well as the fish diversity in the project area.

A variety of different habitats are found in the Seti-Madi River complex. The Madi River has a wide river bed about 500 m upstream the confluence between the Seti and Madi Rivers. The river is often braided with divided wet channels separated by sandbars. The river flood plain is covered with gravels and small sized boulders. Vegetation is sparse on the flood plains. The river substratum is mostly gravel. Algal growth is seen at the surface of the gravel substratum near the shore line. This floodplain area is known to provide a good habitat for fish spawning and feeding of fry as occurs throughout the Project areas. Some seven gravel bar areas along the main Seti River in the area affected by the Project are noted as spawning and breeding zones.

A list of species caught during the July and October sampling periods in the Seti River with indications of the number individuals caught are given in **Table 3.1-1**. It is reported that some 23 species are resident in the Seti River.

Table 3.1-1 Fish Species Composition

S.N	*Scientific Name*	English Name	Local Name	No. Fish in July	No. Fish in Oct.	Total	%
1.	*Anguilla bengalensis*	Torrent catfish	Raj Bam				
2.	*Amblyceps mangois*	Fresh water Eel	Bidur	1		1	0.56
3.	*Barilius barila*	Minor carp	Faketa	22	8	28	15.00
4.	*Barilius bendilisis*	Minor carp	Faketa		13	13	7.30
5.	*Barilius barna*	Minor carp	Pate Faketa				
6.	*Bagarius bagarius*	Gaint Catfish	Gounch				
7.	*Botia almorhae*	Loach	Baghi	1	2	3	1.68
8.	*Chagunius chagunio*	Carp	Gadeni	5	5	10	5.61
9.	*Channa stritus*	Murrels	Hile				
10.	*Channa punctatus*	Murrels	Hile	1		1	0.56
11.	*Channa gachua*	Murrels	Hile		2	2	1.12
12.	*Crossocheilus latius*	Stone roller	Lohare				
13.	*Garra annandalei*	Stone roller	Lohari, Buduna	3		3	1.68
14.	*Garra goytla*	Stone roller	Buduna	2	11	13	7.30
15.	*Glyptothorax trilineatus*	Catfish	Kavre	1		1	0.56
16.	*Glyptothorax telchitta*	Catfish	Kotle	14		14	7.86
17.	*Glypothorax cavia*	Catfish	Kataga	1		1	0.56
18.	*Glyptosternum blythii*	Catfish	Tilkabre				
19.	*Labeo dero*	Minor carp	Gardi	9	13	22	12.35
20.	*Labeo angra*	Minor carp	Gardi,The d/Handey	2	3	5	2.80
21.	*Mastacembelus armathus*	Spiny eel	Bam	4	1	5	2.80
22.	*Mystus aor*	-	Tanger	1			0.56
23.	*Neolissocheilus hexagonolepis*	Copper Mahseer	Katle	13	11	23	12.92
24	*Noemacheilus rupicola*	Stone loach	Gadela	8		8	4.49
25	*Noemacheilus rupicola var inglish*	Stone loach	Gadela		2	2	1.12
26.	*Noemacheilus botia*	Stone loach	Gadela				
27.	*Noemacheilus bevani*	Stone loach	Gadela				
28.	*Pseudocheneis sulcautus*	Catfish	Katanga, Kabre	2		2	1.12
29.	*Puntius conchonius*	Barbs	Karange	1	3	4	2.24
30.	*Clupisoma garua*	-	Jalkapoor	1	2	3	1.68
31.	*Semiplotus semiplotus*	-	Khurpe				
32.	*Schizothorax plagioustomus*	Snow trout	Buche Asala				
33.	*Schizothoraichthys progastus*	Snow trout	Chuhhe Asala				
34.	*Schizothorax richarsonii*	Snow trout	Asala		1	1	0.56
35.	*Tor Putitora (Ham)*	Golden Mahseer	Pahelo Sahar	10	1	11	6.17
36.	*Tor Tor (Ham)*	Mahseer	Sahar	1*			
	(Total)			**100**	**78**	**178**	**100**

** observed only*

Source: Supplemental EIA Survey, JICA Study Team, 2006

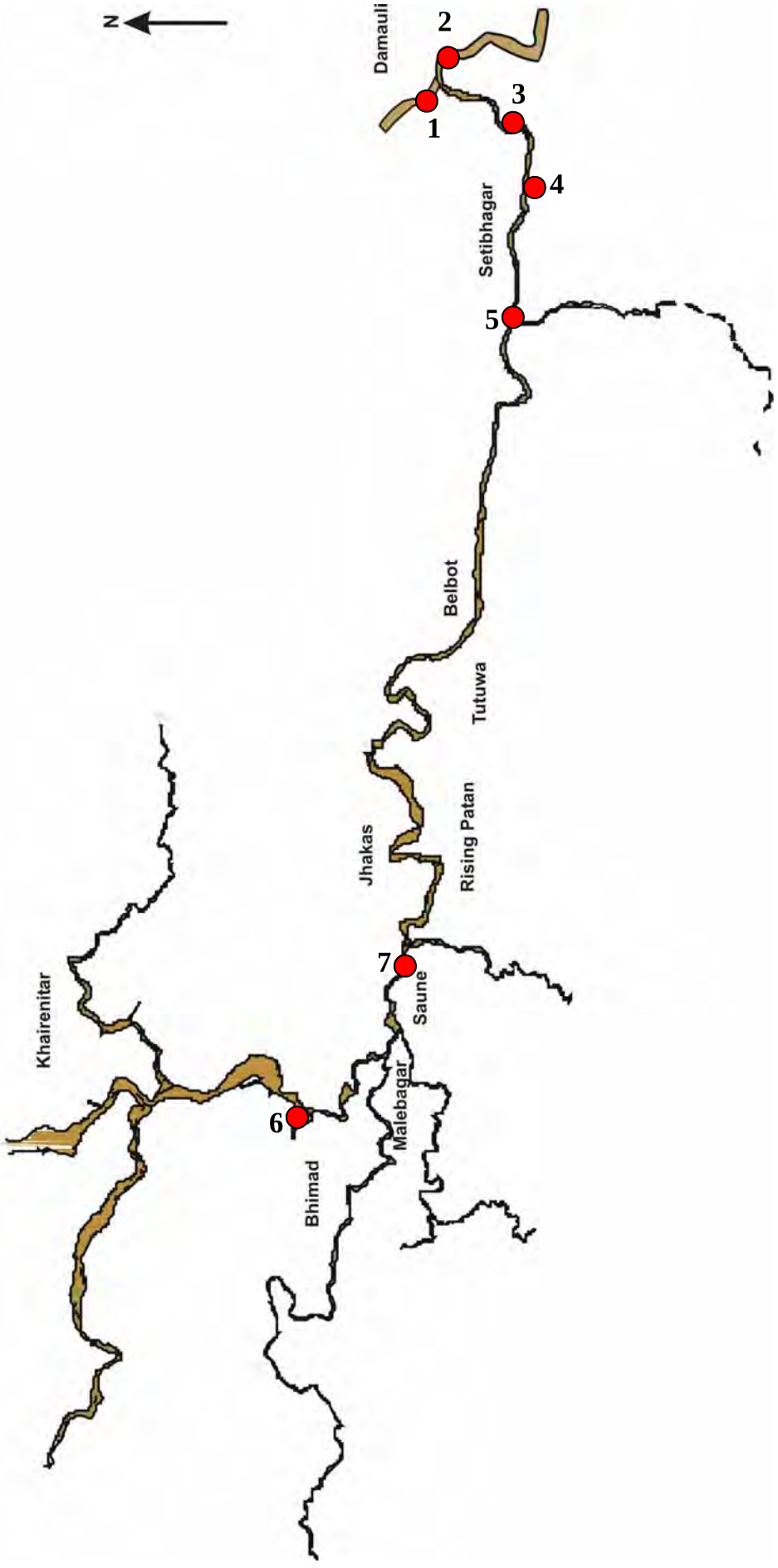

Figure 3.1-1 Fish, Phytoplankton, Zooplankton and Aquatic Insect Sampling Locations

3.1.2 Migratory Fish Species

Six fish species of the project area are the long range Migratory species. Although they are reported from both the Seti and Madi River in the relevant documents, the present survey recorded these species only from the Seti River. Their migration range in the downstream is the Narayani River beyond the Nepal and India border, while in the upstream they are reported from Pokhara valley in the Seti River.

Table 3.1-2 presents the migratory life history of the long distance migrant fish reported from the project area. Normally migration starts with the rise of water temperatures in the downstream areas and first high water periods of pre-monsoon rains. These long fish species migrate to the upstream around Pokhara. The downstream migration starts with the spawning of eggs and decreasing in water temperatures which usually coincides with the end of monsoon rainfall.

Table 3.1-2 Migratory Life History of the Long Distance Migrant Fishes of the Project Area

Scientific Name	Migratory Pattern (Months)											
	J	F	M	A	M	J	J	A	S	O	N	D
Tor Pititora (Golden Mahseer) *Tor Tor* (Mahseer)					↑	↑	↑	↑	↑	↓	↓	↓
Mystus aor (Tangra)					↑	↑	↑	↑	↑	↓	↓	↓
Clupisoma garua (Jalkapoor)					↑	↑	↑	↑	↓	↓	↓	↓
Anguilla bengalensis (Fresh water Eel)	↑	↑	↑	↑	↓	↓	↓					
Bagarius bagarius (Jalkapoor)				↑	↑	↑	↑	↑	↓	↓	↓	↓

Seven species of the project area are mid range migratory species. The migration range is about 15-20 km in the downstream areas of from the Seti River to the Trisuli River. **Table 3.1-3** presents the migratory life history of the mid distance migrant species reported in the project area.

Table 3.1-3 Migratory Life History of the Mid -Range Migrant Fishes of the Project Area

Scientific Name	Migratory Pattern (Months)											
	J	F	M	A	M	J	J	A	S	O	N	D
Labeo dero (Minor carp)			↑	↑	↑	↑	↑	↓	↓			
Labeo angra (Minor carp)				↑	↑	↑	↑	↓	↓			
Neolissochilus hexagonolepis (Copper Mahseer)					↑	↑	↑	↑	↑	↓	↓	↓
Chagunius chagunio (Rewa)				↑	↑	↑	↑	↓	↓			
Schizothoraichthys progastus (Point nosed snow trout)		↑	↑	↑						↓	↓	↓
Schizothorax richarsonii (Snow trout)		↑	↑	↑						↓	↓	↓
Schizothorax plagiostomus (Snow trout)		↑	↑	↑						↓	↓	↓

Remaining twenty-three fish species are the resident fish of the area. These fishes migrate only few kilometers from their place of birth for spawning and feeding purpose.

3.1.3 Spawning Ground

The Seti River and its tributary provide the suitable spawning and nursery habitat for both resident and migratory species. The major spawning ground and nursery or rearing area observed in the project area are as listed in **Table 3.1-4**.

Table 3.1-4 Confirmed Spawning Ground and Nursery or Fry Rearing Areas

SN	River Stretch	Spawning and Nursery or Rearing Ground	Suitable for Species
1	Bhimad near Wantan Khola and near upstream area	There is small isolated pool	Fries and fingerlings of Snow trout, Copper mahseer and Golden mahseer were seen. They are netted out for confirmation. Algal bloom and insect larvae serving as fish food are plentiful.
2	Bhimad to Phedi Khola confluence Good for Hatchery	Seti river joined by Jange and Phedi Khola.	Fry and fingerlings of Copper mahseer, Mahseer and Minor carp and Torrent minnows sheltering in algal bed and crevices of stones
3	Dam to Seti and Madi confluence	Spawning and nursery area at the upstream of Damauli Bazaar	Fry, fingerling and adult fish were observed in isolated pools. Copper mahseer, Mahseer, Minor carp and Catfishes are the major species.
4	The Madi and Seti confluence at Damauli	Nursery is found at left bank just below the Damauli town.	High species diversity, fish larval fingerlings were seen. Several dead fry of snow trout and Mahseer were collected. Besides these fry of Minor carps, Torrent minnows and Stonerollers are the commercially important species noted in this stretch of river.
5	Seti river near powerhouse Betani Good for Hatchery	Proposed powerhouse and tail water release site	Fingerlings of Torrent minnows, Loach, Spiny eel, Stone roller, Deep-bodied mahseers, Snow trout and Catfishes

3.1.4 Vulnerable, Endangered and Rare Fish Species

Out of the total of 36 species caught, none are officially Red Listed by IUCN but one species is listed as “Endangered”, 3 as “Vulnerable” and 5 as “Rare” under a classification system devised, but not yet accepted either the Fisheries Department or the conservation authorities, IUCN (Shrestha, 1995). **Table 3.1-5** shows the status of conservation.

Table 3.1-5 Status of the Conservation

S.N	Scientific Name	Local Name	English Name	Status of conservation
1.	*Anguilla bengalensis*	Fresh water Eel	Raj Bam	R
2.	*Amblyceps mangois*	Torrent catfish	Bidur	R
3.	*Barilius barila*	Minor carp	Faketa	C
4.	*Barilius bendilisis*	Minor carp	Faketa	C
5.	*Barilius barna*	Minor carp	Pate Faketa	C
6.	*Bagarius bagarius*	Giant catfish	Gounch	C
7.	*Botia almorhae*	Loach	Baghi	I

S.N	Scientific Name	Local Name	English Name	Status of conservation
8.	*Chagunius chagunio*	Carp	Gadeni	V
9.	*Channa striatus*	Murrel	Hile	O
10.	*Channa punctatus*	Murrel	Hile	O
11.	*Channa gachua*	Murrel	Hile	C
12.	*Crossocheilus latius*	Stone roller	Lohare	C
13.	*Garra annandalei*	Stone roller	Lohari, Buduna	C
14.	*Garra goytla*	Stone roller	Buduna	C
15.	*Glyptothorax trilineatus*	Catfish	Kavre	C
16.	*Glyptothorax telchitta*	Catfish	Telcapre, Kotle	C
17.	*Glypothorax cavia*	Catfish	Kataga	C
18.	*Glyptosternum blythii*	Catfish	Tilkabre	R
19.	*Labeo dero*	Minor carp	Gardi	C
20.	*Labeo angr*	Minor carp	Gardi,Thed/Handey	C
21.	*Mastacembelus armatus*	Spiny eel	Bam	C
22.	*Mystus aor*	-	Tenger	C
23.	*Neolissochilus hexagonolepis*	Copper Mahseer	Katle	V
24	*Noemacheilus rupicola*	Stone loach	Gadela	C
25.	*Noemacheilus rupicola var inglish*	Stone loach	Gadela	C
26.	*Noemacheilus botia*	Stone loach	Gadela	C
27.	*Noemacheilus bevani*	Stone loach	Gadela	C
28.	*Pseudocheneis sulcatus*	Catfish	Katanga, Kabre	O
29.	*Puntius conchonius*	Barbs	Karange,Bhite	C
30.	*Clupisoma garua*	-	Jalkapoor	C
31.	*Semiplotus semiplotus*	-	Khurpe	C
32.	*Schizothorax plagiostomus*	Snow trout	Buche Asala	V
33.	*Schizotharx richarsonii*	Snow trout	Asala	V
34.	*Schizothoraichthys progastus*	Snow trout	Chuhhe Asala	V
35.	*Tor putitora*	Golden Mahseer	Pahelo Sahar	V
36.	*Tor tor*	Deep-bodied Mahseer	Sahar	E

Note: V = Vulnerable, R = Rare, O = Occasional, C = Common, E = Endangered, I = Insufficiently know

3.1.5 Fishing Activity

There is no full time fisherman in the Seti and Madi Rivers now. Culturally, the Bote communities (ferry rider community) are linked with fishery in the region. Peoples from these communities were professional boating people, who provide transit facilities to the communities across the Seti and Madi Rivers at ferry points. Besides ferry operations across the river, they used to practice fishing as their main livelihood.

With the replacement of boats by the suspension bridges across Seti and Madi Rivers, the traditional ferry operations of the Bote community of the region completely came at halt. These ferry operating communities are now attached to agro-economic practices for their livelihood and only occasionally carry out fishing in their free time and could be termed as part time fishermen more of recreational type not depending on fishing for livelihood. At Damauli, there are a few Indians (about 3), who make their livelihood by selling fish of the Seti and Madi River areas to the local hotels and restaurants.

All ethnic groups of the Seti River in the proposed reservoir area practice part time fishing for recreation. However, Bote, Magar, Gurung and Kumal ethnic groups practice part time fishing more

than the other ethnic groups in their free time. The fishes caught are mostly consumed by themselves. They sell their fish only when it is more than their household requirement. The prices of local fish at the markets varies from NRs.140/kg to 160/kg depending upon the size of the fish. Normally the small fishes fetch lower value than the large size fish.

3.1.6 Economic Importance

Even though not important from a viewpoint of the conservation, some fish species are valuable for the economic activities of the local fisherman. Fishing activity and economic importance of fish species are given in **Table 3.1-6**.

Table 3.1-6 Economic Value of the Fish Species of the Project Area

S.N	Scientific Name	English Name	Local Name	Economic Importance
1.	*Anguilla bengalensis*	Torrent catfish	Raj Bam	Oily fish 1,L, 3
2.	*Amblyceps mangois*	Fresh water Eel	Bidur	1,L
3.	*Barilius barila*	Minor carp	Faketa	1,M
4.	*Barilius bendilisis*	Minor carp	Faketa	1,M
5.	*Barilius barna*	Minor carp	Pate Faketa	1,M
6.	*Bagarius bagarius*	Gaint Catfish	Gounch	1,L
7.	*Botia almorhae*	Loach	Baghi	1,L
8.	*Chagunius chagunio*	Carp	Gadeni	1,M, 2 ,3
9.	*Channa stratus*	Murrels	Hile	1,L
10.	*Channa punctatus*	Murrels	Hile	1,L
11.	*Channa gachua*	Murrels	Hile	1,L
12.	*Crossocheilus latius*	Stone roller	Lohare	1,M
13.	*Garra annandalei*	Stone roller	Lohari, Buduna	1,M
14.	*Garra goytla*	Stone roller	Buduna	1,M
15.	*Glyptothorax trilineatus*	Catfish	Kavre	1,M
16.	*Glyptothorax telchitta*	Catfish	Kotle	1,M
17.	*Glypothorax cavia*	Catfish	Kataga	1,M
18.	*Glyptosternum blythii*	Catfish	Tilkabre	1,L
19.	*Labeo dero*	Minor carp	Gardi	1,H
20.	*Labeo angra*	Minor carp	Gardi,Thed/Handey	1,M
21.	*Mastacembelus armathus*	Spiny eel	Bam	1,M
22.	*Mystus aor*	-	Tanger	1,H
23.	*Neolissocheilus hexagonolepis*	Copper Mahseer	Katle	1,H
24	*Noemacheilus rupicola*	Stone loach	Gadela	1,L
25.	*Noemacheilus rupicola var inglish*	Stone loach	Gadela	1,L
26.	*Noemacheilus botia*	Stone loach	Gadela	1,L
27.	*Noemacheilus bevani*	Stone loach	Gadela	1,L
28.	*Pseudocheneis sulcautus*	Catfish	Katanga, Kabre	1,M
29.	*Puntius conchonius*	Barbs	Karange	1,M
30.	*Clupisoma garua*	-	Jalkapoor	1,H
31.	*Semiplotus semiplotus*	-	Khurpe	1,H
32.	*Schizothorax plagioustomus*	Snow trout	Buche Asala	1,H
33.	*Schizothorax richarsonii*	Snow trout	Asala	1,H
34.	*Schizothoraichthys progastus*	Snow trout	Chuhhe Asala	1,H
35.	*Tor Putitora (Ham)*	Golden Mahseer	Pahelo Sahar	1,H, 2, 3
36.	*Tor Tor (Ham)*	Mahseer	Sahar	1,H, 2, 3

Note: 1= Food Value: L = Low food value H = High food value M = Medium food value
2 = Medicine
3 = Aquarium

3.1.7 Phytoplankton, Zooplankton and Aquatic Insects

Aquatic invertebrates are the most important resources which are the link in the production process in aquatic ecosystem because they include both primary consumers and carnivorous. They form the matured food source of several fishes.

(1) Species Composition/Distribution Pattern and Diversity

Seventy species of phytoplanktons of five different orders were collected in the pre-monsoon and monsoon season from the project area (Annex C.3.1.2). The major orders of phytoplanktons recorded in the project area are Bacillariophyceae, Cyanophyceae, Cholorophyceae, Phyrophyceae, and Xanthophyceae. As expected, the number of species composition and diversity of the phytoplankton was found higher in the post-monsoon season than in the pre-monsoon season (**Table 3.1-7**).

Table 3.1-7 Phytoplankton Species Recorded at Different Sampling Stations

S.N.	Order	Sampling Stations / Number of Species Recorded													
		1		2		3		4		5		6		7	
		J	O	J	O	J	O	J	O	J	O	J	O	J	O
1	*Cyanophyceae*	4	7	3	7	3	6	4	9	3	4	3	5	2	4
2	*Phyrrophyceae*	0	0	0	1	0	0	0	1	0	1	0	0	0	0
3	*Xanthophyceae*	0	2	1	1	0	2	0	2	1	1	0	2	1	2
4	*Bacillariophyceae*	12	26	13	23	15	26	11	24	12	17	11	17	11	22
5	*Chlorophyceae*	3	12	4	13	3	11	7	9	3	11	1	8	5	12
Total Species		**19**	**47**	**21**	**44**	**21**	**45**	**22**	**44**	**19**	**33**	**15**	**32**	**19**	**40**

Note: J = July; O = October
Source: Supplemental EIA Survey, JICA Study Team, 2006

Nineteen species of zooplanktons of three different orders are recorded for the pre-monsoon and post -monsoon season in the study area (Annex C.3.1.2). The major orders of zooplankton recorded from the project area are consisted of Rotifers, Cladocera and Copepoda. The number, composition and diversity declined from pre-monsoon season to post monsoon season are indicated in **Table 3.1-8**.

Table 3.1-8 Zooplankton Species Recorded at Different Sampling Stations

S.N.	Order	Sampling Stations / Number of Species Recorded													
		1		2		3		4		5		6		7	
		J	O	J	O	J	O	J	O	J	O	J	O	J	O
1	*Rotifera*	2	8	2	5	3	7	2	4	3	5	3	3	3	7
2	*Copepoda*	1	2	1	0	1	2	1	1	1	0	1	1	0	1
3	*Cladocera*	1	3	1	1	1	2	1	3	2	3	0	2	1	2
Total Species		**4**	**13**	**4**	**6**	**5**	**11**	**4**	**8**	**6**	**8**	**4**	**6**	**4**	**10**

Notes: J = July, O = October
Source: Supplemental EIA Survey, JICA Study Team, 2006

Twenty-six species of aquatic insects are recorded in the project area (**Table 3.1-9**). The highest number of species was recorded above confluence point. Highest number of species recorded by order Ephemeroptera (5 species). Other major orders are Diptera (4 species), Plecoptera (3 species)**,** Trichoptera (3 species). Species of crab and snail (Gastropoda) were also recorded from the area.

Table 3.1-9 List of Aquatic Insect Collected in the Different Sampling Stations

Species recorded			At confluence		Above confluence		At dam site		At Bhimad Wangtang Khola	
S. No.			J	O	J	O	J	O	J	O
		Order Ephemeroptera								
1	A.	*Baetis sp.*	+	+	+	+	–	+	–	+
2		*Cloeon simle*	–	–	+	–	–	–	–	–
3		*Ecdyonurus sp.*	–	+	–	–	–	–	–	+
4		*Heptogenia sp.*	–	–	–	+	–	–	–	–
5		*Caenis sp.*	–	+	+	+	–	+	–	+
		Order Plecoptera								
6	B.	*Pelopteria sp.*	–	–	+	–	–	–	–	–
7		*Nemoura sp.*	–	–	–	+	–	+	–	–
8		*Isoperla sp.*	–	+	–	–	–	+	–	–
		Order Trichoptera								
9	C.	*Rhyarophila sp.*	–	–	+	–	–	–	–	–
10		*Tabubus sp.*	–	–	+	–	+	–	–	–
11		*Polycentropus sp.*	–	+	–	–	–	+	–	+
		Order Hemiptera								
12	D.	*Gerris sp*	–	–	+	+	–	+	–	–
13		*Hydrometra sp.*	–	–	–	–	–	+	–	–
14		*Nepa sp.*	–	+	–	–	–	–	–	–
		Order Coleoptera								
15	E.	Whirligig beetle	–	–	–	–	–	+	–	+
16		*Psephenus sp.*	+	–	+	–	–	–	–	–
		Order Odonata								
17	F.	*Libuella sp.*	+	–	+	–	–	–	–	–
18		*Cordulegaster sp.*	–	+	–	–	–	–	–	–
	G.	**Order Prosobranchiata**								
19		*Potamopyrgus sp.*	+	–	+	–	–	–	–	–
20		*Lumnae sp.*	+	–	+	–	–	–	–	–
		Order Diptera								
21	H.	*Chironomus sp.*	–	+	+	+	+	+	–	+
22		*Tabanus sp.*	–	–	–	–	–		–	+
23	I.	Water penny beetle	+	+	+	–	–	+	–	+
	K	**Class Crustacea**								
24		*Cancer sp.*	–	–	–	–	–	–	–	+
	L	**Phylum Platyhelminthes**								
25		Water leech	–	–	–	–	–	–	–	+
26		*Dugesia sp.*	–	–	–	–	–	–	–	+
Total			**06**	**09**	**13**	**07**	**02**	**10**	**00**	**11**

Note: J = July; O = October

Source: Supplemental EIA Survey, JICA Study Team, 2006

Less number of species was recorded in the first sampling period in all the sites. Possible reason for this might be due to flooding in the river which washed away the aquatic insects from sampling sites. Some organic matter and submerged vegetation must be present enough for the occurrence of benthic macro-invertebrate but it was found little in most of the sites at that period.

(2) Population Trend in the Study Area

The sampling result shows that Bacillariphyceae is the dominant order in the whole study area which contributes about 73% of the total phytoplankton density. Other orders such as Chlorophyceae and Cyanophyceae are represented but its contribution is only 15.3% and 9.12% respectively among the total population as shown in **Table 3.1-10** (Annex C.3.1.3).

Table 3.1-10 Phytoplankton Density of Different Order

SN	Order	Number/liter	Percentage	Remarks
1.	Cyanophyceae	1,500	9.12	
2.	Phyrophyceae	400	0.24	
3.	Xanthophyceae	3,200	1.94	
4.	Bacillarriphyceae	120,900	73.4	Very high
5.	Chlorohyceae	25,200	15.3	
Total Density		**164,700**	**100**	

Source: Supplemental EIA Survey, JICA Study Team, 2006

The station SN 1 has the highest density among all stations, while there is no large difference in other stations as shown in **Table 3.1-11**.

Table 3.1-11 Phytoplankton Density at different Sampling Stations

S.N	Station Number	Number/liter	Percentage
1.	1	30,800	18.7
2.	2	24,600	14.94
3.	3	22,500	13.66
4.	4	24,800	15.06
5.	5	20,800	12.63
6.	6	19,100	11.6
7.	7	22,100	13.42
Total Density		**164,700**	**100**

Source: Supplemental EIA Survey, JICA Study Team, 2006

Among zooplankton orders Rotifera represents 67.3% of the total population density. Cladocera and Copepoda represent 22.30% and 10.07% respectively in **Table 3.1-12**.

Table 3.1-12 Zooplankton Density of Different Order

S.N	Order	Number/liter	Percentage
1.	*Rotifera*	1,880	67.63
2.	*Copepoda*	280	10.07
3.	*Cladocera*	620	22.30
Total Density		**2,780**	**100**

Source: Supplemental EIA Survey, JICA Study Team, 2006

Table 3.1-13 indicates the overall population density of zooplankton in the stations.

Table 3.1-13 Zooplankton Density at different Sampling Stations/Locations

S.N	Number/liter	Percentage
1	520	18.71
2	280	10.07
3	440	15.83
4	360	12.95
5	460	16.55
6	340	12.23
7	380	13.67
Total	**2,780**	**100**

3.2 Potential Environmental Impact on Fish and Aquatic Life

3.2.1 Construction Phase

The construction works at the dam and the downstream sections will have moderate to high impacts on the river aquatic ecology, as it involves release of excavated materials on the river bed as well as haphazard disposal of construction wastes (slurry of aggregate washing plants, cement batch plants, grouting, spent toxic chemicals, spent mobile and lubricants etc.) and construction workforce wastes. The downstream stretch from the dam site will be affected. The most sever effects will be on the resident fish species because of their limited range of mobility.

Spoil bank located at Beltar is not expected to cause habitat damage of aquatic life in the dry season. In the monsoon, erosion of the deposal materials may increase sediment and turbidity of river waters. However, impacts of such erosion of deposited spoil on the aquatic life are not to be high since the sediment load and turbidity is high on the original river conditions during monsoon season.

3.2.2 Operation Phase

(1) Barrier Impact

The fish migration to the upstream are observed mainly during rainy season in the Seti River. Construction of high concrete dam will block the upstream migration of long distant and mid distant migrant fish species. Twelve migrant fish species (six long distance migrant and six mid range migrants) are recorded in the fish sampling. As some fishes use the Seti River network upstream dam as spawning and rearing ground, the construction of the high dam will cause the serious loss of the spawning habitat of these fishes. As a result of barrier impact, the fish population will gradually decline not only in the upstream areas but also in the downstream.

The magnitude of the barrier impact is high or very high and irreversible especially to the migrant fish species.

(2) Dewatering Impact

After starting the operation of the Project, the river water will be diverted for the power generation. In such a situation, the river stretch from the dam site to the confluence with the Madi River will be nearly dry up for the period excluding discharging from the spillway and sediment flushing operation unless considering an environmental flow. The diversion of water for the power generation will

severely impact on the existing aquatic habitats, the fish population and its diversity in the dewatered stretch.

(3) Reservoir Impact

The river flow velocity in the reservoir area will be substantially reduced. All rapids and stretches of broken water (run and riffle) and spawning and rearing areas will be submerged. The increase of the phytoplankton and the zooplankton in the newly formed reservoir area will provide rich food supply for a variety of omnivorous species. While, the formation of reservoir will also destroy many food sources notably benthic organisms and aquatic insects adapted to fast flowing riverine environment.

Rapid colonization of fish species preferring standing water environment will take place soon after impounding. Fish species preferring run and rapid habitat such as *Noemacheilus rupicola, Noemacheilus botia, Noemacheilus bevani, Pseudocheneis sulcautus, Schizothorax plagioustomus*, and *Schizothoraichthys progastus* might decrease. Fish species preferring shallow pools and backwater may adjust to the new environment and colonize there. Obviously, there will be marked decline in the fish diversity, though the total fish population may increase due to availability of abundant food source, particularly alga, phytoplankton and zooplankton.

(4) Water Level Fluctuation in the Downstream

The aquatic life in the downstream of the tailrace will receive the fluctuation of high and low water flow in the daily operation. Such variations in flow will be large during the dry season (From November till June). This fluctuation of the water level will have a serious impact on the aquatic habitat such as spawning grounds, rearing grounds and feeding grounds. Fish especially fry and fingerlings and small size resident species will not be able to adjust themselves to the rapid decline of the river water level and remain in the pool formed at the riverbank.

(5) Impact by Sand Flash Operation

To maintain the effective storage capacity of the reservoir, the sand flush operation, which is planned to carry out at least once a year, is essential. The reservoir water with the high rate of sediment contamination will release by the opening the sand flush gate equipped in the dam body. The churning effect on the reservoir bottom will increase the fine sediment and organic materials in the downstream river water. This operation will bring the serious impact on the fishes and aquatic life in the downstream due to the deterioration of the water quality as explained in the former chapter of Physical Environment.

(6) Impact due to Eutrophication

Increasing the inflow of nutrient, in particular phosphorus or nitrogen, by the human activity such as sewage and agriculture will accelerate the eutrophication in the reservoir water. It is expected that the algae bloom will occur due to the eutrophication in future. As a result of the algae bloom, the dissolve oxygen required for the fishes will decrease.

3.3 Mitigation Measures and Costs

With respect to proposed mitigation actions, following alternatives were considered;

a) Fish Trapping and Trucking Alternatives
b) Fish Lock or Ladder Alternatives
c) Fish Hatchery to produce native species fingerlings for upstream stocking of the Seti and Madi rivers and downstream in the Seti River and for an open-water stocking of in the reservoir itself on a trial basis

It is proposed that the Kali Gandaki A hatchery would be expanded to cater for this fisheries mitigation measures as it was originally proposed for such purposes. The capacity of Kali Gandaki A Project's fish hatchery can be readily doubled and production of native fry and fingerlings negotiated with the operator, who is under contract to NEA.

The effectiveness of the applied measures may be varied in terms of success depending upon the local field conditions, expertise applied and behavior of the existing aquatic fish species. Any plans to provide for fish trapping and hauling or a fish ladder structure at the dam are both uneconomical and could in no way compensate for the impacts of the Project. It is proposed that proper and adequate provision of a fish hatchery is the most viable method. However, the implementation of the fish hatchery program needs the further detail study.

Initially, three (3) locations on the Seti River (downstream of Damauli), on the Phedi Khola (a reservoir tributary) and on the Madi Khola (just upstream of the quarry site) were examined for the fish hatchery facilities. The costs of a hatchery program for 5 years varied at these sites between NRs. 119.3 million and 129.8 million. However based on discussions with NEA, an extension of the fish hatchery at Kaligandaki A Project facilities was examined and cost estimates were made. The cost of an equivalent five years' program was the preferred alternative at a cost of NRs 76.5 million. From the results of the above comparison, the extension of the fish hatchery at Kaligandaki A Project is proposed as an attractive alternative for the Project.

Though the cost for the hatchery development and research would essentially be part of operation phase, the costs on this item should be disbursed at the start of the construction works and preparation of hatchery facilities and supplying of fish fry should be ready for the dam closure period.

Table 3.3-1 Mitigation Costs for Fisheries

SN	Particulars	Unit Cost (NRs.)	Total Cost (Million NRs.)
1.	Financial and Technical Assistance to Kali Gandaki A hatchery for added production &l facility development and research for Upstream & Downstream Stocking in Seti River system	As Per Estimate	73.6
2.	Annual release of purchased exotic carps to Seti reservoir	2/fishfry	1.9
3.	NEA Extension program for fisheries and mitigation to local fishermen	Lump sum	1.0
4.	**Total Estimated Cost (Million NRs)**		**76.5**
5.	**Total Estimated Cost (USD)**		**1.02 million**

Note: Cost breakdowns are based on local market price

3.4 Environmental Monitoring and Costs

3.4.1 Environmental Monitoring

(1) Construction phase

To confirm the ecological status of the various aquatic lives, the seven stations shall be monitored throughout the construction phase (**Table 3.4-1**).

Table 3.4-1 Monitoring Indicators and Frequency

Monitoring Indicators	Frequency
Aquatic life and ecology survey (fish, phytoplankton, zooplankton and aquatic insects) for baseline analysis at the 7 Baseline stations	Six monthly (dry season and wet season)
Observation of compliance of contractual mitigation clauses	Three monthly

(2) Operation Phase

Compliance and impact monitoring are required during the operation phase. Following indicators as shown in **Table 3.4-2** are proposed for compliance and impact monitoring.

Table 3.4-2 Monitoring Indicators and Frequency

Monitoring Indicators	Frequency
Observation of compliance of contractual mitigation clauses	Construction Phase, Monthly
Compliance to release of environmental flows at Seti	Operation Phase, Daily
Compliance to restriction of fishing activities below tailrace	Operation Phase, Daily
Compliance to fish stocking, fish release in the reservoir and other areas	Operation phase , yearly , project life
Aquatic ecology survey for impact Analysis at the 7 Baseline stations twice a year	Operation Phase , six monthly, after 2 years of project operation, for 10 years

3.4.2 Monitoring Costs

(1) Construction Phase

The compliance monitoring is not envisaged to incur extra costs and the project environmental consultant in the construction phase; however for the aquatic ecological survey twice annually following costs are estimated as shown in **Table 3.4-3**.

Table 3.4-3 Monitoring Costs, Construction Phase

Monitoring Items	Million NRs.
Aquatic ecology survey in the 7 Baseline stations twice a year for 5 years during construction phase @ 0.1 million/monitoring season	1.0
Total for 5 years	**1.0**

Note: Cost breakdowns are based on local market price

(2) Operation Phase

The compliance monitoring is not envisaged to incur extra cost and the NEA environmental staff during operation phase shall address these monitoring issues as required. For the impact monitoring estimated cost is presented in **Table 3.4-4**

Table 3.4-4 Monitoring Costs, Operation Phase

Monitoring Items	Million NRs.
Aquatic ecology survey in the 7 Baseline stations after two years of project operation for 10 years @ 0.15 million/monitoring	3
Total Monitoring cost 10 years	**3**

3.5 Summary of Biological Environmental Costs

The total costs for the biological environment as associated with the various reservoir levels is estimated in **Table 3.5-1**. This table shows the importance of the forestry and fish aspects to the overall cost for the biological component of the Project

Table 3.5-1 Biological Environmental Costs

SN	Particulars	Million NRs
	Reservoir FSL	**415**
1.	Cost for Clearing the Vegetation in the Reservoir under Various FSL	3.72
2.	Capture and release of the two reptile species of the reservoir area,	0.5
3.	Support program for Kali Gandaki A Fish Hatchery	73.5
4.	Fish monitoring during construction phase	1.0
	Sub-total construction	**78.72**
5.	Compensation to the Annual Losses of Forest and Vegetation Resources, Reservoir Area (cost for 20 years)	287.8
6.	Wildlife monitor in the reservoir area & surrounds	0.5
7.	Annual release of indigenous fish fingerlings reservoir area & downstream areas for 20 years	50
8.	Annual release of indigenous fish fingerlings in Seti River upstream for 20 years	30
9.	Monitoring of wildlife habitat and wildlife protection for 20 years	1.2
10.	Fish monitoring during operation phase for 20 years	3
11.	Fish extension program for 10 years	10
	Sub-total Operation	**382.5**
	Grand Total	**461.22**

3.6 Conclusion and Recommendation

No fish species found in the site are listed in the CITES Appendix 3, IUCN the Red List and in the conservation list of the Government of Nepal while there are some species which are important for the local people as a source of food and cash income. Therefore, the mitigation measures discussed above are mainly focusing on maintaining these fish species from the economic viewpoint.

Still it will be necessary to grasp the impacts on the local fish species which are not economically important from the conservation point of view. But there has not been enough information on how other local species will be affected and how the whole species composition will be changed after the water quality and quantity changes during the construction and operation period.

From the viewpoint of conserving the biodiversity of fish and aquatic lives in Seti river, continuous monitoring will be also needed to grasp the impact and changes of the ecology of local fish species.

ANNEX C

Annex C-1: Vegetation Survey of the Upper Seti Storage Hydroelectric Project Area Planted Forest

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
Plantation	**Plot 1**										
Location: Below bridge at the left side of seti river near confluence, bridge to Jhaputar at Damauli											
Date: 3/16/63											
Sisoo	Dalbergia sisoo Roxb.	12	120	22	38.197	0.115	1.261	15.126	20	300	
Sisoo	Dalbergia sisoo Roxb.	8	95	17	30.239	0.072	0.610	4.884			
Sisoo	Dalbergia sisoo Roxb.	20	40	11	12.732	0.013	0.070	1.401			
							Total Volume	**21.410**			
	Cassia tora										
	Eupatorium sp.										
	Parthenium sp.										
Plantation	**Plot 2**										
Location: Huksetar in front of confluence											
Date: 3/16/63											
	Dalbergia sisoo Roxb.	8	90	18	28.648	0.064	0.580	4.641	8	80	
	Dalbergia sisoo Roxb.	10	35	19	11.141	0.010	0.093	0.926			
							Total Volume	**5.567**			
	Ageratum conyzoides										
	Cassia tora										
	Eupatorium sp.										
Plantation	**Plot 3**										
Location: At the left side of Seti confluence, Patan											
Date: 3/17/63											
	Dalbergia sisoo Roxb.	10	110	24	35.014	0.096	1.155	11.555	18		1 cut stump, 2 dead trees
	Dalbergia sisoo Roxb.	8	80	18	25.465	0.051	0.458	3.667			
	Dalbergia sisoo Roxb.	23	50	12	15.915	0.020	0.119	2.745			
							Total Volume	**17.967**			
	Ageratum conyzoides										
	Cassia tora										
	Cynodon dactylon										
	Cyperus rotundus										
	Dioscorea sp.										
	Mimosa pudica										
	Murraya koenigii										
	Oxalis corniculata										
	Phyllanthus amarus										
	Solanum xanthocarpum										

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
Plantation Plot 4											
Location: Geruwatar grazing land											
Date: 3/19/63											
	Dalbergia sisoo Roxb.	4	22	10	7.003	0.004	0.019	0.077	0	24	Small 20 trees
							Total Volume	**0.077**			
	Jatropa curcas										
	Murraya koenigii										
Plantation Plot 5											
Location: Rising patan											
Date: 3/20/63											
	Dalbergia sisoo Roxb.	8	112	18	35.651	0.100	0.898	7.187	8	200	Small 20 trees
							Total Volume	**7.187**			
	Jatropa curcas L.										
	Murraya koenigii										
Plantation Plot 6											
Location: Bhimad, Near Gurung Chihan											
Date: 3/21/63											
	Melia azederach L.	5	50	16	15.915	0.020	0.159	0.796	5	14	
	Melia azederach L.	6	25	9	7.958	0.005	0.022	0.134			
	Dalbergia sisoo Roxb.	4	50	15	15.915	0.020	0.149	0.597	4	75	
	Dalbergia sisoo Roxb.	25	35	10	11.141	0.010	0.049	1.219			
							Total Volume	**2.745**			
	Artemisia indica										
	Colebrookea oppositifolia										
	Eupatorium adenophorum										
	Murraya koenigii										
	Sapium insigne										
Plantation Plot 7											
Location: Bhimad, left side of river (opposite of Gurung Chihan ghat)											
Date: 3/21/63											
	Bombax ceiba L.	6	145	18	46.155	0.167	1.506	9.035	6	6	
	Dalbergia sisoo Roxb.	40	50	13	15.915	0.020	0.129	5.173	5	40	
	Acacia catechu (L.f.) Willd	60	70	15	22.282	0.039	0.292	17.547	10	60	
							Total Volume	**31.754**			

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
Plantation	**Plot 8**										
Location: Bhimad, left side of river, Janajoyotic Higher Sec. School forest											
Date: 3/21/63											
	Dalbergia sisoo Roxb.	6	95	17	30.239	0.072	0.610	3.663	6	2500	440 ropani area
	Dalbergia sisoo Roxb.	14	40	12	12.732	0.013	0.076	1.070			
	Acacia catechu (L.f.) Willd	4	74	17	23.555	0.044	0.370	1.482	4	3000	
	Acacia catechu (L.f.) Willd	17	38	12	12.096	0.011	0.069	1.172			
							Total Volume	**7.386**			
	Dioscorea sp.										
	Lantana camara										
	Murraya koenigii										
	Sapium insigne										
Plantation	**Plot 9**										
Location: Jidi Khola right side, Malebagar											
Date: 3/21/63											
	Dalbergia sisoo Roxb.	2	75	12	23.873	0.045	0.269	0.537	6	180	
	Dalbergia sisoo Roxb.	20	30	7	9.549	0.007	0.025	0.501			
							Total Volume	**1.038**			
Plantation	**Plot 10**										
Location: Bhimad, Jidi Khola left side, Club forest											
Date: 3/21/63											
	Dalbergia sisoo Roxb.	20	80	18	25.465	0.051	0.458	9.167	40	345	
	Dalbergia sisoo Roxb.	35	35	9	11.141	0.010	0.044	1.535			
							Total Volume	**10.703**			
Plantation	**Plot11**										
Location: Bhimad, left side of river, below highway bridge											
Date: 3/21/63											
	Dalbergia sisoo Roxb.	8	75	18	23.873	0.045	0.403	3.223	8	400	
	Dalbergia sisoo Roxb.	40	20	10	6.366	0.003	0.016	0.637			
	Acacia catechu (L.f.) Willd	15	74	12	23.555	0.044	0.261	3.922	15	30	
	Acacia catechu (L.f.) Willd	6	30	10	9.549	0.007	0.036	0.215			
							Total Volume	**7.996**			
	Lantana camara										
	Murraya koenigii										
	Sapium insigne										

Annex C-2: Vegetation Survey of the Upper Seti Storage Hydroelectric Project Area Wild Forest

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
Wild Forest	**Plot 12**										
Location: Damauli left side of river in front of Huksetar											
Date: 3/17/63											
	Shorea robusta	24	80	15	25.465	0.051	0.382	9.167	24		
	Shorea robusta	49	40	10	12.732	0.013	0.064	3.119			
	Schima wallichii	9	50	12	15.915	0.020	0.119	1.074			
	Acacia catechu	1	30	10	9.549	0.007	0.036	0.036			
							Total Volume	**13.397**			
	Cheilanthes dalhosiae										
	Desmodium confertum										
	Dioscorea sp.										
	Elephantopus scaber										
	Eupatorium adenophorum										
	Kharighans										
	Lygodium flexuosum										
	Lygodium japonicum										
	Murraya koenigii										
	Piper longum										
	Sapium insigne										
	Syzygium cumini										
	Woodfordia fruticosa										
Wild Forest	**Plot 13**										
Location: Lower damside at the right side of river											
Date: 3/17/63											
Singane	Pterospermum lanceaefolium	6	125	22	39.789	0.124	1.368	8.206			
Jamun	Syzygium cumini	1	150	24	47.746	0.179	2.149	2.149			
Khaltu		1	60	8	19.099	0.029	0.115	0.115			
Sindure	Mallotus philippensis	1	80	7	25.465	0.051	0.178	0.178			
	Ligustrum confusum	11	40	7	12.732	0.013	0.045	0.490			
Siris	Albizia lebbeck	1	100	18	31.831	0.080	0.716	0.716			
Khayar	Acacia catechu	1	120	30	38.197	0.115	1.719	1.719			
Khirro	Sapinum insigne	3	30	6	9.549	0.007	0.021	0.064			
							Total Volume	**13.638**			
	Achyranthes aspera										
	Arisaema tortuosum										
	Boehmeria rugulosa										
	Callicarpa arborea										
	Colebrookea oppositifolia										
	Desmodium confertum										

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
	Dioscorea										
	Hedera nepalensis										
	Ichnocarpus frutescens										
	Murraya koenigii										
	Nephrolepis cordifolia										
	Pandanus nepalensis										
	Phyllanthus emblica										
	Piper longum										
	Sida cordata										
	Smilax sp.										
	Solanum xanthocarpum										
	Stephania japonica										
	Strobilanthes angustifrons										
	Tetrastigma serrulatum										
	Vitis lanata										
Bankarkalo											
Wild Forest	**Plot 14**										
Location: Lower damside at the left side of river											
Date: 3/17/63											
Singane	Pterospermum lanceaefolium	5	160	25	50.929	0.204	2.546	12.732			
Khayar	Acacia catechu	5	45	12	14.324	0.016	0.097	0.483			
Sindure	Mallotus philippensis	1	60	7	19.099	0.029	0.100	0.100			
Khaltu		1	69	12	21.963	0.038	0.227	0.227			
Jamun	Syzygium cumini	1	50	10	15.915	0.020	0.099	0.099			
Khirro	Sapinum insigne	4	60	12	19.099	0.029	0.172	0.688			
Khayar	Acacia catechu	3	35	6	11.141	0.010	0.029	0.088			
Botdheyro	Lagerstroemia parviflora	1	60	7	19.099	0.029	0.100	0.100			
							Total Volume	**14.518**			
	Ageratum sp.										
	Arisaema tortuosum										
	Bigonia picta										
	Boehmeria rugulosa										
	Colebrookea oppositifolia										
	Dioscorea										
	Elephantopus scaber										
	Hedera nepalensis										
	Ichnocarpus frutescens										
	Justicia adhatoda										
	Kharighans										
	Murraya koenigii										
	Nephrolepis cordifolia										

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
	Sida cordata										
	Smilax sp.										
	Stephania japonica										
	Woodfordia fructicosa										
Wild Forest	**Plot 15**										
Location: Left side of river near bamboo forest											
Date: 3/17/63											
Karma	Adina cordifolia	2	105	14	33.422	0.088	0.614	1.228			
Saj	Terminalia alata	6	110	25	35.014	0.096	1.204	7.222			
Bel	Aegle marmelos	4	50	10	15.915	0.020	0.099	0.398			
Singane	Pterospermum lanceaefolium	2	18	12	5.730	0.003	0.015	0.031			
Sindure	Mallotus philippensis	2	27	12	8.594	0.006	0.035	0.070			
							Total Volume	**8.948**			
	Bauhinia vahlii										
	Boehmeria rugulosa										
	Cissampelos pareira										
	Clerodendrum indicum										
	Cynotis sp.										
	Dendrocalamus sp.										
	Elephantopus scaber										
	Eupatorium sp.										
	Euphorbia sp.										
	Holarrhena pubescens										
	Kharighans										
	Leea macrophylla										
	Murraya koenigii										
	Phyllanthus amarus										
	Sapinum insigne										
	Sida cordata										
	Stephania japonica										
	Vitis lanata										
Wild Forest	**Plot 16**										
Location: Left side of river near bamboo forest below Setibagar											
Date: 3/17/63											
Dabdabe	Garuga pinnata	1	56	15	17.825	0.025	0.187	0.187			
Saj	Terminalia alata	7	175	26	55.704	0.244	3.168	22.177			
Jamun	Syzygium cumini	1	56	11	17.825	0.025	0.137	0.137			
Singane	Pterospermum lanceaefolium	3	50	15	15.915	0.020	0.149	0.448			
Sindure	Mallotus philippensis	2	90	14	28.648	0.064	0.451	0.902			
							Total Volume	**23.852**			

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
	Asuro										
	Bauhinia vahlii										
	Boehmeria rugulosa										
	Dioscorea sp.										
	Elephantopus scaber										
	Eupatorium sp.										
	Leea macrophylla										
	Maesa chisia										
	Murraya koenigii										
	Mussaenda macrophylla										
	Piper longum										
	Sapinum insigne										
	Selaginella										
	Sida cordata										
	Smilax sp.										
Phaner kanda											
Wild Forest	**Plot 17**										
Location: Disturbed forest near limukhola toward setibagar settlement at the left side of seti											
Date: 3/17/63											
	Sapinum insigne	1	220	28	70.028	0.385	5.392	5.392			
Saj	Terminalia alata	4	130	30	41.380	0.134	2.017	8.069			
Karma	Adina cordifolia	cut stump									
Khayar	Acacia catechu	3	60	12	19.099	0.029	0.172	0.516			
Khayar	Acacia catechu	4	35	8	11.141	0.010	0.039	0.156			
Sindure	Mallotus philippensis	3	30	8	9.549	0.007	0.029	0.086			
Siris	Albizia lebbeck	2	80	12	25.465	0.051	0.306	0.611			
							Total Volume	**14.830**			
	Alstonia scholaris										
	Arisaema tortuosum										
Koiralo	Bauhinia variegata										
	Boehmeria rugulosa										
	Colebrookea oppositifolia										
	Dioscorea sp.										
	Eupatorium sp.										
	Murraya koenigii										
Bhalayo	Rhus wallichii										
	Sapium baccatum										
	Sida cordata										
	Smilax sp.										
	Solanum xathocarpum										
	Tetrastigma serrulatum										
	Themeda arundinacea										

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
	Urena lobata+C532										
Wild Forest	**Plot 18**										
Location: Steep slope, at the limukhola bridge, right side of seti river											
Date: 3/17/63											
Jhakre		4	50	8	15.915	0.020	0.080	0.318			
Siris	Albizia lebbeck	1	131	18	41.698	0.137	1.229	1.229			
Sal	Shorea robusta	1	129	18	41.062	0.132	1.192	1.192			
Sindure	Mallotus philippensis	2	18	9	5.730	0.003	0.012	0.023			
							Total Volume	**2.762**			
Gaisimal											
Arphu lahara	Acacia pinnata										
	Adiantum philipense										
	Arisaema tortuosum										
	Bigonia sp.										
	Boehmeria sp.										
	Cheilanthes tenuifolia										
	Cissampelos pareira										
	Desmodium gangeticum										
	Dioscorea bulbifera										
	Eupatorium sp.										
	Murraya koenigii										
Khirro	Sapium insigne										
	Thysanolaena maxima										
	Urena lobata										
Sankhasur											
Phurke ghans											
Wild Forest	**Plot 19**										
Location: At the left side of Seti river, between Limupul and Chulesi pul											
Date: 3/17/63											
Sal	Shorea robusta	4	120	22	38.197	0.115	1.261	5.042			
Karma	Adina cordifolia	3	80	14	25.465	0.051	0.357	1.070			
Bahune kath		4	90	16	28.648	0.064	0.516	2.063			
Singane	Pterospermum lanceaefolium	3	100	18	31.831	0.080	0.716	2.149			
Siris	Albizia lebbeck	2	50	12	15.915	0.020	0.119	0.239			
Khayar	Acacia catechu	5	70	18	22.282	0.039	0.351	1.755			
Simal	Bombax ceiba	2	100	18	31.831	0.080	0.716	1.432			
							Total Volume	**13.749**			
Galeni	Leea macrophylla										
	Murraya koenigii										
Toni	Tona ciliata										
	Woodfordia fructicosa										

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
Wild Forest	**Plot 20**										
Location: Chulesipul right side of river, side of Banjhagara											
Date: 3/17/63											
Katus	Castanopsis indica	1	70	10	22.282	0.039	0.195	0.195			
Katus	Castanopsis indica	2	20	7	6.366	0.003	0.011	0.022			
Sindure	Mallotus philippensis	5	30	8	9.549	0.007	0.029	0.143			
Chilaune	Schima wallichiana	1	105	17	33.422	0.088	0.746	0.746			
Padke	Albizia lucidior	3	40	9	12.732	0.013	0.057	0.172			
Khirro	Sapinum insigne	2	40	11	12.732	0.013	0.070	0.140			
Sal	Shorea robusta	2	40	10	12.732	0.013	0.064	0.127			
							Total Volume	**1.545**			
	Acacia pinnata										
	Ageratum conyzoides										
	Artemisia indica										
	Boehmeria sp.										
	Callicarpa macrophylla										
	Dioscorea bulbifera										
	Dryopteris cochleat										
	Dryopteris filix-mas										
	Lagerstroemia parviflora										
	Murraya koenigii										
	Mussaenda macrophylla										
	Oxalis corniculata										
	Smilax ovalifolia										
	Urena lobata										
Sutumi lahara											
Wild Forest	**Plot 21**										
Location: Toni pul, near the bridge at the right side of seti											
Date: 3/17/63											
Khirro	Sapinum insigne	2	200	18	63.662	0.318	2.865	5.730			
Siris	Albizia lebbeck	2	150	20	47.746	0.179	1.790	3.581			
Padke	Albizia lucidior	1	400	27	127.324	1.273	17.189	17.189			
							Total Volume	**26.499**			
	Ageratum conyzoides										
	Artemisia indica										
	Boehmeria sp.										
	Callicarpa macrophylla										
	Colocasia sp.										
	Dioscorea bulbifera										
	Dryopteris cochleat										
	Dryopteris filix-mas										

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
Asuro	Justicia adhatoda										
	Murraya koenigii										
Tatelo	Oroxylum indicum										
	Piper logum										
	Thysanolaena maxima										
	Urtica dioca										
	Vitis lanata										
Sankhasur											
Sokma											
Bhuganjalo											
Wild Forest	**Plot 22**										
Location: Toni pul, near the bridge at the Left side of seti											
Date: 3/17/63											
Khayar	Acacia catechu	5	80	20	25.465	0.051	0.509	2.546			
Karma	Adina cordifolia	5	60	12	19.099	0.029	0.172	0.859			
Botdhayero	Lagerstroemia parviflora	1	220	25	70.028	0.385	4.814	4.814			
Simal	Bombax ceiba	2	40	10	12.732	0.013	0.064	0.127			
Banpipal	Sapium baccatum	2	50	10	15.915	0.020	0.099	0.199			
							Total Volume	**8.547**			
	Acacia pinnata										
	Albizia lucidior										
	Arisaema tortuosum										
	Bidens pilosa										
	Boehmeria sp.										
	Cheilanthes dalhosiae										
	Colebrookea oppositifolia										
	Colocasia sp.										
	Costus speciousus										
	Dioscorea bulbifera										
	Ichnocarpus frutescens										
	Justicia adhatoda										
Sindure	Mallotus philippensis										
	Murraya koenigii										
	Pyracantha sp.										
	Urena lobata										
	Urtica dioca										
Thotne											
Wild Forest	**Plot 23**										
Location: Near Tutuwa pul, below cultivation at the left of seti river											
Date: 3/17/63											
Chilaune	Schima wallichii	2	200	20	63.662	0.318	3.183	6.366			
Botdhaeyero	Lagerstroemia parviflora	7	100	16	31.831	0.080	0.637	4.456			

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
Bel	Aegle marmelos	1	100	12	31.831	0.080	0.477	0.477			
Padke	Albizia lucidior	7	40	10	12.732	0.013	0.064	0.446			
							Total Volume	**11.746**			
	Acacia pennata										
	Ageratum conyzoides										
	Arisaema sp.										
	Boehmeria rugulosa										
	Colebrookea oppositifolia										
	Cyperus rotundus										
	Desmodium gangeticum										
	Dioscorea bulbifera										
	Eupatorium adenophorum										
	Justicia adhatoda										
Sindure	Mallotus philippensis										
	Momordica dioca										
	Mussaenda macrophylla										
	Pteris vitata										
	Sida cordata										
	Urena lobata										
Wild Forest	**Plot 24**										
Location: Just above Tutuwa village, Sal forest at the right of seti river											
Date: 3/17/63											
Sal	Shorea robusta	30	80	18	25.465	0.051	0.458	13.751			
Sal	Shorea robusta	35	40	10	12.732	0.013	0.064	2.228			
Chilaune	Schima wallichii	7	80	20	25.465	0.051	0.509	3.565			
							Total Volume	**5.793**			
Bhyakur	Dioscorea bulbifera										
	Elephantopus scaber										
Botdhayero	Lagerstroemia parviflora										
	Pteris vitata										
	Sida cordata										
Khari ghans											
Madan laharo											
Wild Forest	**Plot 25**										
Location: Infornt of Geruwatar grass land, Left side of river near Kundule bridge											
Date: 3/17/63											
Khayar	Acacia catechu	7	60	17	19.099	0.029	0.244	1.705			
Khayar	Acacia catechu	8	30	11	9.549	0.007	0.039	0.315			
Simal	Bombax ceiba	7	80	16	25.465	0.051	0.407	2.852			
Bahuni kath		1	130	20	41.380	0.134	1.345	1.345			
Siris	Albizia lebbeck	1	80	18	25.465	0.051	0.458	0.458			
							Total Volume	**6.675**			

Local Name	Botanical Name	No of trees (25x25 m^2 plot)	CBH	Height	DBH	Basal Area	Volume m^3	Total tree volume m^3	Pole size trees	Total tree cf.	Remarks
Wild Forest	**Plot 26**										
Location: Near Bandarkuna, right side of seti river											
Date: 3/17/63											
Sal	Shorea robusta	8	80	18	25.465	0.051	0.458	3.667			
Sal	Shorea robusta	20	40	15	12.732	0.013	0.095	1.910			
Chilaune	Schima wallichii	5	40	12	12.732	0.013	0.076	0.382			
Khayar	Acacia catechu	1	55	10	17.507	0.024	0.120	0.120			
							Total Volume	**6.079**			
	Ageratum conyzoides										
	Artemisia indica										
Bhyakur	Dioscorea bulbifera										
	Eupatorium adenophorum										
	Euphorbia hirta										
Botdhayero	Lagerstroemia parviflora										
Sindure	Mallotus philippensis										
	Murraya koenigii										
	Woodfordia fruticosa										
Wild Forest	**Plot 27**										
Location: Jhakas, Near Bridge at the left side of seti river											
Date: 3/17/63											
Singane	Pterospermum lanceaefolium	3	100	12	31.831	0.080	0.477	1.432			
Khirro	Sapium insigne	1	140	18	44.563	0.156	1.404	1.404			
Khirro	Sapium insigne	7	30	6	9.549	0.007	0.021	0.150			
Khayar	Acacia catechu	12	70	12	22.282	0.039	0.234	2.807			
Botdhayero	Lagerstroemia parviflora	1	30	7	9.549	0.007	0.025	0.025			
							Total Volume	**5.819**			
	Ageratum conyzoides										
	Cassia tora										
	Cheilanthes dalhosiae										
	Cynoglossum zeylanicum										
	Dioscorea bulbifera										
	Eupatorium adenophorum										
	Euphorbia hirta										
	Murraya koenigii										
	Phyllathus amarus										

Annex C-3: Wild Flowering Plants Recorded from the Project Area

SN	Botanical Name	Local Name	Family
1	*Acacia catechu* (L.f.) Willd.	Khayar	Leguminosae
2	*Acacia pennata* (L.) Willd.	Arphu Lahara	Leguminosae
3	*Achyranthes aspera* L.	Datiwan	Amaranthaceae
4	*Acorus calamus* L.	Bojho	Araceae
5	*Adina cordifolia* (Willd. Ex Roxb.) Benth. & Hook.f. ex Brandis	Karma	Rubiaceae
6	*Aegle marmelos* (L.) Corr.	Bel	Rutaceae
7	*Agava americana* L.		Agavaceae
8	*Ageratum conyzoides* L.	Gandhe	Compositae
9	*Albizia chinensis* (Osbeck) Merr.	Seto siris	Leguminosae
10	*Albizia lebbeck* (L.) Bentham	Kalo siris	Leguminosae
11	*Albizia lucidior* (Steudel) I. Nielson ex Hara	Padke	Leguminosae
12	*Alstonia scholaris* (L.) R. Br.	Chhatiwan	Apocynaceae
13	*Amaranthus spinosus* L.		Amaranthaceae
14	*Ardisia solanacea* Roxb.	Seti kath	Myrsinaceae
15	*Arisaema sp.*	Sarpako makai	Araceae
16	*Arisaema tortuosum* (Wall.) Schott	Sarpako makai	Araceae
17	*Artemisia indica* Willd.	Pati	Compositae
18	*Arundinella nepalensis* Trin.	Nigalo	Gramineae
19	*Asparagus racemosus* Willd.	Kurilo	Liliaceae
20	*Atrocarpus lakoocha* Wall.	Badahar	Moraceae
21	*Azadirachta indica* A. Juss.	Neem	Meliaceae
22	*Bambusa nepalensis* Stapleton	Choya bans	Gramineae
23	*Bauhinia purpurea* L.	Tanki	Leguminosae
24	*Bauhinia vahlii* Wight & Am.	Bhorla	Leguminosae
25	*Bauhinia variegata* L.	Koiralo	Leguminosae
26	*Begonia tribenensis* C.R. Rao.		Begoniaceae
27	*Bidens pilosa* L.	Kuro	Compositae
28	*Boehmeria rugulosa* Wall.		Urticaceae
29	*Bombax ceiba* L.	Simal	Bombacaceae
30	*Brassaiopsis hainla* (Buch.-Ham. ex D. Don) Seem	Chunetro	Araliaceae
31	*Butea minor* Buch.-Ham. Ex Baker		Leguminosae
32	*Caesalpinia decapitata* (Foth.) Alston	Arilae kanda	Leguminosae
33	*Callicarpa arborea* Roxb.	Guyela	Verbenaceae
34	*Callicarpa macrophylla* Vah.		Verbenaceae
35	*Cannabis sativa* L.	Ganja	Cannabaceae
36	*Capillipedium assimile* (Stut.) A. Camus.	Muse Khari	Gramineae
37	*Cassia tora* L.		Leguminosae
38	*Castanopsis indica* (Roxb.) Miq.	Katus	Fagaceae
39	*Celtis australis* L.	Khari	Ulmaceae
40	*Centella asiatica* (L.) Urban.	Ghodtapre	Umbelliferae
41	*Chonemorpha fragrans* (Moon) Alston		Apocynaceae
42	*Chrysopogon aciculatus* (Retz.) Trin.	Kuro	Gramineae
43	*Cissampelos pareira* L.	Batulpate	Menispermaceae
44	*Cleome viscosa* L.	Ban tori	Capparaceae
45	*Clerodendrum chinense* (Osbeck) Mabberly		Verbenaceae
46	*Clerodendrum indicum* (L.) Kuntze.		Verbenaceae
47	*Clerodendrum japonicm* (Thunb.) Sweet		Verbenaceae
48	*Coccinia grandis* (L.) Viogt.	Goal kankri	Cucurbitaceae
49	*Coelogyne sp.*		Orchidaceae
50	*Colebrookea oppositifolia* Sm.	Dhurseli	Labiatae
51	*Costus speciosus* (Koenig) Sm.		Zingiberaceae
52	*Crateva unilocularis* Buch.-Ham.	Sipligan	Capparaceae
53	*Crotalaria sp.*		Leguminosae

SN	Botanical Name	Local Name	Family
54	*Cuphea sp.*		Lythraceae
55	*Curculigo orchioides* Gaertn.		Hypoxidaceae
56	*Cuscuta reflexa* Roxb.	Akasbeli	Convolvulaceae
57	*Cyanotis cristata* (L.) D. Don		Commelinaceae
58	*Cynoglossum zeylanicum* (Vahl) Thunb. Ex Lehm.	Kuro	Boraginaceae
59	*Cyperus rotundus* L.	Mothe	Cyperaceae
60	*Dalbergia sisoo* Roxb.	Sisoo	Leguminosae
61	*Datura stramonium* L.	Dhaturo	Solanaceae
62	*Daturo metel* L.	Dhaturo	Solanaceae
63	*Dendrobium* sp.		Orchidaceae
64	*Dendrocalamus strictus* (Roxb.) Nees	Bans	Gramineae
65	*Dendrocalamus strictus* (Roxb.) Nees		Gramineae
66	*Desmodium confertum* DC		Leguminosae
67	*Desmodium gangeticum* (L.) DC		Leguminosae
68	*Desmodium laxiflorum* DC		Leguminosae
69	*Desmodium oojeinense* (Roxb.) Ohashi	Sadan	Leguminosae
70	*Desmostachys bipinnat* (L.) Stapf.	Kush	Gramineae
71	*Dioscorea bulbifera* L.	Githa	Dioscoreaceae
72	*Dioscorea deltoidea* Wall. Ex Griseb	Tarul	Dioscoreaceae
73	*Diospyros malabarica* (Desr.) Kostel.	Tendu	Ebenaceae
74	*Drepanostachyum falcatum* (Munro) Keng f.	Phurke ghans	Gramineae
75	*Drepanostachyum intermedium* (Munro) Keng. f.	Nigalo	Gramineae
76	*Drymaria diandra* Blume	Abijalo	Caryophyllaceae
77	*Duabanga grandiflora* (Roxb. ex DC) Walp	Odal	Lythraceae
78	*Elephantopus scaber* L.		Compositae
79	*Engelhardia spicata* Lsch. ex Blume	Mauwa	Juglandaceae
80	*Ensete glaucum* (Roxb.) Cheesman	Ban Kera	Moraceae
81	*Ergrostis tenella* (L.) Beauvois ex Roem. & Sch.		Gramineae
82	*Erythrina stricta* Roxb.	Phaledo	Leguminosae
83	*Eulaliopsis binata* (Retz.) C.E. Hubbard	Babiyo	Gramineae
84	*Eupatorium adenophorum* Spreng.	Banmasa	Compositae
85	*Euphorbia hirta* L.	Dudhe jhar	Euphorbiaceae
86	*Euphorbia pulcherrima* Wild. ex Klotsch.	Lalupate	Euphorbiaceae
87	*Euphorbia royleana* Boiss	Siudi	Euphorbiaceae
88	*Ficus benghalensis* L.	Bar	Moraceae
89	*Ficus benjamina* L.	Sami	Moraceae
90	*Ficus racemosa* L.	Dumbre	Moraceae
91	*Ficus religiosa* L.	Pipal	Moraceae
92	*Ficus sarmentosa* Buch.-Ham. ex Sm.	Bedulo	Moraceae
93	*Ficus semicordata* Buch.-Ham ex Sm.	Khaniyo	Moraceae
94	*Garuga pinnata* Roxb.	Dabdabe	Burseraceae
95	*Globosa racemosa* Sm.		Zingiberaceae
96	*Habenaria sp*.		Orchidaceae
97	*Hedera nepalensis* K. Koch		Araliaceae
98	*Hedychium ellipticum* Buch.-Ham.ex Sm.		Zingiberaceae
99	*Holarrhena pubescens* (Buch.-Ham.) Wall. Ex G. Don	Khirro	Apocynaceae
100	*Hydrocotyle nepalensis* Hook.		Umbelliferae
101	*Ichnocarpus frutescens* (L.) R. Br.		Apocynaceae
102	*Imperata cylindrica* (L.) P. Beauv	Siru	Gramineae
103	*Jasmine caudatum* Wall ex Lindl.	Jasmine	Oleaceae
104	*Jatropa curcas* L.	Sajiwan	Euphorbiaceae
105	*Justicia adhatoda* L.	Asuro	Acanthaceae
106	*Lagerstroemia indica* L.	Asarae	Lythraceae
107	*Lagerstroemia parviflora* Roxb.	Botdhaero	Lythraceae
108	*Lantana camara* L.		Verbenaceae
109	*Leea macrophylla* Roxb. Ex Homen.	Galeni	Leeaceae

SN	Botanical Name	Local Name	Family
110	*Leucas cephalotes* (Roth) Spreng		Labiatae
111	*Leucas lanata* Benth.		Labiatae
112	*Leucosceptrum canum* Sm.		Labiatae
113	*Ligustrum confusum* Decne.		Oleaceae
114	*Litsea monopetala* (Roxb.) Pers.	Kutmero	Lauraceae
115	*Macaranga denticulata* (Blume) Mull. Agr.		Euphorbiaceae
116	*Maesa chisia* Buch.-Ham. ex D.Don	Bilauni	Myrsinaceae
117	*Maesa macrophylla* (Wall.) A. DC.		Myrsinaceae
118	*Mallotus philippensis* (Lam.) Muell.-Arg.	Sindure	Euphorbiaceae
119	*Mangifera indica* L.	Aamp	Anacardiaceae
120	*Melastoma malabathricum* L.		Melastomataceae
121	*Melia azederach* L.		Meliaceae
122	*Melothria heterophylla* (Lour.) Cogn		Cucurbitaceae
123	*Michelia champaca* L.	Chanp	Magnoliaceae
124	*Mimosa pudica* L.		Leguminosae
125	*Momordica dioca* Roxb. ex Willd.	Ban Karela	Cucurbitaceae
126	*Morus nigra* L.	Kimbu kafal	Moraceae
127	*Murraya koenigii* (L.) Spreng.		Rutaceae
128	*Mussaenda macrophylla* Wall.	Dhobini	Rubiaceae
129	*Myrica esculenta* Buch.-Ham. ex D.Don	Kafal	Myricaceae
130	*Nicandra physaloides* (L.) Gaertn.		Solanaceae
131	*Nyctanthes arbor-tristis* L.	Parijat	Oleaceae
132	*Oroxylum indicum* (L.) Kurz.	Tatelo	Bigoniaceae
133	*Osbeckia chinensis* L.		Melastomataceae
134	*Oxalis corniculata* L.	Chariamilo	Oxalidaceae
135	*Pandanus nepalensis* St. John		Pandanaceae
136	*Parthenium hysterophorus* L.		Compositae
137	*Pennisetum purpureum* Schum & Thom.	Nepiar ghans	Gramineae
138	*Phyllanthus amarus* Schumac. & Thonn.		Euphorbiaceae
139	*Phyllanthus emblica* L.	Amala	Euphorbiaceae
140	*Physalis divaricata* D.Don		Solanaceae
141	*Physalis peruviana* L.		Solanaceae
142	*Pilea glaberrima* (Blume.) Blume.		Urticaceae
143	*Piper longum* L.	Pipla	Piperaceae
144	*Plumeria rubra* L.		Apocynaceae
145	*Premna barbata* Wall. ex Schauer	Ginari	Verbenaceae
146	*Pterospermum lanceaefolium* Roxb.	Singane	Sterculiaceae
147	*Pyracantha crenulata* (D.Don) Roem.		Rosaceae
148	*Quamoclit pennata* Bojer		Convolvulaceae
149	*Quisqualis indica* L.		Combretaceae
150	*Rauvolfia serpentina* (L.) Benth.	Sarpagandha	Apocynaceae
151	*Remusatia pumila* (D.Don) H.L. Li & A. Hay	Jaluko	Araceae
152	*Remusatia vivipara* (Roxb.) Schott.	Jaluko	Araceae
153	*Rhus javanica* L.	Bhakimlo	Anacardiaceae
154	*Ricinus communis* L.		Euphorbiaceae
155	*Rock exaduate*	Silajit	
156	*Rubus ellipticus* Smith	Aiselu	Rosaceae
157	*Saccharum spontaneum* L.	Kans	Gramineae
158	*Salvia plebia* R.Br.		Labiatae
159	*Salvia sp.*		Labiatae
160	*Sapindus mukorossi* Gaertn.	Ritha	Sapindaceae
161	*Sapium baccatum* Roxb.	Ban pipal	Euphorbiaceae
162	*Sapium insigne* (Royle) Benth. ex Hook.f.	Khirro	Euphorbiaceae
163	*Sapondias pinnata* (L.f.) Kurz	Amaro	Anacardiaceae
164	*Sarcococca coriacea* (Hook.) Sweet		Buxaceae
165	*Schima wallichii* (DC.) Korth	Chilaune	Theaceae

SN	Botanical Name	Local Name	Family
166	*Scutellaria discolor* Colebr.		Labiatae
167	*Shorea robusta* Gaertn.	Sal	Dipterocarpaceae
168	*Sida rhombifolia* L.		Malvaceae
169	*Sida cordata (*Burm.f.) Borss.		Malvaceae
170	*Sigesbeckia orientalis* L.		Compositae
171	*Smilax ovalifolia* Roxb. ex D. Don.		Liliaceae
172	*Smilax perfoliata* Lour		Liliaceae
173	*Smilax wightii* A. DC.		Liliaceae
174	*Solanum nigrum* L.		Solanaceae
175	*Solanum torvum* Swartz		Solanaceae
176	*Solena heterophylla* Lour.	Bankankri	Cucurbitaceae
177	*Sonchus wightianus* DC.	Mulapate	Compositae
178	*Stephania japonica* var discolor (Miq.) Forman		Menispermaceae
179	*Strobilanthes angustifrons* C.B. Clarke		Acanthaceae
180	*Symplocos pyrifolia* Wallich ex G. Don.	Kali Kath	Symplocaceae
181	*Syzygium cumini* (L.) Skeels	Jamun	Myrtaceae
182	*Tamarindus indica* L.	Amili	Leguminosae
183	*Terminalia alata* Heyne ex Roth	Saj	Combretaceae
184	*Terminalia bellirica* (Gaertn.) Roxb.	Barro	Combretaceae
185	*Terminalia chebula* Retz.	Harro	Combretaceae
186	*Tetrastigma serrulatum* (Roxb.) Planch.		Vitaceae
187	*Themeda arundinacea* (Roxb.) Ridley	Dhadi ghans	Gramineae
188	*Thespesia lampas* (Cav.) Dalzell & Gibson	Ban Kapas	Malvaceae
189	*Thysanolaena maxima* (Roxb.) O. Kuntze	Amriso	Gramineae
190	*Tinospora cordifolia* (Willd.) Miers.	Gurjo	Menispermaceae
191	*Trewia nudiflora* L.	Ramritha	Euphorbiaceae
192	*Urena lobata* L.	Kuro	Malvaceae
193	*Urtica dioca* L.	Sisnu	Urticaceae
194	*Vanda teres* Lindl.		Orchidaceae
195	*Viscum album* L.	Hadchur	Loranthaceae
196	*Vitis lanata* Roxb.		Vitaceae
197	*Woodfordia fruticosa* (L.) Kurz.		Lythraceae
198	*Zizyphus rugosa* Lam	Bayar	Rhamnaceae
199		Sutim lahara	
200		Pahare laharo	
201		Madan laharo	
202		Kharighans	Gramineae
203		Sankha sur	Gramineae
204		Kholesag	
205		Gurbo	
206		Dambarekanda	
207		Phaner kanda	
208		Bafal	
209		Gai Simal	
210		Siudo	Euphorbiaceae

Annex C-4: Ferns Recorded in the Project Area

SN	Botanical Name	Local Name	Family
1	*Adiantum capillus*-veneris L.		Pteridaceae
2	*Adiantum caudatum* L.		Pteridaceae
3	*Adiantum edgworthi* L		Pteridaceae
4	*Adiantum philipense* L.		Pteridaceae
5	*Cheilanthes albomarginata* C.B. Clarke	Ranisinka	Pteridaceae
6	*Cheilanthes dalhosiae* Hooker	Ranisinka	Pteridaceae
7	*Cheilanthes tenuifolia* (Burman fil.) Swarz.	Ranisinka	Pteridaceae
8	*Dryopteris cochleat* (D. Don) C. Chr.	Niuro	Aspidiaceae
9	*Dryopteris filix-mas* (L.) Schott.	Unyu	Aspidiaceae
10	*Equisetum diffusum* D.Don.	Ankhle	Equisetaceae
11	*Lygodium flexuosum* (L.) Sm		Schizaeaceae
12	*Lygodium japonicum*		Schizaeaceae
13	*Nephrolepis cordifolia* (L.) Presl.	Pani Amala	Davalliaceae
14	*Pteris vitata* L.		Pteridaceae
15	*Pteris wallichiana* Agardh.		Pteridaceae
16	*Selaginella sp.*		Selaginellaceae
17	*Sphenomeris chinense*		Pteridaceae
18	*Tectaria macrodonta* (Fee) C. Christensen	Kali Neuro	Dryopteridaceae

Annex C-5: List of Ornamental Plants Recorded in the Project Area

SN	Botanical name	Local Name	Family
1	*Albizia julibrissin* Durazz.	Rato siris	Leguminaceae
2	*Aloe barbadensis* Mill.		Liliaceae
3	*Bougainvillea glabra* Choisy	Madaniphool	Nyctaginaceae
4	*Callistemon lanceolatus* Dc.	Kalki phool	Myrtaceae
5	*Canna sp.*		Zingiberaceae
6	*Cassia nairobensis* Hort.	Gainde phool	Leguminaceae
7	*Cestrum nocturnum* L.		Solanaceae
8	*Cestrum purpreum* Standl.		Solanaceae
9	*Euphorbia milii* Desmoul.	Kande phul	Euphorbiaceae
10	*Euphorbia pulcherrima* Willd	Lalupate	Euphorbiaceae
11	*Gomphrena globosa* L.	Makhamali pul	Amaranthaceae
12	*Hibiscus rosa-sinensis* L.	China rose	Malvaceae
13	*Hibiscus syriacus* L.		Malvaceae
14	*Hydrangea macrophylla* Ser.	Hansaraj	Hydrangeaceae
15	*Justicia sp.*		
16	*Lantana camara* L.	Banfanda kanda	Verbenaceae
17	*Liriope muscari* Bailey		Liliaceae
18	*Malva rotundifolia* L.		Malvaceae
19	*Malvaviscus arboreus* Cav	Ghanti phool	Malvaceae
20	*Mirabilis jalapa* L.		Nyctaginaceae
21	*Nyctanthes arbor-tristis* L.	Parijat	Oleaceae
22	*Opuntia monacantha* Haw.	Naagphani Kanda	Cactaceae
23	*Quamoclit pennata* Bojer	Jayanti	Convolvulaceae
24	*Rosa alba* L.	Gulab	Rosaceae
25	*Salvia coccinea* Juss.		Labiatae
26	*Salvia splendens* Sello		Labiatae
27	*Tagetes erecta* L.	Sayapatri	Compositae
28	*Tagetes patula* L.	Sayapatri	Compositae

Annex C-6: List of Cereals, Pulses, Vegetables, Spices and Fruits Recorded in Project Area

Sn	Local Name	Varieties	Botanical Name	Family
	Cereals			
1	Latte		*Amaranthus caudatus* L.	Amaranthaceae
2	Tori		*Brassica campestris* L.	Cruciferae
3	Sama		*Echinocloa sp.*	Gramineae
4	Kodo	Asoje	*Eleusine coracana* (L.) Gaertn.	Gramineae
5	Kodo	Mangsire	*Eleusine coracana* (L.) Gaertn.	Gramineae
6	Kodo	Jhaure	*Eleusine coracana* (L.) Gaertn.	Gramineae
7	Kodo	Dallo	*Eleusine coracana* (L.) Gaertn.	Gramineae
8	Kodo	Jwai	*Eleusine coracana* (L.) Gaertn.	Gramineae
9	Kodo	Barse	*Eleusine coracana* (L.) Gaertn.	Gramineae
10	Jau		*Hordeum vulgare* L.	Gramineae
11	Dhan	Ashoje	*Oryza sative* L.	Gramineae
12	Dhan	Kartike	*Oryza sative* L.	Gramineae
13	Dhan	Mangsire	*Oryza sative* L.	Gramineae
14	Dhan	Chaite	*Oryza sative* L.	Gramineae
15	Dhan	Local mansuli	*Oryza sative* L.	Gramineae
16	Dhan	Mansuli sudhariyako	*Oryza sative* L.	Gramineae
17	Dhan	Bakkula Mansuli	*Oryza sative* L.	Gramineae
18	Dhan	Aas Mansuli	*Oryza sative* L.	Gramineae
19	Dhan	Madhise	*Oryza sative* L.	Gramineae
20	Junelo		*Sorghum vulagare Pers.*	Gramineae
21	Gahun	Bel 1064	*Triticum aestivum* L.	Gramineae
22	Gahun	RR 21	*Triticum aestivum* L.	Gramineae
23	Makai	Murali	*Zea mays* L.	Gramineae
24	Makai	Thulo (yellow)	*Zea mays* L.	Gramineae
25	Makai	Sano (white)	*Zea mays* L.	Gramineae
26	Makai	Rato	*Zea mays* L.	Gramineae
27	Makai	Khumaltar	*Zea mays* L.	Gramineae
28	Makai	Dumsi	*Zea mays* L.	Gramineae
29	Makai	Rampur	*Zea mays* L.	Gramineae
30	Makai	Arun	*Zea mays* L.	Gramineae
31	Ghaiya	Kalo		Gramineae
32	Ghaiya	Gunte		Gramineae
	Pulses			
1	Chana		*Cicer arietinum* L.	Leguminosae
2	Gahat		*Dolichos biflorus* L.	Leguminosae
3	Simi	Baramase	*Dolichos lablab* L.	Leguminosae
4	Simi	Hiude	*Dolichos lablab* L.	Leguminosae
5	Bhatta	Kalo	*Glycine max* (L.) Merr.	Leguminosae
6	Bhatta	Seto	*Glycine max* (L.) Merr.	Leguminosae
7	Musuro		*Lens culinaris* Medic.	Leguminosae
8	Mas	Kalo	*Phaseolus mungo* L.	Leguminosae
9	Mas	Phurse	*Phaseolus mungo* L.	Leguminosae
10	Mas	Chhiplo	*Phaseolus mungo* L.	Leguminosae
11	Kerau		*Pisum sativum* L.	Cruciferae
12	Bodi	Makai	*Vigna sinensis* L.	Leguminaceae
13	Bodi	Kartike	*Vigna sinensis* L.	Leguminaceae
14	Bodi	Tane	*Vigna sinensis* L.	Leguminaceae
15	Bodi	Prakash	*Vigna sinensis* L.	Leguminaceae
16	Bodi	Akash	*Vigna sinensis* L.	Leguminaceae
17	Bodi	Lumle	*Vigna sinensis* L.	Leguminaceae
18	Bodi	Boshe	*Vigna sinensis* L.	Leguminaceae

Sn	Local Name	Varieties	Botanical Name	Family
	Vegetables			
1	Ludesag		*Amaranthus viridis* L.	Amaranthaceae
2	Kauli		*Brassica oleraceae* var botrys L.	Cruciferae
3	Banda		*Brassica oleraceae* var capitata L.	Cruciferae
4	Sag		*Brassica sp.*	Cruciferae
5	Khursani	Jire	*Capsicum frutescens* L.	Solanaceae
6	Khursani	Dalle	*Capsicum frutescens* L.	Solanaceae
7	Karkalo		*Colocasia antoquorum* var. esculenta L.	Araceae
8	Pidalu		*Colocasia antoquorum* var. esculenta L.	Araceae
9	Kakro		*Cucumis sativus* L.	Cucrubitaceae
10	Pharsi	Lamo	*Cucurbita pepo* L.	Cucrubitaceae
11	Pharsi	Dallo	*Cucurbita pepo* L.	Cucrubitaceae
12	Gajar		*Daucos carota* L.	Umbellifeare
13	Bhindi		*Hibiscus esculentus* L.	Malvaceae
14	Sakharkhanda		*Ipomoea batata* (L.) Lam.	Convolvulaceae
15	Lauka		*Lagenaria siceraria* (Molina) Standl.	Cucrubitaceae
16	Chamsur		*Lepidium sativum* L.	Cruciferae
17	Ghiraula		*Luffa cylindrica* (L.) Roem	Cucrubitaceae
18	Tamatar	Selsel	*Lycopersicum esculentum* Mill.	Solanaceae
19	Tamatar	Manisha	*Lycopersicum esculentum* Mill.	Solanaceae
20	Karela	Seto	*Momordica chanrantia* L.	Cucrubitaceae
21	Karela	Kalo	*Momordica chanrantia* L.	Cucrubitaceae
22	Mula		*Raphnus sativus* L.	Cruciferae
23	Ishkush		*Sechium edule* (Jacq.) Sw.	Cucrubitaceae
24	Bhenta	Jire	*Solanum melongena* L.	Solanaceae
25	Bhenta	Lamo	*Solanum melongena* L.	Solanaceae
26	Bhenta	Dallo	*Solanum melongena* L.	Solanaceae
27	Aalu		*Solanum tuberosum* L.	Solanaceae
28	Palungo		*Spinacea oleracea* L	Cruciferae
29	Chichinda		*Trichosanthes anguina* L.	Cucrubitaceae
	Spices			
1	Pyaj		*Allium cepa* L.	Amaryllidaceae
2	Lasun		*Allium stivum* L.	Amaryllidaceae
3	Dhaniya		*Coriandrum stivum* L	Umbelliferae
4	Beshar		*Curcuma angustifolia* Roxb.	Zingiberaceae
5	Aduwa		*Zingiber officinale* Rosc.	Zingiberaceae
	Fruits			
1	Bhuikatar		*Ananas comosus* (L.) Merr.	Bromeliaceae
2	Rukhkhatar		*Atrocarpus integra* (Thunb.) Merr.	Moraceae
3	Mewa		*Carica papaya* L.	Caricaceae
4	Kagati		*Citrus aurantifolia* (Chirst.) Swingle.	Rutaceae
5	Nimbuwa		*Citrus lemon* (L.) Burn f.	Rutaceae
6	Bhogate		*Citrus maxima* (Burn.) Herr.	Rutaceae
7	Suntala		*Citrus reticulata* Blanco.	Rutaceae
8	Litchi		*Litchi chinensis* Sonner.	Sapindaceae
9	Amp		*Mangifera indica* L.	Anacardiaceae
10	Kimbukafal		*Morus nigra* L.	Moraceae
11	Kera	Malunge	*Musa paradisica* L.	Musaceae
12	Kera	Ghyu	*Musa paradisica* L.	Musaceae
13	Kera	Muhure	*Musa paradisica* L.	Musaceae
14	Kafal		*Myrica esculenta* Buch.-Ham. ex D.Don	Myricaceae
15	Aaru		*Prunus persica* (L.) Batsch.	Rosaceae
16	Aamba		*Psidium gujava* L.	Myrtaceae
17	Naspati		*Pyrus communis* L.	Rosaceae
18	Ukhu		*Saccharum officinarum* L.	Gramineae

Sn	Local Name	Varieties	Botanical Name	Family
19	Angur		*Vitis vinifera* L.	Vitaceae

Annex C-7: List of Plants Recorded in the Project Area with Various Ethnobotanical Uses

Table C–7.1: List of Plant used to make Agriculture Implements

SN	Local Name	Botanical name	Implements
1	Sadan	*Desmodium oojeinense* (Roxb.) Ohashi	Plough
2	Chilaune	*Schima wallichii* (DC.) Korth	Axe/Sickle handle
3	Sal	*Shorea robusta* Gaertn.	Plough
4	Kali kath	*Symplocos pyrifolia* Wallich ex G. Don.	Axe/Sickle handle
5	Ban khirro		Sickle case

Table C–7.2: List of Edible Plant of Project Area

SN	Local Name	Botanical name	Parts uses	Use value
1	Bel	*Aegle marmelos* (L.) Corr.	Fruit	Fruit
2	Kurilo	*Asparagus racemosus* Willd.	Young shoot	Vegetable
3	Choya bans	*Bambusa nepalensis* Stapleton	Young shoot	Vegetable
4	Koiralo	*Bauhinia variegata* L.	Flower	Pickle
5	Katus	*Castanopsis indica* (Roxb.) Miq.	Fruit	Fruit
6	Ban tori	*Cleome viscosa* L.	Seed	Spice
7	Gol kankri	*Coccinia grandis* (L.) Viogt.	Fruit	Fruit
8	Sipligan	*Crateva unilocularis* Buch.-Ham.	Young shoots	Vegetable
9	Githa	*Dioscorea bulbifera* L.	Fruit	Vegetable
10	Tarul	*Dioscorea deltoidea* Wall. Ex Griseb	Tuberous root	Vegetable
11	Ban kera	*Ensete glaucum* (Roxb.) Cheesman	Fruit	Fruit
12	Dumbre	*Ficus racemosa* L.	Fruit	Fruit
13	Bedulo	*Ficus sarmentosa* Buch.-Ham. ex Sm.	Fruit	Fruit
14	Khaniyo	*Ficus semicordata* Buch.-Ham ex Sm.	Fruit	Fruit
15	Ban karela	*Momordica dioca* Roxb. ex Willd.	Fruit	Vgetable
16	Kimbu kafal	*Morus nigra* L.	Fruit	Fruit
17	Kafal	*Myrica esculenta* Buch.-Ham. ex D.Don	Fruit	Fruit
18	Paniamala	*Nephrolepis cordifolia* (L.) Presl.	Tuberous root	Fruit
19	Jaluko	*Remusatia vivipara* (Roxb.) Schott.	Tender shoots	Vegetable
20	Bhakimlo	*Rhus javanica* L.	Fruit	Fruit
21	Aiselu	*Rubus ellipticus* Smith	Fruit	Fruit
22	Amaro	*Sapondias pinnata* (L.f.) Kurz	Fruit	Fruit
23		*Smilax ovalifolia* Roxb. ex D. Don.	Young shoots	Vegetable
24	Jamun	*Syzygium cumini* (L.) Skeels	Fruit	Fruit
25	Kali Niuro	*Tectaria macrodonta* (Fee) C. Christensen	Young shoots	Vegetable
26	Sisnu	*Urtica dioca* L.	Young shoots	Vegetable
27	Bayar	*Zizyphus rugosa* Lam	Fruit	Fruit/Pickle
28	Gurbo (Mag.)		Young shoots	Vegetable
29	Bochesing (Mag.)		Fruit	Fruit

Table C–7.3: List of Plants Commonly used in Fencing

SN	Local Name	Botanical name
1	Siudi	*Euphorbia royleana* Boiss
2	Sajiban	*Jatropa curcas* L.

Table C–7.4: List of Plants used for Making Local Wine (Fermentation)

SN	Local Name	Botanical name
1	Bhui Katahar	*Ananas comosus* (L.) Merr.
2	Rukha Katahar	*Atrocarpus integra* (Thunb.) Merr.
3	Rudilo	*Clerodendrum indicum* (L.) Kuntze.
4	Pipla	*Piper longum* L.
5	Ukhu	*Saccharum officinarum* L.
6	Mula pate	*Sonchus wightianus* DC.
7	Bheduwa	

Table C–7.5: Plants of Fiber Use Value

SN	Local Name	Botanical name
1	Bhorla	*Bauhinia vahlii* Wight & Am.
2	Kubhindo	*Cucurbita pepo* L.
3	Odal	*Duabanga grandiflora* (Roxb. ex DC) Walp
4	Babiyo	*Eulaliopsis binata* (Retz.) C.E. Hubbard

Table C–7.6: Plants Used in Fish Poisoning

SN	Local Name	Botanical name	Parts used
1	Bhogate	*Maesa macrophylla* (Wall.) A. DC.	Leaf
2	Khirro	*Sapium baccatum* Roxb.	Leaf
3	Chilaune	*Schima wallichii* (DC.) Korth	Bark

Table C–7.7: Plants Used as Fodder

SN	Local Name	Botanical name
1	Bhorla	*Bauhinia vahlii* Wight & Am.
2	Sadan	*Desmodium oojeinense* (Roxb.) Ohashi
3	Dumbre	*Ficus racemosa* L.
4	Bedulo	*Ficus sarmentosa* Buch.-Ham. ex Sm.
5	Khaniyo	*Ficus semicordata* Buch.-Ham ex Sm.
6	Dabdabe	*Garuga pinnata* Roxb.
7	Ginari	*Premna barbata* Wall. ex Schauer
8	Sal	*Shorea robusta* Gaertn.
9	Saj	*Terminalia alata* Heyne ex Roth

Table C–7.8: Medicinal Plants used in Different Disease/Disorder

SN	Local Name	Botanical name	Parts uses	Mode of use	Disease/disorder
1	Khayar	*Acacia catechu* (L.f.) Willd.	Wood	Decoction	Body ache; Stomachache; as tea
2	Bojho	*Acorus calamus* L.	Root		Cough
3	Bel	*Aegle marmelos* (L.) Corr.	Fruit/bark	Pulp; Juice;Decoction	Diarrhoea/ Stomachache
4	Gande	*Ageratum conyzoides* L.	Leaf	Juice	Cut
5	Chhatiwan	*Alstonia scholaris* (L.) R. Br.	Stem	Latex	Sprain
6	Amba	*Psidium guajava* L.	Young shoots	Juice	Stomachache
7	Titepati	*Artemisia indica* Willd.	Leaf	- Juice - Juice+ Justicia sp.	Cut and wound; Boils; Worms - Worms on young buffalo
8	Kurilo	*Asparagus racemosus* Willd.	Root	Paste; Juice	Lactative; Refreezerant
9	Badahar	*Atrocarpus lakoocha* Wall.	Bark	Juice	Stomachache
10	Neem	*Azadirachta indica* A. Juss.	Leaf	Juice	Cooling; Toothache, Malarian fever; Diarrhoea
11	Koiralo	*Bauhinia variegata* L.	Bark	- Juice - Mangifera and Aegle juice	Diahhroea; Refrigerant
12		*Begonia* sp.	Whole plant	Juice	Stomachache
13		*Boehmeria rugulosa* Wall.	Leaf	Paste	Wound
14	Aank	*Calotropis gigantea* (L.) Dryand.	Stem	Latex	Sprain
15	Ganja	*Cannabis sativa* L.	Leaf	Paste	Diarrhoea of cattle
16	Godtapre	*Centella asiatica* (L.) Urban.	Whole plant	Juice	Fever; Refreezerant ;Urine infection
17	Ranisinka	*Cheilanthes dalhosiae* Hooker	Whole plant	Juice	Stomachache
18	Batulpate	*Cissampelos pareira* L.	Root	Juice	Stomachache ; Problem due to oily food
19	Rudilo	*Clerodendrum indicum* (L.) Kuntze.	Leaf	Juice	Fever; Headache; Cold and Cough
20	Akasbeli	*Cuscuta reflexa* Roxb.	Whole plant	Juice	Jaundice
21	Abijalo	*Drymaria diandra* Blume	Leaf	Juice	Fever
22	Sahasrbuti	*Elephantopus scaber* L.	Root	Juice	Refrigerant
23	Bankera	*Ensete glaucum* (Roxb.) Cheesman	Root	Juice	Urine infection; Refrigerant
24	Phadelo	*Erythrina stricta* Roxb.	Bark	Juice	Refrigerant
25	Babiyo	*Eulaliopsis binata* (Retz.) C.E. Hubbard	Young leaves	Paste	Bone fracture
26	Banmasa	*Eupatorium adenophorum* Spreng.	Leaf	Juice	Cut
27	Dude	*Euphorbia hirta* L.	Leaf	Juice	Cut
28	Khniyo	*Ficus semicordata* Buch.-Ham ex Sm.	Root	Juice	Urine infection; Refrigerant
29	Sajiban	*Jatropa curcas* L.	Stem	Juice; Latex	Cuts and Wounds
30	Rohini	*Mallotus philippensis* (Lam.) Muell.-Arg.	Bark	Decoction	Stomachache ; Refrigerant
31	Aanp	*Mangifera indica* L.	Bark	Decoction;Juice	Stomachache; Rheumatism

SN	Local Name	Botanical name	Parts uses	Mode of use	Disease/disorder
32	Champ	*Michelia champaca* L.	Leaf	Paste	Leg fracture of cattle
33	Lajjawati	*Mimosa pudica* L.	Root	Juice	Refrigerant
34	Kimbu kafal	*Morus nigra* L.	Root	Juice	Worms
35	Dhobini	*Mussaenda macrophylla* Wall.	Root	Juice	Fever
36	Kafal	*Myrica esculenta* Buch.-Ham. ex D.Don	Bark	Decoction	Blood dysentery; Bleeding from tooth
37	Chariamilo	*Oxalis corniculata* L.	Whole plant	Juice	Fever
38	Amala	*Phyllanthus emblica* L.	Fruit and bark	Juice; Decoction	Cough and cold
39	Pipla	*Piper longum* L.	Fruits	Freshry	Cough
40	Gineri	*Premna barbata* Wall. ex Schauer	Leaf	Juice with fitkiri	Headache
41	Aiselu	*Rubus ellipticus* Smith	Root	Juice	Urine infection
42	Kans	*Saccharum spontaneum* L.	Root	+ rohini +Pipla + Rani sinka+ gujargano	Stomachache
43	Amaro	*Sapondias pinnata* (L.f.) Kurz	Bark	Paste	Rheumatism
44	Sal dhup	*Shorea robusta* Gaertn.	Latex		Blood dysentery
45		Silajit			Diarrhoea /boils
46	Kantakari	*Solanum surattense* Burm. f.	Fruit	Smoke	Toothache
47	Jamun	*Syzygium cumini* (L.) Skeels	Bark	Juice	Cough, Headache, Sinusites
48	Kali Neuro	*Tectaria macrodonta* (Fee) C. Christensen	Rhizome	Juice	Blood dysentery
49	Barro	*Terminalia bellirica* (Gaertn.) Roxb.	Fruit	Pulp	Cough
50	Harro	*Terminalia chebula* Retz.	Fruit	Pulp	Cough
51	Ban kapas	*Thespesia lampas* (Cav.) Dalzell & Gibson	Whole plant	Paste; Juice	Cut for cattle; wound of human; sprain; Bone fracture of man and cattle
52	Gurjo	*Tinospora cordifolia* (Willd.) Miers.	Stem	Juice	Sprain; Refrigerant
53	Goya	*Vanda teres* Lindl.	Fruit	Pulp	Bone fracture
54	Hadchur	*Viscum album* L.	Leaf	Paste	Facture
55	Dhairo	*Woodfordia fruticosa* (L.) Kurz.	Flower	Juice	Stomachache
56	Bayar	*Zizyphus rugosa* Lam	Seed/root	Juice	Stomachache; Refrigerant ;Smallpox
57	Bheduwa		Leaf	Paste	Boils
58	Ghutuk		Fruit		Refrigerant

Table C–7.9: Plants of Religious Value

SN	Local Name	Botanical name
1	Bojho	*Acorus calamus* L.
2	Titepati	*Artemisia indica* Willd.
3	Katus	*Castanopsis indica* (Roxb.) Miq.
4	Kush	*Desmostachys bipinnat* (L.) Stapf.

Table C–7.10: Plants Used for Roofing

SN	Local Name	Botanical name
1	Babiyo	*Eulaliopsis binata* (Retz.) C.E. Hubbard
2	Khar	*Themeda triandra* Forssk

Table C–7.11: Plants of Timber Value

SN	Local Name	Botanical name
1	Karma	*Adina cordifolia* (Willd. Ex Roxb.) Benth. & Hook.f. ex Brandis
2	Seto siris	*Albizia chinensis* (Osbeck) Merr.
3	Kalo siris	*Albizia lebbeck* (L.) Bentham
4	Padke	*Albizia lucidior* (Steudel) I. Nielson ex Hara
5	Katus	*Castanopsis indica* (Roxb.) Miq.
6	Sisoo	*Dalbergia sisoo* Roxb.
7	Sadan	*Desmodium oojeinense* (Roxb.) Ohashi
8	Mauwa	*Engelhardia spicata* Lsch. ex Blume
9	Rohini	*Mallotus philippensis* (Lam.) Muell.-Arg.
10	Aamp	*Mangifera indica* L.
11	Sigane	*Pterospermum lanceaefolium* Roxb.
12	Ban papal	*Sapium baccatum* Roxb.
13	Khirro	*Sapium insigne* (Royle) Benth. ex Hook.f.
14	Chilaune	*Schima wallichii* (DC.) Korth
15	Sal	*Shorea robusta* Gaertn.
16	Kali kath	*Symplocos pyrifolia* Wallich ex G. Don.
17	Saj	*Terminalia alata* Heyne ex Roth

Annex C-8: Unit Cost for the Afforestation in the Spoil Bank

SN	Particulars	Total required (number)/ha	Unit Rate (NRs.)	Total (NRs.)
1	Seedling procurement	1600	4/seedling	6400
2	Site clearance and development (workers)	300	150/per worker/day	45000
3	Burrow holes for plantation (workers)	40	150/per worker/day	6000
4	Seedling transportation by vehicle from nursery to site (one day)	1	5000/day	5000
5	Seedling transportation afforestation site (workers)	2	150/per worker/day	300
6	Plantation (workers)	20	150/per worker/day	3000
7	Watering and protection (1 workers)	5 years	36000/year	180000
			Total/ha	**245700**

Note: The cost calculation is based on Forest Norms, 2003

Annex C-9 Fish Species Observed at Different Sampling Station and their Measurement

Table C-9.1: Species Composition and Measurement at Different Sampling Stations in July 2006:

Sampling Station	Scientific Name	Common Name	Total	Avg. Size of the Total Caught (cm)	Avg. weight of the Total Caught (g)
1. A.	*Glyptothorax trilineatus*	Kavre	1	10	9
B.	*Labeo angra*	Gardi	2	13	32.5
C.	*Labeo dero*	Gardi	3	16.8	73.3
D.	*Neolischeilus hexagonolepis*	Katle	3	16	95
E.	*Tor Pititora*	Sahar	1	15.5	65
F.	*Chagunius chagunio*	Gadeni,Rewa	2	13.25	42.5
G.	*Garra annandalei*	Lohari,Buduna	3	13.6	41.6
H.	*Garra goytla*	Buduna	1	13	30
I.	*Botia almorhae*	Baghi	1	11.5	35
J.	*Noemacheilus rupicola*	Gadela	1	7.5	15
K.	*Mastacembalus armathus*	Bam	1	35	200
		Total:	**19**		
2. A.	*Mystus aor*	Tanger	1	44	500
B.	*Chagunius chagunio*	Gadeli	3	17	90
C.	*Labeo dero*	Gardi	2	14.6	55
D.	*Tor putitora*	Sahar	2	18	72.5
		Total:	**8**		
3. A.	*Neolissocheilus hexagonolepis*	Katle	1	16	100
B.	*Glyptothorax telchitta*	Kotle	2	9.25	10
C.	*Tor Putitora*	Sahar	1	16.5	80
D.	*Barilius barila*	Fageta	5	4.8	4.1
		Total:	**9**		
4.A	*Pseudocheneis sulcautus*	Katanga,Kabre	2	6.75	10
B.	*Glyptothorax telchitta*	Kotel,Katanga	12	12.7	18.5
C.	*Mastacembalus armathus*	Bam	3	23	12.3
D.	*Noemacheilus rupicola*	Gadela	1	6	5
E.	*Barilius barila*	Fageta	5	6.5	7.6
F.	*Neolissocheilus hexagonolepis*	Katle	3	8.16	18.3
G.	*Garra goytla*	Buduna	1	13.5	20
		Total:	**27**		
5.A.	*Barilius barila*	Fageta	4	5.5	7.25
B.	*Clupisoma garua*	Jalkapoor	2	21.75	100
C.	*Tor putitora*	Sahar	1	24	150
D.	*Labea dero*	Gardi	1	15	30
E.	*Channa punctatus*	Hile	1	7.5	10
		Total:	**9**		
6.A.	*Neolissocheilus hexagonolepis*	Katle	2	12	14
B.	*Barilius barila*	Fageta	6	6.16	7.8
C.	*Tor pitutor*	Sahar	2	9.25	12.5
D.	*Noemacheilus rupicola*	Gadela	6	5.41	7.25
		Total:	**16**		
7.A.	*Neolischeilus hexagonolepis*	Katle	4	17.5	97.5
B.	*Glypothorax cavia*	Kataga	1	19	100
C.	*Tor putitora*	Sahar	4	11.75	22.25
D.	*Labeo dero*	Gardi	3	8.33	15
		Total:	**12**		

Table C-9.2: Species Composition and Measurement at Different Sampling Stations in October 2006

Sampling Station	Scientific Name	Common Name	Total	Avg. Size of the Total Caught (cm)	Avg. weight of the Total Caught (g)
1.	-	-	-	-	-
		Total:	**-**	**-**	**-**
2. A.	*Neolissocheilus hexagonolepis*	Katle	3	21.3	106.6
B.	*Chagunius chagunio*	Gadeli,Rewa	5	17	50
C.	*Labeo dero*	Gardi	11	141.6	22.7
D.	*Labeo angra*	Gardi	2	18	72.5
E.	*Tor putitora*	Sahar	1	24	200
F.	*Garra goytla*	Buduna	2	14.5	21
G.	*Schizothorax richardsonii*	Asala	1	27	150
		Total:	**25**		
3. A.	*Garra goytla*	Buduna	3	13.66	50
B.	*Labeo angra*	Gardi	1	73	900
		Total:	**4**		
4.A	*Garra goytla*	Buduna	3	15.4	38.3
B.	*Labeo dero*	Gardi	1	19.4	75
C.	*Mastacembalus armathus*	Bam	1	42.6	120
		Total:	**5**		
5.A	*Chagunius chagunio*	Gadeni,Rewa	1	13	7
B.	*Botia almorhae*	Baghi	1	14	10
C.	*Neolissocheilus hexagonolepis*	Katle	1	10	5
D.	*Garra goytla*	Buduna	2	25	17
		Total:	**5**		
6.A.	*Neolissocheilus hexagonolepis*	Katle	1	15	50
B.	*Barilius barila*	Fageta	3	9	2
C.	*Garra goytla*	Buduna	1	11	3
D.	*Botia almorhae*	Baghi	1	13.5	5
E.	*Channa gachua*	Hile	2	10.5	4
F.	*Clupisoma garua*	Jalkapoor	1	20	150
		Total:	**9**		
7.A.	*Neolischeilus hexagonolepis*	Katle	6	12.8	10.8
B.	*Clupisoma garua*	Jalkapoor	1	23	50
C.	*Barilius bendelisis*	Fageta	13	9.6	4.7
D.	*Barilius barila*	Fageta	5	5.4	0.46
E.	*Puntius conchonius*	Karange	3	5.5	4.1
F.	*Noemacheilus rupicola var inglish*	Gadela	2	5	0.05
		Total:	**30**		

Table C-9.3: Percentage of Single Fish Species at each Sampling Stations in July 2006

S.N	Scientific Name	Sampling Station														Total Catch	Total Catch %
		1		2		3		4		5		6		7			
		N.C	%	N.C	%	N.C	%	N.C	%	N.C	%	N.C	%	N.C	%		
1.	*Mystus menoda*	1	5.26	-	-	-	-	-	-	-	-	-	-	-	-	1	1
2.	*Labeo dero*	3	15.78	2	25	-	-	-	-	1	11.11	-	-	3	25	9	9
3.	*Labeo angra*	2	10.52	-	-	-	-	-	-	-	-	-	-	-	-	2	2
4.	*Neolissocheilus hexagonolepis*	3	15.78	-	-	1	12.5	3	11.11	-	-	2	12.5	4	33.33	13	13
5.	*Tor Pititora*	1	5.26	2	25	-	-	3	11.11	1	11.11	2	12.5	4	33.33	10	10
6.	*Chagunius chagunio*	2	10.52	3	37.8	-	-	-	-	-	-	-	-	-	-	5	5
7.	*Garra annandalei*	3	15.78	-	-	-	-	-	-	-	-	-	-	-	-	3	3
8.	*Garra goytla*	1	5.26	-	-	-	-	1	3.70	-	-	-	-	-	-	2	2
9.	*Botia almorhae*	1	5.26	-	-	-	-	-	-	-	-	-	-	-	-	1	1
10.	*Noeimacheilus rupicola*	1	5.26	-	-	-	-	1	3.70	-	-	6	37.5	-	-	8	8
11.	*Mastacembalus armatus*	1	5.26	-	-	-	-	3	11.11	-	-	-	-	-	-	4	4
12.	*Mystus aor*	-	-	1	12.5	-	-	-	-	-	-	-	-	-	-	1	1
13.	*Glyptothorax telchitta*	-	-	-	-	2	25	12	44.44	-	-	-	-	-	-	14	14
14.	*Barilius barila*	-	-	-	-	5	62.5	5	18.51	4	44.44	6	37.5	-	-	20	20
15.	*Pseudocheneis sulcautus*	-	-	-	-	-	-	2	7.40	-	-	-	-	-	-	2	2
16.	*Clupisoma gavua*	-	-	-	-	-	-	-	-	2	22.22	-	-	-	-	2	2
17.	*Channa punctatus*	-	-	-	-	-	-	-	-	1	11.11	-	-	-	-	1	1
18.	*Glypothorax cavia*	-	-	-	-	-	-	-	-	-	-	-	-	1	8.33	1	1
															Total:	**100**	**100**

Table C-9.4: Percentage of Single Fish Species at each Sampling Stations in October 2006

S.N	Scientific Name	Sampling Station														Total Catch	Total Catch %
		1		2		3		4		5		6		7			
		N.C	%	N.C	%	N.C	%	N.C	%	N.C	%	N.C	%	N.C	%		
1.	*Labeo dero*	-	-	11	44	-	-	1	20	-	-	-	-	-	-	12	15.38
2.	*Labeo angra*	-	-	2	8	1	25	-	-	-	-	-	-	-	-	3	3.84
3.	*Neolissocheilus hexagonolepis*	-	-	3	12	-	-	-	-	1	20	1	11.1	1	3.3	6	7.69
4.	*Tor Pititora*	-	-	1	4		-	-	-	-	-	-		-	-	1	1.28
5.	*Chagunius chagunio*	-	-	5	20	-	-	-	-	1	20	-		-	-	6	7.69
6.	*Schizothorax richardsonii*	-	-	1	4	-	-	-	-	-	-	-	-	-	-	5	6.41
7.	*Garra goytla*	-	-	2	8	3	75	3	60	2	40	1	11.1	-	-	11	14.10
8.	*Botia almorhae*	-	-	-	-	-	-	-	-	1	20	1	11.1	-	-	2	2.56
9.	*Noemacheilus rupicola var inglish*	-	-	-	-	-	-	-	-	-	-	-	-	2	6.6	2	2.56
10.	*Mastacembalus armatus*	-	-	-	-	-	-	1	20	-	-	-	-	-	-	1	1.28
11.	*Barilius bendelisis*	-	-	-	-	-	-	-	-	-	-	-	-	13	43.3	13	16.66
12.	*Barilius barila*	-	-	-	-	-	-	-	-	-	-	3	33.3	5	16.6	8	10.25
13.	*Clupisoma gavua*	-	-	-	-	-	-	-	-	-	-	1	11.1	1	3.3	2	2.56
14.	*Channa gachua*	-	-	-	-	-	-	-	-	-	-	2	22.2	-	-	2	2.56
15.	*Puntius conchonius*	-	-	-	-	-	-	-	-	-	-	-	-	3	10	3	3.84
															Total:	**78**	

Annex C-10: Phytoplankton and Zooplankton Species Composition/Distribution Pattern and Diversity

S.N.	Species	Station 1		Station 2		Station 3		Station 4		Station 5		Station 6		Station 7	
		Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling
Phytoplankton															
A	**Bacillariophyceae**														
1	*Amphora ovalis*	+	+	-	+	+	+	-	+	+	+	+	+	-	+
2	*Caratonies arcus*	-	-	-	+	-	-	-	-	-	+	-	-	-	-
3	*Cyclotella stelligera*	-	+	+	+	-	-	-	+	+	-	-	+	-	+
4	*Cymatopleura solea*	-	+	+	+	-	+	+	+	-	-	-	-	-	-
5	*Cymatopleura elliptica*	-	+	-	-	-	-	-	+	-	+	-	-	-	+
6	*Cymbella cistula*	+	+	-	+	+	+	+	+	-	+	-	+	+	+
7	*Cymbella cymbiformis*	-	+	-	+	-	+	-	+	-	+	-	+	-	+
8	*Cymbella tumida*	+	+	+	+	-	+	-	+	+	+	-	+	-	+
9	*Fragilaria capucina*	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10	*Fragilaria verescens*	+	-	+	-	+	-	+	-	+	-	+	-	+	-
11	*Gomphonema geminatum*	-	+	-	-	-	+	-	-	-	-	-	+	-	+
12	*Gyrosigma kutzingii*	-	-	-	-	-	-	+	-	+	-	-	-	-	-
13	*Gyrosigma acuminatum*	-	+	-	-	-	+	-	+	-	-	-	-	-	-
14	*Melosira granulata*	-	+	-	+	+	+	-	+	-	+	+	+	-	+
15	*Melosira islandica*	+	+	+	+	+	+	+	+	+	+	+	+	+	+
16	*Melosira verians*	-	-	+	+	-	+	+	+	+	-	-	-	-	+
17	*Navicula viridula*	-	-	+	-	+	-	-	-	-	-	-	-	+	-
18	*Navicula cuspidata*	-	+	-	+	-	+	-	+	-	+	-	+	-	+
19	*Navicula radiosa*	+	+	-	+	+	-	-	-	-	-	+	-	+	-
20	*Nedium affine*	-	+	-	-	-	+	-	+	-	-	-	-	+	+
21	*Nitzschia palea*	-	+	-	-	-	+	-	+	-	-	-	+	-	+
22	*Nitzschia linearis*	-	+	-	+	-	+	-	-	-	-	-	-	-	-
23	*Pinnularia gibba*	-		-	-	+	-	-	-	-	-	+	-	-	-
24	*Pinnularia gentilis*	-	+	-	+	-	+	-	+	-	+	-	-	-	-
25	*Pinnularia viridis*	-	+	+	-	+	+	-	+	+	-	+	-	-	-
26	*Rhizosolenia sp.*	+	-	-	-	-	-	-	-	-	-	-	-	+	-
27	*Stauroneis anceps*	+	+	+	+	+	+	-	+	-	+	-	+	-	+

S.N.	Species	Station 1		Station 2		Station 3		Station 4		Station 5		Station 6		Station 7	
		Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling
28	*Stauroneis phoenicenteron*	-	+	-	-	-	-	-	+	-	-	-	-	-	+
29	*Stauronis acuta*	-	+	-	+	-	+	-	+	-	+	-	+	-	-
30	*Stauronis anceps*	-	-	+	-	-	-	+	-	+	-	-	-	-	-
31	*Surirella robusta*	+	+	-	+	+	+	-	+	-	+	+	+	-	+
32	*Synedra affinis*	+	+	+	+	+	+	+	+	+	+	+	+	+	+
33	*Synedra ulna*	+	+	+	+	+	+	+	+	+	+	+	+	+	+
34	*Tabellaria binalis*	-	+	-	-	-	+	-	-	-	-	-	-	-	-
35	*Tabellaria fenestrata*	-	-	-	+	+	+	+	-	-	-	-	-	+	+
36	*Frustulia vulgarus*	-	-	-	+	-	+	-	-	-	-	-	-	-	+
37	*Staurastrum gracile*	-	-	-	+	-	+	-	+	-	+	-	+	-	+
B	**Pyrophyceae**														
38	*Peridinium pusillum*	-	-	-	+	-	-	-	+	-	+	-	-	-	-
C	**Cyanophyceae**														
39	*Lyngbya limnetica*	-	+	-	+	-	-	-	+	-	-	-	+	-	-
40	*Lyngbya major*	-	+	-	+	+	+	-	+	+	+	-	-	-	+
41	*Merismopedia tenuissina*	+	+	-	-	+	+	+	+	-	-	+	-	+	+
42	*Microchate tenera*	+	+	+	+	-	+	+	+	-	+	-	+	-	+
43	*Nostochopsis labatus*	-	-	-	-	-	+	-	+	-	-	-	-	-	-
44	*Oscillatoria irrigua*	+	+	+	+	+	+	+	+	+	+	+	+	+	+
45	*Oscillatoria obscura*	-	-	-	+	-	-	+	+	+	+	-	-	-	-
46	*Spirulina platensis*	+	+	+	+	-	-	-	+	-	-	+	+	-	-
47	*Gloeotrichia sp.*	-	+	-	+	-	-	-	-	-	-	-	+	-	-
48	*Nostoc sp.*	-	-	-	-	-	+	-	+	-	-	-	-	-	-
D	**Chlorophyceae**														
49	*Ankistrodesmus falcatus*	-	+	-	+	+	+	+	+	-	+	-	+	+	+
50	*Chaetophora incerssata*	-	+	-	-	-	+	-	-	-	+	-		-	-
51	*Cladophora glomerata*	-	-	-	+	-	-	-	-	-	-	-	+	-	-
52	*Closterium moniliferum*	+	+	-	+	-	+	+	+	-	+	-	+	+	+
53	*Closterium pravulam*	-	-	-	-	-	-	+	-	-	-	-	-	-	-
54	*Closterium beiblinii*	`	-	-	+	-	+	-	-	-	-	-	+	-	-
55	*Cosmarium quadrum*	-	+	-	-	-	-	-	-	-	+	-	-	-	+

S.N.	Species	Station 1		Station 2		Station 3		Station 4		Station 5		Station 6		Station 7	
		Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling
56	*Cosmarium binum*	-	+	-	+	-	-	-	-	-	+	-	-	-	+
57	*Genicularia elegans*	-	+	+	+	-	+	+	+	+	+	-	-	+	+
58	*Microspora floccosa*	-	-	-	+	-	+	-	-	-	-	-	-	-	+
59	*Sirogonium sitcticum*	-	+	-	+	-	-	-	+	-	-	-	+	-	-
60	*Spirogyra rhizobrachialis*	+	+	+	+	+	+	+	+	+	+	+	+	+	+
61	*Spirogyra setiformis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	*Spirogyra weberi*	-	+	+	+	-	-	-	+	+	-	-	-	-	+
63	*Stigeoclonum tenue*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	*Treubaria crassispina*	+	+	+	-	-	+	+	+	-	+	-	+	+	+
65	*Ulethrix variabilis*	-	+	-	+	-	+	-	+	-	+	-	+	-	+
66	*Ulethrix zonata*	-	+	-	+	+	+	+	+	-	+	-	-	-	+
67	*Netrium digitus*	-	-	-	+	-	+	-	-	-	+	-	-	-	+
E	**Xanthophyceae**														
68	*Tribonema utriculosum*	-	+	+	-	-	+	-	+	+	+	-	+	+	+
69	*Tribonema minus*	-	+	-	+	-	-	-	+	-	-	-	-	-	+
70	*Mischococcus sp.*	-	-	-	-	-	+	-	-	-	-	-	+	-	-
Zooplankton															
A	**Rotifera**														
1	*Chromogaster testudo*	-	+	-	+	-	+	-	+	-	-	-	-	-	+
2	*Ascomorpha saltrans*	-	+	-	+	-	-	-	+	-	+	-	+	-	-
3	*Chromogaster ovalis*	+	+	-	-	+	+	-	-	+	+	+	+	-	+
4	*Proales decipiens*	-	+	-	+	-	-	-	-	-	+	-	-	-	+
5	*Trichocera rousseleti*	-	+	-	-	-	+	-	-	-	+	-	-	-	+
6	*Colurella obtusa*	-	+	-	+	-	+	-	+	+	-	+	+	+	+
7	*Cephalodella sterea*	-	+	-	-	-	+	-	+	-	-	-	-	-	-
8	*Monostyla cornuta*	-	-	-	-	+	-	-	-	-	-	+	-	+	
9	*Asplanchana priodonata*	-	+	+	+	-	+	+	-	+	-	-	-		+
10	*Trichocera sp.*	+	-	+	-	-	-	-	-	-	-	-	-	+	-
11	*Polyorthra trigla*	-	-	-	-	+	-	+	-	-	-	-	-	-	-
12	*Lecane sp.*	-	-	-	-	-	+	-	-	-	+	-	-	-	+

S.N.	Species	Station 1		Station 2		Station 3		Station 4		Station 5		Station 6		Station 7	
		Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling
B	**Copipoda**														
13	Microcyclops varicans	-	+	-	-	-	+	-	-	-	-	-	-	-	+
14	Nauplius	-	-	+	-	+	-	-	-	-	-	+	-	-	-
15	Cyclops sp.	+	-	-	-	-	-	-	-	+	-	-	-	-	-
16	*Canthocamptus staphylinus*	-	+	-	-	-	+	+	+	-	-	-	+	-	-
C	**Cladocera**														
17	*Bosmina coregoni*	-	+	+	+	-	-	+	+	+	+	-	+	-	-
18	*Bosmina deiteris*	-	+	-	-	-	+	-	+	-	+	-	-	-	+
19	*Alona costata*	+	+	-	-	+	+	-	+	+	+	-	+	+	+

Annex C-11: Phytoplankton and Zooplankton Observed at Different Sampling Station in Upper Seti River Plankton Density No. per litre

S.N.	Species	Station 1		Station 2		Station 3		Station 4		Station 5		Station 6		Station 7	
		Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling
Phytoplankton															
A	**Bacillariophyceae**														
1	*Amphora ovalis*	200	700	-	200	200	300	-	200	400	100	200	300	-	200
2	*Caratonies arcus*	-	-	-	200	-	-	-	-	-	200	-	-	-	-
3	*Cyclotella stelligera*	-	200	200	100	-	-	-	100	200	-	-	300	-	200
4	*Cymatopleura solea*	-	200	200	200	-	200	200	100	-	-	-	-	-	-
5	*Cymatopleura elliptica*	-	400	-	-	-	-	-	200	-	100	-	-	-	100
6	*Cymbella cistula*	200	1300	-	700	200	500	400	600	-	400	-	600	200	200
7	*Cymbella cymbiformis*	-	600	-	200	-	100	-	100	-	500	-	400	-	200
8	*Cymbella tumida*	200	1800	200	1300	-	1400	-	1200	600	1200	-	1000	-	1100
9	*Fragilaria capucina*	1200	3200	800	2600	1600	2500	1400	2400	600	1600	1200	1200	1200	1400
10	*Fragilaria verescens*	800	-	1400	-	600	-	1600	-	800	-	400	-	800	-
11	*Gomphonema geminatum*	-	300	-	-	-	200	-	-	-	-	-	200	-	100
12	*Gyrosigma kutzingii*	-		-	-	-	-	200	-	200	-	-	-	-	-
13	*Gyrosigma acuminatum*	-	400	-	-	-	100	-	100	-	-	-	-	-	-
14	*Melosira granulata*	-	1900	-	1500	600	1400	-	1500	-	800	800	600	-	700
15	*Melosira islandica*	800	700	1000	400	600	200	400	300	1600	200	1200	800	800	200
16	*Melosira verians*	-	-	600	300	-	200	800	200	600	-	-	-	-	200
17	*Navicula viridula*	-	-	200	-	200	-	-	-	-	-	-	-	200	-
18	*Navicula cuspidata*	-	600	-	400	-	400	-	300	-	200	-	300	-	400
19	*Navicula radiosa*	200	200	-	200	200	-	-		-	-	200	-	400	
20	*Nedium affine*	-	300	-	-	-	100	-	100	-	-	-	-	200	100
21	*Nitzschia palea*	-	100	-	-	-	200	-	200	-	-	-	300	-	200
22	*Nitzschia linearis*	-	200	-	100	-	100	-	-	-	-	-	-	-	-
23	*Pinnularia gibba*	-		-	-	200	-	-	-	-	-	200	-	-	-
24	*Pinnularia gentilis*	-	300	-	200	-	300	-	200	-	300	-	-	-	-
25	*Pinnularia viridis*	-	200	200	-	200	100	-	100	400	-	200	-	-	-
26	*Rhizosolenia sp.*	200			-	-		-	-	-	-	-	-	200	-
27	*Stauroneis anceps*	200	500	200	200	400	200	-	100	-	300	-	400	-	200
28	*Stauroneis phoenicenteron*	-	300	-	-	-	-	-	200	-	-	-	-	-	200

S.N.	Species	Station 1		Station 2		Station 3		Station 4		Station 5		Station 6		Station 7	
		Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling
29	*Stauronis acuta*	-	400	-	100	-	100	-	200	-	100	-	200	-	-
30	*Stauronis anceps*	-	-	200	-	-	-	200	-	200	-	-	-	-	-
31	*Surirella robusta*	200	300	-	200	200	300	-	200	-	100	200	200	-	200
32	*Synedra affinis*	600	1100	600	700	400	500	200	600	800	900	600	800	1200	700
33	*Synedra ulna*	400	1700	800	1200	600	1300	600	1200	1200	800	400	600	1400	800
34	*Tabellaria binalis*	-	200	-	-	-	200	-	-	-	-	-	-	-	-
35	*Tabellaria fenestrata*	-	-	-	200	200	200	200	-	-	-	-	-	200	300
36	*Frustulia vulgarus*	-	-	-	200	-	200	-	-	-	-	-	-	-	300
37	*Staurastrum gracile*	-	-	-	300	-	200	-	400	-	100	-	200	-	100
B	**Pyrophyceae**														
38	*Peridinium pusillum*	-	-	-	200	-	-	-	100	-	100	-	-	-	-
C	**Cyanophyceae**														
39	*Lyngbya limnetica*	-	300	-	200	-	-	-	100	-	-	-	200	-	-
40	*Lyngbya major*	-	200	-	100	200	100	-	100	400	300	-	-	-	200
41	*Merismopedia tenuissina*	200	100	-	-	200	100	400	200	-	-	600	-	200	200
42	*Microchate tenera*	200	300	200	200	-	300	200	300	-	200	-	100	-	200
43	*Nostochopsis labatus*	-	-	-	-	-	200	-	100	-	-	-	-	-	-
44	*Oscillatoria irrigua*	400	300	600	400	200	100	200	300	400	200	200	300	400	200
45	*Oscillatoria obscura*	-	-	-	100	-	-	400	200	200	100	-	-	-	-
46	*Spirulina platensis*	200	300	200	200	-	-	-	200	-	-	200	300	-	-
47	*Gloeotrichia sp.*	-	300	-	200	-	-			-		-	200	-	-
48	*Nostoc sp.*	-	-	-	-	-	200	-	200	-	-	-	-	-	-
D	**Chlorophyceae**														
49	*Ankistrodesmus falcatus*	-	200	-	300	200	100	200	100	-	300	-	200	200	200
50	*Chaetophora incerssata*	-	300	-	-	-	200	-	-	-	200	-		-	-
51	*Cladophora glomerata*	-	-	-	100	-	-	-	-	-	-	-	300	-	-
52	*Closterium moniliferum*	400	200	-	200	-	100	200	300	-	100	-	200	400	100
53	*Closterium pravulam*	-	-	-	-	-	-	200	-	-	-	-	-	-	-
54	*Closterium beiblinii*	-	-	-	200	-	200	-	-	-	-	-	200	-	-
55	*Cosmarium quadrum*	-	400	-		-	-	-	-	-	200	-	-	-	300
56	*Cosmarium binum*	-	200	-	100	-	-	-	-	-	100	-	-	-	100
57	*Genicularia elegans*	-	200	400	100	-	100	200	200	400	200	-	-	400	100

S.N.	Species	Station 1		Station 2		Station 3		Station 4		Station 5		Station 6		Station 7	
		Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling
58	*Microspora floccosa*	-	-	-	200	-	100	-	-	-	-	-	-	-	200
59	*Sirogonium sitcticum*	-	300	-	200	-	-	-	200	-	-	-	200	-	-
60	*Spirogyra rhizobrachialis*	200	300	400	200	200	300	800	600	200	300	600	400	800	500
61	*Spirogyra setiformis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	*Spirogyra weberi*		300	200	100	-	-	-	100	200	-	-	-	-	100
63	*Stigeoclonum tenue*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	*Treubaria crassispina*	200	200	200	-	-	200	200	100	-	100	-	200	400	300
65	*Ulethrix variabilis*	-	700	-	200	-	300		400	-	200	-	300	-	400
66	*Ulethrix zonata*	-	300	-	200	200	300	200	400	-	200	-	-	-	300
67	*Netrium digitus*	-	-	-	100	-	100	-	-	-	200	-	-	-	100
E	**Xanthophyceae**														
68	*Tribonema utriculosum*	-	100	200	-	-	200	-	200	400	100	-	200	400	300
69	*Tribonema minus*	-	200	-	100	-	-	-	200	-	-	-	-	-	200
70	*Mischococcus sp.*	-	-	-	-	-	200	-	-	-	-	-	200	-	-
oplankton															
A	**Rotifera**														
1	*Chromogaster testudo*	-	20	-	40	-	20	-	20	-	-	-	-	-	40
2	*Ascomorpha saltrans*	-	80	-	40	-	-	-	40	-	60	-	40	-	-
3	*Chromogaster ovalis*	20	40	-	-	20	40	-	-	20	60	40	80	-	20
4	*Proales decipiens*	-	20	-	20	-	-	-	-	-	40	-	-	-	20
5	*Trichocera rousseleti*	-	40	-	-	-	20	-	-	-	20	-	-	-	20
6	*Colurella obtusa*	-	20	-	20	-	60	-	40	20	-	40	40	20	60
7	*Cephalodella sterea*	-	20	-	-	-	20	-	40	-	-	-	-	-	-
8	*Monostyla cornuta*	-	-	-	-	40	-	-	-	-	-	20	-	40	
9	*Asplanchana priodonata*	-	40	20	40	-	20	40	-	40	-	-	-	-	40
10	*Trichocera sp.*	20	-	40	-	-	-	-	-	-	-	-	-	20	-
11	*Polyorthra trigla*	-	-	-	-	20	-	20	-	-	-	-	-	-	-
12	*Lecane sp.*	-	-	-	-	-	20	-	-	-	40	-	-	-	20
B	**Copipoda**														
13	*Microcyclops varicans*	-	20	-	-	-	20	-	-	-	-	-	-	-	20
14	*Nauplius*	-	-	20	-	20	-	-	-	-	-	20	-	-	-
15	*Cyclops sp.*	20	-	-	-	-	-	-	-	20	-	-	-	-	-
16	*Canthocamptus staphylinus*	-	40	-	-	-	20	20	20	-	-	-	20	-	-

S.N.	Species	Station 1		Station 2		Station 3		Station 4		Station 5		Station 6		Station 7	
		Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling	Pre Smapling	Post Sampling
C	**Cladocera**														
17	*Bosmina coregoni*	-	20	20	20	-	-	20	40	40	20	-	20	-	-
18	*Bosmina deiteris*	-	40	-	-	-	40	-	20	-	20	-	-	-	20
19	*Alona costata*	20	40	-	-	40	20	-	40	20	40	-	20	20	20

Note: Pre sampling collection date May & june 2006
Note: Post sampling collection date 12 & 13 October 2006
Post sampling collection by : Raj Kapur Napit

ENVIRONMENTAL AND SOCIAL CONSIDERATION (ESC) REPORT

PART D

SOCIO-ECONOMIC AND CULTURAL ENVIRONMENTAL ASSESSMENT

PART D SOCIO-ECONOMIC AND CULTURAL ENVIRONMENTAL ASSESSMENT

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CHAPTER 1 INTRODUCTION

1.1 Background

The Government of Nepal is implementing rural electrification and hydroelectric development projects by using its abundant water resource in Tenth Plan (2002-2007) to support for poverty reduction. Present total installed capacity in Nepal 614 MW as of July 2006. Nepal has been suffering from shortage of power in the dry season since Run-off-river type of hydropower plants can only marginally regulate river discharge for power generation. In order to meet the ever increased power demand, Nepal Electricity Authority (NEA) conducted studies on storage type hydropower development and identified Upper Seti Storage Hydroelectric Project (hereinafter referred to as the Project) as one of the potential storage type of hydropower for development. The Government of Nepal then requested the Government of Japan to implement an upgrading feasibility study (hereinafter referred to the Study) under the technical assistance of Japan International Cooperation Agency (JICA). The JICA Study Team (the Study Team) commenced the Study in February 2005.

NEA carried out an Environmental Impact Assessment (EIA) for the Project based on the field work in January 2003, with report compilation later that year and then a Public Consultation Meeting held in January 2004 and a draft EIA submitted to Department of Electricity Development (DOED) in July 2004. The EIA report has been formally issued and is in the process of review by Ministry of Water Resources (MOWR). After review by MOWR, it will be submitted to the Ministry of Environment, Science and Technology (MOEST) for its approval.

The existing EIA prepared by the NEA recognized 45 households as those who need to be relocated, 324 households as those who will lose their assets, and 917 ha to be acquired due to the Project in the Reservoir area at the Full Supply Level (FSL) of 425 m and 10 m as risk zones. These estimates were based on the use of 1:25,000 scale maps with a contour interval of 20 m and EIA site investigations using established benchmarks and altimeters in the Upper Reservoir. As the EIA regulatory system in Nepal does not include social environmental considerations to a large degree, the existing EIA report neither discusses a wide variety of these social environmental issues nor develops a framework of Resettlement Plan (RP), which is clearly required during the feasibility study phase as per JICA Guidelines for Environmental and Social Considerations published in 2004 (JICA Guidelines) and other guidelines of key international donor agencies. Hence, a separate Supplemental EIA Survey including the detailed socio-economic survey is obviously required to fill the gap of the existing EIA report and to accommodate the requirement of JICA Guidelines.

1.2 Objectives

Based on socio-economic and cultural perspectives, Supplemental EIA Survey has the following four objectives:

- Review the general socio-economic and cultural situation of the project district, affected VDCs and communities,
- Study on the socio-economic and cultural impact due to the project activities at district-, VDCs- and community-levels,
- Develop a framework of Resettlement Plan and Social Action Plan and
- Prepare a framework for Environmental Management Plan

1.3 Methodology

The methodologies for accomplishing the above objectives are mainly based on Literature Search, Field Survey, Household Survey, and Focus Group Discussion (**Figure 1.3-1**).

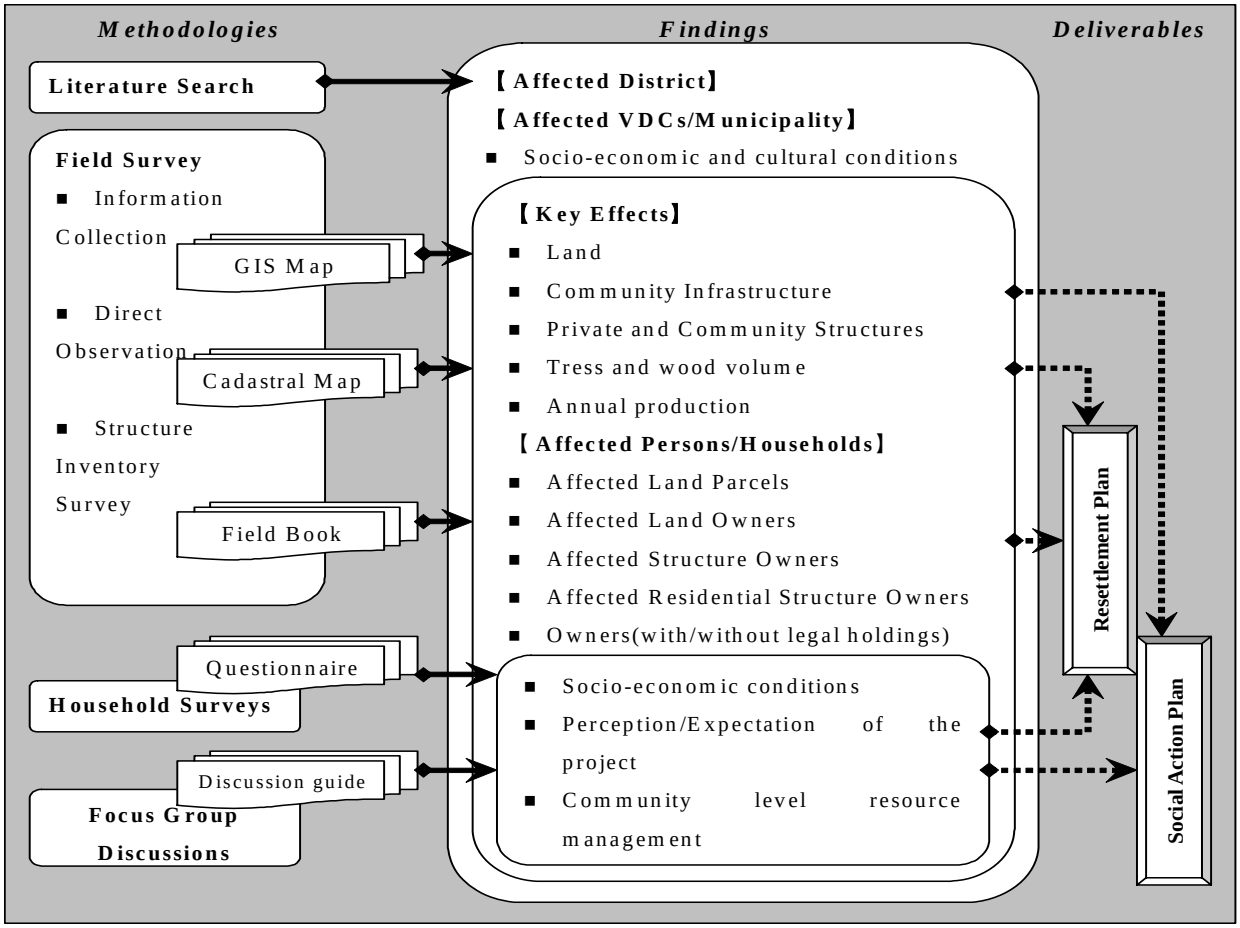


Figure 1.3-1 Methodologies, Expected Findings and Deliverables

(1) Literature Search

Prior to the Field Survey, literature search has been conducted including the 2001 census survey (CBS, 2001), District Profile of Tanahu District (DDC, 2001), Poverty Mapping Report, Tanahu (DDC,

2001) and other secondary data available in order to grasp the current socio-economic and cultural conditions in Tanahu District and affected VDCs. One of the limitations of literature search was that some statistics data sometimes would differ from one source to another. Another limitation was that some statistics data of Vyas municipality were not available while those of affected VDCs were available.

(2) Field Survey

To complement the results of literature search, the Study Team and the local consultant team have visited the government and other relevant offices of Tanahu District and collected the secondary information from them.

The cadastral maps that are the official land use maps showing the land and land plot numbers in the map have been obtained from the district Survey Office through GIS consultants. These cadastral maps were prepared some 30-35 years ago, and division in the land plots have been updated every 5 years. They do not include the information on the forest, barren areas, river corridors, shrub land and grasslands. In fact, they do not exactly reflect the current situation in a timely manner. Thus, the obtained cadastral maps have been superimposed onto the GIS mapping in order to specify the affected areas including land parcels. Furthermore, the Field Book that is the list of the land plots of cadastral maps has been used to find out the ownership of respective land plots and the land area. By using these GIS maps, cadastral maps and the Field Book, inventory structure survey was carried out to collect the detailed information on affected structures including the number of structure, the materials of structure, and ownership of each structure. Its results were also used to estimate the loss of affected structures. Besides, the comparison among the cadastral maps and GIS maps, direct field observation was very useful as a basis to identify and estimate the number of residential structure affected owners without legal holdings and affected cultivated land without legal registration.

There were some limitations of the Field Survey. Due to high absentees during the survey, all the land parcels could not be verified. Further, a number of land areas under cultivation were observed, but not defined as land parcels legally. Another limitation was that the cadastral maps for Jamune VDC were not provided. Because of that, there was no information on land plot affected and affected land owners in Jamune although the information on affected structures including residential structures was collected and confirmed through the inventory structure survey. Wantang Khola, Phedi Khola and Tittuwa were not covered by the inventory structure, survey since these areas were identified as Risk Zones after the completion of the field survey. The GIS Map was only used to estimate the number of affected structures and their owners. The few areas of the project facility sites were also not covered by the inventory structure survey due to the redesign of the project facility sites after the completion of the field survey. It is proposed that these limitations need to be taken into consideration during the Detailed Design Phase.

(3) Household Surveys

For the purpose of identifying the socio-economic situation and the perceptions towards the project among the affected people, the local consultant team comprising sociologist and engineers had carefully designed a structured questionnaire in collaboration with the Study Team. Altogether 399 households of the project affected VDCs and municipality of Tanahu District, more specifically, who live below 425 m of reservoir FSL were selected randomly and interviewed using the structured questionnaire (**Table 1.3-1**). The ethnic and caste of these households are described in **Table 1.3-2**. Those who do not have legal holdings are also included as the target of HH Survey. It should be noted that most of the households in Jamune VDC who are likely to be affected by the project were not covered by this Survey because they were not present during the Household (HH) Survey. However, overall the sample represents about 50 percent households who have land or assets in the area below 425 m of reservoir FSL[1] and are likely to be affected by the project activities.

Table 1.3-1 Sample of Household Survey

Bhimad	Chhang	Majkot	Rising Ranipokhari	Kotdurbar	Kahun Shivapur	Vyas (Damauli)	Total
4	85	47	137	17	21	88	399

Note: The sample households were selected from those who have land or assets in the area below 425m of FSL reservoir and presented during the period of the survey. In other words, some unidentified owners of land or assets in the Field Book and the absentees during the survey were excluded. Thus, the number of sample households varied from one VDC to another.

Source: Supplemental EIA Survey, JICA, 2006

Table 1.3-2 Ethnic/Caste Division

Ethnicity/Caste	Caste Name	Frequency	Percent	
Brahmin/Chhetri/Thakuri	Brahmin	63	15.79	19.0
	Chhetri	13	3.26	
Adibasi/Janjati[2]	Magar	204	51.13	69.7
	Gurung	34	8.52	
	Newar (Shrestha)	23	5.76	
	Majhi, Bote	17	4.26	
Dalit[3]	Sarki	9	2.26	8.0
	Kami	17	4.26	
	Damai	6	1.50	
Other	Sanyasi	13	3.26	3.3
	Grand Total	399	100	100

Source: Supplemental EIA Survey, JICA Study Team, 2006

(4) Focus Group Discussion

Focus Group Discussions were held to identify the status of the natural resources uses and the level of women empowerment within the project area at the community level in 13 different localities

[1] The number of affected land owners of the project area was estimated to be 838 (See Table 3.2-2).
[2] About 60 indigenous tribes of Nepal are defined as Adibasi/Janjati by Nepal Government.
[3] Mainly three castes such as Shoe Maker (Sarki), iron-workers (Kami) and tailors (Damai) are included in Dalit caste.

indicated below. The findings of Focus Group Discussions have been also used as a basis for formulating the Social Action Plan.

Table 1.3-3 Focus Group Discussion

SN	Areas	VDC, Group Discussion Place	Ward	Covered Village	No. of Participants		Ethnic and Caste Group
					M	F	
1	Inside Reservoir Area	Bhimad, Khanaltar	4	Khanaltar, Bhimad Birta	6	0	Magar, Newar
2		Rising Ranipokhari, Rising Patan	5	Rising Patan, Wantang, Saune	2	5	Magar, Gurung
3		Rising Ranipokhari, Khakahre	7	Bhainsikile, Amdanda, Bandarkuna	0	13	Gurung, Newar,
4		Kotdurbar, Maidan Swanra	1	Ward No.1 & 2	0	5	Brahmin
5		Khaun Shivapur, Bakle	9	Bakle, Kahun Shivapur, Ranidanda, Tallo Setang	7	7	Brahmin, Chhetri
6		Kahun Shivapur, Beltar	9	Mathillo Jhapu, Tallo Jhapu, Dharapani, Bharkeni Beltar	5	16	Magar, Dalit, Newar, Gurung
7		Vyas Municipality, Tallo Patan	1	Tallo Patan (Close to Batching Yard)	0	32	Magar
8		Vyas Municipality, Beni Patan	3	Beni Patan (Batching Yard Site)	0	15	Magar
9	Outside Reservoir Area/Soil Dumping Site	Kahun Shivapur, Beltar	1	Mathillo Jhapu, Tallo Jhapu, Dharapani, Bharkeni Beltar	0	21	Magar, Dalit
10		Vyas Municipality, Tallo Patan	7	Tallo Patan (Close to Batching Yard)	9	5	Brahmin, Chhetri
11		Vyas Municipality, Beni Patan	7	Beni Patan (Batching Yard Site)	15	0	Gurung, Brahmin, Magar, Newar.
12		Vyas Municipality, Beteni	7	Beteni	0	11	Magar
13		Vyas Municipality, Bairenitar	7	Botegaun, Kumaltari, Atrauli Birenitar	14	2	Bote, Darai

Source: Supplemental EIA Survey, JICA Study Team, 2006

1.4 Identification of Project Affected Areas

The affected areas are categorized into the following three groups.

-Group 1: It comprises areas affected by the project components such as reservoir, dam, and powerhouse, tailrace, and switches yards and involves effects related to land and property acquisition besides loss of natural resources and community properties.

Group 1 can be further categorized into the following two impact areas in the Supplemental EIA Survey.

i) Reservoir area —Full Supply Level 415 + 10 m

It refers to an inundated reservoir area. Based on the results of the Optimization Study, an elevation of 415 m was selected as the most optimum Full Supply Level (See the details in Part A

of this report).

ii) Risk zones

The Study Team based on the discussion with NEA regarded i)Wantang Khola, ii)Phedi Khola and iii) Tittuwa as Risk Zones. In these areas, the deposit materials have vertically formed the overhanging cliffs, and been constantly eroded. Since the terrace breaks in some places, and will be in danger of slope failure due to the implementation of the project, a 50 m horizontal distance from the edge of the cliff was delineated as Risk Zones. Furthermore, a 10 m vertical distance has been added to the FSL as Risk Zone for safety purposes, which was the same method as that used by the NEA. Land, structures and loss of agricultural production within such Risk zones will be compensated.

Bhimad Bajar was not included in this category since it is least likely that the project with FSL 415 m affects this area directly. However, Bhimad Bajar will be also in danger of slop failure because of erosion caused by the flood or heavy rain. Accordingly, the appropriate measures are needed to be taken (See the details in Part B of this report).

-Group 2: It comprises of project facility structures required for the construction of the project such as access roads, camps, batching yards and spoil disposal yards etc. Similar to the project components it involves effects related to land and property acquisition besides loss of natural resources and community properties.

-Group 3: It comprises of downstream effects. It does not involve loss of land and property, but will impair the utility aspects of the natural resources due to changes in river flows twice daily.

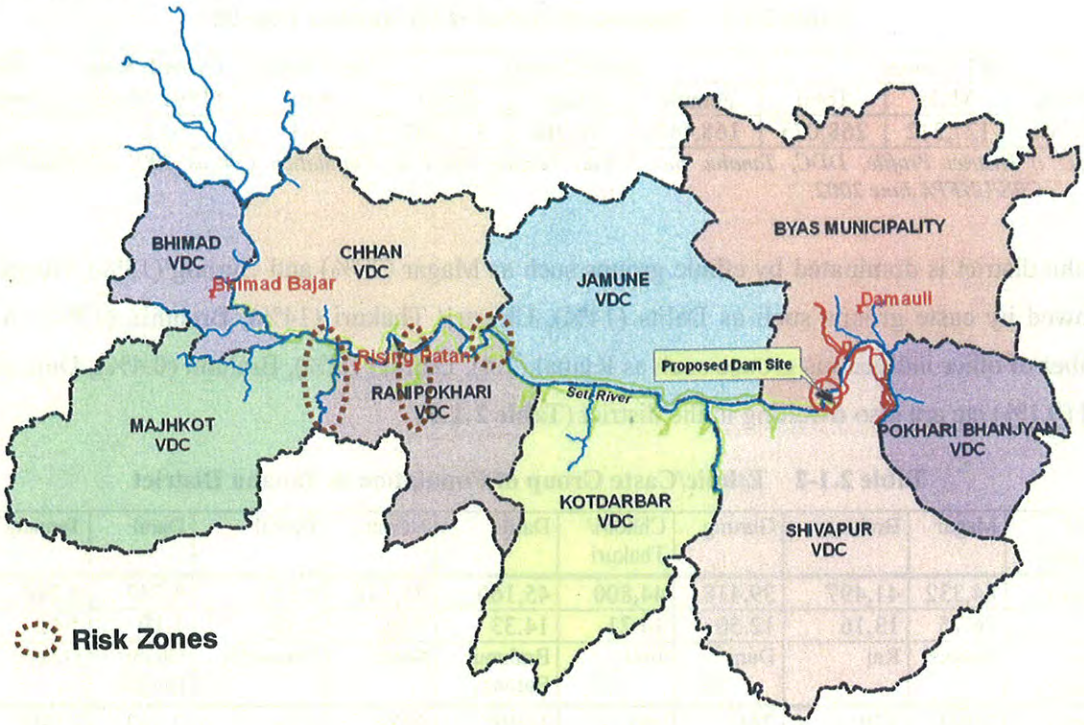
Table 1.4-1 and **Figure 1.4-1** indicate the VDCs and Municipality affected by the project for each category.

Table 1.4-1 VDCs/Municipality and Wards[4] Affected by the Project Components

Group 1	Reservoir Areas (FSL 415m)	Bhimad (Ward No.1,2), Chhang (Ward No.1,2,4,7,8), Majkot (Ward No.9), Rising Ranipokhari (Ward No.7, 9), Kotdurbar (Ward No.2, 7), Jamune (Ward No. 1,2,3,4,5,6), Kahun Shivapur VDCs (Ward No.3), Vyas Municipality (Ward No.7)
	Risk Zones	i)Wantang Khola (Majkot-Rising Ranipokhari), ii)Phedi Khola (Rising Ranipokhari), and iii) Tittuwa (Rising Ranipokhari) and iv) a 10 m vertical distance from FSL 415 m — Bhimad (Ward No.1.2), Chhang (Ward No.1,2,4,7,8,9), Majkot (Ward No.9), Rising Ranipokhari (Ward No.7,9), Kotdurbar (Ward No.2,7), Jamune (Ward No.1,2,3,4,5,6), Kahun Shivapur (Ward No.3) VDCs, Vyas Municipality (Ward No.7)
Group 2	Project Facility Sites	Kahun Shivapur (Ward No.1,2), Vyas Municipality (Ward No.7)
Group 3	Downstream Areas	Kahun Shivapur, Pokhari Bhanjyang, Keshavtar, Dharampani, Baidi, Chhipchiipe, Devghat, Deurali VDCs

Note: ⋯ is hereinafter referred to "Affected VDCs and Municipality" in this report and Final Report.

Source: Supplemental EIA Survey, JICA Study Team, 2006



Note: Pokhari Bhanjyan VDC regarded as one of the affected VDCs by NEA in existing EIA was categorized into Group 3 in this report and the supplemental EIA.
Source: GIS Map, JICA, 2006

Figure 1.4-1 VDCs/Municipality Affected by the Project (Group 1 and Group 2)

The affected VDCs/Municipality" refers to seven VDCs and one municipality, namely Bhimad, Chhang, Majkot, Rising Ranipokhari, Kotdurbar, Jamune, Kahun, Shivapur VDCs and Vyas Municipality in this report and the Supplemental EIA since these areas will be seriously affected by the project compared to other VDCs categorized into Group 3 abovementioned.

[4] Ward is the smallest administrative unit in Nepal. VDCs are made up of 9 wards.

CHAPTER 2 SOCIO-ECONOMIC AND CULTRUAL SITUATION

2.1 Tanahu District

(1) Demographic Characteristics

According to 2001 Census, the total population of Tanahu district is estimated to be 315,237, which accounts for 1.36 percent of the total population of the country and 11.3 percent of the western hill. The average family size of the district is 5.01 that is slightly lower than the national average figure (5.44). All together 62,898 households are living in Tanahu district. The population density of the district is reported to be one of the highest among the hill district (204 persons/km^2), which is significantly higher than the average density of Western hills (152 persons/km^2) and national average density (157 persons/km^2) (**Table 2.1-1**).

Table 2.1-1 Population Status of the Tanahu District

1991 Census			2001 Census			Av. Family size	Growth Rate (1991-2001)	Density (Person/Km^2)
Female	Male	Total	Female	Male	Total			
140,761	127,312	268,073	168,449	146,788	315,237	5.01	1.8	204

Source: i) District Profile, DDC, Tanahu, and Nepali Version, 2001 ii) Population Census 2001 (National Report); CBS/UNFPA June 2002.

Tanahu district is dominated by ethnic groups such as Magar (27%) and Gurung (13%), Newar (8%) followed by caste groups such as Dalits (14%), Chhetri/ Thakuri (14%), Brahmin (13%). A small number of other indigenous groups such as Kumal (2.4), Dairai (1.2%), Brahmu (0.4%), Dura (0.3%), Jirel (0.1%) etc are also dwelling in the district (**Table 2.1-2**).

Table 2.1-2 Ethnic/Caste Group of Population in Tanahu District

Caste/ Ethnicity	Magar	Brahmin	Gurung	Chhetri/ Thakuri	Dalits	Newar	Kumal	Darai	Tamang	Muslim
Number	84,332	41,497	39,418	44,800	45,160	25,145	6,915	3,747	3,216	3,229
%	26.75	13.16	12.50	14.21	14.33	7.98	2.19	1.19	1.02	1.02
Caste/ Ethnicity	Sanyasi	Rai	Dura	Jirel	Brahmu/ Baramu	Sonar	Marawadi	Gharti/ Bhujel	Others	Total
Number	2,097	439	781	261	1,398	2022	555	7,523	2,702	315,237
%	0.66	0.14	0.25	0.08	0.44	0.64	0.18	2.39	0.86	100

Source: Population Census 2001; Caste Ethnicity by Districts; CBS

Regarding languages spoken by the people of Tanahu, Nepali language dominates the other languages (63%) followed by Magar (16%), Gurung (10%), Newari (5%), Rai/Rirat (2%).

With respect to religion, Hindu religion by far dominates the other religious group (91%) followed by Buddhist (7%), Muslim (1.7%) and Christian (0.2%). The other religious groups are represented by few tens of households only.

(2) Education

Seventy percent population of Tanahu district above 6 years of age is reported to be literate. The male population has higher literacy rate (79%) compared to the female (56%). The literacy level of the

district is higher compared to the national average literacy (60.2%), male literacy (71.6%) and female literacy (48.9%). However, among the literate population, majority has obtained only primary level education (43.6%) and lower secondary level education (20.2%). Only about 5 percent population has obtained education above certificate level, according to 2001 Census (**Table 2.1-3**).

Table 2.1-3 Level of Education of the Literate Population in Tanahu District

	No Schooling	Primary (1-5)	Lower Secondary (6-7)	Secondary (8-10)	SLC & Equiv.	Certificate. & Equiv.	Graduate & Equiv.	Post Graduate	Others	Level Not Stated	Total
No	17,651	72,450	33,639	17,394	12,480	5,743	2,424	665	504	3,148	166,098
%	10.6	43.6	20.2	10.5	7.5	3.5	1.5	0.4	0.3	1.9	100

Source: CBS 2001.

Tanahu district is facilitated with 425 primary level schools, 59 lower secondary level schools, 96 secondary level schools and 12 higher secondary level schools. In addition, there are 7 campuses in this district. Of the total schools 10 percent are privately owned and 90 percent public owned. Altogether 90,278 students are enrolled at different level, of which 48 percent students are female. Of the total 2749 teachers, 22 percents are female. The teacher student ratio is 1: 33.

Table 2.1-4 Educational Facilities in Tanahu District

Level / School Type	Primary Level			Lower Secondary	Secondary	Upper Secondary	Total
	I-V	I-III	Total				
Number of Government	218	179	397	54	75	8	534
Number of Private	20	8	28	5	21	4	58
Total Number	238	187	425	59	96	12	592
Boy Enrollment	33187			9573	3613	254	46627
Girls Enrollment	32595			7957	2927	172	43651
Number of Male Teacher	1401			342	308	NA	2051
Number of Female Teacher	598			51	18	NA	667
Teacher/Student Ratio	1:35			1:58	1:30	NA	1:33

***Source: I)** District Education Office, Tanahu, 2006**.** District Profile, I) District Soil Conservation Office, Tanahu, 2006 (Nepali Version)*

The gross enrollment ratio (GER) and net enrollment ratio (NER) of the students at different levels of schools are shown in **Table 2.1-5**. It reveal that the enrollment ratio is quite encouraging at the primary level of schools but declines rapidly when the students have to be get enrolled at the higher levels. In spite of relatively high enrollment ratio at the primary school level, the average completion

ratio remains only 26.7 percent. It implies that a number of enrolled students may drop out of the primary schools or fail to pass the examination.

Table 2.1-5 Gross and Net Enrollment Ratio of the Students in Tanahu District

Enrollment ratio at different Level (%)	General Enrollment Ratio (%)		Net Enrollment Ratio (%)	
	Male	Female	Male	Female
Primary	120.4	118.50	91.0	90.4
Lower Secondary	95.2	80.8	54.9	45.9
Secondary	61.8	51.6	32.5	29.2

Source: Annual Report, District Health Profile, Tanahu, 2004/05; District Health Office

(3) Health

The district is served by two hospitals with 15 beds each, one primary health center with 3 beds, 13 health posts, and 31 sub-health posts (**Table 2.1-6**). However, health services within the district are still very poor.

Table 2.1-6 Health-related Institutions in Tanahu District

Institution Type	Number	Remarks
Hospitals	2	Bandipur and Damauli (15 beds each)
Primary Health Centre	1	Bhimad (3 beds)
Health Posts	13	Located at 13 VDCs
Sub-health Posts	31	Located at 31 VDCs
Primary Health Care/Out Reach Clinic	143	
Expanded Program. On Immunization Clinics and Others	215	
Measles Campaign Posts	436	

Source: *Annual Report, District Health Profile, Tanahu, 2061/62; District Health Office*

One doctor is available for 56686 population, one nurse for 12146 population, one Health Assistant (HA)/Community Maternity Assistant (CMA) for 4929 population, one Mother Child Health Worker (MCHW) for 10,921 population, one Primary Care Health Volunteer (PCHV) for 804 population, and one TBA for 1818 population (**Table 2.1-7**).

Table 2.1-7 Ratio of Population Served by Health Professionals

Indicator	Doctor/ Population	Nurse/ Population	HA/CMA/ Population	MCHW/ Population	PCHV/ Population	TBA/ Population
Ratio	1:56,686	1:12,146	1: 4,929	1:10,971	1: 804	1: 1,818

Source: District Health Office, 2006

Among the top ten diseases of the districts, skin diseases followed by Acute Respiratory Infection (ARI), Pyrexia of Unknown Origin (PUO) and diarrhea diseases are most prevalent. A significant number of patients are also suffering from the diseases such as intestinal worms (6.2%), gastritis (6.1%), fall injury /fracture (3.8%), Chronic Obstructive Pulmonary Diseases (CDPD) (3.7%), ear infection (3.1%) and abdominal pain (2.7%) (**Table 2.1-8**).

Table 2.1-8 Top ten Diseases in Tanahu Districts

Diseases	Skin Diseases	ARI	PUO	Diarrhea Disease	Intestinal worm	Gastritis	Injury/ Fracture	COPD	Ear Infection	Abdominal Pain
Number of Patients	22515	13932	11407	10009	8106	7911	4938	4880	4039	3336
%	17.3	10.7	8.8	7.7	6.2	6.1	3.8	3.7	3.1	2.7

Source: District Health Office, 2006

(4) Water Supply and Sanitation

According to DDC, about 74 percent population of the district has access to the piped drinking water facility, while almost 20 percent populations rely on well. 4 percent of people also follow water harvesting practices during rainy season. Remaining population rely on spring, spout, river spring etc (**Table 2.1-9**). The sanitation condition of the district is generally poor as only about 31 percent population use toilet facility. The percent of toilet user household in the rural area is even lower (20%) while it exceed to 80 percent in the urban centers like Damauli, and Bandipur.

Table 2.1-9 Population Using Drinking Water Sources

Drinking Water Sources	Percent (%)
Pipe	74
Well	20
Rain Water	4
Other	2

Source: District Development Committee, 2006

34 percent household use household use pit for the solid waste disposal and 50 percent population are aware on hygienic food. Lack of landfill site in the Damauli Bazaar and use of river bank as urban waste disposal has created many issues related to sanitation system of the district. The storm drainage system is also not sufficient in all the urban centers of the district.

(5) Electricity

According to the DDC record, only about one third of the population is served with electricity facility. Of the total electricity supply 71 percent is distributed from the central grid of Nepal Electricity Authority (NEA), while 16 percent is generated by the individual Gobar Gas plant, 8 percent from micro-hydro power and 6 percent from solar system.

For cooking nearly 66 percent of households use fuel wood and 16 percent households use kerosene. Nearly 10 percent households use LP gas while 8 percent households still rely on animal dung for cooking food.

(6) Economic Activities

Almost 64 percent population of Tanahu district (10 years and above) are economically active, according to 2001 Census, which is similar to national average figure of economically active population. Among the economically active population, the percentage of female is greater (34%) compared to the male (30%) (**Table 2.1-10**).

Table 2.1-10 Economically Active and Inactive Population in Tanahu District

(10 Years and above)

	Economically Active			Economically Inactive		
	Male	Female	Sub-total	Male	Female	Sub-total
Number	70,171	80,006	150,177	36,360	48,561	84,921
%	29.9	34.0	63.9	15.5	20.6	36.1

Source: CBS, 2001.

The economically population are engaged in different occupation. Of the total occupied population majorities (67%) are farm workers that include both skilled and unskilled agricultural, forestry and fishery workers. The second, third and fourth highest category of occupation are elementary occupation (10%), craft trade workers (9%) and service workers (8%) respectively (**Table 2.1-11**).

Table 2.1-11 Occupation of the Economically Active Population (10 years of age and above)

	Legislator/ Officials	Professionals	Technicians	Clerks	Service Workers	Farm Workers	Craft Trade Workers	Plant/Machine Operators	Elementary Occupations	Not Stated	Total
Number	323	3,567	1,979	2,233	11,332	93,552	12,233	1,029	13,242	128	139,618
%	0.23	2.55	1.42	1.60	8.12	67.01	8.76	0.74	9.48	0.09	100.0

Source: CBS 2001.

About one percent households of Tanahu district (449 Households) are landless while 99 percent households (53773 Households) own some certain piece of land. Almost 60 percent of the land owners hold less than 0.5 ha of land, 30 percent household own land between 0.5-<1.0 ha, 12 percent between 1-<2 ha and 1.1 percent between 2.0-<3.0ha. Only 0.2 percent household own 3-<4 ha of land. Average land holding size is 0.54 ha and number of parcel is 2.9. The land holding size and parcel size varies greatly among the large and small holders indicating larger size among the large holders (**Table 2.1-12**).

Table 2.1-12 Landholders and Landholding Size

Landholding Size	Family No.	%	Av. Land area/ HH	Av. Number of Parcel
< 0.1Ha	3,693	6.9	0.05	1.4
20.1-<0.2 Ha	6,005	11.2	0.14	1.7
0.2-<0.5 Ha	20,467	38.1	0.33	2.5
0.5-<1.0 Ha	16,152	30.0	0.68	3.4
1.0-<2.0 Ha	6,765	12.5	1.31	4.3
2.0-<3.0 Ha	587	1.1	2.21	6.1
3.0-<4.0 Ha	104	0.2	3.36	6.0
Total	53,773	100	0.54	2.9

Source: Agricultural Census, 2001 CBS

The district produces all types of cereals such as paddy, maize, wheat, millet, barley etc and cash crops such as sugarcane, tobacco, ginger, cardamom vegetables and fruits. The area, production and yield of major crops grown in the district is shown in **Table 2.1-13**.

Table 2.1-13 Area, Yield（Metric ton/ha）,Production(Metric ton) of Major Crops in Tanahu District (2004/05)

Crops		Area (Ha)	Yield (Million ton/Ha)	Production (Million ton)
Cereals	Main Paddy	13,400	3.1	41,891
	Maize	21,960	2.6	57,096
	Wheat	2,300	1.55	3,956
	Barley	10	0.75	7.5
	Buckwheat	175	0.90	158
	Millet	6,550	1.23	8,089
	Potato	700	8.12	6,188
Cash Crop	Sugarcane	36	10.22	620
	Tobacco	7	0.88	6
	Ginger	450	9.775	4,399
	Cardamom	4	0.75	3
Spices	Haledo	90	5.3	474
	Garlic	140	4.37	612
	Chilli	75	2.99	224
Oilseed		524	0.88	462
Pulses/Beans		3,768	0.83	3,141
Vegetables	Summer	1004	8.203	8236
	Winter	1715	8.205	14070
	Off Season	206	8.176	1668
Fruits	Citrus	1462	5.618	8214
	Winter	105	7.410	778
	Tropical	1164	6.87	7998
Others	Coffee	40	1.25	11
	Sericulture	15	0.20	2.95
	Fish	7	2.286	16
	Beehives	1313 (no.)	3.74/kg/hive	4.910

Source: District Agriculture Profile (2061/062); District Agriculture Office, Tanahu Falgun 2062.

Despite varieties of crop production with a reasonably a good yield rate, the district is reported to be a food deficit district, according to District Agriculture Office, Tanahu. According to its estimate, the district faces annual deficit of close to 1,000 metric tons of cereals when considering the edible production of the district (**Table 2.1-14**).

Table 2.1-14 Food Balance Situation of Tanahu District (in metric ton)

Total Production of Cereals*	Total Edible Production**	Requirement of the District***	Balance/Deficit
139,130	69,973	70,928	955

*Note: * Includes total production of six major cereals namely paddy, wheat, maize, millet, buckwheat and barley.*
***Estimated based on the requirement of seeds, storage loss, processing loss etc.*
**** Estimated based on 2001 Population ,i.e 315,237 and per capita/year cereal requirement of 225 grams.*
Source: District Agriculture Profile (2061/062); District Agriculture Office, Tanahu, February-march 2005/06.

As elsewhere in the other parts of rural Nepal, livestock rearing is an integrated part of the rural livelihood system of Tanahu district. The district has a 0.455 million of animals and 0.317 million of poultry birds. Of the total animal population goat occupies the largest number (48%), followed by buffalos (22%), cattle (21%), pig (8%) and sheep (1%) respectively. Five percent of the animals and 17 percent birds are improved types. The population of buffalos, goats and duck are in increasing trend while the size of cattle, sheep, horse and chicken are decreasing (**Table 2.1-15**).

Table 2.1-15 Total Number of Livestock in Tanahu District

Livestock Type	F.Y:2003/04			F.Y: 2004/05			Change%
	Hybrid	Local	Total	Hybrid	Local	Total	
Cattle	496	96,406	96902	560	95725	96285	-0.64
Buffalos	10,319	90,088	100407	9868	91432	101300	0.89
Goats	9,444	206,265	215709	9605	207980	217585	0.87
Sheep	390	3,848	4238	341	3814	4255	-1.96
Pig	3,556	32,431	35987	3741	32163	35904	-0.23
Horse	0	298	298	0	165	165	-44.63
Total Animals	24,205	429,336	453541	24115	431279	455494	0.43
Hen/Cocks	59,280	260,546	319826	53720	261197	314917	-9.28
Duck	532	2,036	2568	546	2056	2602	1.32
Total Birds	59,812	262,582	322394	54266	263253	317519	-1.51

Source: District Livestock Office, Tanahu 2006

As **Table 2.1-16** indicates, the district produces livestock products such as milk, meat, egg, wool etc equivalent to NRs 842 million annually. It is estimated that approximately 5 percent of the total products are exported to other districts and 95 percent are sold within the district

Table 2.1-16 Annual Production of Livestock Products (2004/05)

Description		Unit	Production	Per Unit Rate	Total Value (000,Rs)
Milk	Cow	Metric .Ton	5336	15/kg	80,040
	Buffalo	Metric .Ton	16532	20/kg	330,640
Meat	Goat	Metric .Ton	666	200/kg	133,200
	sheep	Metric .Ton	14	200/kg	2,800
	Chicken	Metric .Ton	203	130/kg	26,390
	Buffalo	Metric .Ton	2248	100/kg	224,800
	Pork	Metric .Ton	176	90/kg	15,840
Wool-Sheep		Kg	1492	150/kg	224
Egg-Hen/Duck		,000 No.	7031	4/no	28,124
Total					842,058

Source: District Livestock Office, Tanahu 2006

There are 930 different types of industries in Tanahu district. Of the total running industries 65 percent are production oriented, 28 percent service oriented, 5 percent agriculture and livestock related and

remaining related to energy mine and tourism. More than 6,000 persons are reported to be employed in these industries (**Table 2.1-17**).

Table 2.1-17 Type and Number Industries in Tanahu Districts

Type	Number	Running	Closed	Employee
Production Oriented	653	472	181	2849
Service oriented	204	204	0	2769
Agriculture and Livestock	57	37	20	581
Mine Industry	4	3	1	30
Energy oriented	9	9	-	149
Tourism Industries	3	3	-	54
Total	930	728	202	6432

Source: District Profile of Tanahu District, DDC, Tanahu, 2001

According to UNDP (2004), the average per capita income of the district is estimated to be 218 US$ (NRs 16,071), which is lower than that of 220 US $ (NRs 16,203) of western Hills and US$ 240 (NRs 17,722) of Nepal. **Table 2.1-18** reveals that more than half of the households fall far below the average per capita income.

Table 2.1-18 Households in different Income Category (NRs/HH/Yr) , 2001

Income Range	Up to 5,000	5,001-10,000	10,001-20,000	20,0001-30,000	30,001-40,000	40,001-50,000	Above 50,000	Total
No. of Households	17,966	4,510	4,888	5,945	2,729	2,119	4,653	42,810
%	42.0	10.5	11.4	13.9	6.4	4.9	10.9	100

Source: District Profile of Tanahu District, DDC, Tanahu, 2001

(7) Cultural, Aesthetic and Archeological Value

Tanahu district has a number of historical, cultural and religious places described in **Table 2.1-19**.

Table 2.1-19 Cultural and Religious Places in Tanahu District

Place	Features
Devghat	Religious place of Hindu Community, Mela (gathering) at 1st of Magh
Chhabdi Barahi	Famous temple of Chhabdi goddess, Daily pray by religious people
Dhorbarahi	Famous temple of Barahi goddess, daily pray by religious people
Vyas Cave	Meditated place of Vyiaas a writer of religious holy book Bedh, Situated at the confluence of two holy river Seti and Madi
Thanithan Mai Temple	Bunch of followers will serve to goddess for the sake long life
Birth Place of Bhanu Bhakta	Home of Nepali great poet Bhanu Bhakta Acharya kept in its natural condition
Tanahusur Durbar	Capital city of Tanahu state, Sen empire
Ghanshi Kuwa	Water pond by poor farmer (Ghansi), an inspire person to Bhanubhakta acharya
Siddha cave (bandipur)	A Cave where about 1000 peoples can reside
Siddha cave (Bhimad)	A Cave have six floors but can visit on five floor only
Bandipur	Naturally beautiful place where northern himalayan ranges can clearly observe, Temples like Bhagbati, Khadkadevi Mai also remains.
Chinkeshworikota	Temple of Chinkeshwori Mai, Place from where trekking route can develop
Bandipur	Place for Gurung and Newar community, Famous in Nepali folk dance Kauda and others
Dhorphirdi, Phirphire, Raipur	Route for developing village tourism, Rich in Folk Music and Songs (Dohari geet, Panche Baja, Chuttala etc),Some beautiful places like Rajasthalkot, Milinium cave, RaipurKot etc

Source: District Profile of Tanahu District, DDC, Tanahu, 2001

2.2 Affected VDCs/Municipality

The Upper Seti Storage Hydroelectric Project will affect seven VDCs and one municipality, namely Bhimad, Chhang, Majkot, Rising Ranipokhari, Kotdurbar, Jamune, Kahun Shivapur, and Vyas Municipality of Tanahu district. This section describes the socio-economic situation of these affected VDCs and municipality. Since Pokhari Bhanjyang was previously included as one of affected VDCs in existing EIA report prepared by NEA and located in the vicinity of the proposed project facility sites, it was also included in this survey. As one of the limitations of study of affected VDC/Municipality is that some statistic data of Vyas Municipality was not available in some information sources, some statistic data are shown for only affected VDCs.

(1) Demographic Characteristics

Eight VDCs and one municipality accounts for 24 percent of the total land area and 26 percent of the total population of Tanahu district. According to 2001 Census, the number of total households and population of these areas are estimated to be 16,152 and 80,884. The average family size of these areas is 5.0, almost similar to district average. The ration of male population and female population is 1:1.13. The average population density of the project site is 215, which is higher that the district and national average.

The population density varies significantly between the eight VDCs and municipality. Vyas municipality, for instance has the highest population density (409 persons/km^2) while Kahun Shivapur VDC has the lowest population density (92 person/km^2). The population of the project site has been increased by at the rate of 3.2 percent per annum and reached from 61433 in 1991 to 80,884 in 2001. The growth rate varies distinctly among the different VDCs and municipality. The Vyas municipality has the highest population growth rate (6.1% /annum) while the population has been decreased in some of the VDC such as Pokhari Bhanjyang (0.81%/annum). Better access of roads, services, economic opportunities and security are reported to be the key factors for higher population growth rate and density (**Table 2.2-1**). The major settlements and market center are Vyas Municipality and Bhimad VDC.

Table 2.2-1 Household and Population of the Project Affected VDC/Municipality (2001)

VDC/Municipality	Population (Number)			Households (HHs)	Area (Km^2)	Population Density (Km^2)	Population Growth Rate (1991-2001)
	Male	Female	Total				
Bhimad	2895	3250	6145	1382	23.8	258	3.8
Chhang	2859	3478	6337	1318	34.48	104	0.62
Majhkot	3683	4238	7921	1378	50.41	157	3.2
Rising Ranipokhari	1930	2247	4177	740	29.76	140	4.0
Kotdurbar	2850	3496	6346	975	25.86	245	1.41
Jamune	4438	5127	9565	1929	27.85	343	1.5
Kahun Shivapur	4031	4035	8066	1087	87.45	92	3.09
Pokhari Bhanjyang	1902	2180	4082	832	28.14	145	-0.81
Vyas Municipality	13449	14796	28245	6511	69.01	409	6.1
Total	38037	42847	80884	16152	376.76	215	3.2

Source: I)District Profile of Tanahu District Profile, DDC, Tanahu 2001, II) CBS 2001.

With regard to caste and ethnic composition, Magar, the indigenous ethnic group is the dominant population in these areas, which represents 36 percent of the total population followed by Brahmin (14%), Dalit (12%), Newar (6%), and Chhetri (8%) (**Table 2.2-2**).

Table 2.2-2 Population by Caste/ Ethnic Group in the Project VDCs/ Municipality

V.D.C	Magar	Brahmin	Gurung	Chhetri	Newar	KDS	Thakuri	Kumal	Darai	Muslim	Others	Total
Bhimad	1231	1357	59	155	999	797	48	254	0	92	1153	6145
Chhang	2379	424	556	324	921	1177	73	297	0	7	179	6337
Majhkot	4400	591	494	11	305	1005	581	293	0	0	241	7921
Rising Ranipokhari	1725	551	471	128	898	233	0	0	0	0	171	4177
Kotdurbar	5058	44	0	260	162	551	0	0	0	0	271	6346
Jamune	2866	1365	133	1400	1529	1594	146	27	0	21	484	9565
Kahun Shivapur	6064	63	9	33	11	927	884	0	0	0	75	8066
Pokhari Bhanjyang	1724	737	104	273	8	850	60	7	30	0	289	4082
Vyas Municipality	3896	5922	2081	3523	2716	2728	470	619	2939	472	2879	28245
Total (No)	29343	11054	3907	6107	7549	9862	2262	1497	2969	592	5742	80884
%	36.3	13.7	4.8	7.6	9.3	12.2	2.8	1.8	3.7	0.7	7.1	100

Note: KDS= Kami, Damai, Sark.i
Source: 2001 Population Census, 2001.

A large majority population of the project area is following Hindu religion (91.1%) followed by Buddhist religion (78%), Islam (0.7%), and Christian religion (0.1%). The populations that follow Hindu and Buddhist religion are found in all the project VDCs and municipality. Eighty percent of the population that follows Islam population is concentrated in Vyas municipality. The Christian are concentrated mainly in three VDCs such as Pokhari Bhanjyang, Bhimad and Ranipokhari and Vyas municipality.

(2) Education

Within and adjacent to the affected VDCs and municipality, there are 151 primary schools, 20 lower

secondary schools, 35 secondary schools, 2 higher secondary schools and 3 campuses under the supervision of 6 Resource Centers. Ninety percent of these educational institutions are public and 10 percent are private, which is similar to overall district status (**Table 2.2-3**).

Table 2.2-3 Access to different Types of Schools in the Affected VDCs/Municipality

Resource Centre/ VDC/Municipality	Government Managed							Private Managed						Number of Total Schools
	Primary		LLS	SS	HSS	Total	Cam-pus	Primary		LSS	SS	HSS	Total	
	I-V	I-III	IVIII	I-X				I-V	I-III	I-VIII	I-X			
Nirmal MA Bi./ Vyaas Municipality	13	7	4	8	0	32	3	5	6	1	5	1	18	50
Keshabtar, MA Bi./ Pokhari Bhanjyang	14	8	2	3	0	27	0	0	0	0	0	0	0	27
Sahidganga Ma. Bi/ Kahun Shivapur,	13	12	4	3	0	32	0	0	0	0	0	0	0	32
Sringa Ma.Bi/ Kotdurbar Rising	13	7	2	5	0	27	0	0	0	0	0	0	0	27
Min Ma Bi, Jamune, Chhang.	14	14	4	5	0	37	0	0	0	1	1	0	2	39
Janjyoti Uchha Ma Bi./Bhimad	15	9	2	3	1	30	0	1	0	0	2	0	3	33
Total	82	57	18	27	1	185	3	6	6	2	8	1	23	208

Source: DEO, Tanahu, 2006

The literacy status of the affected VDCs shown in **Table 2-2-4** reveals that 61 percent of the total population of the area literate. The ratio of female literacy is significantly lower compared to male literacy rate. According to other information source, Census 2001, the average literacy rate of Vyas Municipality is estimated to be over 75 percent.

Table 2.2-4 Literacy Status of Affected VDCs

Affected VDCs/ Municipality	Literacy rate			Adult Literacy (15+yrs)		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Bhimad	39.8	30.25	70.06	43.6	30.98	74.58
Chhang	40.98	25.98	66.96	40.57	23.22	63.79
Rising Ranipokhari	39.92	25.57	65.49	44.56	24.14	68.7
Kotdurbar	38.36	21.49	59.85	40.89	15.55	56.43
Jamune	38.02	27.29	65.31	41.93	22.6	64.53
Majhkot	37.52	22.11	59.63	39.24	18.64	57.88
Pokhari Bhanjyang	34.43	23.59	58.01	36.68	23.05	59.73
Kahun Shivapur	27.44	24.28	51.72	22.37	19.26	41.63
Average	37.1	24.08	61.18	38.93	20.82	59.76

Source: DEO, Tanahu, 2006

As **Table 2.2-5** indicates, close to 84 percent of the population has access of primary schools within 1 km distance. In the case of Kahun Shivapur, only half of the population can have access to primary schools within 1 km distance.

Table 2.2-5 Distance to Nearby Primary School

Affected VDCs/	Within 1km (%)	More than 1 Km less than 2km (%)
Bhimad	70.59	29.41
Chhang	96.3	3.7
Majhkot	78.38	21.62
Rising Ranipokhari	89.47	10.53
Kotdurbar	97.14	2.86
Jamune	93.75	6.25
Kahun Shivapur	50	30
Pokhari Bhanjyang	94.74	5.26
Average Project VDCs	83.46	15.36

Source: DEO, Tanahu, 2006

Eighty eight percent of the children at school age are enrolled at the primary level 5-9 years in the affected VDCs and municipality. This is still lower compared to the district average NER (96%). In some of the VDCs such as Bhimad, the NER at primary level is found most poor (48%) while that of Vyas municipality is 113% (**Table 2.2-6**).

Table 2.2-6 Net Enrollment Ratio of Primary Level in the Affected VDCs/ Municipality

Affected VDCs/ Municipality	NER at Primary Level (5-9years) in 2005		
	Male (%)	Female (%)	Total (%)
Bhimad	46	51	48
Chhang	94	82	88
Majhkot	88	80	84
Rising Ranipokhari	88	97	93
Kotdurbar	99	107	103
Jamune	82	91	87
Kahun Shivapur	101	88	94
Pokhari Bhanjyang	96	105	100
Vyas Municipality	113	114	113
Average Project VDCs/ Municipality	95	81	88
District Average	95	96	96

Source: DEO, Tanahu 2006.

(3) Health

The project site is served with one 15 bed hospital located at Damauli of Vyas municipality, one Primary Health Centre with 3 bed facility at Bhimad, one health post located at Tharpu, Chhang VDC and 6 Sub-health posts located in 6 VDCs.

Table 2.2-7 Health Related Institutions and Facilities in the Project VDCs/ Municipality

Institution Type	Location in Affected VDCs/Municipality	Physical Facilities
Hospital	Damauli, Vyas M. -10	Land Area 10-6-2 ropani, 14 rooms, Electricity, Telephone, Toilet. Water Supply available
Primary Health Center	Bhimad-1	Land Area 10-15-3 ropani, 24 rooms, Electricity, Telephone, Toilet. Water Supply available
Health Post	Chhang-1, Tharpu	Land Area 5-0-0 ropani, 7 rooms, Electricity, Water Supply available
Sub-Health Post	Jamune-4	Land Area 5-0-0 ropani, 1 room, Water Supply available
	Kahun Shivapur (Suke-4)	4 rooms, Water Supply available
	Kotdurbar-4	1 room, Water Supply available
	Pokhari Bhanjyang-7	3 rooms
	Rani Pokhari	2 rooms,
	Majhkot	5 rooms,

Source: District Health Office, Tanahu, 2006.

All the health related indicators of the affected VDCs and municipality are not available. However, the assessment of the malnutrition level by Poverty Mapping Project DDC (2001) reveals that almost one quarter of the affected VDC population has low malnutrition level. The malnutrition level varies significantly among the affected VDCs and 85 percent population of Ranipokhari VDC has low malnutrition level while 99 percent population of Chhang VDCs have no any malnutrition problems (**Table 2.2-8**).

Table 2.2-8 Malnutrition Level at Affected VDC

Affected VDCs	Malnutrition Level (%)			
	Severe	Moderate	Low	None
Bhimad	4.98	55.25	20.97	18.8
Chhang	0	0.63	0	99.37
Majhkot	8.97	40.34	33.1	17.6
Rising Ranipokhari	1.24	12.32	84.97	1.46
Kotdurbar	1.28	6.41	10.51	81.8
Jamune	0	4.38	0.73	94.9
Kahun Shivapur	8.15	62.46	26.77	2.62
Pokhari Bhanjyang	2.1	17.76	7.16	72.99
Average Project Site	3.34	24.94	23.02	48.70
District Average	3.92	35.88	20.08	40.12

Source: Poverty Mapping Report, Tanahu, DDC 2001

(4) Water Supply and Sanitation

Only about 52 percent of the population in the affected VDCs are reported to be supplied with piped water, compared to over 70 percent in the district. Although almost 80 percent population are fetching drinking water within one hour time, a significant number of population (15%) spend more than 5 hours in a day to fetch drinking water. A large number of such population are reported in Majhkot VDC (29%) and Kahun Shivapur VDC (27%) (**Table 2.2-9**).

Table 2.2-9 Accessibility of Water Supply in the Affected VDCs

Affected VDCs	Access to safe drinking water (% of HHs)	% of HHs reporting drinking water accessibility in different hours			
		< 1Hrs	1-<3 Hrs	3-5Hrs	>5Hrs
Bhimad	67.95	65.33	1.51	14.13	19.04
Chhang	38.24	85.37	0.95	0	13.69
Majhkot	28.16	55.69	14.57	0.52	29.22
Rising Ranipokhari	88.65	96.81	1.62	0	1.57
Kotdurbar	31.63	86.41	1.15	0	12.43
Jamune	37.5	98.75	1.04	0	0.12
Kahun Shivapur	46.67	69.85	3.54	0	26.62
Pokhari Bhanjyang	78.61	77.46	4.78	0.9	16.87
Average	52.18	79.46	3.64	1.94	14.96

Source: Poverty Mapping Report, Tanahu, DDC, 2001

The spring sources of water remain as major sources of water supply in the affected VDCs. **Table 2-2-10** presents some of the major sources being utilized for drinking water located in the affected VDCs and municipality. Besides these sources, it is reported that 11 medium level drinking water schemes have been proposed by the district assembly to serve in affected VDCs and Municipality expect for Bhimad, Chhang, Pokhari Bhanjyang VDCs, of which some are under construction and the other are about to be completed.

Table 2.2-10 Sources of Drinking Water being used and Impacted by the Project

Affected VDCs/Municipality, Ward	Source Type	Source Name	Location	Beneficiary Household (HH)
Chhang VDC Ward 4, Chokre	Pond/Pokhari	Chokre Pokhari	Just below Chokre village	39
Chhang VDC Ward 5, Fulbari Ghaderi	Pond/Pokhari	Chokre	Chokre	20
	Pipe water	Pipale	Pipale	15
Chhang VDC Ward 7, Jhakash Fulbari	Pipe water	Chitung Khola	Jhakash-Fulbari	23
Rising Rani Pokhari VDC Ward 9, Rising Patan	Spring /Mulpani	Kumalpani	Rising Patan	50
	Spring /Mulpani	Amalapani	Rising Patan	50
	Spring /Mulpani	Dulegaunda	Rising Patan	40
	Spring /Mulpani	Dhunge Pandhero	Rising Patan	200
	Spring /Mulpani	Tarebhir	Rising Patan	70
Rising Rani Pokhari VDC Ward 9, Rising Patan – Kharkhare	Stream	Bokse Chhahra	Sanutari	16
Kotdurbar V D C Ward 1, Maidan Swanra	Spring /Mulpani	Risini Khola	Ward-3	35
Kahun Shivapur VDC Ward 3, Bakle	Kuwa	Bakle Kuwa	Bansbot	4
	Kuwa	Sarki Kuwa	Kahun	50
	Pipe Water	Kheradi	Kahun Basti	20
	Kuwa	Gidha	Ranibari Gidha	5
Vyas Municipality Ward 7, Beni Patan	Spring /Mulpani	Linde Dhara	Near School	25
	Water Tank	Dharakholsi and Asagurikholsi	Asaguri	45
	Pipe Water	Dharakholsi	Asaguri Puchhar	1

Source: Supplemental EIA Survey, JICA, 2006.

Unavailability of safe drinking water to 48 percent of the population and lack of toilet facility to 77 percent of the population indicates the poor sanitation condition of the project affected VDCs. In 5 VDCs (62%), the access of toilets is limited to less than 15 percent households. Further, almost 36 percent households have no access of hospital within 3 km distance (**Table 2.2-11**).

Table 2.2-11 Sanitation Condition of the Project VDCs

Affected VDCs	%of HH not access to Safe Drinking Water	Access to Sanitation Service	
		%HH Not access to latrine	%HH not having Hospital within 3km
Bhimad	32.05	58.96	35.29
Chhang	61.76	85.25	37.04
Majhkot	71.84	91.45	62.16
Rising Ranipokhari	11.35	88.05	47.37
Kotdurbar	68.37	92.05	22.86
Jamune	62.5	37.25	9.38
Kanhun Shivapur	53.33	73.96	25
Pokhari Bhanjyang	21.39	90.0	47.37
Average Project VDCs	47.82	77.12	35.81
District total/Average	43.47	73.04	29.25

Source: Poverty Mapping Report, 2001

(5) Electricity and Transportation

Only about 13.3 percent population in the project VDCs are connected with electricity services for lighting. Remaining households use mainly kerosene for lighting. Among the 8 VDCs, larger population of Bhimad and Jamune are connected with electricity facility (42 and 38%), while none of the households in the Kahun Shivapur have access with electricity services (**Table 2.2-12**). Fuel wood is the main source for cooking for the large majority households in the project VDCs except in few urban and semi-urban areas such as Vyas Municipality, Bhimad where the well off households and businessmen use LP Gas and kerosene.

Table 2.2-12 Percentage of Population Served with Electricity

Affected VDCs	Pokhari Bhanjyang	Rani Pokhari	Jamune	Majhkot	Kahun Shivapur	Kotdurbar	Bhimad	Chhang	Total
% of Pop.	6.0	0.5	37.5	7.2	0	0.4	41.7	13.4	13.3

Source: Periodic District Plan (2058/59-2063/064); DDC Tanahu

Assessment of access of other services in the project area reveal that with 2 km of distance 53 percent of the affected households have access of motorable facility followed by 39 percent population with 4 km and 8 percent with 6 km. Similarly, 39 percent of the population has access to the major trail within 0.5 km distance (**Table 2.2-13**).

Table 2.2-13 Motorable Road Accessibility

Affected VDCs	Motorable road accessibility (%)			Major trail accessibility within 0.5 km (%)
	Within 2km	More than 2 km and less than 4km	More than 4 km and less tan 6km	
Bhimad	47.06	47.06	5.88	82.35
Chhang	66.67	33.33	0	33.33
Majhkot	51.35	40.54	8.11	2.7
Rising Ranipokhari	57.89	42.11	0	63.16
Kotdurbar	25.71	71.43	2.86	54.29
Jamune	95.31	4.69	0	48.44
Kahun Shivapur	10	40	45	30
Pokhari Bhanjyang	68.42	31.58	0	0
Average	52.8	38.8	7.73	39.28

Source: Poverty Mapping Report, 2001, DDC Tanahu.

(6) Economic Condition

Sixty-eight percent of the population of age and over is economically active. Of the total economically active population 64 percent are female (**Table 2.2-14**).

Table 2.2-14 Population 10 Years Of Age And Over By Usually Economic Activity For Village Development Committee /Municipality

Affected VDCs/ Municipality	Economically Active						Economically Inactive					
	Male		Female		Total		Male		Female		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Bhimad	1282	59	1494	60	2776	59	898	41	1000	40	1898	41
Chhang	1220	62	1892	69	3112	66	747	38	840	31	1586	34
Majhkot	2073	82	2767	82	4840	82	452	18	595	18	1047	18
Rising Ranipokhari	1383	100	1842	100	3226	99	0	0%	7	0	7	0
Kotdurbar	1663	79	1975	78	3638	63	434	21	543	22	977	21
Jamune	2270	67	2483	62	4753	64	1136	33	1548	38	2684	36
Kahun Shivapur	1724	62	1798	61	3522	61	1070	38	1173	39	2243	39
Pokhari Bhanjyang	1101	87	1617	95	2718	91	170	13	94	5	263	9
Vyas Municipality	6417	63	6252	55	12669	59	3702	37	5157	45	8858	41
Total	19133	69	22120	67	41254	68	8609	31	10957	33	19563	32
%	31.4		36.4		67.8		14.2		18.0		32.2	

Source: CBS, 2001

Agriculture combined by livestock remains to be the main occupation for the majority of the population in the affected VDCs. The assessment of income of households by DDC (2001), however reveal that the households derive major portion of their income (86%) from non-agricultural income. The average income of NRs 24,620 is significantly lower than the average national income of western hills estimated by NLSS 2004, i.e NRs 64,447 (**Table 2.2-15**).

Table 2.2-15 Share of Agricultural and Non-agricultural Income in the Project VDCs

Affected VDCs	Income from Agriculture &Live.		Income from Non-Agricultural Activities.		Total Rs
	Rs	%	Rs	%	
Bhimad	5,315	14.3	31,811	85.7	37,126
Chhang	873	1.60	53,761	98.4	54,634
Majhkot	1,838	8.6	19,641	91.4	21,479
Rising Ranipokhari	996	6.7	13,852	93.3	14,848
Kotdurbar	2,353	8.4	25,628	91.6	27,981
Jamune	149	16.4	760	83.6	909
Kahun Shivapur	5,793	31.3	12,709	68.7	18,502
Pokhari Bhanjyang	10,789	50.2	10,697	49.8	21,486
Average	3,513	14.3	21,107	85.7	24,620

Source: District Profile of Tanahu District, DDC, Tanahu, 2001

The poverty mapping of the affected VDCs further reveal that 80-90 percent households of the project VDCs fall in the below poverty line(**Table 2.2-16**).

Table 2.2-16 Poverty by Income in the Project VDCs

Affected VDCs	Poverty by income (NPC Cut off Point) Rs. 30000/household/year to meet 2256kcal intake				Poverty by income (NPC Cut off Point) Rs. 50000/hh/year of $150/Capita/year			
	Above Poverty Line (>Rs 30000)		Below Poverty Line (<30000)		Above Poverty Line (>Rs 30000)		Below Poverty Line (<30000)	
	HH	%	HH	%	HH	%	HH	%
Bhimad	324	37.53	539	62.43	220	25.48	643	74.48
Chhang	443	46.63	507	53.37	330	34.74	620	65.26
Majhkot	142	12.24	1018	87.76	106	9.14	1054	90.86
Rising Ranipokhari	117	18.97	500	81.08	60	9.73	557	90.33
Kotdurbar	291	37.31	489	62.69	168	21.54	612	78.46
Jamune	7	0.73	953	99.27	7	0.73	953	99.27
Kahun Shivapur	59	9.08	591	90.92	33	5.08	617	94.92
Pokhari Bhanjyang	83	12.39	587	87.61	40	5.97	630	94.03
Total Project Site	1466	22.05	5184	77.95	964	14.5	5686	85.5
District Total	9646	20.72	33174	79.28	4809	10.21	38011	89.79

Source: Poverty Mapping Report, Tanahu, DDC 2001

The Food sufficiency status of the project VDCs shown in **Table 2.2-17** reveals that only 37 percent households in the project area have food sufficiency throughout the year.

Table 2.2-17 Food Sufficiency Status of Affected VDC

Affected VDCs	Total HHs	Food Sufficiency			
		>=12m Sufficiency.		<12m Sufficiency	
		HH	%	HH	%
Bhimad	863	195	22.59	668	77.37
Chhang	950	209	22.00	741	78.00
Majhkot	1160	590	50.86	570	49.14
Rising Ranipokhari	617	303	49.14	314	50.92
Kotdurbar	780	204	26.15	576	73.85
Jamune	960	624	65.00	336	35.00
Kanhun Shivapur	650	240	36.92	410	63.08
Pokhari Bhanjyang	670	123	18.36	547	81.64
Total Project VDCs	6650	2488	37.4	4162	62.6
District Total	42821	13758	32.12	29062	68.57

Source: Poverty Mapping Report, Tanahu, 2001

The project affected VDCs have several resource potential with respect to enhancement of livelihood if the resources are properly utilized. All the VDCs are identified as potential pocket for livestock development specially the goat. The collaborative forest management practices adopted in Vyas Municipality and Bhimad and Pokhari Bhanjyang VDCs have been a major source of income of the local community. Similarly, the VDCs have great potentials for the commercialization of crops and other agricultural crops.

(7) Cultural and Historical Places

Vyas cave and Shidha cave in Bhimad VDC are some of the famous and historical and cultural places located in the affected VDCs. More detailed information is found in Focus Group Discussion.

2.3 Affected Persons/Households

The Household Survey was undertaken targeting randomly selected 399 households having land or assets below 425 m of reservoir FSL in affected VDC and municipality to grasp the socio-economic and cultural situation of affected persons and households (See also Annex D: Household Survey Questionnaire). The households in Jamune VDC were not covered by this Survey since those who have land or assets below 425 m were not present during the Household Survey. The sample represents about 50 percent households of the area (below 425m reservoir FSL) that are expected to have some types of impact due to project activities. The findings of the survey are analyzed and presented in the respected headings in the following paragraphs.

(1) Demographic Characteristics

Eighty percent of the surveyed households are headed by male members while 19 percent are headed by female members. The total population of 399 survey households is estimated to be 2839. The average family size is 7.1, which is significantly higher than the average family size of the project affected VDCs (i.e. 5.0) and district average family size (i.e.5.01). Of the total population 47 percent are female (**Table 2.3-1**).

Table 2.3-1 Population and Family Size of the Sample Households

Description	Households		Population			Average Family Size
	Number	%	Male	Female	Total	
Male Headed	322	80.7	1237	1107	2344	7.3
Female Headed	77	19.3	248	237	485	6.3
Total	399	100	1485	1344	2839	7.1

Source: Supplemental EIA Survey, JICA Study Team, 2006

The sample households are divided into 4 major ethnic/caste groups. As **Table 2.3-2** indicates, Magar was the most dominant population (51%), followed by Brahmin (15.79%), Gurung (8.52%) and Dalit (8%).

Table 2.3-2 Ethnic/Caste Division

Ethnicity/Caste	Caste Name	Frequency	%	
Brahmin/Chhetri/Thakuri	Brahmin	63	15.79	19.0
	Chhetri	13	3.26	
Adibasi/Janjati[5]	Magar	204	51.13	69.7
	Gurung	34	8.52	
	Newar (Shrestha)	23	5.76	
	Majhi, Bote	17	4.26	
Dalit[6]	Sarki	9	2.26	8.0
	Kami	17	4.26	
	Damai	6	1.50	
Other	Sanyasi	13	3.26	3.3
	Grand Total	399	100	100

Source: Supplemental EIA Survey, JICA Study Team, 2006

Slightly more than half of the survey households are adopting joint family system under which 2-3 generations of families live together while 46 percent households are found residing under nuclear family system. It is reported the nuclear system of family structure has increased over the years.

The ratio of families adopting joint family system is equal to that of nuclear family among Dalits, higher among Brahmin/Chhetri and Adibasi/Janjati. However, majority of the Sanyasi (62%) group are following nuclear system of family structure. Similarly, majority and almost an equal percentage of male and female headed households are also adopting joint family structure (**Table 2.3-3**).

[5] *About 60 indigenous tribes of Nepal are defined as Adibasi/Janjati by Nepal Government.*
[6] *Mainly three castes such as Shoe Maker (Sarki), iron-workers (Kami) and tailors (Damai) are included in Dalit caste.*

Table 2.3-3 Family Structure of Survey Households

Categories	Nuclear		Joint		Total	
	Nos.	%	Nos.	%	Nos.	%
Brahmin/ Chhetri/ Thakuri	34	44.7	42	55.3	76	100.0
Adibasi/ Janajati	125	45.0	153	55.0	278	100.0
Dalit	16	50.0	16	50.0	32	100.0
Other (Sanyasi)	8	61.5	5	38.5	13	100.0
Total/ Overall	183	45.9	216	54.1	399	100.0
Male	147	45.7	175	54.3	322	100.0
Female	36	46.8	41	53.2	77	100.0
Total/ Overall	183	45.9	216	54.1	399	100.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

It is found that almost half of the surveyed households are residing in the area more than two generation before, 24 percent one generation before and 30 percent within last 30 years. Among those living within last three decades, the large majority (98 %) were migrated from the same district (**Table 2.3-4**).

Table 2.3-4 Period of Settlement

Categories	Two Generation Before		One Generation Before		Recent (within 30 Years)		Total		Place of Recent Migrants (for within 30 years migrants)					
									Migrated from the Same District		Migrated from other District		Total Migrating	
	No.	%	No.	%	No.	%	No.	%	No.	%	No	%	No.	%
Brahmin/ Chhetri/ Thakuri	29	38.2	24	31.6	23	30.3	76	100	23	100			23	100
Adibasi/ Janajati	143	51.4	54	19.4	81	29.1	278	100	80	98.8	1	1.2	81	100
Dalit	15	46.9	9	28.1	8	25.0	32	100	8	100			8	100
Other (Sanyasi)			7	53.8	6	46.2	13	100	4	66.7	2	33.3	6	100
Total/ Overall	187	46.9	94	23.6	118	29.6	399	100	115	97.5	3	2.5	118	100
Male	157	48.8	77	23.9	88	27.3	322	100	86	97.7	2	2.3	88	100
Female	30	39.0	17	22.1	30	39.0	77	100	29	96.7	1	3.3	30	100
Total/ Overall	187	46.9	94	23.6	118	29.6	399	100	115	97.5	3	2.5	118	100

Source: Supplemental EIA Survey, JICA, 2006

The age structure of sample population shown in **Table 2.3-5**, reveal that 58 percent of the population fall in the age group of 16-60 years and can be considered as economically active[7]. Almost a quarter of population fall in the age group of 6-15 years and can be considered as school going population. The population below 5 years of age (11%) and above 60 years (7%) can be considered as economically inactive group.

[7] *According to National Planning Commission of Nepal population 10 years of age and above are considers as economically active group.*

Table 2.3-5 Age Group of Surveyed Population (%)

	Up to 5 Years			6 to 15 Years			16 to 60 Years			Over 60 Years			Total		
Sex	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
%	5.5	5.4	10.9	12.4	11.7	24.1	31.2	26.9	58.1	3.4	3.5	6.9	52.5	47.5	100

Source: Supplemental EIA Survey, JICA Study Team, 2006

The surveyed families follow three religions. The majority of the families (86%) have adopted Hindu religion followed by Buddhist (14%) and Christian (0.3%). The followers of Buddhist and Christian religion are found only among Adibasi/Janjati within the sample frame (**Table 2.3-6**).

Table 2.3-6 Religion of the Surveyed Families

Categories	Hindu		Buddhist		Christian		Total	
	No.	%	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri	76	100.0					76	19.0
Adibasi/ Janajati	223	80.2	54	19.4	1	0.4	278	69.7
Dalit	32	100.0					32	8.0
Other (Sanyasi)	13	100.0					13	3.3
Total/ Overall	344	86.2	54	13.5	1	0.3	399	100.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

(2) Education

A large number of the sample population (79%) is reported to be literate. The literacy percentage of population is relatively better when compared to the average literacy rate of the project VDCs (61%) and district (71%). The literacy rate among male and female members varies greatly as 71 percent of female population are reported to be literate compared to 87 percent of male population. Among different caste/ethnic groups, the literacy rate is higher among Brahmin/Chhetri caste (84%) compared to others (**Table 2.3-7**).

Table 2.3-7 Literacy Status of Population

Categories	Illiterate			Literate			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Brahmin/ Chhetri/ Thakuri	10.0	23.4	16.0	90.0	76.6	84.0	55.2	44.8	100.0
Adibasi/ Janajati	14.3	30.2	21.9	85.7	69.8	78.1	51.9	48.1	100.0
Dalit	14.0	35.2	23.7	86.0	64.8	76.3	54.0	46.0	100.0
Other (Sanyasi)	13.3	21.4	17.2	86.7	78.6	82.8	51.7	48.3	100.0
Total/ Overall	13.4	29.1	20.8	86.6	70.9	79.2	52.7	47.3	100.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

Among the literate population 14 percent had not attended any school while 86 percent had attended schools. The level of education completed by the population is also presented in **Table 2.3-8**. The Table reveals that 39 percent of the population has completed primary level education, 27 percent

each have completed lower secondary and secondary level education and 7 percent has completed above School Leave Certificate (SLC) level education. The percentage of population that have completed education at the secondary level education and above SLC is found higher among the Brahmin/Chhetri community compared to others.

Table 2.3-8 Distribution of Literate Population by Level of Schooling (% of Population)

Categories	Completed Level (Class)				
	1-5	6-8	9-10& SLC	>SLC	Total
Brahmin/ Chhetri/ Thakuri	20.1	18.1	41.4	20.4	100.0
Adibasi/ Janajati	42.4	29.5	23.7	4.5	100.0
Dalit	57.1	24.8	16.5	1.5	100.0
Other (Sanyasi)	35.0	32.5	32.5	0.0	100.0
Total/ Overall	38.8	26.9	26.9	7.4	100.0

Note: School Leave Certificate, SLC
Source: Supplemental EIA Survey, JICA Study Team, 2006

(3) Energy for Lighting and Cooking

More than 60 percent of the sample households (64%) are connected with electricity services while 43 percent use kerosene for lighting. The access to electricity is highest among the Sanyashi (100%) and Brahmin/Chhetri (87%) communities while 57 percent of Janjati and 59 percent of Dalit are benefiting from the electricity lighting. The households use more than one source for lighting (**Table 2.3-9**).

Table 2.3-9 Households Using Various Type of Energy for Lightning (Multiple Responses)

Categories	Kerosene		Firewood		Electricity		Other	
	No.	%	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri	21	27.6			66	86.8	1	1.3
Adibasi/ Janajati	134	48.2	1	0.4	159	57.2	5	1.8
Dalit	15	46.9			19	59.4		
Other (Sanyasi)					13	100.0		
Total/ Overall	170	42.6	1	0.3	257	64.4	6	1.5

Source: Supplemental EIA Survey, JICA Study Team, 2006.

The households use multiple sources of energy for cooking. Five major sources of cooking energy are used by the project affected families. The large majority (94%) are dependent on firewood, followed by bio-gas (27%), LP Gas (10%), Kerosene (2%) and electricity (1%) respectively. Brahmin/ Chhetri and Sanyasi are found to be largest user of bio-gas and LP Gas while only few Dalits are found capable to use bio-gas and LP Gas (**Table 2.3-10**).

Table 2.3-10 Households Using Various Type of Energy for Cooking (Multiple Responses)

Categories	Kerosene		Firewood		Bio-Gas		LP Gas		Electricity	
	No.	%	No.	%	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri			72	94.7	43	56.6	11	14.5		
Adibasi/ Janajati	5	1.8	261	93.9	55	19.8	22	7.9	3	1.1
Dalit	3	9.4	30	93.8	2	6.3	2	6.3	1	3.1
Other (Sanyasi)			13	100.0	7	53.8	3	23.1		
Total/ Overall	8	2.0	376	94.2	107	26.8	38	9.5	4	1.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

The average quantity of firewood consumed by a household in a year is estimated to be 2819 Kg. which is equivalent to NRs 6,128 at local price. Among different categories of households, Adibasi/Janjati is found to be the uppermost user of firewood (i.e. 3055 kg) (**Table 2.3-11**).

Table 2.3-11 Average Quantity of Firewood Used & its Value (NRs)

Categories	Quantity Used/Yr (Kg)	Value Equivalent
Brahmin/ Chhetri/ Thakuri	2046	4369
Adibasi/ Janajati	3055	6678
Dalit	2608	5720
Other (Sanyasi)	2825	5649
Total/ Overall	2819	6128

Source: Supplemental EIA Survey, JICA Study Team, 2006

(4) Water Supply and Sanitation

Majority of the households in the survey area (85%) are found served with piped water supply (while 14 percent households rely on well /pond and one percent on spring (**Table 2.3-12**).

Table 2.3-12 Sources of Drinking Water

Categories	Source of Drinking Water									
	Piped Tap		MUL		Stream/ River		Well/ Pond		Total	
Brahmin/ Chhetri/ Thakuri	69	90.8	1	1.3	2	2.6	4	5.3	76	100.0
Adibasi/ Janajati	231	83.1	2	0.7			45	16.2	278	100.0
Dalit	24	75.0	1	3.1			7	21.9	32	100.0
Other (Sanyasi)	13	100.0							13	100.0
Total/ Overall	337	84.5	4	1.0	2	0.5	56	14.0	399	100.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

With regards to the sanitation, 63 percent households in the study area are using toilets for defecation. It is reported that 82 percent of the toilets are improved types. Among the different categories of households, lowest number of households having toilets is reported among Dalit (44%) and Janjati (57%) while 100 percent of Sanyasi and 86 percent of Brahmin/Chhetri have constructed toilets. It is also found that female headed households are found more aware regarding the construction of toilets than the male households, as 75 percent female households are having toilets compared to 60 percent of male headed households (**Table 2.3-13**). In general, the access to drinking water service and sanitation of the survey households is found better compared to average district and VDC situation**.**

Table 2.3-13 Households Having Toilet Facility

Categories	HH Having Toilet		Type of Toilet Owned			
	Number	Percent	Pit		Improved	
			Number	Percent	Number	Percent
Brahmin/ Chhetri/ Thakuri	65	85.5	7	10.8	58	89.2
Adibasi/ Janajati	159	57.2	33	20.8	126	79.2
Dalit	14	43.8	3	21.4	11	78.6
Other (Sanyasi	13	100.0	2	15.4	11	84.6
Total/ Overall	251	62.9	45	17.9	206	82.1
Male Headed HHs	193	59.9	35	18.1	158	81.9
Female Headed HHs	58	75.3	10	17.2	48	82.8
Total/ Overall	251	62.9	45	17.9	206	82.1

Source: Supplemental EIA Survey, JICA Study Team , 2006

An enquiry with the sample households regarding the other devices of sanitation condition, 98 percent households reported that they have provisioned separate livestock shed and 12 households noted that they have also installed smokeless cook stove (**Table 2.3-14**).

Table 2.3-14 Households Having other Sanitation Devices

Categories	Has Separate Shed		Have Smokeless Stove	
	No	%	No	%
Brahmin/ Chhetri/ Thakuri	75	98.7	15	19.7
Adibasi/ Janajati	273	98.2	28	10.1
Dalit	32	100.0	5	15.6
Other (Sanyasi)	13	100.0	1	7.7
Total/ Overall	393	98.5	49	12.3

Source: Supplemental EIA Survey, JICA Study Team, 2006.

(5) Membership of Community Group and Training

Households' participation in various institutions was also recorded when assessing the quality of life value of the project affected households and it was found only about 29 percent households were representing in local level organizations such as Community Forest Users' Groups, Water Users' Groups, Saving Credit Groups etc. Forty two percent of the households interviewed noted that at least one member of their family members have obtained different types of training. Of the different types of training, the majority of the members have obtaining training related to mason (27%), followed by sewing/cutting (21%), basket/rope (Doko/Namlo) making(14%), driving (12%), carpentry (11%), construction (10%) and so on. Of the total training receiving households majority are from Adibasi/Janjati (75%) and male headed households (86%) (**Table 2.3-15**).

Table 2.3-15 Various Trainings Received by Household Members

Categories	Mason		Carpentry		Sewing/ Cutting		Driving		Construction Related		DOKO, NAMLO Making		Iron Work, Shoe Making and Other		Total	
	No.	%	No.	%	No	%	No.	%	No.	%	No.	%	No.	%	No.	%
Brahmin./Chhetri/ Thakuri			1	7.1	6	42.9	5	35.7	1	7.1			1	7.1	14	100
Adibasi/ Janajati	34	26.8	14	11.0	26	20.5	12	9.4	13	10.2	23	18.1	5	3.9	127	100
Dalit	9	47.4	4	21.1	1	5.3	2	10.5	1	5.3			2	10.5	19	100
Other (Sanyasi)	3	33.3			3	33.3	1	11.1	1	11.1	1	11.1			9	100
Total/ Overall	46	27.2	19	11.2	36	21.3	20	11.8	16	9.5	24	14.2	8	4.7	169	100
Male Headed HHs	40	27.6	17	11.7	24	16.6	18	12.4	15	10.3	24	16.6	7	4.8	145	100
Female Headed HHs	6	25.0	2	8.3	12	50.0	2	8.3	1	4.2			1	4.2	24	100
Total/ Overall	46	27.2	19	11.2	36	21.3	20	11.8	16	9.5	24	14.2	8	4.7	169	100

Source: Supplemental EIA Survey, JICA Study Team, 2006.

(6) Economic Conditions

The main occupation of the majority of the household members is agriculture (56%) followed by service (15%), business (13 %.). A significant numbers of population (16%) are students and are less engaged in earning activities. The highest number of Dalits (30%) is engaged in business and wage earning related activities whereas only 8 percent of Brahmin/Chhetri are engaged in such activities (**Table 2.3-16**).

Table 2.3-16 Major Occupation of the Households

Categories	Agriculture			Service			Student			Business/Wage/ Others			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Brahmin/ Chhetri/ Thakuri	40.7	68.3	53.2	25.8	6.2	16.9	22.2	10.5	21.4	11.3	5.0	8.5	54.6	45.4	100
Adibasi/ Janajati	41.8	78.8	59.1	25.0	2.3	14.4	15.3	12.3	13.9	17.8	6.6	12.6	53.4	46.6	100
Dalit	30.8	60.4	44.1	7.7	1.9	5.1	23.1	18.9	21.2	38.5	18.9	29.7	55.1	44.9	100
Other (Sanyasi)	17.6	63.2	41.7	58.8	5.3	30.6	5.9	15.8	11.1	17.6	15.8	16.7	47.2	52.8	100
Total/ Overall	40.3	74.9	56.4	24.6	3.1	14.7	17.2	14.6	16.0	17.9	7.3	13.0	53.7	46.3	100

Source: Supplemental EIA Survey, JICA Study Team, 2006

Land and livestock holding are the basic indicators of well being in the area as elsewhere in the rural Nepal. The entire households own certain portion of land within the project area. However, only 55 percent households own the most productive irrigated land (Khet) while 92.2 percent households own un-irrigated land (Pakho or Bari land). Similarly, 8 percent own *Kharbari*, 2.5 percent private forest and 2 percent orchard. Majority of the khet owner is recorded for Brahmin/Chhetri while only 22

percent of Dalit own khet land. Compared to male headed households, the percentage of female headed households owning khet is also lower than that of male headed households (**Table 2.3-17**).

Table 2.3-17 Households Owning Different Type of Land

Categories	Total HH Owning Land		HH Owning Khet Land		HH Owning Bari Land		HH Owning Kharbari		HH Owning Private Forest		HH Owning Orchard	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri	76	100.0	61	80.3	64	84.2	13	17.1	4	5.3	2	2.6
Adibasi/ Janajati	278	100.0	150	54.0	259	93.2	16	5.8	5	1.8	6	2.2
Dalit	32	100.0	7	21.9	32	100.0	3	9.4				
Other (Sanyasi)	13	100.0	2	15.4	13	100.0	2	15.4	1	7.7		
Total/ Overall	399	100.0	220	55.1	368	92.2	34	8.5	10	2.5	8	2.0
Male	322	100.0	187	58.1	295	91.6	28	8.7	9	2.8	7	2.2
Female	77	100.0	33	42.9	73	94.8	6	7.8	1	1.3	1	1.3
Total/ Overall	399	100.0	220	55.1	368	92.2	34	8.5	10	2.5	8	2.0

Source: Supplemental EIA Survey, JICA Study Team,, 2006

The average landholding of the surveyed households is estimated to be 0.685ha. Of the total land almost 70 percent is comprised of bari land followed by khet (27%), kharbari (3%) etc. The average land holding size is highest among Brahmin/Chhetri (0.83ha/HH) and lowest among Sanyasi (0.281ha/HH) and Dalit (0.361ha/HH) (**Table 2.3-18**).

Table 2.3-18 Average Land Owned (Own Land Self Cultivated + Rented Out Land)

Categories	Khet (Ha/HH)	Bari (Ha/HH)	Kharbari (Ha/HH)	Private Forest (Ha/HH)	Orchard (Ha/HH)	Total Land Owned (Ha/HH)
Brahmin/ Chhetri/ Thakuri	0.380	0.397	0.052	0.001	0.004	0.834
Adibasi/ Janajati	0.160	0.519	0.017	0.001	0.002	0.700
Dalit	0.031	0.318	0.013			0.361
Other (Sanyasi)	0.053	0.228				0.280
Total/ Overall	0.188	0.470	0.023	0.001	0.002	0.685
Male Headed HHs	0.203	0.500	0.028	0.000	0.002	0.733
Female Headed HHs	0.125	0.346	0.004	0.005	0.001	0.481
Total/ Overall	0.188	0.470	0.023	0.001	0.002	0.685

Source: Supplemental EIA Survey, JICA Study Team, 2006

Besides own land, the households are also found occupying certain portion of government owned land, generally known as *Ailani land.* The average *Ailani* land occupied by a household is estimated to be 0.111 ha. Thus, the total operated land by a household including the Ailani land accounts to 0.796 ha. The households of the project area are growing different types of crops such as cereals (paddy, maize, millet, wheat etc), oil crops, fruits and vegetables. Although 94 percent of the households are growing cereals, pulses and oil crops, the percentage of farmers growing fruits is below 50 percent. Sixty five percent of the households are also growing vegetables. The percentage of farmers growing vegetable is recorded highest among Brahmin/Chhetri caste (85%) and lowest among Dalit community (44%) (**Table 2.3-19**).

Table 2.3-19 Households Cultivating Different Crops

Categories	Cereal, Pulses and Oil Crops		Fruits		Vegetables		Growing at Least One Type	
	No.	%	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri	74	97.4	46	60.5	65	85.5	74	97.4
Adibasi/ Janajati	260	93.5	130	46.8	169	60.8	263	94.6
Dalit	28	87.5	9	28.1	14	43.8	28	87.5
Other (Sanyasi)	12	92.3	12	92.3	10	76.9	12	92.3
Total/ Overall	374	93.7	197	49.4	258	64.7	377	94.5
Male	308	95.7	164	50.9	220	68.3	311	96.6
Female	66	85.7	33	42.9	38	49.4	66	85.7
Total/ Overall	374	93.7	197	49.4	258	64.7	377	94.5

Source: Supplemental EIA Survey, JICA Study Team, 2006

The average area, production and yield of different crops grown in the area are shown in **Table 2.3-20**. The yield figure calculated for different crops indicate the households generally fetch good crop harvest.

Table 2.3-20 Area, Production and Yield of Major Crops Grown by Project Area Households

Description	Paddy	Maize	Wheat	Millet	Potato	Oil Crops	Pulses	Vegetables	Sugar cane	Total
Av. Area under Crops (ha/HH)	0.242	0.516	0.118	0.154	0.008	0.035	0.117	0.019	0.001	1.209
Av. Quantity of Crops Produced (Kg/HH)	638	1162	174	189	57	38	104	206	5	2573
Yield (Mt/ha)	2.6	2.3	1.5	1.2	7.3	1.1	0.88	10.8	11.0	38.68

Source: Supplemental EIA Survey, JICA Study Team, 2006

The average crop intensity of the area is calculated to be 152 percent and varies between 109 percent and 176 percent. The crop intensity is found highest among Dalit community (**Table 2.3-21**).

Table 2.3-21 Cropping Intensity of the Area

Categories	Cultivated Area (Ha)	Cropped Area (Ha)	Cropping Intensity (%)
Brahmin/ Chhetri/ Thakuri	0.900	1.450	161
Adibasi/ Janajati	0.815	1.213	149
Dalit	0.516	0.905	176
Other (Sanyasi)	0.424	0.464	109
Total/ Overall	**0.794**	**1.209**	**152**
Male	0.856	1.291	151
Female	0.536	0.867	162
Total/ Overall	**0.794**	**1.209**	**152**

Source: Supplemental EIA Survey, JICA Study Team, 2006

Despite, good yield and crop intensity of crops majority of the survey households (78%) have reported food deficiency from their own production. The number of households facing food deficiency is reported highest among Dalit (97%) and female headed households (83%) (**Table 2.3-22**).

Table 2.3-22 Food Sufficiency Status in Households Level

Categories	Food Sufficiency					
	Sufficient		Not Sufficient		Total Reporting	
	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri	36	47.4	40	52.6	76	100.0
Adibasi/ Janajati	50	18.0	228	82.0	278	100.0
Dalit	1	3.1	31	96.9	32	100.0
Other(Sanyasi)	1	7.7	12	92.3	13	100.0
Total/ Overall	88	22.1	311	77.9	399	100.0
Male	75	23.3	247	76.7	322	100.0
Female	13	16.9	64	83.1	77	100.0
Total/ Overall	88	22.1	311	77.9	399	100.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

Among those who have reported sufficient from their own production, are also not sufficient for the whole year. Majority of them (46%) are sufficient for 4-6 months, 32 percent up to 3 months and 23 percent 7-9 months (**Table 2.3-23**).

Table 2.3-23 Duration of Food Sufficiency in Households Level

Categories	Food Sufficient Months							
	Sufficient up to 3 Months		Sufficient for 4-6 Months		Sufficient for 7 to 9 Months		Total Reporting	
	No.	%	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri	11	27.5	17	42.5	12	30.0	40	100.0
Adibasi/ Janajati	67	29.4	108	47.4	53	23.2	228	100.0
Dalit	16	51.6	12	38.7	3	9.7	31	100.0
Other (Sanyasi)	4	33.3	5	41.7	3	25.0	12	100.0
Total/ Overall	98	31.5	142	45.7	71	22.8	311	100.0
Male Headed HHs	70	28.3	119	48.2	58	23.5	247	100.0
Female Headed HHs	28	43.8	23	35.9	13	20.3	64	100.0
Total/ Overall	98	31.5	142	45.7	71	22.8	311	100.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

To meet the food deficiency, the households are adopting more than one strategy and use of wage labor income (41%) and borrowing of money (40%) and use of income from service/pension (36%) are the main strategy adopted by majority of the households (**Table 2.3-24**).

Table 2.3-24 Copping Strategies against Food Deficit (Multiple Response)

	Borrow Money to Buy Food	Use Income from Wage Labor	Sale of HH Assets	Use Income from Porter	Sale of Livestock	Use Income from Service/ Pension	Other	Av. Amount Spend to Purchase Food (Rs)
No.	160	127	9	7	52	111	30	11,156
%	40.1	41.0	2.9	2.3	16.8	35.8	9.4	

Source: Supplemental EIA Survey, JICA Study Team, 2006

A significant number of household members (43%) are migrating from the area for seasonal earnings to meet their food deficit. The migration of households occurs irrespective of caste and ethnicity. At least one member of the household is migrated for the seasonal earning. The average income per migration is estimated to be NRs 14,433 (**Table 2.3-25**).

Table 2.3-25 Migration of Household Members for Seasonal Earning

Categories	HH having Members Migrated for Job		Average No. of Persons per Migrating HH	Income per Migrating HH (Rs)/ Season
	No.	%		
Brahmin/ Chhetri/ Thakuri	33	43.4	1.48	14258
Adibasi/ Janajati	124	44.6	1.48	14856
Dalit	11	34.4	1.36	12382
Other Sanyasi	4	30.8	1.50	8400
Total	172	43.1	1.48	14,433

Source: Supplemental EIA Survey, JICA Study Team, 2006

Households that are borrowing loans to meet food deficit and other household necessities use mostly three sources namely: friends/relatives (39%), Agricultural Development Bank (24%) and local money lenders (19%). The total amount borrowed by a household is NRs 31,123/annum. The borrowers pay up to 36 percent rate of interest which is charged by the local money lenders. The rate of interest charged by the banks and cooperatives ranges between17-20 percent (**Table 2.3-26**). However, due to the complicated official process, most of the borrowers prefer friends, relatives and local money lenders to quick lending although they have to pay higher rate of interest.

Table 2.3-26 Borrowing of Loan (Source, Amount and Rate of Interest)

Description	Average Amount Borrowed (Rs)							
	Agricultural Development Bank	Nepal Bank Limited	Co-operatives	Small & Cottage Institutions	Local Money Lender/ Merchant	Friends/ Relatives	Other Sources	Total /Average
% of Borrower	24.4	0.6	6.9	3.8	19.4	39.4	15.6	40.1
Av. Amount Borrowed (Rs/HH)	5820	125	627	2018	7574	13798	1162	31123
Av. Rate of Interest	17.3	18.0	20.2	22.8	30.3	32.0	16.4	25.4

Source: Supplemental EIA Survey, JICA Study Team, 2006

Eighty four percent of the households are rearing at least one type of livestock. Among the different types of livestock, the animals reared by majority of the households are rearing goat/sheep (73%) followed by buffalos (72%), cattle (66%) and pig (37%). Similarly, 64 percent of the households are also rearing poultry birds (**Table 2.3-27**).

Table 2.3-27 Households Rearing Different Kinds of Livestock

Categories	Livestock Type											
	Cattle		Buffalos		Sheep/ Goat		Poultry		Pig		At Least One Type	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri	41	60.3	60	88.2	46	67.6	13	19.1	2	2.9	68	89.5
Adibasi/ Janajati	164	70.4	153	65.7	181	77.7	188	80.7	115	49.4	233	83.8
Dalit	11	52.4	16	76.2	11	52.4	12	57.1	7	33.3	21	65.6
Other (Sanyasi)	6	50.0	11	91.7	7	58.3	1	8.3			12	92.3
Total/ Overall	222	66.5	240	71.9	245	73.4	214	64.1	124	37.1	334	83.7

Source: Supplemental EIA Survey, JICA Study Team, 2006

The average livestock size is 4.6 for cattle, 1.6 for buffalo, 4.6 for gat/sheep1 for pig. The total animal holding size is estimated to be largest among the Adibasi/Janjati (11), followed by Brahmin/Chhetri (6.8) and Sanyasi (6.1). The Dalit has the lowest animal holding size among the four categories of the survey households. The average holding size of the poultry birds is 12.7 and unlike the animals, the average holding size of poultry birds also recorded highest among Janjati (16) (**Table 2.3-28**). According to household survey, about 12 percent of households are selling at least one type of livestock product and majority of the households (69%) are selling milk and milk products.

Table 2.3-28 Average Number of Livestock Holding

Categories	Number of Animals					Poultry
	Cattle	Buffalos	Sheep/ Goat	Pig	Total Animals	
Brahmin/ Chhetri/ Thakuri	1.4	2.1	3.2	0.1	6.8	5.2
Adibasi/ Janajati	2.8	1.6	5.5	1.2	11.1	16.0
Dalit	1.2	1.1	1.6	0.6	4.5	4.8
Other (Sanyasi)	1.5	2.0	2.6	0	6.1	3.8
Total/ Overall	2.3	1.6	4.6	0.9	9.4	12.7

Source: Supplemental EIA Survey, JICA Study Team, 2006

The survey households are generating income from more than one source (**Table 2.3-29**)[8]. However, a large majority of the households are deriving income from agriculture (94%) followed by livestock (56%), loan (38%), salary/pension (33%), remittance and wage earning (32% each) and business (9%).

Table 2.3-29 Households Reporting Various Sources of Income

Categories	Agri.	Live stock	Wage Earning	Salary /Pension	Remittance	Loan	Business	Interest/ Sell	Total
Brahmin/ Chhetri/ Thakuri	97.4	52.6	10.5	39.5	28.9	52.6	9.2		100.0
Adibasi/ Janajati	94.6	60.1	35.6	31.3	35.3	33.1	7.9	1.1	100.0
Dalit	87.5	43.8	50.0	25.0	18.8	37.5	12.5	3.1	100.0
Other (Sanyasi)	92.3	30.8	38.5	46.2	15.4	61.5	15.4		100.0
Total/ Overall	94.5	56.4	32.1	32.8	32.1	38.1	8.8	1.0	100.0
Male Headed HHs	96.6	60.2	33.5	31.4	32.0	39.8	8.1	0.9	100.0
Female Headed HHs	85.7	40.3	26.0	39.0	32.5	31.2	11.7	1.3	100.0
Total/ Overall	94.5	56.4	32.1	32.8	32.1	38.1	8.8	1.0	100.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

The average annual household income of the surveyed household is estimated to be NRs 185,364 which is significantly higher than the district average income of the Western hill estimated by NLSS 2003/04.The highest annual income is derived by Brahmin/Chhetri (Rs238, 419/HH/Yr) while Sanyasi and Dalit are deriving the lowest income lower than the average income. Although 94 percent of the surveyed households are deriving income from agriculture sector, the contribution of this sector

[8] It is often difficult to get accurate information on households reporting income and expenditure by the household survey in which the households may hesitate to report the actual information because of fear of higher taxation rates.

in the average household income is only 24 percent. Almost one third contribution in the total average income is derived from foreign remittance. Similarly, the contribution of wage earning and livestock is 8 percent and 4 percent respectively (**Table 2.3-30**).

Table 2.3-30 Average Annual Household Income

Categories	Agriculture	Livestock	Wage Earning	Salary/ Pension	Foreign Remittance	Loan	Industry/ Business/ Rentals	Interest & Asset Sell	Total
Brahmin/Chhetri/Thakuri	54,362	3,556	3,684	33,324	59,526	80,618	3,349	-	238,419
Adibasi/ Janajati	43,112	8,460	16,443	21,665	65,222	18,874	3,766	376	177,916
Dalit	37,245	5,785	26,150	18,013	31,875	18,906	5,094	56	143,124
Other (Sanyasi)	30,190	5,673	14,923	36,592	14,769	32,462	3,846	-	138,455
Total/ Overall	44,363	7,220	14,742	24,079	59,819	31,080	3,795	266	185,364
Male	46,867	7,438	15,732	19,644	62,850	33,978	3,024	266	189,801
Female	33,894	6,311	10,597	42,623	47,143	18,961	7,019	265	166,813
Total/Overall	44,363	7,220	14,742	24,079	59,819	31,080	3,795	266	185,364
%	23.9	3.9	7.9	13.0	32.3	16.8	2.0	0.20	100.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

The average annual expenditure is estimated to be Rs 119,511[9], of which major portion is spent in purchasing food items (57.91%) followed by health and education (13.19%), transportation and religious activities (9.22%),clothing (7.34%), and fuel (6.82%). The average expenditure is also recorded highest among the Brahmin/Chhetri community (**Table 2.3-31**).

Table 2.3-31 Average Annual Household Expenditure

Categories	Food Items	Alcohol & Tobacco	Clothing	Jewelries/ Asset Purchase	Fuel	Inputs (Agri/ Livestock)	Health & Education	Transportation/ Religion and Other	Total
Brahmin/Chhetri/ Thakuri	74,173	701	9,239	1,191	6,421	5,054	27,047	18,473	142.299
Adibasi/Janajati	68,608	3,426	8,693	1,145	8,753	2,172	12,772	9,344	114,913
Dalit	68,941	3,820	8,250	452	7,213	1,302	10,748	7,656	108,382
Other (Sanyasi)	53,793	369	9,038	-	7,529	3,290	26,262	11,707	111,988
Total/Overall	69,213	2,839	8,773	1,061	8,145	2,688	15,769	11,024	119,511
Male Headed HHs	71,000	3,016	8,829	984	8,206	2,900	15,529	11,885	122,349
Female Headed HHs	61,736	2,100	8,540	1,385	7,892	1,800	16,772	7,423	107,648
Total/Overall	69,212	2,839	8,773	1,061	8,145	2,688	15,769	11,024	119,511
%	57.91	2.38	7.34	0.89	6.82	2.25	13.19	9.22	100

Source: Supplemental EIA Survey, JICA Study Team, 2006

[9] It may exclude loan payments. Since anything that comes to the household is income, loan can be regarded as income. However, information on loan payments is neither given by the surveyed household, not included in Table 2.3-31. Net saving of the household is very difficult to grasp from the given income and expenditure tables.

(7) Perception about the Hydroelectric Project and Desired Compensation

Although majority of the households interviewed expressed their likeliness over the project 10 percent households also expressed their dissatisfaction over the project due to different reasons (**Table 2.3-32**). One of the major reasons given by the households over the dissatisfaction is the damage/loss of property.

Table 2.3-32 Perception about the Project

Categories	Like		Do Not Like		Total	
	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri	67	88.2	9	11.8	76	100.0
Adibasi/ Janajati	251	90.3	27	9.7	278	100.0
Dalit	30	93.8	2	6.3	32	100.0
Other (Sanyasi)	12	92.3	1	7.7	13	100.0
Total/ Overall	360	90.2	39	9.8	399	100.0
Male	286	88.8	36	11.2	322	100.0
Female	74	96.1	3	3.9	77	100.0
Total/ Overall	360	90.2	39	9.8	399	100.0

Source: Supplemental EIA Survey, JICA Study Team , 2006

Seventy eight percent of the households have desired cash compensation for the use of house and land to be used by the project while 14 percent were willing to have land for land (**Table 2.3-33**).

Table 2.3-33 Desired Compensation for the land used by the Project

Categories	Cash for House and Land		Land for Land		House for House		Land for House and Land		Other		Not Reporting		Total HHs	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Brahmin/Chhetri/ Thakuri	61	80.3	9	11.8			1	1.3	5	6.6			76	100
Adibasi/Janajati	209	75.2	43	15.5	1	0.4	11	4.0	5	1.8	9	3.2	278	100
Dalit	27	84.4	2	6.3	1	3.1	2	6.3					32	100
Other (Sanyasi)	13	100											13	100
Total/ Overall	310	77.7	54	13.5	2	0.5	14	3.5	10	2.5	9	2.3	399	100
Male Headed HHs	249	77.3	45	14.0	1	0.3	12	3.7	8	2.5	7	2.2	322	100
Female Headed HHs	61	79.2	9	11.7	1	1.3	2	2.6	2	2.6	2	2.6	77	100
Total/ Overall	310	77.7	54	13.5	2	0.5	14	3.5	10	2.5	9	2.3	399	100

Source: Supplemental EIA Survey, JICA Study Team, 2006

Among those willing to get cash compensation 88 percent noted that they will buy land from the cash compensation while 27 percent were willing to build house. Similarly, 8 percent households noted that they will pay loan from the cash compensation while about 3 percent expressed their desire to establish business (**Table 2.3-34**).

Table 2.3-34 Reasons for demanding Cash Compensation

Categories	Purchase Land		Build House		Pay Loan		Establish Business		Other		Not Reporting		Total HHs	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Brahmin/ Chhetri/ Thakuri	52	85.2	21	34.4	15	24.6	1	1.6	1	1.6	1	1.6	61	100
Adibasi/ Janajati	186	89.0	46	22.0	6	2.9	6	2.9	2	1.0	4	1.9	209	100
Dalit	23	85.2	11	40.7	2	7.4					1	3.7	27	100
Other (Sanyasi)	11	84.6	7	53.8	2	15.4	1	7.7					13	100
Total/ Overall	272	87.7	85	27.4	25	8.1	8	2.6	3	1.0	6	1.9	310	100
Male Headed HHs	216	86.7	71	28.5	22	8.8	7	2.8	3	1.2	6	2.4	249	100
Female Headed HHs	56	91.8	14	23.0	3	4.9	1	1.6					61	100
Total/ Overall	272	87.7	85	27.4	25	8.1	8	2.6	3	1.0	6	1.9	310	100

Source: Supplemental EIA Survey, JICA Study Team, 2006

The perceptions of households were also recorded with regard to the type of settlement plan they prefer if they were to resettle due to project. In response 61percent noted that they would prefer self rehabilitation at nearby area. 35 percent preferred self rehabilitation outside the project area while about 4 percent were happy to accept project rehabilitation measures at nearby area (**Table 2.3-35**).

Table 2.3-35 Types of Resettlement Plan Preferred

Categories	Self Rehabilitation Nearby		Project Rehabilitation Nearby Place		Self Rehabilitation Outside Project Area		Total	
	No	%	No	%	No	%	No	%
Brahmin/ Chhetri/ Thakuri	30	68.2	1	2.3	13	29.5	44	57.9
Adibasi/ Janajati	111	62.0	8	4.5	60	33.5	179	64.4
Dalit	15	55.6	1	3.7	11	40.7	27	84.4
Other (Sanyasi)	4	30.8			9	69.2	13	100.0
Total/ Overall	160	60.8	10	3.8	93	35.4	263	65.9
Male Headed HHs	131	63.0	7	3.4	70	33.7	208	64.6
Female headed HHs	29	52.7	3	5.5	23	41.8	55	71.4
Total/ Overall	160	60.8	10	3.8	93	35.4	263	65.9

Source: Supplemental EIA Survey, JICA Study Team, 2006

The households also expressed expectation of several benefits after the resettlement of displaced families by the project. The highest expectation was made for opportunity of employment (61%), followed by trainings (7%) and soft loan (6.3%) (**Table 2.3-36**).

Table 2.3-36 Expected benefit after the Resettlement

Categories	Service		Skill/ Training		Soft Loan		Other		Not Reporting		Total Sample	
	No	%	No	%	No	%	No	%	No	%	No	%
Brahmin/ Chhetri/ Thakuri	41	53.9	3	3.9	10	13.2	5	6.6	17	22.4	76	100.0
Adibasi/ Janajati	167	60.1	23	8.3	14	5.0	7	2.5	67	24.1	278	100.0
Dalit	25	78.1	1	3.1	1	3.1			5	15.6	32	100.0
Other (Sanyasi)	10	76.9	1	7.7			1	7.7	1	7.7	13	100.0
Total/ Overall	243	60.9	28	7.0	25	6.3	13	3.3	90	22.6	399	100.0
Male	192	59.6	26	8.1	24	7.5	9	2.8	71	22.0	322	100.0
Female	51	66.2	2	2.6	1	1.3	4	5.2	19	24.7	77	100.0
Total/ Overall	243	60.9	28	7.0	25	6.3	13	3.3	90	22.6	399	100.0

Source: Supplemental EIA Survey, JICA Study Team, 2006

2.4 Community Resources and Properties

Focus Group Discussions were held in 13 different communities within the affected VDCs and municipality (See Target Group for Focus Group Discussion in **Table 1-3-3**). These discussions revealed that forest resources and water resources were indispensable for the daily life of these community people. These resources are very often managed by the community people themselves as common resources and properties.

(1) Forest Resource Use

1) Fodder Use Pattern of the Study Area:

Fodder has been supposed to be one of the several important resources being used by the beneficiary farming system households to raise their cattle, buffaloes and other small ruminants. Fodder use pattern differs from one community to another community. Fodder resources for cattle and buffalo are collected for 2-6 months from their own cultivation while they are collected for the remaining months from government forest in most cases, from community forest and private forest in some cases. As a whole, sources of the resources are mainly government forest, secondly community forest and very few private forest and cultivated land.

2) Supply of Fuel Wood Demand:

In the study area those beneficiary households who were ranked relatively better economic status, most of them have been found using biogas specially for cooking and for other purposes like preparation of livestock feed Kundo/concentrate and for occasional heating they use fuel wood. Those beneficiary households who have food shortage of more than 6 months from their own products are not using biogas and fully depend upon fuel wood. Very few households who are residing in relatively remote village, planted or kept few number of trees within their premises otherwise most of the households have been reported dependant on forest.

3) Availability of Grazing Resources:

In the project area open space for livestock grazing has been observed not enough for the number of livestock held in the area. Forest has been reported to be more in use for the grazing

of cattle and small ruminants. For about two or three months the practice of fallow grazing after crop harvesting was reported. Pressure on forest has been noted in excess; forest has been using for timber, for fuel wood, for fodder on to of that for grazing as well.

4) Roofing Material

Initially, in the project area natural roofing material was used exclusively so it used to be extracted in huge amount but now a days since the custom has changed and most households use either slate or zinc sheet as roofing material the consumption of natural roofing material has decreased. It was seen that some houses and even some cattle sheds are constructed in permanent way so the consumption is decreasing but still for the general population and especially economically weak households natural roofing material is still the best option.

(2) Water Resource Use

The sources of drinking water differ from community to community. They include pond, pipe water, water tank, spring and stream. In most places except for Vyas Municipality, it was reported that irrigation water from the stream is available (See **Table 2.4-1** and **Table 2.4-2**).

Table 2.4-1 Sources of Drinking Water

Group No.	Source Type	Source Name	Location	Beneficiary Household
1. V D C- Chhan-4, Chokre				
	Pond/Pokhari	Chokre Pokhari	Just below Chokre village	39
2. V D C- Chhan- 5, Fulbari Ghaderi				
	Pond/Pokhari	Chokre	Chokre	20
	Pipe water	Pipale	Pipale	15
3. V D C- Chhan-7, Jhakash Fulbari				
	Pipe water	Chitung Khola	Jhakash-Fulbari	23
4. V D C- Bhimad – 1, Khanaltar				
	-	-	-	-
5. V D C- Rani Pokhari - 9, Rising Patan				
	Spring /Mulpani	Kumalpani	Rising Patan	50
	Spring /Mulpani	Amalapani	Rising Patan	50
	Spring /Mulpani	Dulegaunda	Rising Patan	40
	Spring /Mulpani	Dhunge Pandhero	Rising Patan	200
	Spring /Mulpani	Tarebhir	Rising Patan	70
6. V D C- Rani Pokhari - 9, Rising Patan – Kharkhare				
	Stream	Bokse Chhahra	Sanutari	16
7. V D C- Kotdarbar - 1, Maidan Swanra				
	Spring /Mulpani	Risini Khola	Ward-3	35
8. V D C- Kahun Shivapur - 3, Bakle				
	Kuwa	Bakle Kuwa	Bansbot	4
	Kuwa	Sarki Kuwa	Kahun	50
	Pipe Water	Kheradi	Kahun Basti	20
	Kuwa	Gidha	Ranibari Gidha	5
9. V D C- Kahun Shivapur - 1, Beltar				
	-	-	-	-
10. Vyas Municipality - 7, Tallo Patan				
	-	-	-	-
11. Vyas Municipality - 7, Beni Patan				
	Spring /Mulpani	Linde Dhara	Near School	25
	Water Tank	Dharakholsi and Asagurikholsi	Asaguri	45
	Pipe Water	Dharakholsi	Asaguri Puchhar	1
12. Vyas Municipality - 7, Beteni				
	-	-	-	-
13.Vyas Municipality - 5, Baireni-Botegaun				
	-	-	-	-

Source: Supplemental EIA Survey, JICA Study Team, 2006

Table 2.4-2 Irrigation Scheme and Source

Group No.	Source Type	Ssheme Name	Location	Beneficiary Household
1. V D C- Chhan-4, Chokre				
	Stream/Khola	Dumre Khola Kulo	Duwan	7
2. V D C- Chhan- 5, Fulbari Ghaderi				
	Stream/Khola	Chokre Canal	Chokre	35
3. V D C- Chhan-7, Jhakash Fulbari				
	Stream/Khola	Huti Khola Kulo	Chokretar	18
4. V D C- Bhimad - 1, Khanaltar				
	Stream/Khola	Birta Nahar		40
	Stream/Khola	Mathillo Kulo		40
5. V D C- Rani Pokhari - 9, Rising Patan				
	-	-	-	-
6. V D C- Rani Pokhari - 9, Rising Patan – Kharkhare				
	Stream/Khola	Bandarkuna Kulo	Bandarkuna	45
	Stream/Khola	Jhakash Kulo	Sankhar,Jhakash	8
	Stream/Khola	Sankhar Kulo	Sankhar	6
	Stream/Khola	Tarebhir Kulo	Tarebhir khet	6
7. V D C- Kotdarbar - 1, Maidan Swanra				
	Stream/Khola	Odare Kulo	Shivapur	3
	Stream/Khola	Chhabise Kulo	Kotdarbar	6
	Stream/Khola	Wasebagar-1	Kotdarbar	3
	Stream/Khola	Wasebagar-2	Kotdarbar	2
	Stream/Khola	Dhap Kulo	Kotdarbar	3
	Stream/Khola	Manpure Khola Kulo	Kotdarbar	1
	Stream/Khola	Khahare Khola Kulo	Kahun Shivapur	2
8. V D C- Kahun Shivapur - 3, Bakle				
	Stream/Khola	Mathillo Kulo	Ranguwa	20
	Stream/Khola	Barala Tharamuni	Tharamuni	3
	Stream/Khola	Phordi Khola Muhan	Lima Khola	2
	Stream/Khola	Khare Khola kulo	Khahare	3
9. V D C- Kahun Shivapur - 1, Beltar				
	-	-	-	-
10. Vyas Municipality - 7, Tallo Patan				
	-	-	-	-
11. Vyas Municipality - 7, Beni Patan				
	Stream/Khola	Asaguri Kulo	Asaguri Danda	3
12. Vyas Municipality - 7, Beteni				
	-	-	-	-
13.Vyas Municipality - 5, Baireni-Botegaun				
	-	-	-	-

Source: Supplemental EIA Survey, JICA Study Team, 2006

(3) Cemetery and Cremation Ground

Most communities have their own cremation grounds near the river, which do not have tangible structures. It was found in several cases that different ethnic groups use the same place (See **Table 2.4-3**).

Table 2.4-3 Cemetery and Cremation Ground

Group No.	Name of cemetery & cremation ground	Locality name	Users' households	Users ethnic group
1. V D C- Chhan-4, Chokre				
	Seti Ghat	4,5 wards of Chhan VDC	600	Newar, Magar, Damai, Kami, Chhetry, Brahmin
2. V D C- Chhan- 5, Fulbari Ghaderi				
	-	-	-	-
3. V D C- Chhan-7, Jhakash Fulbari				
	Kundale Ghat	Chhap, Manapang	1000	Magar, Sarki, Damain, Chhetri, Kami,
	Chokretar	Chokre, Chhan, Hatiya	400	Newar, Magar, Kami, Chhetri
	Sankhra-lower	Chhan, Ghaderi	25	Newar
	Sankhra-upper	Chhan, Ghaderi	100	Gurung
	Khayarlo Ghat	Chhan, Ghaderi	100	Gurung
	Mankhola Ghat	Chhan, Nayabasti	300	Magar, Kami, Damai,
4. V D C- Bhimad - 1, Khanaltar				
	Talloghumaune, Seti Ghat	Bhimad, Chhang Majhkot, Arunodaya	5000	Brhamin, Chhetry, Kumal Magar, Gurung, Damain...
5. V D C- Rani Pokhari - 9, Rising Patan				
	Seraghat-Seti Beni	Ranipokhari, Chhan	100	Newar, Magar, Kami, Brahmin, Chhetri, Damain
	Dablyanghat-Ghumaune	Ranipokhari, Chhan	90	Newar, Magar, Kami, Brahmin, Chhetri, Damain
	Dablyanghat- Turture	Ranipokhari, Chhan	70	Newar, Magar, Kami, Brahmin, Chhetri, Damain
6. V D C- Rani Pokhari - 9, Rising Patan – Kharkhare				
	Badarkunaghat	Rising Patan	50	Magar,Sarki, Kami
	Geruwaghat	Rising Patan	70	Magar, Kami
	Kundaleghat	Paltyang	80	Magar, Kami
7. V D C- Kotdarbar - 1, Maidan Swanra				
	Limadovan	Banjhogara, Chhapbesi	150	Magar,Sarki, Kami, Newar
8. V D C- Kahun Shivapur - 3, Bakle				
	-	-	-	-
9. V D C- Kahun Shivapur - 1, Beltar				
	-	-	-	-
10. Vyas Municipality - 7, Tallo Patan				
	Seti-Madi Beni **	Syamgha, Jamune, Manapang VDCs, 6,7,8 wards of Municipality	4000	All caste except the people of other religion rather than Hindu
11. Vyas Municipality - 7, Beni Patan				
	"	"	"	"
12. Vyas Municipality - 7, Beteni				
	"	"	"	"
13.Vyas Municipality - 5, Baireni-Botegaun				
	"	"	"	"

*Note: ** No other impact except the flow of Seti River may not possible.*
Source: Supplemental EIA Survey, JICA Study Team, 2006

(4) Religiously and Culturally Significant Spots

Some communities have a temple or other religious places for gathering. Some of them can be used for only specific ethnic groups while others can be used for any ethnic and caste groups (**Table 2.4-4**).

Table 2.4-4 Temple, Religiously and Culturally Significant Spots

Group No.	Type of Temple	Location	Specific ethnic group observing	User Household
1. V D C- Chhan-4, Chokre				
	X	X	X	X
2. V D C- Chhan- 5, Fulbari Ghaderi				
	X	X	X	X
3. V D C- Chhan-7, Jhakash Fulbari				
	Shimbhu Sivalaya	Shangumukh	Newar,Gurung,Magar	100
	Nagasthan	Shangumukh	Newar,Gurung,Magar	100
	Maisthan	Pulkhomukh	Newar,Gurung,Magar	100
	Nagasthan	Khayarlo	Newar,Gurung,Magar	100
4. V D C- Bhimad - 1, Khanaltar				
	Pauwa-Community Gathering Place[1]	Masanghat Setidovan	All caste	4-5,000
	Chaupari[2]	Masanghat Setidovan	All caste	4-5,000
5. V D C- Rani Pokhari - 9, Rising Patan				
	Ekle deuta	Dovan	Bramhin (gaire)	150
	Religious spot (Rudri garne Thaun)	Turture	Bramhin (gaire)	150
6. V D C- Rani Pokhari - 9, Rising Patan – Kharkhare				
	Kundala Thanti[3]	Geruwater	All passer-by	
7. V D C- Kotdarbar - 1, Maidan Swanra				
	Thanti	Lima khola	Magar	19
8. V D C- Kahun Shivapur - 3, Bakle				
	X	X	X	X
9. V D C- Kahun Shivapur - 1, Beltar				
	X	X	X	X
10. Vyas Municipality - 7, Tallo Patan				
	Ganesh mandir	Tallo Patan (Owner-Madhu Maya Malla)	All Hindus	65
11. Vyas Municipality - 7, Beni Patan				
	X	X	X	X
12. Vyas Municipality - 7, Beteni				
	Dhursyangdi Barahi	Beteni	Magar and other Hindus	60
13.Vyas Municipality - 5, Baireni-Botegaun				
	X	X	X	X

Note:
[1] Constructed by Matrisishu Kalyan Ama Samuha, Bhimaad-1.
[2] Constructed by Magar Ama Samuha, Bhimaad-1.
[3] Constructed by a widow of Jamdar Satabir Ale on the memory of her husband.
Source: Supplemental EIA Survey, JICA Study Team, 2006

(5) User's Group

There are various types of user group in the communities. 8 community forest users' groups, 13 water users' groups, 2 irrigation water users' groups, 3 livestock raising group, 7cereal farms groups, 13 women groups, 7 saving credit groups have been identified by community people participate in this focus group discussion (See Annex D List of User's Group) .

CHAPTER 3 SOCIO-ECONOMIC AND CULTURAL EFFECTS

3.1 Loss of Land and Property

The implementation of the project will bring about the adverse socio-economic and cultural effects during both the construction phase and the operational phase. These impacts can be categorized into four issues, namely i) loss of land and property, ii) direct impacts to households, iii) socio-economic and cultural impacts during construction, and iv) socio-economic and cultural impacts during operation.

This section describes these key socio-economic and cultural effects in reservoir area, risk zones and project facility sites, which have been assessed by the Supplemental EIA Survey.

(1) Affects on Cultivation Lands

The cultivated lands areas are under the ownership of the local people. As indicated in **Table 3.1-1**, the project will affect 151.22 ha of the cultivated areas, accounting for approximately 15% of the total affected land.

Table 3.1-1 Cultivated Areas in the Reservoir Site as per GIS Maps and Cadastral Maps

Type of Land Use	Reservoir FSL415+10m	Risk Zones (Wantang Khola, Phedi Khola, and Tittuwa)	Project Facility Sites	Grand Total
Cultivated areas (ha)	108.89	6.51	35.82	151.22

Source: GIS Map, JICA Study Team, 2006

Irrigated land (Keti)

In the reservoir areas, the affected cultivated land areas were measured by using the GIS maps and the cadastral maps as per the records of District Survey Office (**Table 3.1-2**). Most agricultural land is located in Rising Patan in Rising Ranipokhari VDC, Saune and Chhore Patan in Majhkot and Bhimad Bajar and its vicinity in Bhimad VDC. A comparative analysis of the cultivated land area by using GIS and the cadastral map reveals that the GIS land use under cultivation is higher than the cadastral map. This can imply that in the reservoir area, there are many land plots which are under cultivation use, but are not legally registered in the Land Revenue Office or in the District Survey Office.

Table 3.1-2 Cultivated Areas in the Reservoir Site as per GIS Maps and Cadastral Maps

Affected VDC	Cultivated land (ha)		Estimated cultivated land without legal registration
Reservoir FSL 415+10m	GIS Map	Cadastral Map	
Bhimad	4.18	1.39	2.79
Chhang	26.61	22.09	4.52
Majhkot	12.76	15.28	-2.52
Rising Ranipokhari	28.37	38.75	-10.38
Kotdurbar	14.74	6.00	8.74
Jamune	11.46	0	11.46
Kanhun Shivapur	10.76	10.11	0.65
Total	**108.89**	**93.62**	**15.26**

Note: The Geruwatar area is currently under grass land, but is registered as agricultural land. The GIS map has recorded this area as grassland. It is because of this, the actual cultivated land in Rising Ranipokhari VDC is less than the cultivated land indicated in cadastral maps.

Source: GIS Map, JICA Study Team, 2006, and Cadastral maps. District Survey Office

(2) Affects on Agricultural Products

The annual production loss from the agricultural areas occupied by the project is presented in **Table 3.1-3**. It is estimated that 660 metric ton of annual production will be lost due to the implementation of the project. If we assume that average crop yields for paddy are 3.15 metric tons per ha, the annual loss of paddy production resulting from the project is approximately 285 million tones, accounting for 43% of the total annual production loss. Since the great majority of the local people in affected areas are engaged in agriculture, the project will bring about adverse impacts on their livelihood.

Table 3.1-3 Annual Production Loss of the Agricultural Land

Loss Type		Production losses in metric ton (1000 kg)				
		Reservoir FSL415+10m	Risk Zones (Wantang Khola, Phedi Khola, and Tittuwa)	Project Facility Sites	Grand Total	Percent
Irrigated land	Paddy	205.8	12.30	67.7	285.8	43.25
	Wheat	24.83	1.48	8.17	34.48	5.22
	Maize	43.12	2.58	14.18	59.88	9.06
	Early paddy	52.66	3.15	17.32	73.13	11.07
Upland	Maize	108.89	6.51	35.82	151.22	22.89
	Millet	20.91	1.25	6.88	29.04	4.39
	Pulses	19.60	1.17	6.45	27.22	4.12
Grand Total		**475.81**	**28.45**	**156.52**	**660.78**	**100**

Note: Estimated upland and irrigated land in the reservoir/project facility site area = 60 percent irrigation khet land, and 40 percent upland (bari land) based on Tanahu district average. Since the compensation for loss of agricultural products is officially estimated based on the unit yield of district average data, it was used here.

Cropping intensity and production per ha of land in irrigated khet land			*Cropping intensity and production per ha of land in upland (bari land)*		
Crop Type	*Cropping % in the land*	*Production/ha (MT)*	*Crop Type*	*Cropping % in the land*	*Production/ha (MT)*
Paddy	*100*	3.15	*Maize*	*100*	2.5
Wheat	*20*	1.9	*Millet*	*40*	1.2
Maize	*33*	2	*Pulses*	*50*	0.9
early paddy	*26*	3.1			

Source: Supplemental EIA Survey, JICA Study Team, 2006

(3) Affects on Forest Land

Most of the forest land affected is under the jurisdiction of the Department of Forest and is under the government managed forest category. A part of the government managed forest has been handed over to the community forest for management and sustainable use. Patches of private forests are also found within the affected project area managed by individual households. The status of affected forest area in the project area is presented in **Table 3.1-4**.

Table 3.1-4 Forest Area by Management Types in the Project Area

Management Types	Reservoir FSL415m	Project Facility Sites	Grand Total
National Forest (Protection Forest)	259.84	51.91	311.75
Community Forest	88.77	16.79	105.56
Private Forest	5.29	0	5.29
Total (ha)	**353.89**	**68.7**	**422.59**

Source: Supplemental EIA Survey and GIS Map, JICA Study Team, 2006

The National Forest under government managed category has highest area followed by the Community Forest (CF). Private Forest is limited to within 6 ha. As shown in **Table 3.1-5**, there are 7 CFs to be affected by the reservoir inundation with FSL 415 m. Especially, in the case of three CFs such as Salbas CF in Kahun Shivapur VDC Ward No.1, Shidhabatasan CF in Jamune VDC Ward No.6 and Ghunmanune Danda CF in Rising Ranipokhari VDC Ward No.9, the large portion of community forest, i.e., 20% to 45% of the total areas will be inundated. Within the project facility sites, along the right bank of Seti River, lies Beltar-Bachangauda Community Forest along the eastern limits of the proposed spoil bank area in Beltar and at the eastern end of Huksetar. According to the Supplemental EIA Survey, the total area of the forest is 5.1 ha[10] and the total number of users is 120 households.

Since most of the local people are highly dependent on forest resources such as fodder and fuel wood in their daily lives, the inundation of forests in the project area will bring about negative impacts on these people (See Section 2.4 of Part C in this report).

[10] Since the project facility sites were redesigned after the completion of the Supplemental EIA Survey, these estimates need to be revised.

Table 3.1-5 Community Forests affected by the Reservoir Inundation

S N	Name of Community Forest (CF)	Total user households and population	Total area CF (ha)	Location	Stretch affected (km)	Total area affected at FSL 415 m (ha)	Percentage of CF affected (%)
1	Banchare Danda CF	86 (457)	18.78	Chhang VDC	0.2	1.12	5.96
2	Sangu Pokhara CF	24 (154)	20.3	Chhang VDC	0.5	0.19	0.94
3	Ghumaune Danda CF	59 (269)	53.95	Rising Ranipokhari VDC, Ward 9	4.3	10.37	19.22
4	Shidhabatasan CF	125	104	Jamune VDC Ward 6	2.9	25.84	24.85
5	Bansghari CF	218 (1488)	63.75	Rising Ranipokhari VDC, Ward 1 and 2	1.35	6.2	9.73
6	Bajar Thumki CF	95 (859)	80	Kotdurbar VDC, ward 7	0.55	1.32	1.65
7	Salbas CF	248 (1626)	65.5	Kahun Shivapur VDC, Ward 1	2.25	29.11	44.44
Total			**406.28**		**12.05**	**74.15**	**18.25**

Source: Supplemental EIA Survey, JICA Study Team, 2006

3.2 Direct Impacts to the Households

All the people or households whose land or property is acquired by the project temporarily or permanently are generally defined as the project affected persons/households. These affected persons/households are those who will lease their land temporarily in negotiation with the contractor, and those who will be permanently displaced by the dismantling and construction of the project structures, project facilities, and reservoir inundation. The extent of impact severity will vary from household to household, and is also dependent on the loss of land and property, their current social and economic conditions, and likely conditions after the acquisition of land and property. This section describes various impacts to the households.

(1) Affected Land Parcels of the Project

The cadastral maps were the basic input for the identification of the land parcel in the project affected area. The Household Survey of the affected people could not verify all the land parcels due to higher number of absentees during the survey. Besides, there are number of land areas under cultivation, but are not defined as land parcels legally and the limited field survey was unable to define these lands in land parcel category. The cadastral maps of the area limits mapping only to agricultural areas of the survey period, i.e. about 35 years back with few modifications only. The forest, barren areas, river corridors, shrub land and grasslands are not shown in the cadastral maps. **Table 3.2-1** presents the accounted land parcels in the project affected area as per the cadastral maps.

Table 3.2-1 Number of Land Plots Affected by the Project

Affected VDCs/Municipality (FSL 415+10 m)	Number of land plots
Bhimad	21
Chhang Bazaar	116
Majkot	134
Rising Ranipokhari	252
Kotdurbar	68
Kahun Shivapur	52
Total land plots affected (Reservoir)	***643***
Kahun Shivapur VDC	
Access road	24
Spoil disposal (Beltar)	317
Base camp (Huksetar)	55
Vyas Municipality	
Access road (Benipatan and Betini)	130
Total land plots affected (project facility sites)	***526***
Grand Total Land plots affected Project	**1169**

Source: Cadastral maps of the affected area

(2) Affected Land Owner Families of the Project

Table 3.2-2 presents the numbers of land owners actually verified and those estimated from the database of field book of District Survey Office. The number of total private land owners is estimated to be 838 people.

Table 3.2-2 Number of Affected Land Owners of the Project Area

Particulars	Reservoir area FSL 415+10 m	Project Facility Sites
Owners identified plots	471	662
Owner unidentified plots	113	55
Government plots	59	9
Estimated private owners of unidentified plots	70	34
Private owners of identified plots	275	405
Total arable land not registered (ha)	16.6	
Estimated private owners of the not registered plots	54	
Total owners	**839**	
Total Private Owners	**838**	
Government Owner	**1**	

Note: Estimation of owners of unidentified plots and areas is based on the total identified owners Vs identified plots areas for 435 m levels.
Source: Supplemental EIA Survey, JICA Study Team, 2006

Legally, there are no tenant families in the project area. However, the number of landowner and tenant will be further validated during final check survey to be conducted by the developer.

(3) Affects on Private Built Structures

The project is envisaged to affect two types of built structures, namely privately owned structures and community owned structures. The privately owned structures include houses, and cowsheds, toilets and other facilities. As indicated in **Table 3.2-3**, 313 private structures in total will be affected by the Project. Close to 55 % of the total affected private structures are located in the project facility sites, in which the congested communities have been developed due to the good access to Damauli.

Table 3.2-3 Affected Private Structures

	Affected VDCs/Municipality	Number of Affected Private Structures
Reservoir Area (FSL 425+ 10 m)	Bhimad,	0
	Chhang	31
	Majkot,	4
	Rising Ranipokhari	82
	Kotdurbar	5
	Jamune	18
	Kahun Shivapur	0
	Vyas Municipality	0
	Total	140
Project Facility Sites	Kahun Shivapur-Beltar (for Spoil disposal)	64
	Kahun Shivapur-Huksetar (for base camp)	41
	Vyas Municipality- Lower terrace (for access road Benipatan-Dam right bank of Seti)	68
	Total	173
Grand Total		**313**

Source: Supplemental EIA Survey, JICA Study Team, 2006

(4) Affected Structure Owners of the Project

Generally, one owner has several structures. The number of owners having affected structures is presented in **Table 3.2-4**. For the reservoir area and project facility sites, the name of each owner having these affected structures was identified. In the case of Risk Zones, i.e., Wantang Khola, Phedi Khola and Tittuwa, it was estimated to be 20 people based on the GIS Map since these areas were not covered by the inventory structure survey.

Table 3.2-4 Structure Affected Owners of the Project area.

Affected VDCs/Municipality	Reservoir Area 415+ 10 m	Risk Zone(Wantang Khola, Phedi Khola, and Tittuwa)*	Project Facility Sites		Grand Total
Bhimad,	0	0			0
Majkot,	3	0			3
Chhang	8	0			8
Rising Ranipokhari	11	20			31
Jamune	12	0			12
Kotdurbar	5	0			5
Kahun Shivapur	0	0	Spoil disposal (Beltar)	22	22
			Base camp (Huksetar)	8	8
Vyas Municipality	0	0	Access road	21	21
Total	***39***	***20***		***51***	***110***

Note: For the Risk Zones, it was assumed that all structures belong to different 20 people due to no inventory structure survey.
*Source: Supplemental EIA Survey and *GIS Map, JICA Study Team, 2006*

(5) Residential Structure Affected Owners

The entire owners having affected structures are not residing in these structures. **Table 3.2-5** presents the number of affected owners of residential structures, who need to be relocated from the present residential premises to a new location. In other words, these people will be immediately and severely affected by the implementation of the project.

Table 3.2-5 Residential Structure Affected Owners of the Project Area

Affected VDCs/Municipality	Reservoir Area 415+ 10 m	Risk Zone(Wantang Khola, Phedi Khola, and Tittuwa)*	Project Facility Sites		Grand Total
Bhimad,	0	0			0
Majkot,	0	0			0
Chhang	7	0			7
Rising Ranipokhari	4	20			24
Jamune	9	0			9
Kotdurbar	0	0			0
Kahun Shivapur	0	0	Spoil disposal (Beltar)	18	18
			Base camp (Huksetar)	7	7
Vyas Municipality	*0*	0	Access road	21	21
Total	***20***	***20***	***46***		***86***

Note: For the Risk Zones, it was assumed that all structures might be residential structures due to no inventory structure survey.
*Source: Supplemental EIA Survey and *GIS Map, JICA Study Team, 2006*

(6) Residential Structure Affected Owners without Legal Holdings

Some of the residential structure owners to be affected by the project have no legal holdings of the land plots. Their residential structure is located in the government land. In some places, the local school authority of the area, have given these land plots to these people on token money for school funds with the assurance that the plots will be registered in their name. Such residential structure owners are found at Wantang Khola, of Rising Ranipokhari and Beltar of Kahun Shivapur VDC. There are a number of such land owners in Bhimad, Chhang, Rising Ranipokhari, and Jamune VDC.

Apart from this, there are people having residential structures in others land but without any legal document. **Table 3.2-6** presents the number of such residential structures in the reservoir area and project facility sites.

Table 3.2-6 Residential Structure Affected Owners without Legal Holdings

Particulars	Number
Reservoir Area FSL 415+10 m	
Residential Structures in government land without legal holdings	29
Project Facility Sties	
Residential Structure in others land	1
Grand Total	**30**

Source: Supplemental EIA Survey, JICA Study Team, 2006

(7) Seriously Project Affected Families and Project Affected Families

As previously mentioned, the effect of the project due to acquisition of land and other assets is not equal for all the affected people. Some people may lose significant amount of land or residential house while others may be marginally affected due to loss of small portion of land or income. Those who need to lose their houses and relocate may not be seriously affected in terms of economic point of view if they have sufficient amount of land or other assets in non-affected areas. It is very difficult to identify a definitive conclusion on the severity of impacts objectively to each of project affected people since there are not reliable data base on the social and economic conditions of the households in VDC and district levels. There have been no standard criteria of Seriously Project Affected Families (SPAF) and Project Affected Families (PAF) in Nepal. Every project has developed and used different criteria of SPAF and PAF[11].

Although 339 households were randomly selected from the potentially affected households as a sample, it is useful here to comprehend the picture of most disadvantaged groups among these affected households, who need to be given special consideration during the detailed design phase and implementation of rehabilitation programs under the Social Action Plan.

Thus, a distinction has been made between SPAF and PAF taking consideration of two poverty related criteria and putting the sample households. The criteria for SPAF are given below;

- Marginal households having < 5 ropani (0.25ha) of land or
- Households having the below poverty line per capita/annum income of NRs 8902(defined by Nepal Living Standard Survey 2003/04 for Rural Western Hill)

Based on the land holding criteria, altogether 263 households (66% of total) are identified as SPAF, while under the per capita poverty line income criteria, only 30 households (7.5%) are identified as

[11] Kaligandaki A project has employed categorization of the project affected households on the basis of the loss of land. Any households losing more than 50% of the total land irrespective of the landholding size and other off-farm income, were identified as SPAF and the rest as PAF. This evaluation was based on the answers of the respondents in the household survey.

SPAF (**Table 3.2-7**).

Table 3.2-7 SPAF and PAF by VDC

Affected VDCs/ Municipality	By Land Ceiling < 5 Ropani						By < NRs 8902 Per Capita Annual Income						% of Total (N=399)
	SPAF		PAF		Total		SPAF		PAF		Total		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Bhimad	1	25.0	3	75.0	4	100	0	0	4	100	4	100	1.0
Chhang	24	51.1	23	48.9	47	100	3	6.4	44	93.6	47	100	11.8
Majhkot	8	38.1	13	61.9	21	100	3	14.3	18	85.7	21	100	5.3
Rishing Rani Pokhari	51	58	37	42	88	100	2	2	86	98	88	100	22.1
Kotdurbar	7	41.2	10	58.8	17	100	4	23.5	13	76.5	17	100	4.3
Kahun Shivapur	108	78.8	29	21.2	137	100	11	8.0	126	92.0	137	100	34.3
Vyas	64	75.3	21	24.7	85	100	7	8.2	78	91.8	85	100	21.3
Grand Total	**263**	**65.9**	**136**	**34.1**	**399**	**100**	**30**	**7.5**	**369**	**92.5**	**399**	**100**	**100**

Source: Supplemental EIA Survey, JICA Study Team, 2006

The SPAF are found mostly among the Dalit (78%) compared to other four categories of caste/ethnic households under the land holding criteria, while under the per capita income criteria, highest number of Adibashi/ Janjati (9%) are categorized as SPAF (**Table 3.2-8**).

Table 3.2-8 SPAF and PAF by Cast/Ethnicity

Caste/ Ethnicity	By Land Ceiling < 5 Ropani						By < NRs 8902 Per Capita Annual Income						% of Total (399)
	SPAF		PAF		Total		SPAF		PAF		Total		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Brahmin/ Chhetri/ Thakuri	39	51.3	37	48.7	76	100	5	6.6	71	93.4	76	100	19.0
Adibasi/ Janajati	190	68.3	88	31.7	278	100	24	8.6	254	91.4	278	100	69.7
Dalit	25	78.1	7	21.9	32	100	1	3.1	31	96.9	32	100	8.0
Other (Sanyasi)	9	69.2	4	30.8	13	100	0	0	13	100	13	100	3.3
Grand Total	**263**	**65.9**	**136**	**34.1**	**399**	**100**	**30**	**7.5**	**369**	**92.5**	**399**	**100**	**100**

Source: Supplemental EIA Survey, JICA Study Team, 2006

3.3 Socio-Economic and Cultural Impact during Construction Phase

(1) Affects on Infrastructures

The reservoir inundation affects a variety of infrastructure facilities of the communities. They include motorable roads, suspension bridges, foot trails, irrigation canals, and electricity distribution.

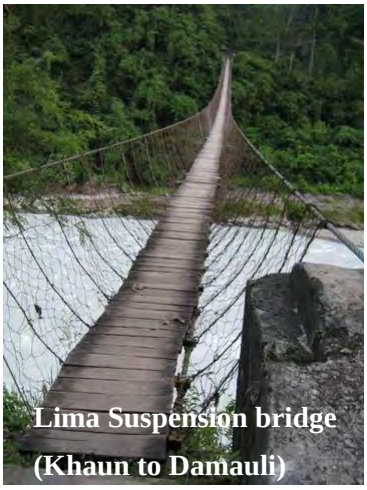
1) Motorable Road

Motorable roads are one of important transportation means of moving goods and people from the bazaar areas such as Damauli and Bhimad Bajar to the rural villages. Motorable roads to be submerged by the reservoir of FSL 415 m are presented below.

Table 3.3-1 Affected Motorable road – gravel

SN	Name of Structure	Location VDC/Municipality	FSL 415 m Affected Stretch (m)	Remarks
1	From Majkot to Wantang Khola	Majkot	200	Replace by rerouting
2	From Wantang Khola to Rising Patan	Rising Ranipokhari	100	Replace by rerouting
	Total		**300**	

Source: Field Survey of Supplemental EIA Survey, JICA Study Team, 2006


Lima Suspension bridge (Khaun to Damauli)

2) Bridge and Suspension Bridge

The inundation of suspension bridges will seriously affect the daily life of the local people living on either bank of Seti River since these suspension bridges is the lifeline of the transportation and communication for them. **Table 3.3-2** indicates the name, the location and the affected stretch of these affected suspension bridges and a bridge.

Table 3.3-2 Affected Suspension Bridges

SN	Name of Structure	Location VDC/ Municipality	FSL 415 m Affected stretch (m)	Remarks
1	Suspension Bridge across Seti from Rising Patan to Jhakas (Jhakas Pool)	Rising Ranipokhari/ Chhang	125	Replace by longer SB
2	Suspension Bridge across Seti from Geruwatar to Kundale (Kundale Pool)	Rising Ranipokhari/ Chhang	110	Replace by longer SB
3	Suspension Bridge across Seti from Tutuwa to Belbot (Tutuwa Pool)	Rising Ranipokhari/ Jamune	110	Replace by longer SB
4	Suspension Bridge across Seti from Belbot to Machang Bhagar (Tuni Pool)	Kotdurbar/ Jamune	135	Replace by longer SB
5	Suspension Bridge across Seti from Bajogara to (Chule Pool)	Kotdurbar/ Jamune	125	Replace by longer SB
6	Suspension Bridge across Seti from Bajogara to Bhagar (Lima Pool)	Kahun Shivapur / Jamune	135	Replace by longer SB
	Total		**740**	

Source: Supplemental EIA Survey, JICA Study Team, 2006

3) Foot Trails

The foot trails is also very important transportation mode for the local people living on either bank of Seti River since these foot trails can serve to connect one community to another, and the scattered communities and the district headquarter Damauli as well as Bhimad Bajar. The affected foot trails are described below.

Table 3.3-3 Affected Foot trails

SN	Name of Structure	Location VDC/ Municipality	FSL 415 m Affected stretch (m)	Remarks
1	From Tallo Tar to Jhakas along left bank of Seti	Chhang	2,000	Replace by rerouting
2	From Jalbire –Bandarkuna to Geruwatar along right bank of Seti	Rising Ranipokhari	2,600	Replace by rerouting
3	From Jhakas to Kundaletar along left bank of Seti	Chhang	3,000	Replace by rerouting
4	From Jaruwapani to Jhakas suspension bridge	Rising Ranipokhari	750	Alternative to be decided
5	From Rising Patan to Jhakas suspension bridge	Rising Ranipokhari	500	Alternative to be decided
6	From Geruwatar to Amdanda	Rising Ranipokhari	520	Alternative to be decided
7	From Kundaletar to Lankuswara	Chhang	410	Alternative to be decided
8	From Tittuwa to Tittuwa suspension bridge	Rising Ranipokhari	260	Alternative to be decided
9	From Tittuwa suspension bridge to Betini along left flank of Seti	Jamune / Vyas Municipality	13,500	Replace by rerouting
10	From Tittuwa suspension bridge to Tuni suspension bridge along right flank of Seti	Rising Ranipokhari / Kotdurbar	2,500	Replace by rerouting
11	From Chap to Tuni suspension bridge	Kotdurbar	225	Alternative to be decided
12	From Dumdanda to Tuni suspension bridge	Jamune	260	Alternative to be decided
13	From Bahapur to Tuni suspension bridge	Jamune	730	Alternative to be decided
14	From Machang Bhagar to Chelekarna	Kotdurbar	500	Alternative to be decided
15	From Banjgara to Chule Suspension bridge	Kotdurbar	500	Alternative to be decided
16	From Banjgara to Lima suspension bridge	Kahun Shivapur/ Kotdurbar	250	Alternative to be decided
17	From Lima suspension bridge to Rainidanda	Kahun Shivapur	300	Alternative to be decided
18	From Satan to Lima suspension bridge along Lima Khola	Kahun Shivapur	2,500	Alternative to be decided
19	From Chule suspension bridge to Barchyan	Jamune	320	Alternative to be decided
20	From Lima suspension bridge to Parithan	Jamune	320	Alternative to be decided
	Total		**31,945**	

Source: Supplemental EIA Survey, JICA Study Team, 2006

4) Irrigation cannels

The formation of the reservoir with the FSL of 415 m will submerge one irrigation cannel located in Rising Ranipokhari. Since all the land irrigated by this canal falls below the reservoir levels, there is no alternative at all.

Table 3.3-4 Affected Irrigation Canals

SN	Name of Structure	Location VDC /Municipality	FSL 415 m Affected stretch (m)	Remarks
1	Irrigation System of Bandarkuna	Rising Ranipokhari	3,000	No alternative
	Total		**3,000**	

Source: Supplemental EIA Survey, JICA Study Team, 2006

5) Electricity Distribution Line

Table 3.3-5 shows the name, location and affected stretch of electricity distribution line.

Table 3.3-5 Affected Electricity Distribution Line

SN	Name of Structure	Location VDC/ Municipality	FSL 415 m Affected stretch (m)	Remarks
1	From Majkot to Rising Patan	Majkot/ Rising Ranipokhari	600	Replace by rerouting
2	From Rising Patan to Jhakas	Rising Ranipokhari	1,500	Replace by rerouting
	Total		**2,100**	

Source: Supplemental EIA Survey, JICA Study Team, 2006

6) Water Resources

Other infrastructures to be affected by the project are 3 pipe water system, 2 ponds, and 11 natural springs (See **Table 3.3-6**).

Table 3.3-6 Affected Water Resources

SN	Name of Structure	Source Name	Location, Ward, VDC/Municipality	Beneficiary Households
1	Pipe Water	Pipale	Pipale, Ward 5 Chhan VDC	15
2	Pipe Water	Chitung Khola	Jhakash-Fulbari, Ward 7 Chhan VDC	23
3	Pipe Water	Kheradi	Kahunn Basti , Ward 8, Kahun Shivapur VDC	20
4	Pond/Pokhari	Chokre Pokhari	Just below Chokre Village, Chokre, Ward 4, Chhang VDC	39
5	Pond/Pokhari	Chokre	Chokre Ward 5 Chhang VDC	20
6	Natural Spring	Kumalpani	Rising Patan, Ward 9, Rani Pokhari VDC	50
7	Natural Spring	Amalapani	Rising Patan, Ward 9, Rani Pokhari VDC	50
8	Natural Spring	Dulegaunda	Rising Patan, Ward 9, Rani Pokhari VDC	40
9	Natural Spring	Dhunge Pandhero	Rising Patan, Ward 9, Rani Pokhari VDC	200
10	Natural Spring	Tarebhir	Rising Patan, Ward 9, Rani Pokhari VDC	70
11	Natural Spring	Bokse Chhahra	Sanutari, Ward 9, Rani Pokhari VDC	16
12	Natural Spring	Risini Khola	Ward-3, Maidan Swanra, Ward 1, Kotdurbar VDC	35
13	Natural Spring	Bakle Kuwa	Bansbot, Ward 3, Kahun Shivapur VDC	4
14	Natural Spring	Sarki Kuwa	Kahun, Ward 3, Kahun Shivapur VDC	50
15	Natural Spring	Gidha	Ranibari Gidha, Ward 3, Kahun Shivapur VDC	5
16	Natural Spring	Linde Dhara	Near School, Beni Patan, Ward 7, Vyas Municipality	25

Source: Supplemental EIA Survey, JICA Study Team, 2006

7) Summary of Affected Infrastructures

Table 3.3-7 presents the summary of main infrastructures to be affected by the project.

Table 3.3-7 Project Affected Main Infrastructures

Type of Infrastructure	Reservoir FSL 415 (m)
Motorable road gravel	2
Bridge and Suspension Bridges	6 suspension bridges
Foot Trails	20
Irrigation Canals	1
Electricity Distribution	2

Source: Supplemental EIA Survey, JICA Study Team, 2006

(2) Affects on Community Built Structures

The implementation of the project will adversely affect several community structures. These structures include 1 cremation structure (ghat) used by Gurung in local communities in Bhimad, 1 temple called Mahadev Temple located in Chhang VDC, and 5 resting places. The loss of these community building structures might lead to the adverse effects on the existing community support network and socio-cultural and religious practices such as neighborhood gathering, worship and festivals. Particularly such temple and cremation structure are essential for the religious and cultural practices of the local people, which require the appropriate compensation for the loss of these structures.

Table 3.3-8 Affected Community Structures

	Name of VDCs/Municipality	Affected Community Structures	
	Reservoir FSL 415+ 10 (m)	Number	Type of Structures
Reservoir Area	Bhimad,	2	Ghat 1, Resting place 1
	Chhang	1	Temple 1
	Majkot	0	
	Rising Ranipokhari	2	Resting places 2
	Kotdurbar	2	Resting places 2
	Jamune	0	
	Kahun Shivapur	0	
	Vyas Municipality	0	
	Total	*7*	
Project Facility Sites	Kahun Shivapur-Beltar (for *Spoil disposal)*	0	
	Kahun Shivapur-Huksetar (for base camp)		
	Vyas Municipality- Lower terrace (for access road Benipatan-Dam right bank of Seti)		
	Total	*0*	
Grand Total		**7**	

Source: Supplemental EIA Survey, JICA Study Team, 2006

(3) Risk of Erosion and Slope Failure

The risk of shoreline erosion, and land failure in the long run along the shore line exists throughout the reservoir due to the geologic materials. Such risk will be increased after the implementation of the project. Since the people often utilize the edge of land for cultivation and other purposes in rural

villages due to the small landholding, it is necessary to delineate a 10 m vertical height from the FSL as the risk zones and take necessary measures such as planting work for the purpose of slope stability. Meanwhile, the extent to risk of land failure in the areas such as Wantang Khola, Phedi Khola and Tittuwa is much higher than other areas. Application of bioengineering or civil works for these Risk Zones is very costly. Even with the application of these measures, it is difficult to control such failures in the long run (See also the Social Action Plan).

(4) Water supply, Sanitation and Health

The construction of activities and the likely increase in population of the area during the construction phase may give increased pressure to the existing water supply system and bring about the shortages of drinking water. This may also generate conflicts and dissatisfaction between the local users and new users. Furthermore, the influx of large number of workers during the construction will potentially deteriorate the existing sanitation conditions. The lack of proper sanitary measures and increase in water pollution and solid waste can bring about the break of the epidemics such as typhoid, cholera, and diarrhea. Other communicable diseases like STD and HIV cannot be ruled out when a large number of people flock and live in a limited area at the construction sites. Since the people have very little knowledge about these sexual transmitted diseases in general, the appropriate measures such as awareness and education programs are needed to be taken.

(5) Accidents and Occupational Health

Work related injuries and accidents are likely to occur during the construction phase. For not only for those who are engaged in construction work but also the local community people, there are accidental risks since they live close to the construction sites.

(6) Vulnerable Groups

The experiences in other project areas have shown that women and children are vulnerable groups. Girl trafficking, and sexual and labor exploitation can happen during the construction phase. Although child labor is prohibited as per the Nepal's law, children are engaged in stone quarries and other menial jobs. Besides women and children, elderly people can be regarded as one of vulnerable groups, who may be in more danger of accidental risks and health hazard. In some cases, it will be more difficult for these elderly people to be relocated away from the current places to new places since they have had a strong and long relationship with the community people and an attachment for their own structures and community itself.

Woman and Child working in stone quarrying in Damauli

(7) Inflow of a large number of workers

The influx of a number of workers including construction labors into the project area will bring about a number of impacts to the local communities and environment. As previously mentioned, it is likely to give significant stress to the local water supply system and existing public facilities and to

deteriorate the sanitation conditions and environment. There will be also potential risks of spread of communicable diseases such as typhoid, cholera, and diarrhea if the appropriate measures for sanitation cannot be taken. Furthermore, the inflow of a number of male workers might increase the sexual activities, and consequently lead to the possibilities of transmitted diseases such as STI and HIV. In addition, the possibilities of trafficking and sexual exploitation of women or children cannot be ruled out. Since it is assumed that the construction workers will come from different places and different ethnic and caste groups to work in the limited areas for the long time, there will be also possibilities of social conflict and disruption between these workers and the local communities, or these workers and project management.

(8) Affects on the livelihood of fishermen

It will be less likely that the project adversely affects any specific fishermen communities like Kaligandaki A Project. Furthermore, there are no full time fisherman in Seti and Madi Rivers now. The Bote community (ferry rider community) used to be engaged in ferry operations across the Seti and Madi Rivers and practice fishing as their main livelihood. In accordance with the replacement of boats by the suspension bridges, the traditional ferry operations came to halt. They are now engaged in agro-economic activities and only occasionally fishing in their free time. Other ethnic groups such as Magar, Gurung and Kumal are engaged in part-time fishing for their recreation. Accordingly, it cannot be said that the project will directly and seriously affect specific fishermen groups or fishermen communities. However, it can be assumed that the water diversion of Seti River will bring about some effects on the fisheries resources in the project area, and may influence their fishing activities to some extent (See Part C Biological Environmantal Assessment).

(9) Beneficial Impacts

Once the construction of the project starts, significant and visible impacts will be realized in the local economy of the project area. It can be assumed that economy activities will be boom in settlements close to the project facility sites. Various employment opportunities will be also increased due to the implementation of the project.

3.4 Socio-Economic and Cultural Impact during Operational Phase

(1) Down Stream Effects

There may be accidental risks to the life of people and the cattle, particularly in the downstream areas due to surge of water in the Seti River twice a day during the peak power demand periods. Sudden release of water and the fluctuation in the flow downstream of the powerhouse will also affect the white water rafting tour operators who have been recently opened and carried out in the Seti River up to Deughat that is close to Narayanghat. On the other hand, it will be less likely that there are serious down stream effects on the agricultural activities in the areas since the local people in down stream areas do not take water from Seti River for the purpose of irrigation but from small streams.

Safety Issue

Regarding the downstream safety issue, it is not examined in detail from environmental viewpoints in this stage of the project since topographic survey and hydraulics of the downstream river course have not been conducted. So far, any economic activities by villagers such as irrigation has not been found in the immediate area of tailrace as long as preliminary examination by using the topographic map at 1:25,000 scale and field reconnaissance, since the area is composed of deep gorge. Therefore, a siren system will be proposed to install in the section between dam site and tailrace. The siren system will be installed, at least, at 2 sites in the vicinity of confluence of the Madi River. The sound of siren reaches area within 500 m radius from the siren. In further stage of the project, topographic survey in the downstream river course and detailed hydraulic examination such as increase speed of downstream water level in water discharge for power generation should be conducted.

Impact to White Water Rafting

Regarding the potential impact to the white water rafting, two types of the impacts are considered; (1) In non-power generation period, rafting activity would be disturbed in the downstream river course since shortage of water level and flow speed at certain section of the river course may occur due to regulation of water discharge from the dam (On the other hand, there is no any impact in the downstream area of the dam since there is no rafting activity at present.), and (2) In power generation period, danger on rafting activity in the river and camp site for rafting tour at river reservation (or river side area) would be considered due to immediate increase of downstream water level by discharging from tailrace outlet. Same situation of the latter can be considered in the sediment flushing operation. However, since downstream conditions and present rafting activity are not known in detail as well as the safety issue, type and degree of the impact for the rafting activity can not clearly be identified in the study. In addition, possibility to implement the rafting activity in the non-power generation period should be examined and discussed between NEA and rafting operators in the further stage of the project.

i) In non-power generation period

In the project operation, impact to the rafting activity would occur in the period of rafting activity between February and May and between September and December in the river section between the confluence of the Madi River and Trisuli River, where daily average flow volume will be almost half of the present flow volume. However, in addition to where hydraulic condition such as lack of water level and speed in some river sections can not be predicted due to lack of information on downstream river course, present rafting activity is not known in detail. Therefore, exact impact and possible measures can not be identified and proposed in the present stage of the study.

ii) In power generation period

While water discharge period for power generation is planned between 7:00 a.m. and 8:00 a.m. and between 17:00 pm and 22:00 p.m., impact to the rafting activity by ban of the activity

during the above discharge period can not clearly be identified at present since present rafting activity is not well known in the study. Possibility to implement the rafting activity in the non-generation period should be discussed between NEA and rafting operators in further stage of the project.

Regarding safety measure at camp site for participants of rafting tour, identification of the danger area and safe location in rapid increase of the water level have to be conducted in further stage of the project. In addition, information board to notice the danger area, and information dissemination and public awareness campaign for rafting operators and participants by some modes such as brochure and newspaper should be arranged as well as warning system and patrol activity before/after the discharge.

(2) Withdrawal of Economic Activities

First and foremost impact during the operational phase is the withdrawal of economic activities flourished during the construction phase since most of the construction related workforce will leave the project areas. However, it is likely that some economic activities will continue or be further promoted in these areas because of the relatively good location close to urban areas such as Damauli and Bhimad Bajar. Considering this, the impact of the withdrawal of economic activities during the operational phase can be assumed to be low to moderate.

CHAPTER 4 THE FRAMEWORK OF RESETTLEMENT PLAN

4.1 Rationale for Land Acquisition and Resettlement

Resettlement Effect can be defined as all negative situations directly caused by the Project, including loss of physical and non-physical assets, including loss of land, property, income generation opportunities, cultural sites, cultural identify, social structures and networks and ties. Efforts have been made to minimize resettlement effects during the selection of the project optimum design. However, as mentioned in Chapter 3, the project is likely to bring about the resettlement effects as follows;

Reservoir FSL 415 m + Risk zone 10 m

• Affected Cultivated Land	151.22 ha
• Affected Built up Area	1.7 ha
• Affected Forest Land	480.09 ha
• Loss of Agricultural Production	660.77 MT
• Number of Affected Private Structure	313
• Number of Affected Community Structure	7
• Number of Affected Private Land Owners	838 households
• Number of Affected Structure Owners	110 households (half of them living in the project facility sites)
• Number of Residential Structure Owners =Relocatee	86 households (about one-third of them having non-legal title)

This Resettlement Plan (RP) is therefore, prepared to effect the payment of compensation and rehabilitation for the individuals, households, and communities affected by the project in accordance with JICA Guidelines.

4.2 Review of Policy and Legal Framework

(1) JICA Policy on Resettlement

The JICA Guideline for Environmental and Social Considerations 2004 (JICA Guideline) rests on the following principles:

- Involuntary resettlement should be minimized by exploring all viable project options.
- Affected families/persons should be fully informed and consulted.
- A resettlement plan should be prepared for those to be displaced.
- Affected families/persons should receive compensation sufficiently and support from the project proponents in a timely manner to improve their standard of living, income opportunities, and production levels, or at least to restore them to pre-project levels.
- Involuntary resettlement should be conceived and executed as a development project.

- The resettlement plan implementation has to be monitored by the project proponents.

Regarding the compensation for the non-title holders, the Advisory Council of Environment and Social Considerations Review, a standing advisory council established by JICA, has strongly required the NEA and Study Team to address the provision of the compensation for them if these non-title holders have lived there with structures, and cultivated the land for certain years.

(2) Review of Relevant Government Laws and Policies

Nepal has a long history of involuntary resettlement. However, there is not a clear and comprehensive policy on the resettlement of project displaced families. To date, different development projects have been implementing involuntary resettlement, compensation and rehabilitation activities on the basis of specific circumstances without the framework of a coherent policy. Existing legal provisions of the country on land acquisition, compensation and rehabilitation also are not sufficient enough to address the needs of the project-displaced people. Major legal documents that provide guidance to involuntary resettlement caused by hydropower projects are as follows:

- The Constitution of Nepal (1990)
- The Land Acquisition Act (1977) as amended in 1992
- Water Resources Act (1992)
- Electricity Act (1992)
- Hydropower Regulation (1993)
- Electricity Development and Management Act (2005)

The review of these existing policies and legal framework are presented below.

The Constitution of Nepal 1990

The Constitution of Nepal (1990), as supreme law of the land, has guaranteed the right to property for Nepalese citizens. According to Article 17 of the Constitution, private property could be acquired for the purpose of public interest by providing due compensation to owner of property, following the procedures of providing compensation for any property, as prescribed by law.

The Land Acquisition Act 1977 and Land Acquisition Regulations 1969

The Land Acquisition Act (1977) and the Land Acquisition Rules (1969)[12] are the two main legal instruments that specify the procedures of land acquisition and compensation. The government of Nepal can acquire the land at any place by providing the compensation pursuant to the Land Acquisition Act for any public purpose or for the operation of any development projects initiated by government institution. The principal steps in the land acquisition process are presented below.

[12] Rules have never been updated.

Table 4.2-1 Principal Steps in the Land Acquisition Process

Step	Action	Responsibility	Time Required	Clause No. in LAA
1	Identifies the areas of land to be acquired and requests authorization from the concerned Ministry or Department to proceed with acquisition	Project Manager (PM)	Determined during engineering detailed design work	3, 4
2	Ministry/Department officially authorizes the PM to initiate preliminary action for land acquisition	Concerned Ministry /Department	0.5 month	5
3	Issues notice of preliminary action and affix it in proper places for information	PM	1 month	6(1)
4	After 3days, begins preliminary investigation including the identification of suitable land required for the project, and submits all documents including description of the damage and the cost estimations for compensation to Chief District Officer (CDO) for further action	PM	1-2 months	6 (2, 3), 7, 8(1)
5	May complain to the CDO about the amount of compensation for losses of their assets	Land & Property Owners	0.5 month	7(3)
6	Reviews all documents submitted by PC, and makes final decision on complaints of compensation for losses	CDO	2 months	9(1)
7	Issues a land acquisition notice which should be displayed at the following places; -Project Office -Office of CDO -At concerned Municipality or VDC Offices -Land Administration or Revenue Offices -Thoroughfares located around the concerned lands -At any other relevant places The notice should also indicate that the land owners shall submit an application claiming compensation within a minimum time limit of 15 days, with evidence of the land ownership certificate. If the owners of the land are allowed to demolish house/compound wall and take construction materials for their resettlement or cut trees or standing corps, then a time limit has to be set for such activities.	CDO	2-3 months	9(2)
8	Informs personally land owners who may not see the notice	CDO	0.5 month	9(3)
9	After receiving the land acquisition notice, suspends any land transaction until the CDO directs it to lift the suspension	Land Revenue Office	0.5 month	9(4)

Step	Action	Responsibility	Time Required	Clause No. in LAA
10	CDO forms a Compensation Fixation Committee (CFC) comprising the following members to determine the amount of compensation payable: -CDO -Land Administrator, or Land Revenue Officer -PC in the case of a Project and officer designated by the CDO for other purposes -A representative of the DDC The compensation will be based on cash compensation. On request from the concerned parties, land to land compensation could be given if the government possesses land[13]. CFC will determine the amount of compensation considering: -Current price of land -Value of standing crop, houses, walls, sheds, -Loss incurred as a results of shifting residence or place of business	CFC	2 months	13(2)
11	CDO provides information to the concerned parties regarding the list of the persons being compensated	CDO	0.5 month	18(1)
12	May complain to Ministry of Home (MoH) through the CDO within 7 days of the public notification, specifying the reasons for the complaint	Land & Property Owners		11 (1)
13	Consults the PM and decides on such complaint within 15 days. For this purpose, the MoH shall exercise the powers vested in the District Court to conduct investigations, summoning witnesses, recording statements or procuring documents	CDO	0.5 month	11 (2, 3)
14	Takes possession of the concerned land and hands it over to concerned office for which it is acquired after: Finalization of the amount of compensation by the CFC Decision has been made on complaint, or At any time after expiry of the time limit for filing complaints	CDO	2 months	12(10)
15	Notifies the amount of compensation payable by the concerned Ministry or Department	CDO	0.5 month	19
16	Authorizes the PC to make compensation payment to the land owners	Ministry/Department	0.5 month	13(1)
17	PM makes payment to land owners in presence of Revenue Officer, CDO and DDC officers' representatives	PC	2 month	13(2)
18	Must receive compensation amount within a time limit of 3 months after which he/she will not be entitled to any compensation	Land & Property Owners	3 months	37
19	Takes possession of the land and hands it over to the concerned Ministry or Department and notifies the local Land Revenue Office within 15 days of acquisition	CDO	2 months	22
20	Obtains land ownership certificates and deposits copies with concerned Ministry or Department and project office	PM	1 month	

Source: "Public Works Directives", PWD Management Unit, MoPPW, HMGN, 2002,

Water Resources Act 1992 and Water Resources Regulation 1993

According to Section 16 (1) of the Act, if private land has to be used in order to utilize water resources, the licensed person can request the government to acquire the land through standard procedures (Land

13 Although land for land acquisition is introduced by the Act, the government has not taken seriously to provide land for land compensation in the last twenty years of enforcement of the Act.

Acquisition Act 1977). The government will compensate the affected parties by the project or will make avail the compensation from the license through evaluation of the property as per the prevailing laws. Section 10 states that the compensation amounts shall be paid to the affected persons deducting the depreciation cost of the land and property against which the compensation has to be made.

Electricity Act 1992 and Electricity Rules 1993

Section 33 of the Electricity Act deals with land acquisition issues. The licensed person can request the government to acquire the land for the purpose of electricity generation, transmission, and distribution. The government can acquire the land through the standard procedures (Land Acquisition Act 1977). Due compensation for the acquired land and other property due to the project shall be paid by the applicant of the project.

Hydropower Regulation 1993

Rule 32 and 33 empower the government to acquire the land and property for the development of hydropower projects and to prohibit the use of land around hydropower development area. The developer should provide the compensation amount to the affected parties, which will be decided by the Compensation Fixation Committee (CFC). According to Rule 35, the CFC will comprise of the members including person nominated by the government, project representative, hydropower specialist nominated by the government, representative of project affected parties, and representative concerned District Revenue Office, and representative elected member of the affected VDCs or Municipality.

Electricity Development and Management Act 2005

The Act provides right for utilization and acquisition of other's land and property for the purpose of hydropower development if the developer may submit an application to the government. The government shall arrange for such land and property acquisition after examining the application of the developer. According to the Section 40 and 41, the developer should compensate the affected parties as per the prevailing laws and exercise the rehabilitation and resettlement program for the affected parties as an integrated program in order to ensure their livelihood to be as equivalent to or higher than the pre-project conditions. Section 42 states that the developer during construction and development of hydropower projects should ensure the maximum benefit of employment or other subsidiary opportunities development for the local affected people.

(3) Constraints of Existing Government Laws and Policies

Over the years, a progressive trend has been recognized to address the involuntary resettlement of the people affected by the development project under the legal framework. However, there exists some confusion and overlapping in the provisions made in prevailing Acts and Regulations regarding the involuntary resettlement. Furthermore, these Acts and Regulations do not fully address the issues of compensation, resettlement and rehabilitation. Some constraints and limitations of existing Acts and Regulations are presented below.

No linkages among Acts and Regulations－Various pieces of Acts and Regulations that are applicable to the hydropower development projects are overlapping with one another to some extent, and also self sanding with no linkages among them.

Not exclusively define the mode of compensation－Although the prevailing Acts and Regulations state the affected people are eligible for the compensation of the affected land property, the mode of compensation is not exclusively defined. The Compensation Fixation Committee (CFC) is empowered to evaluate the affected land and property for the purpose of cash compensation without any guidance. It is not clear whether the evaluation criteria will be based on the current market price or on the prevailing rates of Land Revenue Office. It is the often the case that the rates of Land Revenue Office are far lower than the current market price, which implies that the compensation based on the rates of Land Revenue Office is not enough to ensure the livelihood of the affected people at least to be as equivalent or higher than the pre-project conditions. Water Resource Act states that compensation payments will be made only after deduction of depreciation. This is against the concept of ensuring to improve the living standard of the affected people, or at least to restore them to pre-project levels. Furthermore, it is also against the best practices of resettlement in Nepal adopted by the guidelines of many international donor agencies such as Asian Development Bank (ADB), World Bank and Organization for Economic Co-operation and Development (OECD).

Different constitution of the Compensation Fixation Committee－In practice, Land Acquisition Act is the umbrella Act with regard to the acquisition for the land and the property. However, the provisions made for the constitution of the CFC differ widely from this umbrella Act and other subsequent Acts such as Water Resource Act, Electricity Act and Electricity Development and Management Act.

Not cover all types of loss－Except for the Electricity Development and Management Act, none of the previous Acts and Regulations has made specific provision of resettlement and rehabilitation. Even the Electricity Development and Management Act recognizes the legal title holders of the land and property as the eligible parties alone for compensation, resettlement, and rehabilitation. There are no provisions for compensation, resettlement, and rehabilitation for those who have non-legal holdings although they have used the individual and community properties for generations. None of Acts and Regulations has stipulated an entitlement matrix to regulate the compensation, resettlement and rehabilitation of the displaced people due to the Project.

Efforts to regulate compensation, resettlement and rehabilitation of the project displaced people in Nepal were made several times with the assistance of donor, particularly ADB. The National Planning Commission with the technical assistance of ADB is recently working to prepare a National Policy and Legislation on resettlement and rehabilitation of the project displaced people. Although there were several stakeholder meetings for this new framework, it will take some time to get an approval from the concerned government agencies, cabinet, and the parliament because of the on-going political disturbance in Nepal.

4.3 Review of Involuntary Resettlement Experiences in Similar Hydroelectric Projects

The government of Nepal does not have a separate policy for dealing with the displacement and resettlement caused by the hydropower development projects, but implements the resettlement and rehabilitation program for the displaced people by formulating project specific policies to satisfy the needs of the respective donor agencies. This section reviews two recent Hydroelectric Projects, namely Kaligandaki A and Middle Marsyangdi and examines the resettlement and rehabilitation measures, which can be considered for application in RP of Upper Seti Hydroelectric Project.

(1) Kaligandaki A

Kaligandaki A Hydroelectric Project, the largest hydropower project constructed so far in Nepal, is a daily poundage type scheme located on Kaligandaki River with an installed capacity of 144 MW. The project generated about 842 GWh of electric energy annually. The main components of the project include a 28.5 km access road, a 44 m high and 105 m long dam at Kaligandaki River, one 5.91 km long headrace tunnel, a powerhouse station at Beltani, and 132 KV transmission lines to sub-stations at Pokhara and Butwal. The project construction work was started in 1997 under the loan assistance of ADB and Overseas Economic Corporation Fund (OECF), now known as Japan Bank for International Cooperation (JBIC) and completed in 2002.

The major resettlement effects of the project are as follows:

- Acquired land -208.68 ha
- Acquired houses-217 houses
- Affected Families -1468 households (SAF and PAF)
- Seriously Affected Families (SAF)-263 households who lost a house or more than 50% of land or more than 60% of income
- Project Affected Families (PAF)- 1205 households
- Relocateee-21 households, out of which 18 are from Bote families.

Due to the influence of ADB guidelines, the project has given much priority to resettlement and rehabilitation program for the affected families and people. The cash compensation was provided to the affected families and people. In the past, compensation rates were usually based on the rate determined by the government without any consultation with the affected people. In the project, the CFC consulted with the representatives of affected families and determined the compensation rate based on the prevailing market price by taking their suggestions into consideration. For those who lost their houses, the project paid for their houses at replacement cost and allowed these families to take construction materials from their old house. For the SAF, the project provided rent money of NRs 1000 per household per month for a period of 4 months. The project also paid the land registration fees for those who need to be relocated when they purchased replacement land. Due consideration was given to 18 Bote families, one of the indigenous people, by building houses, one primary schools and one community meeting hall and giving priorities of employment opportunities.

As mitigation and rehabilitation measures, the project has launched various Community Support Programs including agriculture, forest, health facilities, micro-credit, and so on. Through a series of discussion with the local people, various training such as bee keeping and vegetable cultivation have been conducted under the Agriculture Intensification Program, which has benefited these local people.

Employment was prioritized to SAF, AFP from affected VDCs and other people. During the construction phase, 2568 people in total were employed, and more than three-fourths of the SPAFs and PAFs were employed. To monitor these environmental mitigation measures and rehabilitation, Kali Gandaki Environmental Management Unit was formed, which was the first time in the hydropower projects in Nepal.

The following are lessons learned from the Kaligandaki A Hydroelectric Project.

- **Community consensus valuation approach as an indispensable approach for resettlement and rehabilitation programs -** This project included the representatives of affected communities into the members of CFC and consulted them regarding the compensation rate. Besides this, the project placed emphasis on consultation and dialogue with the affected people to implement Community Support Programs. Such community consensus valuation approach might contribute to rapport building between the project stakeholders and the affected people and smooth implementation of resettlement and rehabilitation programs.
- **Compensation and rehabilitation should be given to SPAFs in a timely and appropriate manner-** It can be said that the Kaligandaki A project has given due consideration and priorities to SPAFs, particularly Bote families who were completely displaced, by providing houses, community infrastructures and employment opportunities. It was reported that the majority of these Bote families were happy with the resettlement and rehabilitation programs provided by the project. However, it was found based on the field visit that some Bote families were not happy because of being displaced twice and being provided with the land and house by the project behind the schedule. There seems to be room for improvement of the way of resettlement and rehabilitation for SPAFs.

(2) Middle Marsyangdi

The Middle Marsyangdi Hydroelectric Project, located on Marsyangdi River in Lamjung district s a daily poundage run of river scheme with an installed capacity of 70 MW and an average annual energy generation of 398 Gwt, hr. The project is jointly financed by the government of Germany, through Kiriditaustall for Wiedaraufban (KfW), and the government of Nepal and NEA. The project construction work has started since June 2001, and will be completed by end of 2007. However, it is behind the schedule due to the insurgency between the Maoists and the authority.

The resettlement effects caused by the project are mainly as follows:

- Acquired land -3833 ha
- Affected Families -379 households

- Relocateee-66 households

The project has strictly complied with the Resettlement Plan provisions of compensation to the affected people. The cash compensation for land and other property was paid to the affected families and people based on the rate fixed by the CFC through negotiations involving these affected families and people. The project also paid various allowance such as loss of business allowance for 3 months, disturbance allowance for 6 months, rent allowance for 4 months and transportation allowance. Furthermore, the project also gave gift land plots to compensate the loss of residential area in a new location site. The affected households who were living as tenants in other people's houses also received gift land plots equivalent to 0.012 ha.

The project has established a mechanism of maximization of local people employment in the project construction works by regular notification through the Contractor's project management office. As a result, a number of local people have got construction jobs. As of May 2006, close to 43% of construction workers are from local affected people and the people from the vicinity of the project sites. As rehabilitation and enhancement measures, the Neighborhood Support Program including health, education, water supply and sanitation roads, and electrification has been carried out based on the consultation with the affected VDCs. Under this program, the fund has been allocated to different VDC to empower the local people. Several schools were renovated and a health post was upgraded to a health clinic with a laboratory. Various training such as bee keeping, poultry farming, and goat raising was provided to affected families and community people. Resettlement and Rehabilitation Unit (RENU) has been responsible for undertaking these resettlement and rehabilitation programs.

The lessons learned from the Middle Marsyangdi Hydroelectric Project are presented below.

- **Land acquisition should be accomplished in a single package –** Land and property acquisition have been undertaken by RENU as per the RP provisions. It was found that the land take in the same area was executed in different times as to the requirement of the project. As a result, the land value of the earlier land acquisition was lower than the land acquired in the later periods. Because of this, some affected people whose land was acquired earlier felt that the project has treated them differentially, which has adversely affected them. At least in the same place, the land acquisition should be accomplished around the same time so that the affected people would not have feeling of unfairness.
- **Necessary facilities should be developed as early as possible for the affected families –** One of the innovative features of this project is that it provided gift land plots for those who were displaced as an additional bonus besides the cash compensation for the land and other property. The provision of gift land has benefited the affected people and families. However, it was pointed out that other facilities such as drinking water supply system had not been developed when they were relocated to the new resettlement sites. Now these facilities are under the construction but should have been developed beforehand to minimize their hardship.
- **Appropriate mechanism should be in place for implementation of social action programs –**

As a part of the project enhancement program, the Neighborhood Support Program has been undertaken in affected VDCs. In some places, the affected communities were not included so that they did not receive any significant benefits from this program. It seems that the activities have been planned through the consultation with the limited stakeholders such as the representatives of VDCs. The affected areas due to the implementation of the project vary from one place to another within one VDC. It is necessary to develop an appropriate mechanism of planning and allocating budget of these enhancement programs, in which the close consultation with the affected communities and affected people can be duly ensured within one VDC.

4.4 Resettlement Policy Framework for the Project

(1) Resettlement Policies

The resettlement activities to be pursued by of the project will be guided by the following basic policies:

- Land acquisition and involuntary resettlement shall be avoided where feasible or minimized to the extent possible through the incorporation of social considerations into project design options.
- Where population displacement is unavoidable, individuals, households and community losing assets, livelihood and other resources shall be informed and consulted
- Affected Persons (APs) shall be compensated at replacement costs for all losses and damaged assets. The absence of legal titles to lands, property, and facilities shall not be a bar to compensation.
- APs shall be fully compensated and resettled before their houses are demolished and their land and facilities are acquired.
- A resettlement plan shall be prepared and consulted with APs in advance of the implementation of the project
- The resettlement plan implementation shall be monitored
- The resettlement shall be executed as part of the development project.
- After RP implementation, the economic and social conditions of the APs should be improved or at least maintained.

(2) Compensation Policy for the Project

The following compensation policies are part of the overall policy on resettlement/relocation. The Land Acquisition Act 1977, Water Resource Act (1992) and Water Resource Regulation (1993) will be the key legal procedures that shall be followed for the compensation determination and payments.

1) The permanent loss of land (agricultural, residential, commercial and forestry)

- APs whose land (agricultural, residential, commercial and forestry) will be acquired permanently for project main component (dam, powerhouse, tailrace, switch yards, reservoir

inundation area etc.) and facility sites (access roads, batching yards, camps, spoil disposal yards etc.), the land shall be paid at replacement rate based on the valuation of lands by the Compensation Fixation Committee (CFC). Such land parcel registration shall be transferred to the developer.

- If the remaining land parcel after permanent acquisition is too small (i.e. less than 64 square meter) and the APs does not own adjoining plot and is willing to dispose the land, the entire plot shall be acquired at the replacement cost.
- Landowners of the risk zone that is a 10 m vertical distance from the FSL will be compensated in cash at the replacement cost as per NEA's practices. The CFC in consultation with local government and APs shall decide the replacement costs of the land.
- Landowners of the permanently acquired lands in three Risk Zones, namely Wantang Khola, Phedi Khola, and Tittuwa will be compensated in cash at the replacement cost. The CFC in consultation with local government and APs shall decide the replacement costs of the land.

2) The loss of crop/plants/trees

- Crops that will be damaged during project construction shall be compensated to APs based on the current fair market value determined by District Forest Office, District Agriculture Office or other government agencies to the maximum of one year production.

3) The loss of houses and other structures including utility facilities

- Houses and other structures including utility facilities (electricity, telephone, water supply, toilets, bio-gas plants etc.) shall be compensated based on their replacement cost which is the cost of materials and labor in the locality or as evaluated by the district norms at the time of relocation. No depreciation shall be applied. Additionally, the associated land plots of the houses shall be provided as Middle Marsyangdi Hydroelectric Project did. The house owners/structure owners shall be responsible for dismantling the affected house/structure and shall own salvageable materials.

4) The loss of community facilities and resources

- The project affected community facilities (such as temples, irrigation canals, footbridges, graves and ghats (a ghat is a Hindu cremation place which is a small and open platform-like structure at river bank) shall be compensated at replacement cost or restored to their previous condition or replaced in areas identified in consultation with affected communities and the relevant authorities.
- The standing stock of forest products in the Community Forests will be the property of the Community Forest User Groups or will be according to the prevailing laws.
- The compensation for the resources such as community forests and religious forests, grass land or shrub land shall be included the loss of fuel wood volumes and grazing lands.

5) The loss of government property

- Government infrastructure and facilities including utilities affected by the project shall be repaired or replaced or compensated at replacement costs in consultation with the relevant departmental authorities.
- Government forest areas shall be acquired in consultation with the Department of Forestry and any trees therein shall be the property of Department of Forest as per the prevailing laws.

6) Grant of disturbance compensation

- Disturbance compensation equivalent to the daily minimum wage for one person in the project-affected area multiplied by 180 days will be compensated as disturbance compensation to the affected households. This grant shall be used to defray the affected household's daily expenses while adjusting to their new environment.

7) Transportation allowance to displaced households and owners of the affected community structures

- For APs of acquired house structure and owners of affected community structure, an additional transport allowance of NRs. 18,000[14] as a grant shall be paid to cover the transportation of the salvaged materials.

8) Land Plot Grants to Relocatee

- For APs, whose residential house structure is acquired by the project and has to relocate his residential location, will be granted a land plot as a gift plot close to the existing residential area if available. Since there are no appropriate large resettlement sites within or near the project affected areas, the relocate will be provided an amount equivalent to the gift land area rather than the land plot in consultation with them irrespective of the relocate affected residential land size[15]. The gift plot equivalent to one Ropani land (508m^2) is proposed based on the experience of Middle Marsyangdi Hydroelectric Project.

9) Compensation for business losses

- Compensation for business losses in amount up to NRs 30000 will be paid or based on daily income which ever is lower, as reflected on income tax return multiplied by the number of days of business stoppage due to the project, but in no case shall it be more than 90 days.

10) House Rental Allowances

- House rental compensation @ rate of NRs. 200/day for 180 days will be compensated to the affected households. This grant shall be used to rent the house close to the new construction site of the house.

[14] The rate of transportation allowance was set based on the rate taken by Middle Marsyangdi Hydroelectric Project in consideration with price boost.

[15] Further, the Household Survey revealed that a majority of the people would prefer cash compensation and want to relocate themselves in areas of their wish.

(3) Valuation Process

Valuation of land and other property shall follow the government of Nepal Acts and Regulations and the ADB resettlement policy.

1) Valuation of land

Valuation of the land on project's structural components, reservoir area and facility sites will be made by the CFC as per section 13 of the Land Acquisition Act 1977. The composition of the CFC members will be as per Rule 88 of Electricity Rules[16]. The land evaluation cost shall be based on the replacement cost. Consideration to residential, urban, and rural agricultural land and closeness to motorable road, main foot trail etc shall be taken while evaluating the land replacement cost of the affected areas.

2) Valuation of house and other structures and utilities

Decisions on the valuation of house and other structures and utilities by CFC shall be based on the valuation norms of the District Development Committee or valuation made by District Office of Housing. Depreciation shall not be included in the valuation.

3) Valuation of trees and biomass

Decisions on the valuation of trees and biomass by CFC shall be based on the valuation norms of the District Forest Office or Valuation made by the officers of District Forest Office.

4) Valuation of damaged crops and agriculture produce

Decision on the valuation of damaged crops and agriculture produce by the CFC shall be based on the valuation norms of the District Agriculture Office or Valuation made by the officers of District Agricultural Office. Valuation shall be made to the actual damage of the crops and agriculture produce.

(4) Participation of Affected and Displaced Families

The affected and displaced families shall be informed and consulted during the pre-relocation activities on compensation package and procedures for payment and settlement of conflicts/disagreements. They will also be regularly informed and consulted during RP implementation. Requests for meeting/consultations with CFC to resolve related issues/concerns could be coursed through the Project Management Office (PMO).

(5) Entitlement/Eligibility of Affected Households/Persons

The following APs, communities and government agencies as defined are eligible for payment of compensation as provided in the RP:

- **Landowner** - A person who owns land/s within the project-affected areas with legal ownership documents. In some exceptional cases, a person who owns land/s within the project-affected

[16] Rule 88 of Electricity Rules stipulates that a compensation fixation committee under the chairmanship of government appointed person, concerned person or the representative of the project, an expert appointed by the government in the filed of electricity, property owner or his/her representative, representative of the Land Revenue Office, representative of the concerned Village Development Committee/Municipality shall decide the compensation of the affected land and property.

areas regardless of proof of such ownership will also be entitled. However, special decisions by the concerned governmental agency shall be made taking into account the local government/ or community's recommendation also.

- **Land tenant** - A person who works on a project-affected land owned by another person with a legal proof from Land Revenue Office.
- **Structure owner** - A person who owns a project-affected building/structure including a dwelling unit but resides in an area not affected by the project.
- **Business owner** - A person who owns or conduct a business within the project-affected area, the operation of which will be disrupted by the construction of the project.
- **Community** - A community who owns project affected building structures or resources and utilizes buildings or resources of the affected areas.
- **Government Agenc**y - A government agency that owns project affected building structures or resources and utilizes buildings and resources of the affected areas.
- **Relocatees** – APs who are actually residing in the affected areas at the time of the conduct of socioeconomic survey and have to move their residences as a result of project construction. The different types of relocatees are:

  a. House and plot owner - a person of family who owns and actually occupies an affected house and lot.

  b. House owner tenant - a person of family who owns and actually occupies a project-affected house with or without the consent of the lot owner.

  c. Informal Settler - a person of family who owns and actually occupies a project-affected house located on a government land or on a private land but without the consent of the owner.

  d. House occupant - a person or family who occupies an affected house either as an occupant free of charge or on rent

Table 4.4-1 shows Entitlement Matrix for the basic compensation to be provided to each AF/AP, communities and government agencies.

(6) Cut-Off Date/Non-Eligibility for Compensation

The validation of APs in this report based on the field survey including house-to-house structure inventory survey of the project affected area that was completed on September 21st 2006. Ministry of Water Resources is yet to publish a public notification pursuant to the Water Resource Act, section 16.3 and Water Resource Regulation, Rule 33.2 in the Nepal Gazette as cut off date for the project compensation and benefits to APs since it is still at the stage of feasibility study. However, concerned agencies are advised to announce a public notification on the cut off date once the implementation of the project is officially finalized to prevent the speculation in land. Furthermore, setting the cut off date will discourage people for further investments in the project affected area. Such public notification should state that the households or persons who will introduce new houses/structures at

the project affected areas after the cut-off date will be considered non-eligible households/persons and therefore will neither be compensated for their properties nor will be granted relocation benefits.

Table 4.4-1 Entitlement Matrix for the Project APs

Types of APs	Type of Compensation/Rehabilitation									
	1) Permanent loss of Land at replacement cost	2) Loss of crops and Natural resources	3) Loss of House and other structures at replacement cost	4) Loss of community facilities and resources	5) Loss of government property	6) Grant for disturbance compensation to displaced households	7) Grant of Transportation allowance to displaced households/community structure	8) Grant of land plot	9) Loss of Business	10) House rental allowance
Landowner	**X**	**X**								
Land tenant	**X**	**X**								
Structure owner			**X**							
Business owner									**X**	
Community		**X**		**X**			**X**			
Government Agency		**X**			**X**					
Relocatees										
House and Lot owner	**X**	**X**	**X**			**X**	**X**	**X**	**X**	**X**
House owner tenant	**X**	**X**	**X**			**X**	**X**	**X**	**X**	**X**
Informal Settler			**X**			**X**	**X**	**X**	**X**	**X**
House occupant						**X**	**X**	**X**	**X**	**X**

Note: Compensation to permanent land with tenant shall be halved between the owner and tenant as per Land Reform Act provisions. The loss of crops and natural resources on such land however shall be paid to the tenant only.

4.5 Community Consultation and Dialogues

(1) Project Stakeholders

The stakeholders other than NEA, Department of Electricity Development, Ministry of Water Resource, Ministry of Environment, Science and Technology are listed and categorized in **Table 4.5-1**.

Table 4.5-1 Project Stakeholders

Stakeholders	Descriptions
Affected Persons /Families/ Communities / Government Agencies	Landowners, house and lot owners, house owners, informal settlers, house occupants, and structure/business owners, various community user groups, community and government agencies whose properties will be affected and/or will be displaced by the project's construction.
District Government Office (District Development Committee) and Offices of Local Governments (Village Development Committees and Municipalities)	All district government offices and local government offices that have jurisdiction on the area occupied by the project.

(2) Mechanisms for Stakeholders' Participation

It is NEA's responsibility to inform all relevant stakeholders of the important aspects of the project so that they can be informed about the decisions on how the construction and operation of the project will affect them and how they can best benefit from it.

1) Dialogues/Consultation

Consultation with the affected APs and communities was started during the socio-economic surveys of the households conducted by NEA in the affected areas since 2001. Public hearings on the project were conducted by NEA on 25th January 2004 in Damauli. During the Study supported by JICA, NEA carried out three-time stakeholder meetings in both Damauli and Kathmandu in June and December, 2006 and in May 2007 as per JICA Guidelines (See Chapter 6 Stakeholder Meeting). A number of APs, local government officials, NGOs and donor agencies participated in these meetings. Such consultation, however, shall continue during the detail design study period. In order to ensure the participation of all types of APs in the consultation meeting, it is better to keep a record of participants by type of APs such as the owner of private lands, the owner of private structures, and relocatee. If some APs are found not to participate in the meeting, the follow-up activities should be undertaken to disseminate necessary information to them. APs, communities and local governments shall be consulted for evaluation of the land and properties for compensation and shall be the part of the Compensation Fixation Committee.

2) Information Campaign

Project brochures were prepared and distributed to the affected APs, local governments and interested local NGOs and CBOs during public hearing and stakeholder meetings in 2004 and later in 2006 and 2007. The brochures gave information on the project alignment, potential impacts and its gravity and steps taken by the project to minimize the impacts.

NEA project office shall organize and will be responsible for the presentation and dissemination of information sought by APs on related issues. A field team from the project management office should regularly provide information at the site level to the APs, local government and NGOs as and when required during planning and implementation of RP.

3) Local Government Endorsement

As per the Environmental Protection Rule, local government endorsement on the project is mandatory pre-requisite for project development. Interaction, discussions, and consultation with regard the project were conducted in the various occasions with the heads and members of local government. Of the 8 project affected local governments, i.e. 1 municipality and 7 VDCs of the Tanahu district, all the local governments have given endorsement for the project development. The copies of the local government endorsement are attached in the EIA report prepared by NEA (2005).

4) Role of NGOs and CBOs

As in any national development project, APs seek the assistance of non-government and/or community-based organizations (NGOs/CBOs) for a nonpartisan or impartial assessment of the project. These groups are encouraged to participate in public hearings or stakeholder meetings and community dialogues and voice out their concerns about the project.

4.6 Resolution of Conflicts, Appeals and Grievance Procedures

Issues, which may arise concerning the land rights and dissatisfactions on the land and property acquisition, value fixation etc. shall be addressed by the Chief District Officer and Ministry of Home as per the legal provisions of the Land Acquisition Act 1977 (Section 7 and 11).

Issues, which may arise concerning payment of lands, crops and improvements and relocation, will be settled by the Project Management Office (PMO). They will be assisted by NEA's legal wing to handle all the legal matters/concerns.

Issues related to the insufficiency of the compensation costs shall be refereed to CFC as a last resort to settle the issue.

(1) Setting up a Complaint Desk[17]

The PMO shall set up a Complaint Desk at its field office to be manned by administrative officer assisted by a field supervisor. All complaints and concerns shall be received at this desk and resolved. Likewise, the PMO shall refer to the concerned office/group all other issues, which cannot be resolved. The APs shall be informed about the status of his/her concerns as soon as possible.

(2) Procedure

The following procedure will be observed in the settlement of conflicts or concerns.

[17] It some projects, it is called a grievance redress committee.

- PMO receives the issue/concern from APs and determines if there is a conflict.
- AP/PMO representative discuss and resolve issue concern. If this is settled, the process ends.
- If not, PMO elevates the concern to the NEA's legal adviser for evaluation/review and resolution.
- If the concern is resolved, the process ends. If not, the PMO through Legal Adviser forwards concern to CFC, which evaluates and provides solution. If resolved at this stage, the process ends.
- If the concern remains unresolved, and If AP is still not satisfied, this is elevated to the Court of Appeals and finally to the Supreme Court by AP.

4.7 Institutional Organization

The NEA is responsible for overall implementation of this RP and shall provide the necessary resources such as the budget and the manpower. To ensure smooth implementation of the RP, the NEA PMO as well as the relocatees are tasked with the following responsibilities. A full fledged PMO will be established by NEA to execute all the responsibilities of project during construction, where as during operation, NEA Operation Department will look into the matters of rehabilitation and enhancements.

(1) Organizational Linkages and Responsibilities

1) Project Management Office (PMO)
   - Conducts consultations/dialogues and project presentation with the APs and concerned VDCs, municipalities, District Development Committee and District Offices respectively
   - Secures project endorsements
   - Identifies affected households/persons and prepares initial valuation of houses/structures as a start point to Compensation Fixation Committee
   - Surveys and valuates lands, crops/improvements and recommends payment of the same to the NEA Board
   - Prepares and secures approval of the RP
   - Secure necessary budget for RP
   - Identifies affected landowners and tenants and negotiates for the acceptance of payment of affected lands, crops, trees and plants as well as prepares estimates and allocate and forward for approval of budget for the payment of the same
   - Facilitates the resolution of resettlement issues
   - Implement RP and provide updates to NEA central office

2) Account Section, PMO
   - Processes and disburses payments for relocation in consultation with PMO

3) Relocatees

- Relocate/transfer their houses and structures outside the project boundaries within thirty (30) days after receipt of payment due them
- Cooperate with the PMO/NEA offices and other government agencies in the implementation of the RP
- Help maintain peace and order during and after relocation
- Comply with all the provisions set forth in connection with the payment of their houses/structures

4.8 Institutional Capability Building and Strengthening

Some of the staff currently working in NEA has been involved in the resettlement planning, structure inventory surveys and socio-economic surveys of the APs in other NEA hydropower projects. They have skills in dealing and maintaining public relationship with the APs and in the conflict resolution.

Some of these NEA staffs will be deputed for RP implementation in the PMO, and will head the RP and SAP Implementation Sub-unit (RSISU), which is newly established (See also Part F Environmental Management Plan). The new staffs to be appointed in the PMO by NEA shall be given training through workshops and seminars from the experienced staffs of NEA involved in other hydropower projects with an objective to strengthen institutional capacity building of the personals prior to the start of RP implementation.

4.9 Implementation Schedule

(1) Relocation Schedule

In any timeframe, the implementation of RP should be accomplished at least three months before the start of construction works in the project components construction sites such as Dam, powerhouse, tailrace, switch yards etc and in the project facility sites. In the reservoir area, RP completion should be accomplished at least six month before the start of project work in the reservoir. Furthermore, community related works and resolution of issues shall continuously be undertaken until completion of RP implementation. Implementation of RP begins upon its approval by NEA Board. Major activities during RP implementation include final determination of costs by Compensation Fixation Committee for permanent land acquisition, land use restriction, house and other structures etc as per RP policy of the project; documentation, processing and payment of relocation compensation; and supervision and monitoring of RP.

A third party monitoring team shall be engaged to oversee the implementation of the RP to ensure that its provisions are properly followed.

(2) Relation of Relocation Activities to Project Schedule

To ensure that the project will be completed on time, NEA Board assigned a Project Manager (PM) to oversee the project implementation by establishing a separate Project Management Office (PMO) with sufficient staffs and resources. The PM is tasked to coordinate and monitor all the activities with the concerned NEA top management during the early stage of the project to ensure that decisions or approval of the related matters would be finished prior to actual project construction/implementation.

Some relocation activities during the planning stage such as information campaigns with the APs and local governments and arrangements to facilitate final determination of compensation costs from CFC are needed. Besides, co-ordination to obtain approvals and permission from other concerned Government of Nepal offices is equally important.

(3) Procedures for RP implementation

- PMO has secured cadastral maps, VDC and DDC maps, etc. necessary for the first hand identification of land required for the projects & land ownership.
- PMO has prepared a master list of the land plots and ownership status from the field book from the District Survey Office and District Land Revenue Office
- PMO request the concerned District Administration Office to acquire necessary land and properties in line with the Land Acquisition Act and other related Acts, Rules and Regulations.
- PMO notifies the people of the project area with plots and owners or tenants to be affected
- PMO requests the District Survey Office to identify the land plots affected by the project and survey and delineate the affected land to finalize the land parcels affected by the project.
- PMO gathers, consolidates or examines the needed documentary requirements such as land titles, proofs of ownership, tax declarations, etc. to facilitate the payment of project claim.
- PMO requests the District Forest Office, the District Development Committee Office and the District Agriculture Offices etc. to evaluate the compensation amount of respective properties.
- PMO prepares public notification of the affected property and request concerned Chief District Officer for notification with details of land parcels, owners/tenants, structures, and other property in the project affected areas.
- PMO assists CFC on investigation, negotiation with APs, and evaluation of the properties for the determinations of the compensation as per RP policy.
- PMO starts paying compensation amounts immediately after all Government decisions.
- PMO co-ordinates and conducts regular consultation with APs, local communities, NGOs, VDC and DDC throughout process in matters related to information dissemination, identification and evaluation of the property, negotiations with APs to resolve any issues of RP.
- PMO monitors the RP and prepare regular updates of RP implementation.

(4) Involvement of APs, Local Government and NGOs

Active participation of APs, NGOs and local governments including VDC, Municipality and DDC will be encouraged to ensure the smooth and successful implementation of the RP. These could be accomplished through the following means:

1) Affected Persons (APs)

- Allowing entry for the preliminary survey of the affected areas by the project
- Collating of documents to support their relocation claims so that assistance and grievances are submitted on time for processing.
- Participation in the count of resources (crops/plants/trees) and cooperation in the valuation of the same including those of their affected lands.
- Chose a representative for participation in the CFC meetings for evaluation of the compensation at market based prices
- Examination/review of the computations of relocation compensations and affixing their signatures on the assistance and grants to facilitate payment of their claims.
- Allowing entry of the construction crew to the affected lands upon receipt of payment and timely dismantling of their houses/structures.

2) NGOs

- Participate in the community dialogues/meetings to resolve issues that may arise during relocation implementation.
- Participate in the detailing the Social Action Programs
- Participate in the RP implementation
- Participate in the implementation of Social Action Programs when necessary

3) Local Governments

Local Governments shall be involved in the RP process in two ways: firstly, as per the role and assignment stated in the prevailing Acts, Laws, Rules and Regulations and secondly, on the request of the PMO. Major roles are:

- Assist to relocatee in looking for suitable places to transfer to facilitate their early relocation.
- Participate in the CFC meetings for the evaluation of compensation
- Participate in the dialogues/meetings with the APs for the resolution of some conflicts associated with the processing/payment of their claims.
- Assist PMO in the prevention of illegal encroachers or new settlers in the affected areas to take advantage of relocation compensation and benefits being granted by the project.

4.10 Monitoring and Evaluation

Monitoring and evaluation are important activities of the RP because these will keep track of NEA's commitments to programs and projects and will ensure the attainment of the program's goals and objectives.

While RP evaluation will be done internally by NEA through PMO. Monitoring of the RP implementation will be done both internally and externally. Internal monitoring will be undertaken by NEA through the PMO and the Department of Electricity Development, Ministry of Water Resources while external monitoring will be contracted out to a third party.

Performance indicators that reflect the program's objectives will be the basis of monitoring and evaluation. The parameters/indicators for monitoring and evaluation will be the RP policy, the entitlement matrix and the procedures elaborated elsewhere in this RP.

(1) Internal Monitoring

The project will be monitoring its own concern particularly the status of their activities as well as expenditures. The expenses will be audited by the NEA Audit Department. The implementation schedule on relocation and rehabilitation will be used in monitoring the activities. Monthly status reports are prepared by the PMO on payment of RP compensation, assistance and grants. The implementation of continuing information campaigns, dialogues, issues and concerns of stakeholders are also included in the PMO report.

The project management will ensure that the monitoring by PMO is conducted as per the requirement. It will regularly review the reports and provide comments and suggestions for improvements. The reports shall also be sent for review and comments to Department of Electricity Development, Ministry of Water Resources and Ministry of Environment, Science and Technology for their review and suggestions.

(2) External Monitoring

The project Manager will contract out external monitoring of the RP implementation to a third party. A term of reference will be prepared by the PMO and reviewed and agreed upon by the funding agency and the third party. NEA will provide cost from the project budget.

(3) Post-relocation evaluation

After completion of resettlement and development activities, a process and impact evaluation will be undertaken as per prevailing Laws. The evaluation will specially assess whether the living standards of the relocatees have been restored or enhanced. It will also review the RP program's efficiency, impact and sustainability. The evaluation results shall serve as NEA's tool or reference to improve the formulation of future relocation/resettlement and rehabilitation programs.

4.11 Compensation and Benefits to Affected Families (AFs) and Affected Persons (APs)

(1) Compensation and Benefits to Affected Families and Affected Persons

Based on compensation policy for the project described in Section 4.4, the identified AFs/APs of the project area will receive the following compensation and benefits:

Table 4.11-1 Proposed Compensation and Benefits of AFs/APs

Affected Households/Persons /Community	Compensation and Benefits
Land owner/ legal title holder and occupier of the land during the cut off date.	1. 100% payment on mark-based rates of the permanent land occupancy for the project components and project facility sites 2. 100% payments of the agricultural production for one year of the agricultural lands
Structure owner other than residential (registered or unregistered or in others land) at the time of cut off date.	1. Replacement cost of structure/associated utilities 2. Transportation allowance
Residential structure owner (registered or unregistered or living with a structures in others land) at the time of cut off date.	1. Replacement cost of house structure/associated utilities without deducting depreciation 2. Disturbance compensation allowance for 180 days for one person at the minimum district wage rate for one person of the house 3. Transportation allowance (lump sum) NRs. 18000 4. House rental allowance for 180 days @ of NRs. 200 per day 5. Gift land plot or equivalent cost of the gift land plot (508m^2) in the adjoining area of the residential structure
Community structure	1. Replacement cost of structures and facilities without depreciation 2. Transportation allowance (lump sum) NRs. 18000

(2) Cost Estimates for Compensation and Benefits of Affected Persons and Affected Families

The cost estimates for the proposed compensation and benefits of APs and AFs are summarized below.

1) Cost Estimation for the Private Land

The cultivated lands are under private ownership. Although there is discrepancy in land area as per GIS and Cadastral maps, the land area including cultivated and build up of the GIS map has been accounted for the cost estimation. **Table 4.11-2** indicates the cost estimation for the lands to be acquired by the Project. The land under government ownership is not accounted.

Table 4.11-2 Cost Estimation for the Private Land

Particulars	Million NRs.
Reservoir FSL 415 m +10 m*	542.76
Risk Zone in 3 places (Wantang Khola, Phedi Khola, Tittuwa)*	32.43
Project Facility Sites **	424.32
Total	**999.51**

*Note:*Cost of land NRs. 250,000/ Ropani (0.051 ha) for reservoir area. Rates obtained from focus group discussions*

*** The land cost is NRs. 600000/0.051 ha, for project facility sites, based on focus group discussions*

2) Cost Estimation for Structures

The cost estimation for the affected structures including both private and community are

presented in below (See the details in Annex D: Structures Types and Cost Estimates, Reservoir, Risk Zones, and Project Facility Site).

Table 4.11-3 Cost Estimation for the Structures

Particulars	Million NRs.
Reservoir FSL 415 m +10 m	12.89
Risk Zone in 3 places (Wantang Khola, Phedi Khola, Tittuwa)	3.33
Project Facility Sites	17.75
Total	**33.97**

Note: Structures cost estimations as per district and Government of Nepal norms.
Pakki House with stone mud motar, and khar roof = NRs. 550/ft 2
Pakki hose with stone mud motar and GI sheet roof = NRs 600/ft2
Pakki house with brick and cement or cement block and GI roof = NRs 750/f2
Pakki house with bick cement or pillar with concrete roof = NRs 900/ft2
Kachhi cowshed with wood and GI sheet roof = NRs 350/ft2
Kachii cowshed or other shed with wood and Khar roof = NRs. 250/ft2

3) Cost Estimation for Agriculture Production Equivalent to One Year Production

Table 4.11-4 indicates the cost estimation for agriculture production equivalent to one year production (See also the details in Annex D: Agriculture Production Loss)

Table 4.11-4 Cost Estimation for Agriculture Production Equivalent to One Year Production

Particulars	Million NRs.
Reservoir FSL 415 m +10 m	0.46
Risk Zone in 3 places (Wantang Khola, Phedi Khola, Tittuwa)	0.027
Project Facility Sites	0.16
Total	**0.647**

Note: Estimated upland and irrigated land in the project area = 60 percent irrigation khet land, and 40 percent upland (bari land)

Cropping intensity and production per ha of land in irrigated khet land

Crop Type	*Cropping % in the land*	*Production/ha MT*	*Production/ha (in NRs)*
Paddy	*100*	*3.15*	*3,064*
Wheat	*20*	*1.9*	*1,880*
Maize	*33*	*2*	*1,540*
Early paddy	*26*	*3.1*	*3,064*

Based on Tanahu district average

Cropping intensity and production per ha of land in upland (bari land)

Crop Type	*Cropping % in the land*	*Production/ha MT*	*Production/ha (in NRs)*
Maize	*100*	*2.5*	*1,540*
Millet	*40*	*1.2*	*1,600*
Pulses	*50*	*0.9*	*2,445*

Based on Tanahu district average

4) Other Rehabilitation Compensation to Relocatee

As per the RP policy described in Section 4.4, the AFs whose residential house structure is to be affected shall be provided disturbance competition, house rental compensation, transportation allowance, and a gift land plot or its equivalent amount of the cost. The cost estimation for such rehabilitation compensation is shown in **Table 4.11-5**.

Table 4.11-5 Other Rehabilitation Compensation to Relocate

Particulars	Million NRs.
Reservoir FSL 415 m +10 m	11.07
Risk Zone in 3 places (Wantang Khola, Phedi Khola, Tittuwa)	2.348
Project Facility Sites	31.53
Total	**44.95**

Note:

**Disturbance allowance 1 day/relocatee = NRs. 150, for 180 days*
***House rentals 1 day/relocatee = NRs. 200 for 180 days*
****Transportation costs/relocatee = NRs. 18000 (lump sum)*
*****Gift land plot Reservoir area= NRs. 250000 (as per focus group discussion)*
****** Gift land plot Project Facility sites= NRs. 600000 (as per focus group discussion)*

5) Transportation Allowance to Affected Structure Owners other than the Affected Residential Structure Owners

Both private and community structure owners shall be compensated transportation allowance for the salvaged of the structure materials as follows (See Annex D: Compensation to Non-residential Structural Owners and Community Owners).

CHAPTER 5 FRAMEWORK OF SOCIAL ACTION PLAN

5.1 Background

The Resettlement Plan (RP) addresses what types of APs will be eligible for what types of compensation and benefits in order to mitigate, particularly, economic impacts on APs. However, it does not respond to the socio-economic effects on the communities such as loss of community resources and property. As assessed in Chapter 3, the adverse impacts to the communities are related with the loss of infrastructures such as motorable roads, suspension bridges and foot trails. The project will also affect the forestland, shrub land, grass land and river flood plain areas. Furthermore, there will be significant loss of the natural resources including forest resources and water resources on which communities are dependent traditionally for livestock raising, agricultural practices, and even for livelihood. The loss of these lands and resources can be considered as a loss of community livelihood, which could not and should not be overlooked in rural villages. The poor, destitute, and disadvantaged groups or communities bear the burden of losses than the high class and affluent people of the society. It is therefore necessary to develop a mechanism to compensate the losses and restoration of livelihood of these people. The framework of Social Action Plan (SAP), i.e. a package of social programs, is conceptualized in the context of the project to reverse these impoverishment risks caused by the Project.

5.2 Basis of Identification of Social Programs

The formulation of Social Programs is based on the assessment of socio-economic effects on the affected persons and community through the Field Survey, the Household Survey and Focus Group Discussion in the project-affected VDCs and municipality under the Supplemental EIA Survey (See Chapter 2 and 3). During Focus Group Discussion undertaken in 13 different places of the project-affected VDCs and municipality, the communities were asked to list three urgent development needs in the context of the local area and categorize those needs into first and second priorities. Prioritization of the development needs differ from community to community. Their felt development needs, when compiled and assessed for all communities of the project areas, are summarized below.

Table 5.2-1 First and Second Priority Needs and Proposed Social Action Programs[18]

S.N.	First Development Priorities		Proposed Social Action Programs
1	Motor road linking to Damauli from the project sites		
2	Clean drinking water supply at the community level	⇨	2. Community's Initiative Support
3	School buildings and improvements in the school facilities	⇨	5. Community/Public Health and Education Enhancement
4	Employment opportunities	⇨	3. Skill Enhancement and Employment
5	Irrigation facilities at the tar areas	⇨	2. Community's Initiative Support
6	Motor bridge over Seti River		
7	Training on herbal farming and processing	⇨	4. Agricultural Development
8	Rural Electrification	⇨	8. Rural Electrification
9	Tourism development		
S.N.	Second Development Priorities		5. Community/Public Health and Education Enhancement
1	Health Posts and health service facilities	⇨	
2	School buildings and improvements in the school facilities	⇨	5. Community/Public Health and Education Enhancement
3	Irrigation schemes	⇨	2. Community's Initiative Support
4	Employment opportunities	⇨	3. Skill Enhancement and Employment
5	Skill development training	⇨	3. Skill Enhancement and Employment
6	Foot trail development	⇨	1. Replacement of Affected Infrastructures
7	Clean drinking water supply at the community level	⇨	5. Community/Public Health and Education Enhancement
8	Restoration of religious places	⇨	1. Replacement of Affected Infrastructures
9	Protection from river erosion	⇨	7. Watershed Management
10	Rural electrification	⇨	8. Rural Electrification
11	Suspension bridges across Seti	⇨	1. Replacement of Affected Infrastructures
12	Community buildings	⇨	2. Community's Initiative Support
13	Tourism development		
14	Barbed weir fencing of the community forests	⇨	2. Community's Initiative Support

Source: Supplemental EIA Survey, JICA. 2006

All of the above listed community development needs, irrespective of the prioritization by the communities, are related to the livelihood and quality of life enhancement. Besides these needs, local women addressed their felt needs of various women development activities in order to improve their knowledge and skills, and enhance their socio-economic status. There are number of Government of Nepal agencies working in the above development areas. Similarly, a host of national and international non-governmental organizations are also working. However, services provided are not sufficient to meet the needs of the people in the project area. Obviously peoples are looking forward some assistance from the side of the project to fulfill their development needs. In the above context, the social action programs have been framed keeping the poor, destitute and disadvantageous groups in the centre of the designed programs.

[18] Regarding the upgrading of affected stretches of road, further examination is needed. The construction of new roads outside the affected areas is out of scope of the project.

5.3 Social Programs

It is proposed that the eight social programs should be conducted to mitigate socio-economic impacts on the affected communities and affected persons and rehabilitate the quality of life of these communities and persons. Eight social programs with the tentative schedule are summarized below.

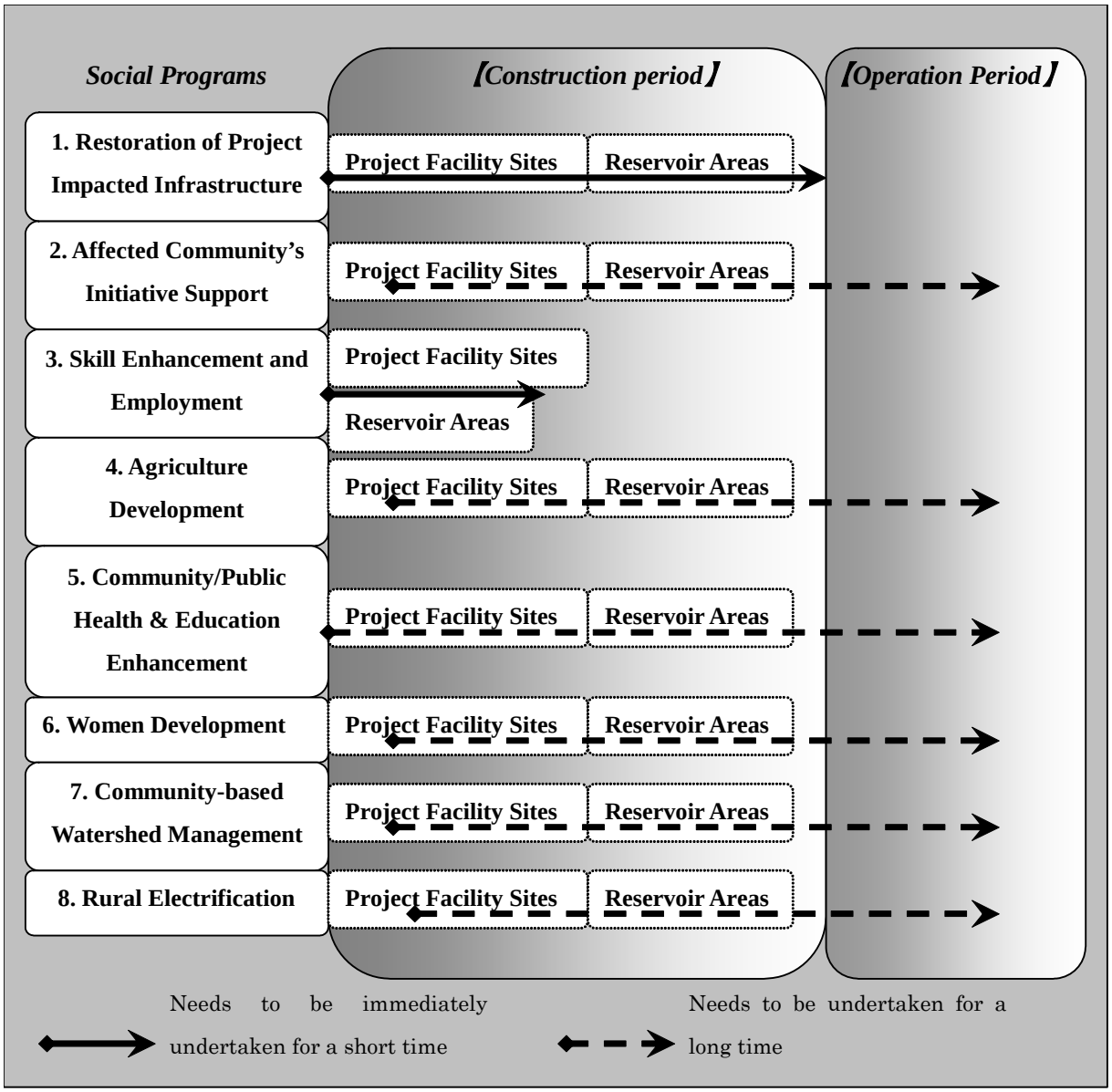


Figure 5.3-1 Proposed Eight Social Programs

(1) Restoration of Project Impacted Infrastructure

The reservoir of FSL 415 m will impound a host of infrastructure facilities, such as motorable roads, suspension bridges, foot trails, irrigation canals, electricity distribution lines, temples and resting places, and so on (See Chapter 3). **Table 5.3-1** estimates the approximate cost of the lost infrastructures at the reservoir area (See also Annex D. Cost breakdowns of the affected infrastructures).

Table 5.3-1 Costs of the Infrastructures Affected by Reservoir Inundation

S.N.	Type of Infrastructures (FSL 415 m)	Million NRs.
1.	Motorable road	0.9
2.	Motorable Bridge and Suspension bridge	16.28
3.	Foot trails	1.5
4.	Irrigation canals	3
5.	Electricity Distribution Line	0.105
Total		**21.785**

Except for the irrigation canal, and water supply sources lying under the inundation, the rest of the other infrastructures need rerouting above the reservoir inundation zone. The irrigation canals, as all the land irrigated by these canals fall below the reservoir levels, do not require rerouting. The water supply sources (the spring sources) also could not be relocated, however, provisions for alternative sources are made under the community's initiative support program.

The suspension bridges, the critical transport infrastructure across Seti, will have to be relocated at appropriate places close to the present suspension bridge locations. The span of the reservoir across Seti at many places is narrower than 300m. Suspension bridges of over 370m span have been built and operational in Nepal. It is therefore, proposed to relocate the existing suspension bridges by the longer suspension bridges in the nearby areas.

Table 5.3-2 presents the cost estimations for the rerouting and relocation of the existing infrastructures affected by the reservoir (See also Annex D: Replacement costs of the Affected Infrastructures).

Table 5.3-2 Cost Estimates for the Replacement of Infrastructures Affected by the Reservoir

S.N.	Type of Infrastructures (FSL 415 m)	Million NRs.
1.	Motorable road	6.125
2.	Motorable Bridge and Suspension bridge	77.7
3.	Foot trails	1.5
4.	Electricity Distribution Line	0.175
Total		**85.5**

The above allocated amount shall be expedited to the local community for the restoration of the affected infrastructure by contracting out such construction work to the local community groups as much as possible. This can be helpful to increase the income of these people, to some extent.

(2) Community's Initiatives Support Program

The project area people have many expectations from the project. The expressions in the focus group discussions and stakeholder meetings reflect the desire of the local people from the project. It is not possible for the project alone to fulfill the people's aspiration of development. However, the project can provide some assistance to meet their development needs on priority basis. Community's initiative support program is designed as a financial assistance program to the project affected communities of the 7 project affected VDCs of the Reservoir area namely, Bhimad, Majkot, Rising Ranipokhari, Chhang, Kotdurbar, Jamune, Kahun Shivapur and Vyas Municipality.

This program has allocated some development funds to each of the affected VDCs. The VDCs will use this fund for the development of the affected wards. The affected ward communities will select development programs of their requirement and can use the allocated funds for the selected programs in condition that the affected VDCs or wards can contribute to about 25% of the estimated cost (in cash or in kind) of the selected program. From this financial assistance, large development works may not be possible, but will certainly help in executing a numbers of medium and small scale community infrastructure development programs such as, motor road, school buildings, water supply schemes, foot trail development, irrigation systems, posts etc. It is also expected that the contribution from the affected VDCs or wards or communities will enhance a sense of ownership for the program. The allocated cost for this program is presented in **Table 5.3-3**.

Table 5.3-3 Allocated Costs for Community's Initiative Support Program

S.N.	Program VDCs/Municipality (FSL 415 m)	Million NRs.
1	Bhimad	2.61
2	Majkot	4.69
3	Chhang	8.08
4	Rising Ranipokhari	8.34
5	Kotdurbar	8.34
6	Jamune	8.34
7	Kahun Shivapur	8.60
8	Vyas	3.13
Total		**52.13**

Note: Basis of cost allocation is Lump sum from the experience of Middle Marsyangdi Hydropower Project

(3) Skill Enhancement and Employment Program

Hydropower construction project requires a large pool of workers skilled, semi-skilled and labor force. Focus group discussion meetings as well as local stakeholder meetings clearly reflect the employment expectations of the people from the project.

To provide job opportunity to the local people in the project, by itself is a mitigation measure to lessen diverse types of social, cultural and other public health risks. Besides, this is a key income restoration option that a project could possibly provide to the local communities. Experiences of the completed and ongoing projects shows very low employment of the local area people in skilful jobs. Only opportunity availed to the local people from the project is expected to be the labor work. In the existing social set up labor work in front of their kith and kin is below dignity option. Besides, local agriculture labor rates are higher than the district rates, and most of the local does not prefer to join the labor jobs unless no options are available for livelihood.

Hence to provide better jobs, skill enhancement suited to project construction works from the local interested and eligible people particularly from the poor, destitute, and disadvantageous communities is a necessity for higher local employment in the project. Experiences of the project skill trainings reveals that the trainee could not get a job in the project on the pretext that the training is not up to the

standard for project works. It is therefore, the quality of the training should meet the requirement for the project employment. The training shall also provide certification on level of training taken and quality of trainee performance in the training tests. Such type of training, will take a bit long time, however, will provide life long skills which could be used in other locations or could be adopted as skill for self-employment.

Besides, there are many peoples in the area who have working skills but due to lack of certificates, or accreditation from recognized institutions are not getting jobs of their potentials. A pre-project survey of the people's skills and testing of skills, certification and accreditation of skills will also help getting project employment.

To accommodate the trainees in the project works, trainings should be carried as early as possible before the start of the construction works. Only public notification on newspaper is not sufficient for the motivation of the people for trainings. Besides, tiffin should be given to these people during the training periods, because many of the poor, destitute or disadvantageous people could not afford living expenses during the training.

Specific articulation of the contractual clauses is also required in the contract document, such that the trainee have maximum chances of fetching skill and semi-skill jobs in the project.

The allocated cost for skill enhancement and employment program is indicated below.

Table 5.3-4 Allocated Costs for Skill Enhancement and Employment Program

S.N.	Training Programs (FSL 415 m)	Million NRs.
1	Carpentry	0.71
2	Masons	0.71
3	Vehicle Driving	1.52
4	Plumbing	1.52
5	Electrical Wiring	1.52
6	Welding	2.54
7	Automobile maintenance	1.62
Total		**10.14**

Note: Basis of cost allocation is Lump sum from the experience of Middle Marsyangdi Hydropower Project

(4) Agricultural Development Program

The reservoir area inundates a large expanse of agricultural land. The loss of agriculture productivity has a direct implication on the livelihood and quality of life of the people impacted directly or indirectly. Rural agricultural jobs are based on the availability of the land for agriculture. Loss of agricultural land, will also impact people who work on the land. To supplement the loss of productivity as well as the loss of rural employment on agricultural land, it is essential to enhance the capabilities of the people on the agricultural front. This could be done by providing training to people regarding the new methods of agricultural enhancement. Horticulture and herbal farming practices could enhance the income level of the people significantly.

Site specific agricultural development, horticulture development or herbal farming program shall be decided upon detail consultation with the local area people and assessment of agricultural, horticulture and herbal production potentials. Besides, it shall explore various options of production increment by the distribution of improved seeds, alternative crops, improved livestock, improved fodder production, vegetable cultivation etc.

The project affected areas are close to the market centers or have access to the market centers such as Pokhara and Kathmandu. Promotion of Rural-Urban Partnership Program as promoted by UNDP in many districts in Nepal, to create market linkage between the towns and rural hinterlands will be of utmost significance in the project area context. Constitution of community based, co-operative type micro-enterprise groups at local levels will be helpful to organize collection depots of local agricultural, horticultural, and herbal produces and arrange for marketing at the Bhimad, Damauli or in Pokhara and Kathmandu. Coordination of the agricultural development program including horticultural and herbal production particularly in Majkot, Rising Ranipokhari, Jamune, Chhang, Kotdurbar, Kahun Shivapur hinterlands with Rural-Urban Partnership Program shall open venues of sustainable agricultural development and income generation in the rural areas. In the context of the all weather road up to Rising Patan and programs of extension of the access road deep into hinterland, it provides needed infrastructure for such rural urban market linkages.

Since the details of agricultural/horticultural/herbal development programs shall be worked out only after consultations with the communities, only cost allocations have been proposed (**Table 5.3-5**). It is understood that these allocated costs will not be exceeded by the program designers while preparing the detailed agricultural/horticultural/herbal development programs in respective areas.

Table 5.3-5 Allocated Costs for Agricultural Development Programs

S.N.	Programs (FSL 415 m)	Million NRs.
1	Agriculture Development (trainings, improved seeds etc.)	5.50
2	Vegetable farming (trainings, improved seeds etc)	2.75
3	Horticulture development (trainings, distribution of saplings etc.)	11.00
4	Herbal farming (training, distribution of seeds, processing etc.)	8.25
Total		**27.51**

Note: Basis of cost allocation is Lump sum from the experience of Middle Marsyangdi Hydropower Project

(5) Community/Public Health and Education Enhancement

This program shall focus on two areas, one near the construction site and the other in the close vicinity of the reservoir affected VDCs.

In the construction sites, influx of the outside workers, their families and shopkeepers including hotel and restaurant owners, consumable item dealers, vegetable grocers etc. not only put pressure on the existing institutions such as schools, health care centers, telecommunications but also create burden on the existing water supply and sanitation conditions. Experience in the construction camps and labor

camps of the development projects, reveals a general decline in the sanitary conditions with implications on the community/public health of the area.

Considering the likelihood of the impact, targeted support programs on public health, sanitation, water supply, health and education institutions are proposed at Benitar, Huksetar, Jhaputar, Betini and Beltar areas.

The program will focus on support for adequate schooling accommodations at Beltar, and Benipatan. Sanitation facilities such as water supply taps, toilets and waste management shall be planned based on the perceived influx of outsiders. A health clinic facility manned by a Medical Doctor shall be established at Benipatan, Betini and Jhaputar on rotational basis during construction phase. Besides, a preventative health program shall be designed and implemented. Education on environmental sanitation and water will be part of the program to prevent fecal-borne diseases such as cholera and other gastro-intestinal diseases from becoming a problem in the construction areas. A focused program on public awareness and education on HIV-AIDS and prevention shall be launched to avoid or minimize the impacts of communicable disease. Malaria is a likely health issue due to influx of population and poor wastewater management and shall be addressed through proper education on sanitation, water management, and other appropriate measures to control and prevent Malaria vectors.

In the reservoir affected VDCs, a special education enhancement and health support service programs shall be launched. These programs will basically focus on the software components of education and health with some support on the facilities and infrastructures.

Although the details of the program sub-components will be designed at the later stage during Detail Design Phase, tentative estimations of the costs have been made considering the present level of understanding of the project activities and the project impact areas. **Table 5.3-6** and **5.3-7** itemized the allocation of funds for the proposed program sub-components.

Table 5.3-6 Allocated Costs for Community/Public Health and Education Enhancement Programs at the Project Construction Sites

S.N.	Program sub-components	Million NRs.
1.	Extension and improvements of water supply systems and taps, construction of public toilets and waste management systems in the boom towns at Beteni, Benipatan, Huksetar, Jhaputar, Beltar	2.90
2.	Support to educational institutions at Benipatan, and Beltar to cater the additional school going children (room space, teacher, etc.)	3.38
3.	Rotational clinical facility manned with a medical doctor during construction phase at Beteni, Benipatan, Huksetar, Jhaputar, Beltar	1.93
4.	Education and prevention programs on environmental sanitation, water related disease, STD, HIV/AIDS, and malaria at the construction camps, labor camps, boom towns and settlements close to project camp sites	1.45
Total		**9.66**

Note: Basis of cost allocation is Lump sum from the experience of Middle Marsyangdi Hydropower Project

Table 5.3-7 Allocated Costs for Community/Public Health and Education Enhancement Programs at the Reservoir Affected VDCs/Municipality

S.N.	Program VDCs/Municipality	Million NRs.
1	Bhimad	0.31
2	Majkot	0.56
3	Chhang	0.97
4	Rising Ranipokhari	1.00
5	Kotdurbar	1.00
6	Jamune	1.00
7	Kahun Shivapur	1.03
8	Vyas	0.38
Total		**6.27**

Note: Basis of cost allocation is Lump sum from the experience of Middle Marsyangdi Hydropower Project

(6) Women Development Program

The focus group discussions only involving women of the project affected area, reveals their status in the society (See Annex D). Most of them have only primary education; have very limited rights on the property, majority depends upon the male counterpart for decision making and above all have the highest burden of work load such as household and agricultural work. Their participation in the community development or in any social organization is very minimal. Livelihood skills are limited to agriculture and household requirements. Although they represent more than half of the population in the project area, their social status generally remains low.

Although girl trafficking is not noted as a serious problem in the area at present, high mobility of the outsiders even in the hinterlands during the construction period, is likely to raise such issues. Ignorance to sexual health among the women of the project area is likely to expose them with the STD, HIV and AIDS. There is a great need of family health and sexual health education to the women in the project affected area.

A specially designed women development program is designed to enhance their quality of life. It includes income generation skills including micro-credit funds, health education and awareness program on STD, HIV and AIDS, family planning and girl trafficking and so on. The programs shall be launched in the 7 VDCs and one municipality of the reservoir affected area as a part of women development program.

Details of the programs will be designed in the detailed design phase through consultation with the APs, affected communities, District Women Development Office and other stakeholders. However, tentative costs for the women development programs are presented in **Table 5.3-8**.

Table 5.3-8 Allocated Costs for Women Development Program

S.N.	Program VDCs/Municipality	Million NRs.
1.	Bhimad	0.65
2.	Majkot	1.17
3.	Chhang	2.02
4.	Rising Ranipokhari	2.08
5.	Kotdurbar	2.08
6.	Jamune	2.08
7.	Kahun Shivapur	2.15
8.	Vyas	0.78
Total		**13.03**

Note: Basis of cost allocation is Lump sum from the experience of Middle Marsyangdi Hydropower Project

(7) Community-based Watershed Management

The reservoir life depends upon the sedimentation rate in the reservoir. As elaborated in physical environmental section, the area close to the reservoir has a higher potential of high sediment volume contribution to the reservoir. Centrally operated watershed management programs, at times, are not effective to control the rate of sediment flow into the reservoir. It is therefore, a separate program of community based watershed management program is proposed for the 7 VDCs and one municipality affected by the reservoir.

The program shall be launched and managed by the communities located close to the reservoir even in the affected VDCs. Technical support to the program shall be provided by the team of watershed management experts to the communities. Program details will be worked out by the technical experts in the detail design phase. However, the main components of such programs will include afforestation in the community degraded lands, bio-engineering works for erosion control, surface drainage management woks in active landslide areas, stream training works to control stream erosion and to arrest the stream sediment loads etc. **Table 5.3-9** presents the estimated amount for the community based watershed management programs.[19]

Table 5.3-9 Cost Estimates for the Watershed Management Programs

S.N.	Program VDCs/Municipality	Million NRs.
1.	Bhimad	0.62
2.	Majkot	1.11
3.	Chhang	1.91
4.	Rising Ranipokhari	1.97
5.	Kotdurbar	1.97
6.	Jamune	1.97
7.	Kahun Shivapur	2.03
8.	Vyas	0.74
Total		**12.31**

Note: Basis of cost allocation is Lump sum from the experience of Middle Marsyangdi Hydropower

[19] For the afforestation in the risk zones, i.e., 10 m hight from the reservoir, the cost has been estimated separately (See Part B). Besides that, the preventive measures for the erosion and the slope failure in Bhimad Bajar will be estimated separately as the civil engineering work.

(8) Rural Electrification

Rural electrification is one of the strong demands of the local area people of the project area. During the stakeholders meetings held in Damauli in June and December 2006 and May 2007, a number of local people in affected VDCs articulated that the project should carry out rural electrification program. Many parts of Bhimad, Rising Ranipokhari, Majkot, Chhang, Jamune, Kahun Shivapur and Bhimad are connected to electricity. Meanwhile, Kotdurbar VDC is yet to be connected to electricity. Even in the VDCs, which are connected to electricity, the distribution lines are yet to cover the entire households of the VDCs. As this project is a hydroelectric project, it is high expectation and demand that the project should at least meet their electricity connection needs. It is therefore proposed to connect the unconnected parts of the project directly affected VDCs to the National Electricity Grid as one of the development gesture of the project. **Table 5.3-10** presents the allocated costs for Rural Electrification of these areas.

Table 5.3-10 Cost Estimates for the Rural Electrification Programs

S.N.	Program VDCs/Municipality	Million NRs.
1.	Bhimad	0.98
2.	Majkot	1.76
3.	Chhang	3.03
4.	Rising Ranipokhari	3.13
5.	Kotdurbar	3.13
6.	Jamune	3.13
7.	Kahun Shivapur	3.23
8.	Vyas	1.17
Total		**19.55**

Note: Basis of cost allocation is Lump sum from the experience of Middle Marsyangdi Hydropower Project

5.4 Information Dissemination and Feedback

Timely and proper dissemination of information by responsible authority through various means including media is an essential part of the project implementation and operation strategy. No information or misinformation, sometimes, creates problems in the project execution. To avoid such gaps and to strengthen the project planning and execution, two-way feedback between the project and concerned stakeholders, it is proposed to institute information dissemination and feedback program as a part of the social program.

This program shall include, besides, establishment of public information centre at the project site, dissemination of information through Local FM stations. It shall also include stakeholders meeting programs within the project area on regular basis. Allocated costs for information dissemination and feedback are included in the administrative and management costs in Environmental Management Plan (See Part F).

5.5 Further Social Program Design

The social programs listed in section 5.3 are generalized Program of Activities. Tentative cost allocations are made to ensure the allocation of necessary costs in the project. However, the project in its detail design phase should restructure the programs in detail through extensive public consultations and field visits. Experiences of the similar hydroelectric projects revealed that such consultations are essential to implement the rehabilitation programs effectively. Since there are a great diversity of communities within the affected VDCs/municipality in terms of the ethnic, caste and culture, the current living standard, the depth of impacts, and the felt needs, it is not so easy in the practice for the project to meet various needs of the local people.

It is, therefore, recommended that the project closely coordinate with not only DDC, affected VDCs/Municipality and other government agencies but also INGOs/NGOs and CBOs working in the affected VDCs/municipality and having the grass-root level network. There are a number of INGOs/NGOs, and CBOs in the Vyas, Bhimad, Chhang, Rising Patan and Kahun Shivapur VDCs, which have had experience of planning and executing the social programs in these areas. As local level NGOs and CBOs play a greater role in social mobilization, their participation in the project implementation is definitely envisaged to remove social bottlenecks, which at times, are crucial in the project management[20].

In the detail design phase, it is also recommended to mobilize the NGOs and CBOs working in the area to design social programs, as to the concepts presented, within the allocated budget framework.

5.6 Social Program Administration

The project itself will be responsible for planning and implementing the Social Action Plan. In this context, the Project Management Office (PMO) shall be responsible for the implementation of the Social Action Plan Programs. Since Environment and Social Studies Department of NEA is short of manpower and resources, project specific offices are executing such social programs in the ongoing projects. It is therefore, the same model of social program administration is also proposed for the project.

A separate Environmental and Social Management Unit (ESMU) under the Project Director of the PMO is proposed. All the logistics required for ESMU will be provided by the Project. There will be a full time staff delegated from NEA heading the unit supported by consultants. A full time Socio-economist/Community Liaison Expert and a Community Development Expert are proposed as outside consultants. These experts will work with local development NGOs and CBOs contracted to assist in implementing SAP components.

[20] There are a number of NGOs/CBOs working with different objectives in Nepal. When selecting NGOs/CBOs as suitable partners that are expected to facilitate affected communities in development activities, it is necessary to consult with local stakeholders such as DDC, representatives of affected VDCs and affected communities in advance and set the clear selection criteria to ensure more transparency of the selection process.

Internal monitoring of SAP shall be carried out by the ESMU. An independent external monitoring and evaluation is proposed for the project to fulfill the requirements of funding donor agency. Monitoring and evaluation by external independent agency is envisaged to help assess SAP implementation and reorient the SAP, if so needed.

In accordance with the peace keeping process in the nation, the expected role of DDC and VDCs will be much more important than ever before. If the local election is completed by the time when the project is launched, it is important to coordinate with newly selected DDC members, VDC chairpersons and the mayor, and implement SAP in affected VDCs/municipality effectively and efficiently.

5.7 Cost Summary for SAP

The cost estimates for the proposed social programs are summarized below.

Table 5.7-1 Cost Summary for SAP

S.N.	Proposed Social Programs	Million NRs.
1	Replacement of Affected Infrastructures by the Reservoir	85.5
2	Community's Initiative Support Program	52.13
3	Skill Enhancement and Employment Program	10.14
4	Agricultural Development Program	27.51
5	Community/Public Health and Education Enhancement Program at the Project Construction sites	9.66
	Community/Public Health and Education Enhancement Program at the Reservoir affected VDCs	6.27
6	Women Development Program	13.03
7	Watershed Management Program	12.31
8	Rural Electrification Program	19.55
Total		236.10

Note: The above cost estimates are based on lump sum from the experience of Middle Marsyangdi Hydropower Project.

CHAPTER 6 STAKEHOLDER MEETINGS

6.1 Overview of Stakeholder Meetings

The consultation with local stakeholders at an early stage of projects is essential for considering the environmental and social factors and ensuring the success of development projects. The JICA ‘s Guidelines stipulates that a series of stakeholders meetings need to be held three times during the feasibility study by the recipient government with the assistance of JICA if the proposed project is classified as Category A that is likely to have significant adverse impacts on the environment and society. As per this Guideline, stakeholder meetings would be held by NEA with the assistance of the Study Team. They were scheduled three times—(i)during scoping phase, (ii)during the time of submission of interim report and (iii) during the time of submission of draft final report in Damauli and Kathmandu respectively.

6.2 First Stakeholder Meeting during scoping phase

(1) Advance notification

Before the 1st stakeholder meeting in Damauli, the public announce was widely made in national daily “Gorkapatra” and local newspaper “Bhanjang”, at local FM program “Machhapuchhre” and on local TV program. Invitation letters were also sent to the affected VDCs, the concerned Ministries, the concerned local government organizations, the political parties, the concerned NGOs, media, universities and other relevant individuals. Furthermore, NEA and the Study Team posted public notice in several villages of affected VDCs and requested them to participate in it (See Annex D Advance notification and List of invited institutions/persons).

(2) Damauli

On June 2 2006, the 1st Stakeholder Meeting was held in the District Development Committee office with the following objectives;

- To explain and disclose information regarding the Project including the scope of the Study, project layout, EIA scoping and issues
- To obtain various opinions, concerns, suggestions and feedback from the public

Close to 450 participants of the meeting included local people of affected VDCs and Vyas municipality as well as other VDCs, government officials, NEA and the Study Team (See Annex D: List of participants). The majority of the local participants were farmers and others were engaged in business, service jobs, studying, social activities, and media. It was found that some farmers left their village in the early morning and took a five-hour walk for the meeting. More than expected, a number of local people attended it. Unfortunately, the ratio of women participants was only 10% of the total participants. It was assumed that they were likely to be too busy in rice planting and other house work to attend the meeting. In order to collect the voices from women, focus group discussion was

conducted targeting women separately by local consultants during the field studies of the supplemental EIA under the Study. The number of local people by affected municipality/VDCs is shown below.

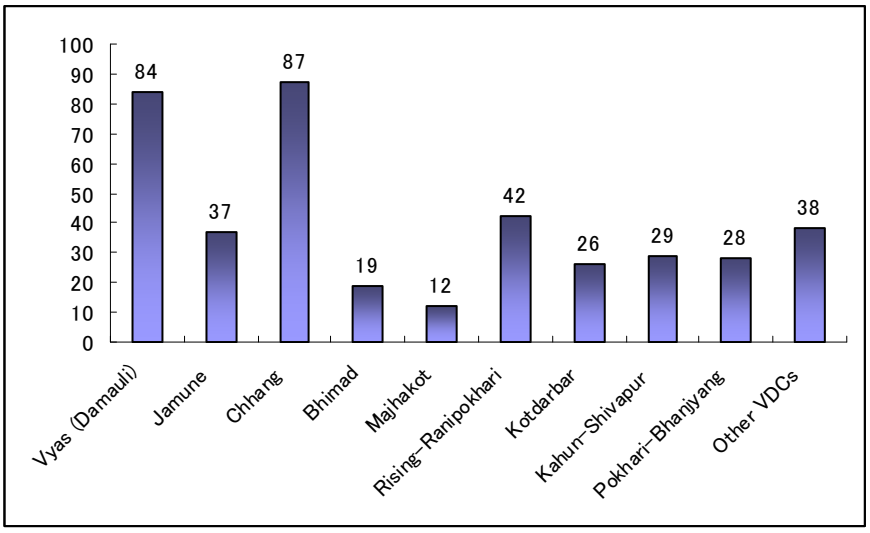
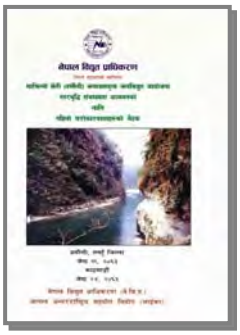


Figure 6.2-1 Participants for the 1st Stakeholder Meeting

The meeting was moderated by the experienced NEA staff member in Nepali language that enabled the local participants to fully understand the presentations and participate in the discussions (See Annex D: Program Schedule). The brochure describing the project in Nepali was also distributed to participants (See Right and Annex D: Brochure). In the beginning, NEA started the meeting with a brief explanation of background and objectives of the proposed upper Seti storage hydroelectric project. They also gave an overview of existing EIA conducted by NEA including a one-day Public Hearing in Damauli on January 25, 2004. Furthermore, the Study Team made presentations on the background of the Study, the layout of the project, and the scoping of supplement EIA to be conducted during the Study (See Annex D: Presentation materials).



Following that, the representatives of political parties made comments on the project, focusing that the proposed upper Seti storage hydroelectric project is extremely essential for the hydroelectric development not only in Tanahu District but also in Nepal. They emphasized that NEA and the Study Team need to consider providing the maximum benefits of the project such as sufficient compensation and employment opportunities to the affected households and the concerned communities, as well as rural electrification of target areas. During the meeting, several local people also expressed their views and made comments on the proposed project and the Study. Most of them showed their positive attitude towards the implementation of the project, and simultaneously deep

concern about the potential impacts on the environment and society. They strongly requested NEA and the Study Team to specify the affected areas and investigate the environmental and social impacts as soon as possible. They highly expected that the proposed project would provide sufficient compensation, employment and various training opportunities, and alternative mode of transportation to the affected families and the affected community people. It was found that comments and concerns raised by local people seem to be the same as those raised by the representatives of political parties and other government agencies (See Annex D: Meeting of Minutes).

In order to get more feedback and comments from participants, a strip paper was distributed in the last session of the meeting. For the illiterate participants, the staff members of NEA and the local consultants of the Study Team helped write their views and comments. 127 participants in total submitted it before they left the meeting. Their opinion, concern and request can be summarized below.

Table 6.2-1 Suggestions, Feedback and Comments from the Participants[21]

1	The propose project is requisite and essential in terms of development in the country as well as in Tanahu District. The development of this project is very crucial to meet ever increasing demand for electricity.
2	The information disclosure and the consultation with the affected areas and local people are very important. For interaction with the local people, VDC Specific Cooperation Committee should be formed as a focal point of the Project. It is necessary to continue to ensure transparency of the progress of project including the Study.
3	The proposed project needs to provide the maximum benefits to the local society.
4	The affected and inundated areas need to be urgently specified.
5	Due consideration should be given to the compensation and resettlement issues including identification of the entitlement and the timing for the compensation, the formation of compensation fixing committee, and the amount of compensation.
6	The priority for provision of employment opportunities should be given to, particularly the directly affected families and the affected VDC people.
7	The provision of training on agriculture development and capacity building need to be considered.
8	Priority consideration needs to be given to the road construction during the construction phase of dam as one of the alternative mode of transportation.
9	The newly constructed suspension bridges in replacement of the inundated bridges and other alternative mode of transportation need to be explored.
10	The environmental mitigation and countermeasures to erosion and landslide that are likely to take place in potentially affected areas need to be planned and carried out.
11	Adverse impacts on forests and specific areas should be assessed. Mitigation measures should be considered seriously.
12	Adverse impacts on aquatic ecology and fisheries should be assessed. Support program related to fisheries development needs to be planned and implemented to assist the affected fishermen.
13	Impacts on biological diversity should be further studied.
14	Electricity facility should be given to affected people and local people in Tanahu District at subsidized rate or cheaper rate.
15	Support program for promoting tourism in Tanahu District needs to be considered.
16	Various development needs should be met by the project. They include construction of irrigation facilities, supply of drinking water, women development activities, and improvement of school infrastructure.
17	We were concerned about the possibilities of the earthquake due to the project. An earthquake risk needs to be studied.

[21] Regardless caste and ethnic groups, these suggestions, feedback and comments were made by participants.

(3) Kathmandu

Following the meeting in Damauli, the 1st Stakeholder Meeting was also held in Kathmandu on June 7. There were 56 participants in total such as concerned government officials, intellectuals, donor agencies, NGOs, media, NEA staff members and the Study Team (See Annex D: List of invited institutions/persons and List of participants). The participants from donor agencies, NGOs and concerned ministries were limited since it was held on the day when many events to celebrate Environmental Day were organized in Kathmandu. The meeting was conducted according to the same meeting agenda as Damauli (See Annex D: Program Schedule and Presentation materials).

The former and active members of parliament from Tanahu District made remarks on the high expectation of the proposed project to meet the more demand for the power and promote rural electrification. They stressed that NEA and the Study Team should carry out the Study in the efficient and effective manner based on the feasible plan without the wasteful spending and time, which can be applied to smooth implementation of the project. They also requested that the mitigation measures against adverse impacts on the environment and society should be well planned and taken. Furthermore, they noted that the project should prioritize the provision of benefits to the local society such as rural electrification.

Some participants from the floor pointed out the necessity of assessing the adverse impacts on natural environment such as fisheries, lands slide and erosion. Others expressed their views that the past similar projects should be reviewed, and lessons learnt from these past projects should be incorporated into the proposed project, particularly in the areas of compensation arrangement and provision of employment opportunities. There were several questions such as the relation between the supplemental environmental assessment to be conducted by the Study and the existing EIA, the discussions of the 1ststakeholder meeting held in Damauli and so on. Both NEA and the Study Team replied the answers of these questions respectively (See Annex D: Meeting of Minutes).

(4) Media Coverage

1st Stakeholder Meetings in Damauli and Kathmandu were covered by the following print media (See also Annex D: Media Coverage)

Table 6.2-2 Stakeholder Meetings Covered by Print Media

S.N.	Print Media	Date
1-1	Gorkapatra (Nepali)*	May 24
1-2	Gorkapatra (English)/translation*	May 24
2-1	Bhanjang National Daily	June 1
2-2	Bhanjang National Daily (English)/translation	June 1
3	The Rising Nepal (English)	June 3
4-1	Gorkapatra (Nepali)	June 4
4-2	Gorkapatra (English)/translation	June 4
5-1	Rajdhani (Nepali)	June 4
5-2	Rajdhani (English)/translation	June 4
6	The Rising Nepal (English)	June 8
7	The Kathmandu Post (English)	June 8

*Note: * public announcement before 1st Stakeholder Meetings*

6.3 Second Stakeholder Meeting

(1) Advance notification

The methods of advance notification for 2nd stakeholder meeting were the same as those for 1st stakeholder meeting such as sending invitation letters to concerned stakeholders, using various media, and posting public notice in several villages of affected VDCs. The public notice was widely made in national daily "Kathmandu Post" and local newspaper "Bhanjang", at local FM program "Machhapurchhre" and on local TV program. Since the majority of populations in target VDCs are Magar and Gurung, the notice was also broadcasted before the popular song radio program to which most of Magar and Gurung were assumed to listen. In addition, the request to encourage women to participate in the meeting was made for the secretary of each target VDC and the local concerned organizations (See Annex D Advance notification and List of invited institutions/persons).

(2) Damauli

The 2nd Stakeholder Meeting was held in the District Development Committee office on December 1 2006 with the following objectives;

- To explain and disseminate information on the Upgrading Feasibility Study and the Project including the following:
  - Study progress and justification for the Project
  - Physical and biological environmental impact (Supplemental EIA)
  - Socio-economic and cultural environmental impact (Supplemental EIA)
  - Optimization of development plan including layout of the Project
- To obtain various public opinions, concerns and feedback through discussions

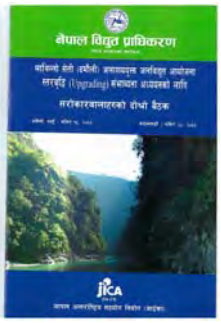
Approximately 600 people participated in the meeting, which exceeded the number of participants in the 1st Stakeholder Meeting. They included farmers, students, those engaged in service jobs and mass media, and local government officers. Regarding the ethnic composition of participants, Magar was 164 people, followed by Brahman (69 people), Newar (60 people), Chhetri (34 people), Dalit (23

people) and Gurung (20 people). Following the 1st Stakeholder Meeting, the participation of women was limited in spite of taking several measures during the advanced notification. Close to 50 women attended the meeting, which accounted for less than 10% of total participants (See Annex D: List of participants).

Table 6.3-1 Participants for the 2nd Stakeholder Meeting

	Name of Municipality/VDC	2nd Meeting
1	Vyas (Damauli)	176
2	Jamune	52
3	Chhang	35
4	Bhimad	43
5	Majhkot	10
6	Rising-Ranipokhari	57
7	Kotdurbar	18
8	Kahun-Shivapur	82
9	Pokhari-Bhanjyang	22
10	その他	79
Total excluding the Study Team, NEA and JICA		574

Like previous stakeholder meeting, the brochure summarizing the results of supplemental EIA Study and optimization of development plan in Nepali was distributed to participants (See Below and Annex D: Brochure). The meeting was started at 11:00 with the welcome speech made by General Manger of NEA (See Annex D: Program Schedule). Following that, NEA gave a brief about the background of the proposed upper Seti storage hydroelectric project. The Study Team made presentations on the progress and status of the Study and the results of supplemental EIA Study from natural and socio-economic environmental aspects and the optimum project layout and scale. Regarding Full Supply Level, it was presented that Full Supply Level of 420 m was optimum at this moment, but might be changed later on considering other environmental indicators (See Annex D: Presentation materials).



Participants in 2nd Stakeholders Meeting

During the 2nd half of meeting, the representatives of Ministry of Water Resources and various political parties made comments on the project. Most of these comments were favorable for the Project, focusing that the proposed project is critical to meet ever increasing demand for electricity and requisite for power sector in Nepal. The representative of each target VDC also expressed their own opinions, concerns and requests. The majority of people requested NEA and the Study Team to minimize environmental impacts as much as possible and maximize the direct and indirect benefits for local communities. Furthermore, some people requested to provide more specific

information on compensatory measures and employment measures. In addition, others requested to hold a consultation meeting at each target VDC level except for mass meetings. It was also pointed out that the Project should be carried out effectively and efficiently unlike Middle Marsyangdi Hydro electric Project[22]. There was no significant difference between opinions and concerns from local people and those from representatives of political parties and other government agencies (See Annex D Meeting of Minutes).

Close to 60 participants submitted their comments and concerns on strip papers or request letters. They were summarized below, which were almost same as those of 1st Stakeholder Meeting.

Table 6.3-2 Suggestions, Feedback and Comments from the Participants[23]

1	The propose project is requisite and essential in terms of development in the country as well as in Tanahu District. The project should be implemented smoothly without any disturbances observed in Middle Marsyangdi Hydro Electric Project.
2	Consultation meetings should be carried out in each affected VDCs to provide more specific and detailed information on the inundated areas, the exact location and compensatory and employment measures. Other environmental mitigations should be provided in next stakeholder meeting.
3	The proposed project needs to provide the maximum benefits to the local society.
4	Due consideration should be given to the compensation and resettlement issues including identification of the entitlement and the timing for the compensation, the formation of compensation fixing committee, and the amount of compensation and measures for those who have no legal titles.
5	The priority for provision of employment opportunities should be given to, particularly the directly affected families and the affected VDC people. The detailed information should be provided as soon as possible.
6	As one of the alternative mode of transportation for inundated roads, due consideration should be given to the road construction. The road from Bhimad or Rising Patan to Dam site, or Damauli needs to be constructed.
7	New suspension bridges should be constructed or other mode of transportation should be considered for inundated suspension bridges.
8	The mitigation measures to protect Bhimad Bajar from erosion should be seriously considered and undertaken. The information about whether gabion walls will be constructed in the possible hazardous areas during the project construction should be provided to the local people.
9	The affected community forest and grazing lands need to be delineated. The mitigation measures should be provided to the affected Forest User Groups.
10	Electricity facility should be given to affected people and local people in Tanahu District at subsidized rate or cheaper rate.
11	Mitigation measures for fisheries should be addressed. Particularly fishery development activities should be carried out in reservoir areas
12	Various development needs such as support for water drinking and schools should be considered and undertaken.

NEA prepared their opinions and replies to comments and issues above mentioned and raised by participants (See Annex D: Reply to comments and issues).

[22] As of the end of November 2006, there was a series of news reporting that the project would not be able to meet the deadline due to the ongoing stoppage of construction work caused by a Moist-affiliated worker's union and that the project cost has already doubled from the original estimate of NRs 13 billion to NRs 26 billion.

[23] There were no significant differences of suggestions, feedback and comments among different caste and ethnic groups.

(3) Kathmandu

The 2nd Stakeholder Meeting was held in Kathmandu on December 6 2006. There were a total of 74 people. They included concerned government officials, mass media, representatives of political parties, NGOs, intellectuals, NEA staff members and the Study Team (See Annex D: List of invited institutions/persons and List of participants). The meeting was conducted according to the same meeting agenda as Damauli (See Annex D: Program Schedule and Presentation materials).

The representative from Ministry of Water Resource and IUCN noted that the NEA should incorporate the results of supplemental EIA Study supported by JICA into existing EIA. The representative from Ministry of Environment, Science and Technology expressed his concern that it was not clear how to incorporate the updated data and information based on the results of supplemental EIA Study into existing EIA, which might potentially make the procedures of approval for EIA delayed. It was also discussed how development and environmental conservation could go together. Some participants suggested that policy-level rather than project-level initiatives need to be taken by National Planning Commission in order to coordinate among different stakeholders having different perspectives for development and environmental conservation. Furthermore, others noted that a coordination mechanism should be built in order to solve conflict of interests between development promoters and environmentalist and among sectors (See Annex D: Meeting of Minutes).

(4) Media Coverage

2nd Stakeholder Meetings were covered by the following print media (See also Annex D: Media Coverage)

Table 6.3-3 2nd Stakeholder Meetings Covered by Print Media

S.N.	Print Media	Date
1	The Himalayan Times (English)	Dec 7
2	The Rising Nepal (English)	Dec 7

6.4 Third Stakeholder Meeting

(1) Methods to hold third Stakeholder Meeting

During the previous stakeholder meetings, a number of local participants requested the NEA and the Study Team to hold smaller-scale meetings rather than mass meetings, which enables the interactive consultation. Therefore, it was decided that the localized stakeholder meetings would be held in two areas namely Beltar in the project facility site and Rising Patan in the upper reservoir area while one stakeholder meeting would be organized in Damauli for the invitees alone.

Third Stakeholder Meeting (Rising Patan)

(2) Advance Notification

The methods of advance notification for localized stakeholder meeting included using various media, posting public notice in several villages of affected VDCs. The public notice was made in local newspaper "Seti Madi Daily", through local FM program "Annapurna", and on caption of three TV programs. For the meeting in Damauli, the invitation was sent by NEA to political parties, government agencies and other relevant institutions (See Annex D Advance notification and List of invited institutions/persons).

(3) Beltar, Rising Patan and Damauli

The 3rd Stakeholder Meeting including localized stakeholder meetings was held from May 4 to May 6 2007 with the following objectives;

- To explain and disseminate information on the Upgrading Feasibility Study and the Project including the following:
  - Overall findings of Study including full supple level and inundated and affected areas
  - Time-line of project stage
  - Environmental mitigation measures
  - Framework of resettlement plan and proposed social action plan
- To obtain various public opinions, concerns and feedback through discussions

Third Stakeholder Meeting (Damauli)

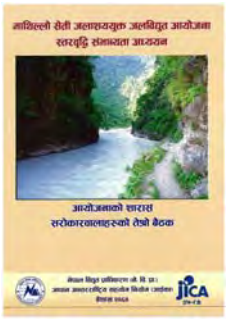
Close to 750 people in total participated in localized stakeholder meetings held in Beltar and Rising Patan. Because of the better access to the meeting places, it seemed that more people could attend meetings this time. Compared to previous meetings, the ratio of women participating meetings was increased from 10 % to 30%. Most of participants were farmers, while others included students, teachers and those engaged in service jobs and business. Among respondents, the majority was Magar (294 people), followed by Brahman (197 people), Newar (89 people), Dalit (81 people), Chhetri (40 people) and Gurung (35 people).

Table 6.4-1 Participants for the 3rd Stakeholder Meeting

	Name of Municipality/VDC	3rd Meeting in Beltar and Rising Patan
1.	Vyas (Damauli)	116
2.	Jamune	12
3.	Chhang	48
4.	Bhimad	13
5.	Majhkot	15
6.	Rising-Ranipokhari	262
7.	Kotdurbar	7
8.	Kahun-Shivapur	210
9.	Pokhari-Bhanjyang	37
10.	Others	34
Total excluding the Study Team, NEA and JICA		754

There were 68 participants in the meeting held in Damauli, including representatives of political parties, line agencies, NGOs and mass media (See Annex D: List of participants).

For the purpose of distribution in the stakeholder meeting, the brochure was published in Nepali and English. It outlines the Study, optimization of development plan, natural environmental and socio-economic and cultural impacts and mitigation measures, timeline of the Project and frequently asked questions (See Right and Annex D: Brochure).



During the first half of the localized stakeholder meeting, oral presentation was made by the local consultant on behalf of the Study Team. (See Annex D: Program Schedule). It included a briefing about the framework of Resettlement Plan, proposed Social Action Plan, and the timeline for the Project. The photos drawing a line of FSL of 415 m were also shown. In the case of the meeting in Damauli, the presentation was made by using computer (See Annex D: Presentation materials). Unlike previous stakeholder meetings, much time was allocated to the second half of the meetings, which enabled more participants to raise concerns and questions and make comments and suggestions for the Study and the Project. There was no significant difference between opinions in the previous stakeholder meetings and those in the third stakeholder meeting in Beltar, Rising Patan and Damauli (See Annex D Meeting of Minutes). They were summarized below.

Table 6.4-2 Suggestions, Feedback and Comments from the Participants[24]

1	The decision whether or not the Project will be implemented should be made as soon as possible. After the Upgrading Feasibility Study, will JICA implement the Project?
2	The proposed project needs to provide the maximum benefits to the local society. Some portion from NEA royalty should be handed over to Tanahu District. How much can Tanahu District receive royalty?
3	Due consideration should be given to the compensation and resettlement issues including identification of the entitlement and the members of compensation fixing committee, and compensation at replacement costs and measures for those who have no legal titles.
4	The priority for provision of employment opportunities should be given to, particularly the directly affected families and the affected VDC people. How many workers will be involved in the project construction works on a daily basis?

[24] There were no significant differences of suggestions, feedback and comments among different caste and ethnic groups.

5	Electricity facility should be given to affected people and local people in Tanahu District.
6	Motorable roads should be built from Bhimad, Rising Patan to dam site, and Damauli.
7	For inundated suspension bridges, the alternatives need to be arranged.
8	Some mitigation measures for the possible hazardous areas including Bhimad Bajar should be provided by the Project.
9	The affected community forest and grazing lands need to be properly compensated. Newly registered community forest in Jamune VDC needs to be compensated.
10	Mitigation measures for fisheries should be undertaken by incorporating the good practices from other hydropower projects such as Kaligandaki A and Kulekhani.
11	Job opportunities, skill training and awareness raising program for avoiding girl trafficking should be given to the local women in affected VDCs.
12	More focus should be given to health education including prevention of communicable diseases.
13	Is there a possibility that a dam will collapse? Is there a possibility that the reservoir areas will be filled with sediments?

As in the previous meeting, NEA prepared their opinions and replies to comments and issues above mentioned and raised by participants (See Annex D: Reply to comments and issues).

(3) Kathmandu

The 3rd Stakeholder Meeting was held in Kathmandu on May 10 2007, in which 53 people including representatives of political parties, representative of Ministry of Forest and Soil Conservation, representatives of concerned organizations, media, NEA staff members and the Study Team participated (See Annex D: List of invited institutions/persons and List of participants). The meeting was conducted in the same way of meeting held in Damauli (See Annex D: Program Schedule and Presentation materials).

Third Stakeholder Meeting (Kathmandu)

Several participants were concerned about the estimated project cost, i.e. some US 340 million dollars. Some noted that not only donor agencies but also the Government of Nepal and people should share its cost. Others suggested that the accurate cost be estimated as much as possible before the implementation of the Project in order to avoid the situation of Middle Marsyangdi Project where the project has been significantly delayed, and consequently the project cost has continued to increase. In the end of meeting, the managing director of NEA emphasized the importance and necessity of the Project to meet the increasing demand for electricity. Furthermore, he strongly requested the government to make a policy in collaboration with the ministries concerned to enable the NEA to execute hydroelectricity projects more efficiently and effectively (See Annex D: Meeting of Minutes).

(4) Media Coverage

The following print media covered 3td Stakeholder Meetings (See also Annex D: Media Coverage).

Table 6.4-3 3rd Stakeholder Meetings Covered by Print Media

S.N.	Print Media	Date
1	Nepal Samachar Patra (Nepali)	May 7
2	The Himalayan Times (English)	May 11
3	The Rising Nepal (English)	May 11

CHAPTER 7 FURTHER INVESTIGATION

The following recommendations were made for further investigation and necessary action during the Detailed Design phase.

- Further investigation is recommended to identify land plot affected and affected land owners through collecting the cadastral maps for Jamune VDC.
- Further investigation is required to conduct the inventory structure survey for the areas such as Wantang Khola, Phedi Khola and Tittuwa as well as Project Facility Sites, which were not completely covered by the Supplemental EIA Survey.
- The framework of Resettlement Plan and the Social Action Plan are required to be further updated including cost estimates during the Detailed Design phase. Particularly, it is significantly necessary to develop the detailed design of proposed Social Action Programs through consultation with the local people, the affected VDCs and municipality, DDC and other stakeholders such as line agencies, INGOs/NGOs and CBOs working in the affected VDCs and municipality.

The proposed mitigation and enhancement measures should be incorporated into the Tender Documents and Contract Agreement that require the Contractors to abide by any terms and conditions, and undertake definitely these measures.

ANNEX D

Annex D – Contents

Household Survey Questionnaire

First Stakeholders Meeting

- Advance Notification of First Stakeholders Meeting in Camauli and Kathmandu
- List of Invited Institutions/Persons of First Stakeholder Meeting in Damauli
- Participants Registered in the First Stakeholder Meeting at Damauli, June 2nd, 2006
- Program Schedule of First Stakeholder Meeting in Damauli
- Brochure of First Stakeholder Meeting
- Presentation Material in Damauli
- Minutes of First Stakeholder Meeting in Damauli
- List of Invited Institutions/Persons of First Stakeholder Meeting in Kathmandu
- Participants Registered in the First Stakeholder Meeting at Kathmandu, June 7, 2006
- Program Schedule of First Stakeholder Meeting in Kathmandu
- Presentation Material in Kathmandu
- Minutes of First Stakeholder Meeting in Kathmandu
- Media Coverage of First Stakeholder Meeting

Second Stakeholders Meeting

- Advance Notification of Second Stakeholders Meeting in Camauli and Kathmandu
- List of Invited Institutions/Persons of Second Stakeholder Meeting in Damauli
- Participants Registered in the Second Stakeholder Meeting at Damauli, December 1, 2006
- Brochure of Second Stakeholder Meeting
- Program Schedule of Second Stakeholder Meeting in Damauli
- Presentation Material in Damauli
- Minutes of Second Stakeholder Meeting in Damauli
- Reply to Comments and Issue Raised by Stakeholders at Second Stakeholder Meeting in Damauli
- List of Invited Institutions/Persons of Second Stakeholder Meeting in Kathmandu
- Participants Registered in the Second Stakeholder Meeting at Kathmandu, December 6, 2006
- Program Schedule of Second Stakeholder Meeting in Kathmandu
- Presentation Material in Kathmandu
- Minutes of Second Stakeholder Meeting in Kathmandu
- Media Coverage of Second Stakeholder Meeting

Third Stakeholders Meeting

- Advance Notification of Third Stakeholders Meeting
- List of Invited Institutions/Persons of Third Stakeholder Meeting
- Brochure of Third Stakeholder Meeting
- Participants Registered in the Third Stakeholder Meeting in Beltar, Rising Patan, Damauli

Presentation Material in Beltar, Rising Patan, Damauli

Minutes of Third Stakeholder Meeting in Damauli

Reply to Comments and Issue Raised by Stakeholders at Third Stakeholder Meeting in Beltar, Rising Patan, Damauli

Advance Notification of Third Stakeholders Meeting in Damauli

List of Invited Institutions/Persons of Third Stakeholder Meeting in Kathmandu

Presentation Material in Kathmandu

Participants Registered in the Third Stakeholder Meeting in Kathmandu

Minutes of Third Stakeholder Meeting in Kathmandu

Advance Notification of Third Stakeholders Meeting in Kathmandu

Household Survey Questionnaire

Household Survey Questionnaire

Development Region :	District :
VDC/ Municipality:	Ward No. : Village :
Date of Interview:	Name of Interviewee :
Name of Interviewer:	

100. General Information/Demography

110 Name of Household head:	120 Sex:
130 Caste:	150 Religion:

Sex: 121 Male 122 Female

Caste: 131 Brahmin 132 Chetri 133 Magar 134 Sanyashi 135 Bote
136 Kumal 137 Kami 138 Damai 139 Sarki 140 Others

Religion: 151 Hindu 152 Muslim 153 Buddhist 154 Christian 155 Others

200 How long your family is residing in this locality?

210 Ancestral (before two generation) 220 Only a generation ago

230 Recently Migrated (before 30 years)

240 If it is recently migrated then :

241 Migrated District: 242 Migrated:

243 Migrated Village:

300 Family Structure

310 Nuclear Family 320 Joint Family

330 Information about family members along with household owner:

S.N	Name of family Members	Sex (1)	Age	Relation to family head	Education (2)	Occupation (3)	Skill / Training (4)

Note : 1. Sex: 10. Male – 11. Female

2. Education (above 6 yrs of age)	3. Occupation	4. Skill / Training above 15 yrs of age
22. Illiterate	31. Agriculture	38. Mason
23. Can only read and write	32.Business	39.Carpenter
24.Primary (1-5class)	33. Job/Services	40. Tailor
25. Lower secondary (6-8 class)	34. Labour	41. Blacksmith
26. Higher Secondary (9-10)	35. Student	42. Shoemaker
27. SLC	36. Unable to work	43.Driver
28.Intermediate	37. Others (Specify)	44.Construction
29. Bachelor		45. Weaving Doko/Nanglo
30. Master		46. Hetuada Cement Employee
		47. NEA Employee
		48. Other (Specify)

400. If some of your family members have gone ouside for employment:

S. N	Relation to family head	Inside country destination	Abroad Destination	Average monthly income (Rs.)
1				
2				
3				

500. Agriculture practices and livestock raising:

510 Do You have land under your family ownership Yes No

520 If you own land give the following details of your land ownership and tenancy type:

S. N	Land Type	Own land operated				Rented- in				Rented-Out				Govt.land			
		R	A	P	D	R	A	P	D	R	A	P	D	R	A	P	D
	Khet																
	Bari																
	Kharbari																
	Forest																
	Orchard																
	Total																

Note: R = Ropani, A = Ana , P = Pisa, D = Dam

530 Main crops their coverage area, productivity and income from the sale of them

S. N.	Main Crops	Cropped Area				Production (in KG)	Unit Price Rs.	Total Rs.	Sold quantity Kg	Income from sale Rs
		R	A	P	D					
A	**Bari**									
	Upland paddy									
	Maize									
	Wheat									
	Millet									
	Pulses									
	Oilseed									
	Potato									
	Sugarcane									
	Other (specify)									
B	**Khet**									
	Paddy									
	Wheat									
	Maize									
	Potato									
	Pulses									
	Oilseed									
	Winter vegetable									
	Other (specify)									

540 Is your own production enough for your family? 541 Yes 542 No

550 If not, for how many months is it deficit?

551 3 months 552 6 months 553 9 months

560 How do you meet your food requirement for the deficit months?

561 Wage earning 562 Loan 563 Service

564 borrowing 565 Selling of fixed assets 566 Selling of current assets

567 Other (specify)

570 How much you spend for deficit food in last year? (Give in Rs)

580 Have you taken loan from any source? 581 Yes 582 No

590 If you have, provide the following details?

Name of source	Amount of Loan	Interest /Annum
591 Agric. Development Bank		
592 Nepal Bank Limited		
593 Rastriya Banijya Bank		
594 Cooperative organization		
596 Micro credit		
597 Local money lender		
598 Relatives/Neighbours		
599 Others (Specify)		

600 Raising of Livestock and Poultry Birds

610 Give the type and numbers of animals and birds and income from the sale of them:

code	Type of livestock	Local	Improved	Total	Last years' income from the sale
611	Cow/Bullock				
612	Buffalo				
613	Goat/Sheep				
614	Birds (chicken, duck, pegion etc.)				
615	Others (specify)				

620 Last years' income from the sale of livestock products

Code	Type of Production (1)	Unit (2)	Sold Quantity (3)	Total Income (4)(Rs.)
621	Milk/Khuwa			
622	Ghee			
623	Egg			
624	Wool			
625	Hide			
626	Others (Specify)			

630 Have you planted fruit treesin your farm land? 631 Yes 632 No

640 If you have planted fruit trees then give details

Types of fruit trees (1)	Total No (2)	No of Fruit bearing trees (3)	Total sales quantity last year kg (4)	Unit cost (5) Rs	Total sales (6) Rs

650 Are you involved in vegetable farming? 651 Yes 652 No

660 What are the different types of vegetables you are growing in relation to the area?

Types of vegetables (1)	Total area (2)				Production (Kg) (3)	Total sales quantity last year kg (4)	Unit cost (5) Rs	Total sales (6) Rs
	R	A	P	D				

700 Energy Use

710 For cooking purposes what types of fuels you use and quantity?

Code	Fuel type	Quantity	Unit Cost	Total cost
711	kerosene			
712	wood			
713	bio gas			
714	LPG			
715	Electricity			
716	Others			

720 For lighting purpose what types of fuels you use and quantity?

Code	Fuel type	Quantity (1)	Unit Cost (2)	Total cost (2)
711	kerosene			
712	wood			
713	bio gas			
714	LPG			
715	Electricity			
716	Others			

800 Irrigation

810 Do you have irrigated land 811 Yes 812 No

820 If you have irrigated land then what is your means/source of irrigation?

821 Channel 822 Canal 823 Pond 824 Pump set

825 Rain water 826 Other (specify)

900 Drinking water

910 What is your source of drinking water?

911 Piped water supply 912 spring) 913 Irrigation channel

914 Streams/rivers 915 Well /Kuwa 916 Other (specify)

1000 Health/Hygiene

1010 Recently, was any member of your household ill? 1011 Yes 1012 No

1020 If yes state the followings

Relation to family Head (1)	Type of disease (2)	Sex (3)	Age (4)	Sick days (numbers) (5)

1030 If yes then where and who was consulted for the treatment?

1031 Dhami/Jhankri (local healer) 1032 Herbal medicine

1033 Healthpost 1034 Other (specify)

1040 How much was spending for treatment? (in Rs)

1050 Have you constructed a toilet in your house? 1051 Yes 1052 No

1060 What type of toilet is it? 1061 Pit latrine 1062 Latrine (Permanent)

1070 Are the livestock kept in the same house with human beings or separately?

1071 Separately 1072 Not separately

1080 If livestock are in the same house what is the arrangement?

1081 Livestock in ground floor 1082 Human beings in upper floor

1083 Both in ground floor

1090 Have you installed smokeless oven in your kitchen? 1091 Yes 1092 No

1100 Involvement in any organizations/groups

1110 Is any of your family members involved in any Organizations/Groups

1111 Yes 1112 No

1120 If yes then provide following details?

Sex of the member	Name organization	Membership type	Objective of organization

1200 Income/Expenditure

1210 Provide the details of the annual income and expenditure of you household.

Income			**Expenditure**		
S.N.	**Main Topic**	**Rs**	**S.N.**	**Main Topic**	Rs
	Cereals		1	Food grain purchase	
	Pulses		2	Vegetables/fruits	
	Dairy products		3	Meat/egg	

Income			Expenditure		
S.N.	**Main Topic**	**Rs**	**S.N.**	**Main Topic**	Rs
	Livestock		4	Ghee.oil,salt,spices	
	Vegetables		5	Milk,sugar,tea	
	Fruits		6	Cigarratte,bidi,tobacco,tamakhu	
	Fish		7	Alcoholic beverages	
	Cottage industry		8	Clothes,shoes,sandals	
	Wage earning		9	Jwellery	
	Salary/pension*		10	Kerosene/electricity	
	Income from foreign country**		11	Fertilizer/seed purchase	
	Interest		12	Livestock purchase	
	Business/trade		13	Expenses to agriculture	
	Selling of asset		14	Education of childrens	
	House rent		15	Medicine expenses	
	Loan taken		16	transportation	
	Contractor		17	Taxes	
	Others (specify)		18	Purchase of assets	
			19	Expenses for religious purpose	

*Salary/pension: earned in long-term stay, Use data from Questions 400, 530, 590, 610, 620, 640, 660, 710, 720, 1050 for income and expenditure as appropriate.

**Income from foreign country: earned in short-term stay

1300 Information on the Project affected Property Only

1310 Details of Registered land affected by the project under your ownership

S.N.	Types of Registered land	Plot No	Area				Is the land under tenent	Who cultivates the land
A.1	Khet							
A.1								
A.1								
A.2	Bari							
A.2								
A.2								
A.3	Kharbari							
A.3								
A.3								
A.4	Forest							
A.4								
A.5	Orchard							

1320 Details of unregistered land affected by the project used by you

S.N.	Types of unregistered land	Area				Is it under registration process	From whom you take the land
		R	A	P	D		
A.1	Khet						
A.1							
A.1							
A.2	Bari						
A.2							
A.2							
A.3	Kharbari						
A.3							
A.3							
A.4	Forest						
A.4							
A.5	Orchard						

1330 Production and market value of the crops grown in the affected area:

S.N.	Main crops	Production (Kg)	Unit price (Kg)	Total value
	Bari			
1	Upland paddy			
2	Maize			
3	Wheat			
4	Millet			
5	Pulses			
6	Oilseed			
7	Potato			
8	Sugarcane			
9	Others			
	Khet			
1	Paddy			
2	Wheat			
3	Maize			
4	Potato			
5	Pulses			
6	Oilseed			
7	Winter vege.			
8	Sugarcane			
9	Others			

1340 Do you grow Fruits/Vegetables in the affected land 1341 Yes 1343 No

1350 If fruit cultivation practiced on affected land, provide the following details:

Types of fruit	Total No of plants	No. of fruit bearing trees	Production in (Kg)	Price Rs/Kg	Total cost (Rs)

1360 If vegetable cultivation practiced on impacted land, provide the following details:

Types of vegetable	Area				Total Production in (Kg)	Price Rs/Kg	Total cost (Rs)
	R	A	P	D			

1400 Views towards the project

1410 Do you like the project 1411 Yes 1412 No

1420 If Yes, give three main reasons of liking

1421

1422

1423

1430 If No, give three main reasons of dislike

1431

1432

1432

1500 Preferences for compensation, resettlement and rehabilitation

1510 If you are likely to loose a major portion of land or entire asset, what type of compensation package so you prefer (select your priority for two in your priority and write 1 and 2)

1511 Payment in cash only 1512 Land for land

1513 House for house 1514 House for house and land for land

1515 Othars (specify)

1520 If you prefer cash compensation, please specify the reason.

1521 To purchase land 1522 To build house 1523 To pay debt

1524 To start business 1525 Other (specify)

1530 What kind of resettlement support do you expect in case your residential house and major portion of land is affected by the project construction works and reservoir?

1531 Resettle by self in the nearby locality

1532 Resettle as community if the project offers this option in the nearby locality

1533 Resettle as individual outside the locality

1534 Resettle as community if the project offers this option in the outside project locality

1540 If you prefer outside project area then where please give three localities you prefer

1541 1542 1543

1550 If the project affects your land and property what kind of rehabilitation opportunities/ benefits do you expect from the project?

1551 Employment 1552 Skill Training 1553 Soft Loan

1554 Others (specify)

1560 What are the problems that you/your family might have to face as a result of the project implementation? Please specify.

S.N.	Social	Economic
1		
2		
3		
4		
5		
6		

1570 What are the advantages that you/your family would get as result of the project construction works?

1571

1572

1573

1580 What are your three main suggestions to minimize loss of income and property?

1581

1582

1582

1590 What will be the positive and negative impact of the project?

SN	Positive impact	Negative impact	Solutions and suggestions regarding negative impact

23.4 Comments of the interviewer

Focus Group Discussion –List of Users' Group

1) Community Forestry Users' Group.

1.	V D C- Chhan-4, Chokre				
	X				
2.	V D C- Chhan- 5, Fulbari Ghaderi				
	X				
3.	V D C- Chhan-7, Jhakash Fulbari				
	X				
4.	V D C- Bhimad - 1, Khanaltar				
	X				
5.	V D C- Rani Pokhari - 9, Rising Patan				
	X				
6.	V D C- Rani Pokhari - 9, Rising Patan - Kharkhare				
	1	Ghumaune Community Forest user's Group Ward NO 9 User's HHs-150 Dalit 25 Non Dalit 125 (Magar ie, Janajati)	Working Committee		
			M	F	2051/4/7
			8	3	
	2	Bhadauredanda Community Forest user's Group User's HHs-325 Dalit 75 Non Dalit 250 (Newar, Gueung, Magar, Chhetry, Bramhin	Working Committee		
			M	F	2050/1/7
			10	3	
	Both of the community forest users' HHs are nearly the same. Ghumaune Community Forest is located at Ward NO 9 whereas Bhadauredanda Community Forest is at Ward NO 8. Bhadauredanda Community Forest is larger in area and it is likely that the users' HHs are also more than double.				
7	V D C- Kotdarbar - 1, Maidan Swanra				
	Kalika Community forest user's (Group) households are reported 165 of which only one household is from Dalit. There are 11 members in working committee and all of them are female.				
8.	V D C- Kahun Shivapur - 3, Bakle				
	Bakle Community Forest user's (group) households are 100 and non dalit has been included in the group. The forest is located at Siddasthan of Ward NO 3 and has been formed with 11 members working committee including 2 females.				
9.	V D C- Kahun Shivapur - 1, Beltar				
	There are two community forest user's group in Ward NO 1 of Kahe Shivapurnaluly Salbas Community Forest user's group and Bochang Community forest user's group and the users HHs are the same of both group. They are located at Dharapani and Beltar respectively. A total of 250 HHs are included in the users' group of which 40 are dalit and rest 210 are non dalit. Total of 17 member working committee with 3 females have been formed in Salbas group and 13 members working committee headed by a woman in Bochang included 2 female and 11 male members.				
10.	Vyas Municipality - 7, Tallo Patan				
	X				
11.	Vyas Municipality - 7, Beni Patan				
	X				
12.	Vyas Municipality - 7, Beteni				
	X				
13.	Vyas Municipality - 5, Baireni-Botegaun				
	Two community forests have been reported used by the residents of Bairenitar but both of them are located outside of the impacted area. Kandathumki is located at just upper part of the Bairenivillage and Tekanthumki across the Madi River at Gunadi side. They are just users and not included in the working committee and each of the household pays Rs 60 per year as member fee.				

2) Drinking Water Users' Group

SN	Name of the scheme	Name of source scheme	Beneficiary HHs		Working Committee		Initiated by
			Gurung	Newar	M	F	
1.	V D C- Chhan-4, Chokre						
	X						
2.	V D C- Chhan- 5, Fulbari Ghaderi						
	X						
3.	V D C- Chhan-7, Jhakash Fulbari						
	Chitung Khola Drinking Water Users Group						
	Chitung Khola DWUG	Chitung Khola	75	25	8	3	Ex-Indian Army soldiers' association
4.	V D C- Bhimad - 1, Khanaltar						
	X						
5.	V D C- Rani Pokhari - 9, Rising Patan						
	Charchare DWUG	Charchare Khola	Dalit 1	Others 199	9	2	District Drinking Water Office
	Note: Other caste- Chhetri, Newar, Magar						
6.	V D C- Rani Pokhari - 9, Rising Patan - Kharkhare						
	Sindus Khola DWUG	Bokse Chhahara, Tarebhir	30	90	8	3	District Drinking Water Office
7	V D C- Kotdarbar - 1, Maidan Swanra						
	Chandiya Khola DWUG	Chandiyan Khola	1	34	7	2	VDC-Fund
	Kapidi DWUG	Kapidi Muhan	-	103	9	2	VDC-Fund
	Chabadi DWUG	Chabadi Muhan	-	14	7	2	VDC-Fund
	Arkhodi DWUG	Arkhodi Khola	13	13	5	2	VDC-Fund
8.	V D C- Kahun Shivapur - 3, Bakle						
	X						
9.	V D C- Kahun Shivapur - 1, Beltar						
	Linde Khola DWUG	Linde Khola	40	131	13	3	British Welfare Fund UK
	Pinsili Khola	Pinsili Khola	Reportedly these three sources are also handled by Linde Khola drinking water users group.				
	Mukuluk Khola	Mukuluk					
	Chanp Khola	ChanpKhola					
10.	Vyas Municipality - 7, Tallo Patan						
	Asapuri DWUG	Asapuri Muhan	Janajati 25	-	5	2	DDC and Municipality Magar,Tamang Giri,Newar,Boti
11.	Vyas Municipality - 7, Beni Patan						
	X	X	X	X	X	X	
12.	Vyas Municipality - 7, Beteni						
	Beteni DWUG	Beteni Kholsi	33 Magar	2 Ranabhat	5	-	Byas Municipality
13.	Vyas Municipality - 5, Baireni-Botegaun						
	X	X	X	X	X	X	X

3) Irrigation water users' group

SN	Name of the Irrigation Water user group	Name of source scheme	Beneficiary HHs		Working Committee		Initiated or Trained by	Remark
					M	F		
1.	V D C- Chhan-4, Chokre							
	X	X	X	X	X	X	X	X
2.	V D C- Chhan- 5, Fulbari Ghaderi							

SN	Name of the Irrigation Water user group	Name of source scheme	Beneficiary HHs		Working Committee		Initiated or Trained by	Remark
					M	F		
	X	X	X	X	X	X	X	X
3.	V D C- Chhan-7, Jhakash Fulbari							
	X	X	X	X	X	X	X	X
4.	V D C- Bhimad - 1, Khanaltar							
	Jidi Khola Birta Pachar	Jidi Khola Birta Bandh	38 Brm	2	8	1	DADO-Tanahun & local users group	Joint venture
5.	V D C- Rani Pokhari – 9, Rising Patan							
	Bidhuwa Irrigation Water users group	Hentang Khola	12 Dalit	102 Brm	12	3	DIO-Tanahun	
6.	V D C- Rani Pokhari – 9, Rising Patan - Kharkhare							
	X							
7	V D C- Kotdarbar - 1, Maidan Swanra							
	X							
8.	V D C- Kahun Shivapur - 3, Bakle							
	X							
9.	V D C- Kahun Shivapur - 1, Beltar							
	X							
10.	Vyas Municipality - 7, Tallo Patan							
	X							
11.	Vyas Municipality - 7, Beni Patan							
	X							
12.	Vyas Municipality - 7, Beteni							
	X							
13.	Vyas Municipality - 5, Baireni-Botegaun							
	X							

4) Livestock Raising Group

SN	Name of group	Beneficiary household	Members		Objective	Who trained/Initiated
			M	F		
1.	V D C- Chhan-4, Chokre					
	-	-	-	-	-	-
2.	V D C- Chhan- 5, Fulbari Ghaderi					
	-	-	-	-	-	-
3.	V D C- Chhan-7, Jhakash Fulbari					
	-	-	-	-	-	-
4.	V D C- Bhimad - 1, Khanaltar					
	-	-	-	-	-	-
5.	V D C- Rani Pokhari - 9, Rising Patan					
	BudhuwaRhising Patan-Joint Livestock raising group	42 HHs Gurung, Brm Newar	11		Livestock promotion & income generation	DLSO-Tanahun
6.	V D C- Rani Pokhari - 9, Rising Patan – Kharkhare					
	-	-	-	-	-	-

SN	Name of group	Beneficiary household	Members		Objective	Who trained/Initiated
			M	F		
7	V D C- Kotdarbar - 1, Maidan Swanra					
	Chandra-Tara Pig keeping grp	Total 150 Dalit 1 Other 149 Majority Magar, few Chhetry, Bramhin	2	9	Income generation poverty reduction	Urja Bikas
8.	V D C- Kahun Shivapur - 3, Bakle					
	-	-	-	-	-	-
9.	V D C- Kahun Shivapur - 1, Beltar					
	-	-	-	-	-	-
10.	Vyas Municipality - 7, Tallo Patan					
	-	-	-	-	-	-
11.	Vyas Municipality - 7, Beni Patan					
	-	-	-	-	-	-
12.	Vyas Municipality - 7, Beteni					
	-	-	-	-	-	-
13.	Vyas Municipality – 5, Baireni-Botegaun					
	Goat keeping group	All Bote Female 48		48	Income generation and poverty reduction	DLSO-Tanahun

5) Cereal Farms Group

SN	Name of group			Members		Objective	Who trained/Initiated
				F	M		
1.	V D C- Chhan-4, Chokre						
	-	-		-	-	-	-
2.	V D C- Chhan- 5, Fulbari Ghaderi						
	-	-		-	-	-	-
3.	V D C- Chhan-7, Jhakash Fulbari						
	-	-		-	-	-	-
4.	V D C- Bhimad - 1, Khanaltar						
	-	-		-	-	-	-
5.	V D C- Rani Pokhari - 9, Rising Patan						
	Vegt. Cereal Farmers Group	Brah 31	Gur 1	4	28	Vegetable production income generation	DADO-Tanahun
6.	V D C- Rani Pokhari - 9, Rising Patan – Kharkhare						
	Jana Uddhar Krishi Samuha	Total HHs 23-Newar, Chhetry, Bramhin		5	18	Vegetable production income generation	DADO-Tanahun
7	V D C- Kotdarbar - 1, Maidan Swanra						
	Chandra-Tara Beekeeping group	Dalit 1	Other 149	2	9	Income generation	Urja Bikas
	Chandra-Tara vegetable promotion group	Dalit 1	Other 149	10	15	Vegetable production income generation	
8.	V D C- Kahun Shivapur - 3, Bakle						
	-	-		-	-	-	-

9.	V D C- Kahun Shivapur - 1, Beltar						
	Vegetable Promotion group	Dalit 3	Janajati 22	13	12	Promotion of offseason vegetable	VDRC-Gaindakot
10.	Vyas Municipality - 7, Tallo Patan						
	-	-		-	-	-	-
11.	Vyas Municipality - 7, Beni Patan						
	Matsyakanya Namuna group	30 HHs all Magars		30	-	Vegetable production income generation	Yokoyama Japanese Club & Local Rotary club
12.	Vyas Municipality - 7, Beteni						
	-	-		-	-	-	-
13.	Vyas Municipality - 5, Baireni-Botegaun						
	Dharapani Tarkari Bikas Samuha	15 All Bote women		15	-	Vegetable production, income generation & poverty reduction	ID Nepal

6) Women's group

SN	Name of group	Group objective	Members		W. Comt.	Registered at	Remark
1.	V D C- Chhan-4, Chokre						
	-	-	-	-	-	-	-
2.	V D C- Chhan- 5, Fulbari Ghaderi						
	-	-	-	-	-	-	-
3.	V D C- Chhan-7, Jhakash Fulbari						
	Amasamuha Jhakash	Women awareness and empower	Gurung 75	Newar 25	11	DAO-Tanahun	
4.	V D C- Bhimad - 1, Khanaltar						
	Matrisisu kalyan Amasamuha	" S & C	Total 80		11	DAO-Tanahun	Bramhin,Kumal, Magar, Chhetry, Newar
			50 Bram	30 Newar, Kumal			
	Saraswati Samudayik Amasamuha	" S & C	18 Total member	-	6	-	Bramhin,Kumal, Magar, Chhetry, Newar
	Magar Amasamuha	" S & C	100 Magar	-	15	-	All Magar
5.	V D C- Rani Pokhari - 9, Rising Patan						
	Kalyankari Amasamuha	" S & C	37 Bramhin	-	-	DAO-Tanahun	All Bramhin members
6.	V D C- Rani Pokhari - 9, Rising Patan – Kharkhare						
	Janakalyan Amasamuha	" S & C	Total 54 Dalit 8, others 46		11	DAO-Tanahun	Magar-13 Gurung-13 Newar-14 Rest-14 (Kami,Bramhin, Chhetri, Damai
7	V D C- Kotdarbar - 1, Maidan Swanra						
	Kalikamai Amasamuha	" S & C	Total 60		13	Initiated By Urja Bikas	All Magar
8.	V D C- Kahun Shivapur - 3, Bakle						
	Janakalyan Amasamuha	" S & C	Total 22		9	Local women	All Magar

SN	Name of group	Group objective	Members	W. Comt.	Registered at	Remark
9.	V D C- Kahun Shivapur - 1, Beltar					
	Laligurans Amasamuha	" S & C	Total-48, Magar-34,Dalit-5,others-9	7	DAO, WDO-Tanahun	Others-Thakuri, Ranabhat
10.	Vyas Municipality - 7, Tallo Patan					
	-	-	- -	-	-	-
11.	Vyas Municipality - 7, Beni Patan					
	Janachetana Amasamuha	" S & C	Total 70	11	DAO-Tanahun	Mixed caste
12.	Vyas Municipality - 7, Beteni					
	Janakalyan Amasamuha	" S & C	Total 35, Magar-33,Ranabhat-1,Dalit-1	5	Local women	
13.	Vyas Municipality - 5, Baireni-Botegaun					
	Kalyankari Amasamuha		Total 48	7	DAO-Tanahun & initiated by WDO-Tanahun	All Bote Women

7) Saving and Credit Group

SN	Name of the group	Beneficiary Household		Member		Objective	Initiated/ trained by	Remarks
				M	F			
1.	V D C- Chhan-4, Chokre							
	-	-	-	-	-	-	-	-
2.	V D C- Chhan- 5, Fulbari Ghaderi							
	-	-	-	-	-	-	-	-
3.	V D C- Chhan-7, Jhakash Fulbari							
	Babu Kosh Samuha	75	25	7	-	Saving & credit	Local farmer	Gurung 75 Newar 25
	Ama Kosh Samuha	75	25	1	6	"	"	"
	Ekata Uva Club	75	25	4	3	"	"	"
4.	V D C- Bhimad - 1, Khanaltar							
	-	-	-	-	-	-	-	-
5.	V D C- Rani Pokhari - 9, Rising Patan							
	-	-	-	-	-	-	-	-
6.	V D C- Rani Pokhari - 9, Rising Patan – Kharkhare							
	-	-	-	-	-	-	-	-
7	V D C- Kotdarbar - 1, Maidan Swanra							
	-	-	-	-	-	-	-	-
8.	V D C- Kahun Shivapur - 3, Bakle							
	-	-	-	-	-	-	-	-
9.	V D C- Kahun Shivapur - 1, Beltar							
	-	-	-	-	-	-	-	-
10.	Vyas Municipality - 7, Tallo Patan							
	-	-	-	-	-	-	-	-
11.	Vyas Municipality - 7, Beni Patan							
	1. Tol Bikash Samuha – Upallo & Tallo patan	Mixed -	caste	38	38	Saving & credit	Byas muni-cipality & Partnership dev. Prog.	Gurung, Brahmin, Newar, Magar
	2. Beni Patan Tol Bikash Samuha	"	"	25	39	"	"	"
	3. Mahila Samuha	"	"	_	25	"	"	"
12.	Vyas Municipality - 7, Beteni							
	Beteni Tol Bikash Samuha	33	2	5	2	"	"	Magar-33, Other-2
13.	Vyas Municipality - 5, Baireni-Botegaun							
	-	-	-	-	-	-	-	-

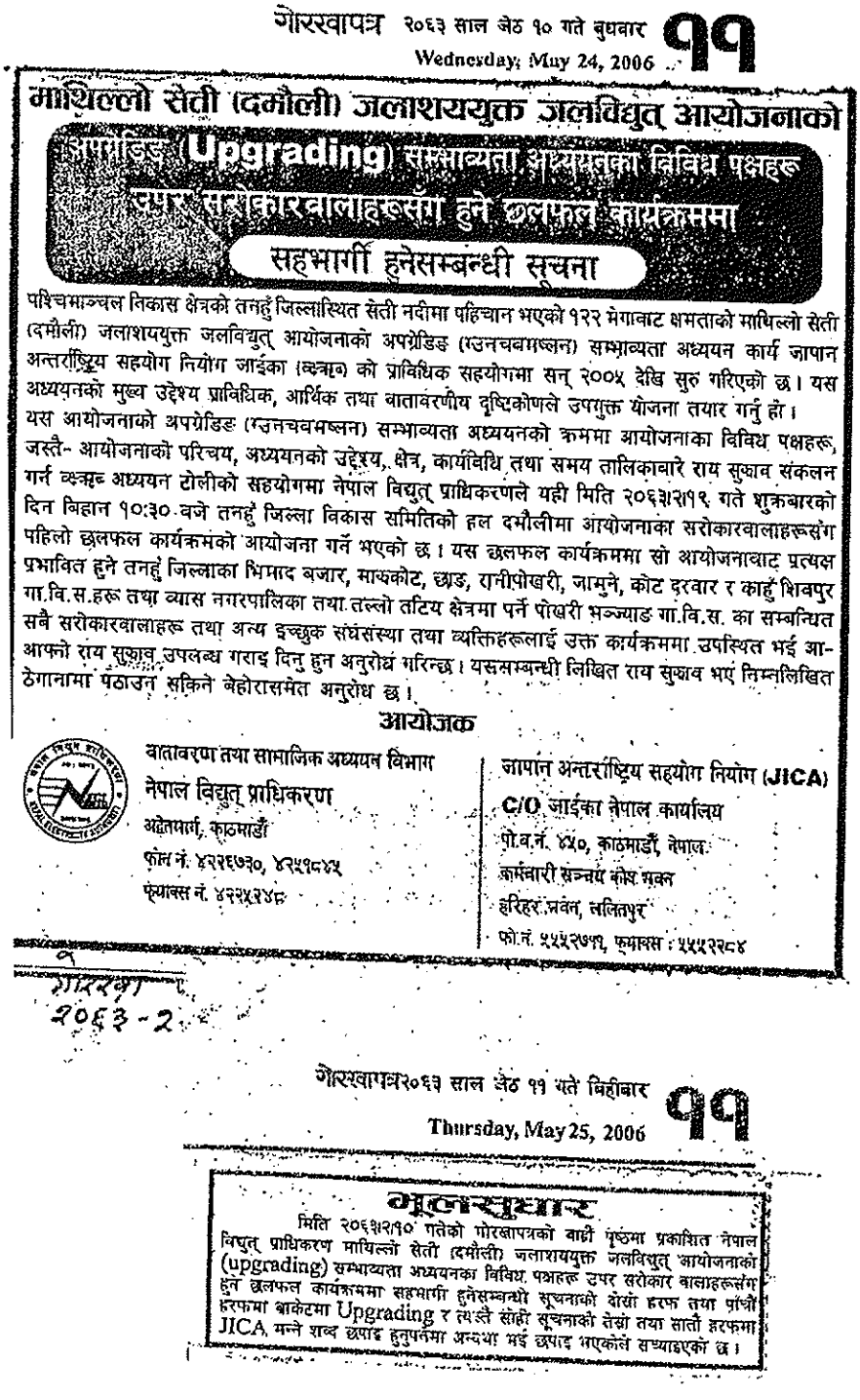
First Stakeholders Meeting

Advance Notification of First Stakeholders Meeting

in Camauli and Kathmandu

Advance Notification of First Stakeholders Meeting in Damauli and Kathmandu

1- Public notice published in the national newspaper "Gorkhapatra" 24th May2006 (Nepali)



गोरखापत्र २०६३ साल जेठ १० गते बुधवार ११
Wednesday, May 24, 2006

माथिल्लो सेती (दमौली) जलाशययुक्त जलविद्युत् आयोजनाको अपग्रेडिङ (Upgrading) सम्भाव्यता अध्ययनका विविध पक्षहरू

बारे सरोकारवालाहरूसँग हुने छलफल कार्यक्रममा सहभागी हुनेसम्बन्धी सूचना

पश्चिमाञ्चल विकास क्षेत्रको तनहुँ जिल्लास्थित सेती नदीमा पहिचान भएको १२२ मेगावाट क्षमताको माथिल्लो सेती (दमौली) जलाशययुक्त जलविद्युत् आयोजनाको अपग्रेडिङ (रुनचवमप्लन) सम्भाव्यता अध्ययन कार्य जापान अन्तर्राष्ट्रिय सहयोग नियोग जाईका (ब्क्ब्क) को प्राविधिक सहयोगमा सन् २००५ देखि सुरु गरिएको छ। यस अध्ययनको मुख्य उद्देश्य प्राविधिक, आर्थिक तथा वातावरणीय दृष्टिकोणले उपयुक्त योजना तयार गर्नु हो।

यस आयोजनाको अपग्रेडिङ (रुनचवमप्लन) सम्भाव्यता अध्ययनको क्रममा आयोजनाका विविध पक्षहरू, जस्तै- आयोजनाको परिचय, अध्ययनको उद्देश्य, क्षेत्र, कार्यविधि तथा समय तालिकाबारे राय सुझाव संकलन गर्न ब्क्ब्क अध्ययन टोलीको सहयोगमा नेपाल विद्युत् प्राधिकरणले यही मिति २०६३।२।१९ गते शुक्रबारको दिन बिहान १०:३० बजे तनहुँ जिल्ला विकास समितिको हल दमौलीमा आयोजनाका सरोकारवालाहरूसँग पहिलो छलफल कार्यक्रमको आयोजना गर्ने भएको छ। यस छलफल कार्यक्रममा सो आयोजनाबाट प्रत्यक्ष प्रभावित हुने तनहुँ जिल्लाका भिमाद बजार, माध्यकोट, छाङ, रानीपोखरी, जामुने, कोट दरबार र काहुँ शिवपुर गा.वि.स.हरू तथा ब्यास नगरपालिका तथा तल्लो तटिय क्षेत्रमा पर्ने पोखरी भञ्ज्याङ गा.वि.स. का सम्बन्धित सबै सरोकारवालाहरू तथा अन्य इच्छुक संघसंस्था तथा व्यक्तिहरूलाई उक्त कार्यक्रममा उपस्थित भई आफ्नो राय सुझाव उपलब्ध गराइ दिनु हुन अनुरोध गरिन्छ। यससम्बन्धी लिखित राय सुझाव भए निम्नलिखित ठेगानामा पठाउन सकिने बेहोरासमेत अनुरोध छ।

आयोजक

वातावरण तथा सामाजिक अध्ययन विभाग
नेपाल विद्युत् प्राधिकरण
अक्षेतमार्ग, काठमाडौं
फोन नं. ४२२६७३०, ४२५१८४५
फ्याक्स नं. ४२२५२४८

जापान अन्तर्राष्ट्रिय सहयोग नियोग (JICA)
C/O जाईका नेपाल कार्यालय
पो.ब.नं. ४५०, काठमाडौं, नेपाल
कार्यभारी सञ्चय कोष भवन
हरिहर भवन, ललितपुर
फो.नं. ५५५२७७१, फ्याक्स : ५५५२२८४

गोरखापत्र
2063-2

गोरखापत्र२०६३ साल जेठ ११ गते बिहीबार ११
Thursday, May 25, 2006

शुद्धिपत्र

मिति २०६३।२।१० गतेको गोरखापत्रको बाह्रौं पृष्ठमा प्रकाशित नेपाल विद्युत् प्राधिकरण माथिल्लो सेती (दमौली) जलाशययुक्त जलविद्युत् आयोजनाको (upgrading) सम्भाव्यता अध्ययनका विविध पक्षहरू उपर सरोकार वालाहरूसँग हुने छलफल कार्यक्रममा सहभागी हुनेसम्बन्धी सूचनाको दोस्रो हरफ तथा पाँचौं हरफमा आकेटमा Upgrading र त्यस्तै सोही सूचनाको तेस्रो तथा सातौं हरफमा JICA, भन्ने शब्द छपाइ हुनुपर्नमा अन्यथा भई छपाइ भएकोले सच्याइएको छ।

2- Public notice published in the national newspaper "Gorkhapatra" 24th May2006 (English)

Notice

Stakeholders meeting for the Upgrading Feasibility Study of Upper Seti (Damauli) Storage Hydroelectric Project

Upgrading feasibility study of 122 MW Upper Seti (Damauli) Storage Hydroelectric Project identified at Tanahu District of Western Development Region of Nepal has started since 2005 under the technical assistance of JICA. Main Objective of the study is to prepare a technically viable and economically affordable and environmentally sustainable optimum project plan.

In the process of the upgrading feasibility study of the project, Nepal Electricity Authority (NEA) with the assistance of JICA Study Team is organising first stakeholders meeting on the 2nd of June 2006, Friday, at 10.30 AM in the District Development Committee Hall, Damauli, Tanahu district to discuss project background, objectives, area, scope of works and study schedules. Concerned institutions/organisations and individuals particularly from the directly project affected Village Development Committees (VDCs) Bhimad Bazzar, Majkot, Chhan, Ranipokhari, Kot Darbar and Kanhu-shivapur and Byas Municipality and Pokhari Bhanjyng VDC of downstream areas are requested to participate and present their concerns and suggestions in the meeting. Concerned institutions/organisations and individuals could also submit their written concerns on the following addresses.

Proponent

Environmental and Social Study Department
Nepal Electricity Authority (NEA)
Adait Marga, Kathmandu
Phone : 4226730, 4251845
Fax : 4225248

Japan International Cooperation Agency (JICA)
C/O JICA Nepal Office
Post Box No. 450, Kathmandu, Nepal
Karmachari Sanchayakosh Bhavan
Harihar Bhavan, Lalitpur
Phone :5552711
Fax : 5552284

3- Public notice published in the local newspaper "Bhanjyang " 1st June 2006. The content was the same as 1-2.

प्रत्येक बुधवार र शनिबार प्रकाशित हुने

भन्ज्याङ

पहिलो

राष्ट्रिय दैनिक

वर्ष २५ अङ्क ४९ २०६३ जेठ १८ गते बिहीबार (Bhanjyang National Daily, 1 June 2006) मूल्य २ रुपैयाँ

माथिल्लो सेती (दमौली) जलाशययुक्त जलविद्युत आयोजनाको स्तरवृद्धि (Upgrading) सम्भाव्यता अध्ययनका विविध पक्षहरू उपर सरोकारवालाहरूसंग हुने छलफल कार्यक्रममा सहभागी हुने सम्बन्धी

सूचना !

पश्चिमाञ्चल विकास क्षेत्रको तनहुँ जिल्ला स्थित सेती नदीमा पहिचान भएको १२२ मेगावट क्षमताको माथिल्लो सेती (दमौली) जलाशययुक्त जलविद्युत आयोजनाको स्तरवृद्धि (Upgrading) सम्भाव्यता अध्ययन कार्य जापान अन्तर्राष्ट्रिय सहयोग नियोग जाईका (JICA) को प्राविधिक सहयोगमा सन् २००५ देखि सुरु गरिएको छ । यस अध्ययनको मूख्य उद्देश्य प्राविधिक, आर्थिक तथा वातावरणीय दृष्टिकोणले उपयुक्त योजना तयार गर्नु हो ।

यस आयोजनाको स्तरवृद्धि (Upgrading) सम्भाव्यता अध्ययनको क्रममा आयोजनाका विविध पक्षहरू, जस्तै आयोजनाको परिचय, अध्ययनको उद्देश्य, क्षेत्र, कार्यविधि तथा समय तालिका बारे राय सुझाव संकलन गर्न JICA अध्ययन टोलीको सहयोगमा नेपाल विद्युत प्राधिकरणले यहि मिति २०६३।२।१९ गते शुक्रबारको दिन बिहान १०:३० बजे तनहुँ जिल्ला विकास समितिको सभा कक्ष दमौलीमा आयोजनाका सरोकारवालाहरूसंग पहिलो छलफल कार्यक्रमको आयोजना गर्ने भएको छ । यस छलफल कार्यक्रममा सो आयोजनाबाट प्रत्यक्ष प्रभावित हुने तनहुँ जिल्लाका भिमाद बजार, माझकोट, छाङ, रानीपोखरी, जामुने, कोटदरबार र काहूँ शिवपुर गाविसहरू तथा व्यास नगरपालिका तथा तल्लो तटिय क्षेत्रमा पर्ने पोखरी भञ्ज्याङ्ग गाविसका सम्बन्धित सबै सरोकारवालाहरू तथा अन्य इच्छुक संघ संस्था तथा व्यक्तिहरूलाई उक्त कार्यक्रममा उपस्थित भई आ-आफ्नो राय सुझाव उपलब्ध गराई दिनु हुन अनुरोध गरिन्छ । यस सम्बन्धी लिखित राय सुझाव भए निम्न लिखित ठेगानामा पठाउन सकिने व्यहोरा समेत अनुरोध छ ।

आयोजक :

वातावरण तथा सामाजिक अध्ययन विभाग
नेपाल विद्युत प्राधिकरण
अद्वैतमार्ग, काठमाण्डौ
फोन नं. : ४२२६७३०, ४२५१८४५
फ्याक्स नं. : ४२२५२४८

जापान अन्तर्राष्ट्रिय सहयोग नियोग
(JICA)
C/O जाईका नेपाल कार्यालय
पो.ब.नं. ४५०, काठमाण्डौ, नेपाल
कर्मचारी संचय कोष भवन
हरिहर भवन, ललितपुर
फोन नं. : ५५५२७११, फ्याक्स ५५५२३८४

List of Invited Institutions/Persons of First Stakeholder Meeting

in Damauli

List of Invited Institutions/Persons of First Stakeholder Meeting in Damauli

S.No.	Name	Address
1	District Development Committee	Damauli, Tanahaun
2	District Administrative Office	Damauli, Tanahaun
3	District Police Office	Damauli, Tanahaun
4	Women Development Office	Damauli, Tanahaun
5	NGO Federation	Damauli, Tanahaun
6	District Agricultural Office	Damauli, Tanahaun
7	District Forest Office	Damauli, Tanahaun
8	District Public Health Office	Damauli, Tanahaun
9	Six Community Forest Offices	Affected VDCs, Letter were Given through District Forest Office
10	ACAP	Pokhara, Nepal
11	Lee Bird, National Level NGO	Pokhara, Nepal
12	Inland Fisheries Research Center, Nepal Agricultural Research Council (NARC)	Begnas, Pokhara, Nepal
13	Nepali Congress, District Executive Committee	Damauli, Tanahaun
14	CPNUML, District Executive Committee	Damauli, Tanahaun
15	Nepali Congress Democratic, District Executive Committee	Damauli, Tanahaun
16	Janamorcha Nepal (One of the Communist Party), District Executive Committee	Damauli, Tanahaun
17	Nepal Communist Party Maoist, District Executive Committee	Damauli, Tanahaun
18	Machha Puchere FM	Pokhara, Nepal
19	Bhanjyung National Daily (Newspaper)	Damauli, Tanahaun
20	Reporter, Nepal Samachar Patra	Damauli, Tanahaun
21	Reporter, The Rising Nepal	Damauli, Tanahaun
22	Reporter, Kantipur	Damauli, Tanahaun
23	Reporter, Annapurna Post	Damauli, Tanahaun
24	Journalist Association	Damauli, Tanahaun
25	Reporters Clube	Damauli, Tanahaun
26	Consumers Federation	Damauli, Tanahaun
27	Chairman, Civil Society	Damauli, Tanahaun
28	Vyas Municipality	Damauli, Tanahaun
29	Secretaries of all the Affected VDCs	Tanahaun
30	Campus Chif	Bhanu Bhakta Campus, Khairani Tar, Tanahaun
31	Members of the Parliament	3 Persons from Tanahaun District
32	Ministry of Environment, Science and Technology	Singa Durbar, Kathmandu
33	Ministry Of Water Resource	Singa Durbar, Kathmandu
34	Department of Electricity Development	Anam Nagar, Kathmandu

Participants Registered in the First Stakeholder Meeting

at Damauli, June 2nd, 2006

Participants Registered in the First Stakeholder Meeting at Damauli, June 2nd, 2006

S.No.	Name	VDC, Ward	Office Organization	Profession,Level	Contact no.	Age	Sex
	Bhagwatipur VDC						
1	Krishna Bahadur Shrestha	Bhagwatipur 2		Agriculture		50	M
2	Aaita Ram Pariyar	Bhagwatipur 2		Agriculture		30	M
3	Krishna Prasad Gaire	Bhagwatipur 2		Agriculture		50	M
4	Bal Krishna Gairhe	Bhagwatipur 2		Agriculture		48	M
5	Laxman Pariyar	Bhagwatipur 2 samang		Agriculture		26	M
6	Som Prasad Pariyar	Bhagwatipur-2		Agriculture		30	M
7	Til Bahadur Ale	Bhagwatipur-2		Agriculture		63	M
8	Lal Bahadur Pariyar	Bhagwatipur-2 Samang		Agriculture		45	M
9	Din Bahadur Pariyar	Bhagwatipur 2 Samung		Agriculture			M
	Bhimad VDC						
1	Chandra Kanta Timilsina	Bhimad	Bhimad VDC	Secretary		34	M
2	Tirtha Shrestha	Bhimad				35	M
3	Yaga Narayan Subedi	Bhimad					M
4	Viswo Bandhu Bhandari	Bhimad 1	Bhanjyang Daily	Editor	560907	58	M
5	Chakra pani subedi	Bhimad 1		Agriculture		60	M
6	Krishna Aryal	Bhimad 2		Business		33	M
7	Prem Bahadur Thapa	Bhimad 8		Agriculture		35	M
8	Ananta bahadur Rana	Bhimad 8		Agriculture		49	M
9	Thamman Singh Thapa	Bhimad 8		Agriculture		55	M
10	Gyan Thapa	Bhimad 9		Army		35	M
11	Dhan Maya Ale	Bhimad chang 8		Agriculture		35	F
12	Sumitra Gautam	Bhimad chang patan 8		Agriculture		40	F
13	Ram Chandra Parajuli	Bhimad, 2		Agriculture		48	M
14	Rajendra Aryal	Bhimad, 2		Computer	9803156817	28	M
15	Dadhi Raj Subedi	Bhimad-1			9846047121	53	M
16	Nas Dutta Bhandari	Bhimad-2		Agriculture		47	M
17	Man Kumari	Bhimad-2		Agriculture	570271	40	F
18	Narayan Khanal	Bhimad-7	Nepal Communist Party,UML	office		44	M
19	Meera Thapa	Bhimad		Agriculture		28	F
	Chang VDC						
1	Khimananda Wagle	Chang patan		Agriculture		30	M
2	Prem Bahadur Thapa	Chang 2		Agriculture		48	M
3	Shree Bahadur Thapa	Chang 2		Agriculture		52	M
4	Jhul Bahadur Thapa	Chang- 2		Agriculture		53	M
5	Bum Bahadur Thapa	Chang -2	Shree Ganesh Sec. School	Teacher		45	M
6	Tirtha raj Wagle	Chang 4		Secretary	9846049173	48	M
7	Til Bahadur Ale	Chang 4		Agriculture		47	M
8	Bal Bahadur Ale	Chang 4		Agriculture		44	M
9	Om Bahadur Ale	chang 4		Agriculture		27	M
10	Man Bahadur Thapa	chang 4		Agriculture		50	M
11	Mitra Lal Shrestha	chang 4		Agriculture		55	M
12	Sam Sher Thapa	chang -4	School	Teacher		40	M
13	Tra Raj Rana	Chang 6			560375	52	M
14	Dil Bahadur Gurung	Chang 7		Agriculture		29	M
15	Hmal Gurung	Chang 7		Student		17	M
16	Ram Gurung	Chang 7		Student		21	M
17	Tek Bahadur Gurung	chang 7	Thani Devi Primary school	Service		29	M
18	Hasta Bahadur Gurung	chang 7	Thani Devi Primary school	service		20	M
19	Padma Bahadur Gurung	chang 7		Agriculture		50	M
20	Chandra Bahadur Gurung	Chang 7		Agriculture		40	M
21	Samel Gurung	Chang 7		Agriculture, student		16	M
22	Tank Bahadur	Chang 8		Agriculture		54	M
23	Rajan Khanal	Chang 8		Agriculture		14	M
24	Ramchandra Tiwari	chang 8		Service		27	M
25	Bal Kumal	Chang 8				24	M
26	Mina Adhikari	Chang 8		Agriculture		28	F
27	Tilu Gurung	Chang 8		Agriculture		30	F
28	Amrita Bhandari	Chang 8		Agriculture		21	F
29	Dhan Bahadur Nepali	Chang 8		Agriculture		51	M
30	Ravilal Aryal	Chang 8		Social worker		68	M
31	Iman Singh Thapa	Chang 8		Agriculture		50	M
32	Man Bahadur Thapa	Chang 8		Agriculture		54	M
33	Santa Bahadur	chang 8		Agriculture		52	M
34	Shankar Pariyar	Chang 8		Tailoring	529369	30	M
35	Purna Bahadur Pariyar	Chang 8		Tailoring	529369	36	M
36	Shree Lal Tamang	Chang 9		Agriculture	9846065603	58	M
37	Bim Kumar Shrestha	Chang Patan 8		Agriculture		34	M
38	Dil Bahadur Pariyar	Chang Patan 8		wage based		33	M
39	Top Bahadur Rana	Chang Patan 8		Student		16	M
40	Suk Maya Thapa	Chang Patan 8		Agriculture		35	F
41	Jit Bahadur Thapa	Chang Patan 8		Agriculture		65	M
42	JhampaNath Upadhyaya	Chang Patan 8		Agriculture		48	M
43	Baburam Wagle	Chang Patan 8		Agriculture		39	M
44	Til Bahadur Kumal	Chang Patan 8		Agriculture		63	M
45	Parimaya Kumal	Chang Patan 8		Agriculture		45	M
46	Nindra kala Poudel	Chang Patan 8		Agriculture		60	F
47	Radha Bhandari	Chang patan 8		Agriculture		28	F
48	Gyanu Maya Poudel	chang patan-8		Agriculture		49	F
49	Bhim Bahadur Kumal	chang patan-8		Agriculture		63	M
50	Kamal Bahadur Kumal	chang patan-8		Agriculture		48	M
51	Harka Bahadur Gurung	chang patan-8		Carpenter		25	M
S.No.	Name	VDC, Ward	Office Organization	Profession,Level	Contact no.	Age	Sex

52	Man Bahadur Kumal	chang patan-8		Agriculture		31	M
53	Santa Ram Thapa	chang patan-8		Agriculture		30	M
54	Chandra Kantha Pokhrel	chang patan-8		Agriculture		34	M
55	Som Kanta Wagle	chang patan-8		Agriculture		47	M
56	Buddhi Bahadur Kumal	chang patan-8		Agriculture		45	M
57	Devi Lal Kumal	chang patan-8		Agriculture		66	M
58	Min Bahadur Gurung	chang patan-8		Agriculture		49	M
59	Ek Bahadur Kumal	chang patan-8		Agriculture		48	M
60	Padma Kumari Adhikari	chang patan-8		Agriculture		60	F
61	Nirmaya Kumal	chang patan-8		Agriculture		57	F
62	Sabitri kumal	chang patan-8		Agriculture		54	F
63	Bhesh Bahadur Kumal	chang patan-8		Agriculture		22	M
64	Tara Bahadur Pathak	Chang,		Agriculture		40	M
65	Birkha Bahjadur Kamal	Chang, 8		Agriculture		41	M
66	Lil Bahadur Kumal	chang, 8		Agriculture		40	M
67	Sama Bahadur Pathak	chang, 8		Agriculture		39	M
68	Guman Singh Ran	Chang-4		Agriculture		61	M
69	Nanda Bahadur Thapa	Chang-4		Agriculture		53	M
70	Dan Bahadur Ale	Chang-4		Agriculture		58	M
71	Kum Bahadur Thapa	Chang-4		Agriculture		44	M
72	Lekh Narayan Shrestha	Chang-4 chokre		Agriculture		62	M
73	Shree Raj Rana	Chang-6		Agriculture		59	M
74	Uttar Kumal	Chang-7		Agriculture		56	M
75	Khil Bahadur Gurung	Chang-7		Agriculture		50	M
76	Som Bahadur Gurung	chang-7		Agriculture		42	M
77	Hem Bahadur Gurung	chang-7		Agriculture		53	M
78	Man Narayan Shrestha	Chang-7		Agriculture		46	M
79	Dil Bahadur Gurung	Chang-7		Agriculture		24	M
80	Samsher Gurung	Chang-7		Agriculture		26	M
81	Santa Bahadur Gurung	Chang-7				24	M
82	Gir Bahadur Gurung	Chang-7		Agriculture		44	M
83	Yuv Raj Wagle	Chang-8	School	Teacher		42	M
84	Durga Pathak	Chang-8		Agriculture		42	M
85	Padma Mani Sharma	Chang-8		Agriculture		49	M
86	Sukmaya Thapa	Chang-8		Agriculture		32	F
87	Ratna Bahadur Pathak	ChangPatan-8		Agriculture		40	M
	Dhor Phidi						
1	Ganesh Bahadur V.K	Dhor Phidi 3		Business		24	M
2	Krishna Bahadur Ranamagar	Dhor Phidi 6		Agriculture		24	M
3	Tara Prasad Kafle	Dhor Phirdi 5		Student		26	M
	Jamune VDC						
1	Lok Raj Subedi	Jamune	Jamune VDC	(Nayab Subba),Secretar	9856024893	35	M
2	C.S Ghimire	Jamune		Agriculture	9846027429	59	M
3	Vishnu Pandit	Jamune		Service	9846029341	32	M
4	Hari Nath Khanal	Jamune		Service	9846043140	48	M
5	Raju Rana	Jamune 1		Agriculture		40	M
6	Mahakali Khanal	Jamune 1		Agriculture		56	F
7	Savitra Karki	Jamune 1	Barahi Women Saving	President		40	F
8	Om Bahadur Ale	Jamune 1		Agriculture		30	M
9	Dirgha BahadurAleMagar	Jamune 1		Social worker		65	M
10	Devi Lal Khanal	Jamune 2		Agriculture		62	M
11	Hari Bahadur Rana Magar	Jamune 3		Nepali congress, VDC president		60	M
12	Parwati Shrestha	Jamune 4		Agriculture		40	F
13	Shreedhar Ranabhat	Jamune 4		Ward President		65	M
14	Del Bahadur Ranabhat	Jamune 4		Agriculture		77	M
15	Shukra Narayan Shrestha	Jamune 4		Agriculture		53	M
16	Narayan Ghimire	Jamune 6		Business		34	M
17	Dharma Raj Ghimire	Jamune 6		Business		28	M
18	Hom Bahadur Ale	Jamune 6		Agriculture		48	M
19	Madhumaya thapa	Jamune 6		Business		35	F
20	Bal Krishna Ghimire	Jamune 7		Social worker	9846064135	42	M
21	RamBhakta Ghimire	Jamune 7		Teacher		31	M
22	Upendra Ghimire	Jamune 7		Agriculture	9846027585		M
23	Laxman Adhikari	Jamune 7		Agriculture		45	M
24	ShivaDanta Lamichane	Jamune 7	School	Teacher		52	M
25	Shree Prasad Shrestha	Jamune 8	Nepali communist Party, UML	Social worker	9846062269	32	M
26	Min Bahadur Gurung	Jamune 9		Agriculture		45	M
27	Dhananjaya Shrestha	Jamune 9		Agriculture		52	M
28	Narya singh ale	Jamune-1		Agriculture		66	M
29	Vijaya Raj Khanal	Jamune-1		Teacher		45	M
30	Khem Bahadur Thapa	Jamune-1Gunadi		Agriculture		40	M
31	Eman Singh	Jamune-2		Agriculture		46	M
32	Tirtha Raj Adhikari	Jamune-7		Agriculture		37	M
33	Ram Chandra Ghimire	Jamune-7	Bhanjyang National Daily	Journalist		37	M
34	Tara Bahadur Thapa	Jamune-8		Agriculture		75	M
35	Ram Bahadur Ale	Jamune-8		Agriculture		44	M
36	Manju Kafle	Jamune-8	Barahi women Multi-cooperative	Manager		26	F
37	Babu Ram Khanal	Jamune 1Gunadi,		Service	9846043109	53	M
	Kanhu Shivapur VDC						
1	Ramesh Poudel	Kanhu Shivapur		Student		30	M
2	Dil Maya Thapa	Kanhu Shivapur		Agriculture		40	F
3	Hom Kumari Maji	Kanhu Shivapur 1		Agriculture		38	F
4	Juna Sahi	Kanhu Shivapur 1		Agriculture		30	F
5	Matisara Magar	Kanhu Shivapur 1		Agriculture		52	F

S.No.	Name	VDC, Ward	Office Organization	Profession,Level	Contact no.	Age	Sex
6	Shiv Lal Thapa Magar	Kanhu Shivapur 1		Agriculture	561455	53	M
7	Dal Bahadur Nepali	Kanhu Shivapur -1	Buddha Primary School	Teacher		34	M
8	Ram Bahadur Thapa	Kanhu Shivapur -1		Business		52	M
9	Mohan Kumar Thapa	Kanhu Shivapur -1		Agriculture		40	M
10	Phal Bahadur Thapa	Kanhu Shivapur -1		Agriculture		35	M
11	Tej Bahadur Thapa	Kanhu Shivapur -1		Agriculture		48	M
12	Nar Bahadur Thapa	Kanhu Shivapur -1		Agriculture		58	M
13	Bishnu Thapa	Kanhu Shivapur -1		Business		32	F
14	Manmaya Thapa	Kanhu Shivapur -1		Agriculture		42	F
15	Sushil Bahadur Thapa	Kanhu Shivapur -1			561708	18	M
16	Govardan Thapa	Kanhu Shivapur 3		Agriculture		39	M
17	Lal Bahadur Thapa	Kanhu Shivapur -3		Agriculture		63	M
18	Bal Bahadur Thapa	Kanhu Shivapur -3		Agriculture		73	M
19	Bhim maya Sarung	Kanhu Shivapur-1		Agriculture		38	F
20	Khem Bahadur Rana	Kanhu Shivapur-1		Agriculture		42	M
21	Til Bahadur Thapa	Kanhu Shivapur-1		Agriculture		53	M
22	Dambar Thapa	Kanhu Shivapur-1	Deepak Primary school	Teacher		34	M
23	Dal Raj Thapa	Kanhu Shivapur-3		Agriculture		25	M
24	Baburam Ale	Kanhu Shivapur-3		Agriculture		39	M
25	Nayan Singh	Kanhu Shivapur-3		Agriculture		45	M
26	Dan Bahadur Ale	Kanhu Shivapur-3		Agriculture		34	M
27	Shir Prasad Ale	Kanhu Shivapur-3		Agriculture		55	M
28	Shree Bahadur Magar	Kanhu Shivapur-3 Sewan		Agriculture		65	M
29	Om Bahadur Saru	Kanhu Shivapur 3		Agriculture		40	M
	Keshavtar						
1	Shaigram Bhattarai	Keshavtar	UML	worker		30	M
2	Shur Bahadur	Keshavtar-7		Agriculture		40	M
	Kihu						
1	Vishnu Sigdel	Kihu-3		Teacher		42	M
2	Tej Prasad Wagle	Kihu-3		Student		16	M
3	Tika Ram Wagle	Kihu-3		Student		17	M
	Kot Durbar VDC						
1	Bir Bahadur Thapa	Kot Durbar	Arun Primary School	Teacher		33	M
2	Guru Dutta Ghimire	Kot Durbar	Kot Durbar	Secretary			M
3	Sher Bahadur Ale	Kot Durbar 1		Agriculture		37	M
4	Dil Singh Ale	Kot Durbar 1		Agriculture		49	M
5	Man Bahadur Thapa	Kot Durbar 1		Agriculture		60	M
6	Hom Bahadur	Kot Durbar 1	Shree Dharma Primary school	Teacher		53	M
7	Nar Bahadur Ale	Kot Durbar 1	Dharma Primary School	Teacher		45	M
8	Man Bahadur Jhyari	Kot Durbar 1		Agriculture		49	M
9	Gom Bahadur Ale	Kot Durbar 1		Agriculture		47	M
10	Bam Bahadur Thapa	Kot Durbar -1		Agriculture		60	M
11	Jhul Bahadur V.K	Kot Durbar 3		Agriculture		62	M
12	Sun Maya V.K	Kot Durbar 3		Agriculture		24	F
13	Motilal Thapa	Kot Durbar 4		Agriculture		44	M
14	Hari Bahadur Thapa	Kot Durbar 7		Agriculture		50	M
15	yam Bahadur Thapa	Kot Durbar 7		Social worker	9846067134	28	M
16	Nar Bahadur Thapa	Kot Durbar 7		Agriculture		56	M
17	Budhi Bahadur	Kot Durbar1		Agriculture		37	M
18	Padma Bahadur Ale	Kot Durbar-1		Agriculture		42	M
19	Likha Ram Lilami	Kot Durbar-1		Agriculture		20	M
20	Jhul Bahadur Ale	Kot Durbar-1		Agriculture		41	M
21	Tek Bahadur Ale	Kot Durbar-1		Agriculture		60	M
22	Bhim Bahadur Thapa	Kot Durbar-7		Agriculture		63	M
23	Padma Bahadur Thapa	Kot Durbar-7		Agriculture		52	M
24	Min Bahadur	Kot Durbar-7		Agriculture		35	M
25	Jak Bahadur Ale	Kot Durvar 1		Agriculture		26	M
26	Tanka Bahadur Thapa	Kotdurbar 7	ShreeShringa Sec. School	Teacher	561260	34	M
	Majhakot VDC						
1	Mohan Bir Gurung	Majhakot 5		VDC secretary		55	M
2	Om Bahadur Thapa	Majhakot 6		Ward President		55	M
3	Sher Bahadur Thapa	Majhakot 7		Agriculture		51	M
4	Ram Sharan sharma Gairhe	Majhakot 9	DEO	representative		54	M
5	Balram Marasini	Majhakot 9		Teacher		45	M
6	Krishna Hari Gaisha	Majhakot -9	Kyamin Sec. School	Teacher		40	M
7	Man Bahadur Rana	Majhakot-1		Agriculture		62	M
8	Narayan Lamsal	Majhakot-2	Shiva Primary school	Teacher		32	M
9	Rana Bahadur Gurung	Majhakot-6	Bal Niketan primary school	Teacher		40	M
10	Dhan Bahadur Gurung	Majhakot-6		Agriculture		52	M
11	Dharma Raj Singh	Majhakot8		Agriculture		59	M
12	Saraswati Pandey	Majhakot-9	Ganesh Primary School	Teacher		35	F
	Pokhari Bhanjyang VDC						
1	Amrit Prasad Pantha	Pokhari Bhanjyang	Pokhari Bhanjyang VDC	VDC secretary		33	M
2	Chaya Dutta Acharya	Pokhari Bhanjyang		Agriculture		50	M
3	Krishna maya Thapa	Pokhari Bhanjyang 1		Student		16	F
4	Laxmi Ale	Pokhari Bhanjyang 1		Student		14	F
5	Nani Maya Saru	Pokhari Bhanjyang 1		Agriculture		56	F
6	Man Kumari Thapa	Pokhari Bhanjyang 1		Agriculture		40	F
7	Seti Maya Pariyar	Pokhari Bhanjyang 1		Agriculture		50	F
8	Moti Saru	Pokhari Bhanjyang 1		Agriculture		40	F
9	Laxmi Kant Mishra	Pokhari Bhanjyang 1	Shree Sidda Beni L. sec. Schoo	Teacher	9846062063	43	F
10	Yem Bahadur Ale	Pokhari Bhanjyang 1		Agriculture	9846055546	51	M
11	Bijuli Prasad Tiwari	Pokhari Bhanjyang 1		Agriculture		51	M
12	Jau Maya Thapa	Pokhari Bhanjyang 1		Agriculture		38	F

S.No.	Name	VDC, Ward	Office Organization	Profession,Level	Contact no.	Age	Sex
13	Dhan Pariyar	Pokhari Bhanjyang 1		Agriculture		60	F
14	Diwas Tiwari	Pokhari Bhanjyang -1		Agriculture		23	M
15	Dhruwa Raj Tiwari	Pokhari Bhanjyang -1		Agriculture		31	M
16	Baburam Wagale	Pokhari Bhanjyang -1		Agriculture		59	M
17	Bhakta Bahadur Thapa	Pokhari Bhanjyang 2	vice president	Agriculture		58	M
18	Chandra Bahadur Ranabhat	Pokhari Bhanjyang 2		Agriculture		60	M
19	Ganga Bahadur	Pokhari Bhanjyang 2		Agriculture		48	M
20	Megh Nath Poudel	Pokhari Bhanjyang 3		Agriculture		58	M
21	Ram Chandra Basnet	Pokhari Bhanjyang 3		Agriculture		49	M
22	Hari Bahadur Pantha	Pokhari Bhanjyang 4		Agriculture		47	M
23	Purna B.Ranabhat	Pokhari Bhanjyang Beibas		Agriculture		73	M
24	Yog Maya Ale	Pokhari Bhanjyang1		Agriculture		37	F
25	Ram Nath Tiwari	Pokhari Bhanjyang-1		Agriculture		43	M
26	Prem Raj Pantha	Pokhari Bhanjyang-7		Overseer	561520	25	M
27	Gagan Singh Ale	Pokhari Bhanjyang8		Agriculture		72	M
28	Lekh Bahadur Ran	Pokhari Bhanjyang-9	Ex-army, British	Social Serivce	560005	48	M
	Rani Pokhari VDC						
1	Chandra Nath Pandit	Rani Pokhari	Rani Pokhari VDC office	Service	9846026024	40	M
2	Tek Bahadur Thapa	Rani Pokhari 7		Agriculture		49	M
3	Chetra Bahadur Thapa	Rani Pokhari 7		Agriculture		52	M
4	Jhul Bahadur Thapa	Rani Pokhari 7		Agriculture		63	M
5	Mitra Singha Ghenga Thapa	Rani Pokhari 7		Agriculture		41	M
6	Narayan Prasad Gairhe	Rani Pokhari 9		Business		55	M
7	Nanda Biram Gaire	Rani Pokhari- 9		Agriculture		44	M
8	Ram Nath Subedi	Rani Pokhari- 9	NEA	Staff		45	M
9	Surya Prasad Gaire	Rani Pokhari- 9	Shree Deepak Secondary Scho	Teacher		39	M
10	Basu Dev Sharma	Rani Pokhari 9 Risin Patan		Agriculture		53	M
11	Phul Bahadur Rana	Ranipokhari 7		Agriculture		58	M
12	Durga Bahadur Thapa Magar	Ranipokhari 7		Agriculture		44	M
13	Hom Bahadur Thapa	Ranipokhari 7		Agriculture		32	M
14	Nar Bahadur Thapa	Ranipokhari 8		Agriculture		38	M
15	Raju Kumar Shrestha	Ranipokhari 8		Agriculture		37	M
16	Dil Bahadur	Ranipokhari 9		Agriculture		54	M
17	BojhRaj Gairhe	Ranipokhari 9		Agriculture		63	M
18	Netra lal Shrestha	Ranipokhari 9		Agriculture		62	M
19	Baburam Shrestha	Ranipokhari 9		Agriculture		42	M
20	Rekh Bahadur Thapa	Ranipokhari 9		Agriculture		52	M
21	Hasta Bahadur Thapa	Ranipokhari 9		Agriculture		59	M
22	Bishnu Bahadur Thapa	Ranipokhari 9		Agriculture		18	M
23	Rana Bahadur Thapa	Ranipokhari 9		Agriculture		42	M
24	Hom Bahadur Thapa	Ranipokhari 9		Agriculture		43	M
25	Pushpa Raj Gairhe	Ranipokhari 9	Janmorcha Nepal	Agriculture	560367	50	M
26	Aaita Bahadur Bishwakarma	Ranipokhari-2 Risin		Agriculture		45	M
27	Yem Bahadur Gurung	Ranipokhari-7		Agriculture		45	M
28	Hari Kumar Thapa	Ranipokhari-7		Agriculture		35	M
29	Pushpa Raj Gaire	RaniPokhari-9	Jan Morcha Nepal			50	M
30	Ban Bahadur Ale	Ring Dada 3		Agriculture		33	M
31	Som Bahadur Thapa	Risin 7		Student		18	M
32	Sek B.	Risin Patan		Agriculture	5570130	58	M
33	Jhul Bahadur	Risin Patan-9		Agriculture		44	M
34	Ran Prasad Shrestha	Risin Patan-9		Agriculture		52	M
35	Til Bahadur Thapa	Risin Rani Pokhari 7		Agriculture		48	M
36	KrishnaRamThapa	Risin Rani Pokhari 7		Agriculture		64	M
37	Dhan Bahadur Thapa	Risin Rani Pokhari 7		Agriculture		22	M
38	Madhav Gairhe	Risin Ranipokhari		Agriculture		28	M
39	Bal Bahadur Thapa	Rising 1		Agriculture		25	M
40	Yuv Raj Ale	Rising 1		Agriculture		31	M
41	Bum Bahadur Ale	Rising 1		Agriculture		48	M
42	Dan Bahadur Shrestha	Rising Rani Pokhari 2		Business	561260	25	M
	Vyas Municipality						
1	Jhalak Nath	Vyas N.P	DDC	Service		42	M
2	Arjun Sunar	Vyas N.P		Business			M
3	Amrit	Vyas N.P					M
4	Hem Kant Lamsal	Vyas N.P 11 subarna Marga		Service	9846043111	56	M
5	Kumar Kanchan G.C	Vyas N.P	Vyas N.P Municipality	Section officer	59003		M
6	Badri Nath Neupane	Vyas N.P 5 damauli	DDC	Service		50	M
7	Sita Adhikari	Vyas N.P 1		social mobiliser	9846055608	30	F
8	Ram Maya Kunwar	Vyas N.P 1		Agriculture		51	F
9	Devendra Raj Hamal	Vyas N.P 1	Nepal Bar Association,Tanahu	Advocate	9846043115	58	M
10	Arjun Giri	Vyas N.P 1	Vyas N.P Municipality	Service		43	M
11	yam Bahadur Thapa	Vyas N.P 1	Vyas N.P Municipality	Service	9846062886	30	M
12	Shankar Pariyar	Vyas N.P 1		Furniture	561660	40	M
13	Arjun Lal Batas	Vyas N.P 10		Engineer		26	M
14	Bel Bahadur Thapa	Vyas N.P 10		Agriculture		46	M
15	Babu Ram Bhandari	Vyas N.P 10	District Administration office	Service	9846043452	31	M
16	Sushil Prasad Wagle	Vyas N.P 10	Adikavi BhanuBhakta campus	Vice Principal	9846062374	31	M
17	Krishna Ram Wagle	Vyas N.P 10				54	M
18	Pradeep Kafle	Vyas N.P 10		Journalist	560232	33	M
19	Shankar Narayan Shrestha	Vyas N.P 10	Nepali Communist Party, UML		9856024448	39	M
20	Rabin Poudel	Vyas N.P 10	Tanahu Awaj Weekly	Journalist	9846040375	33	M
21	Purusottam Kafle	Vyas N.P 10		Agriculture		64	M
22	Babu Ram Wagale	Vyas N.P 10		Business		44	M
23	Bhim B. Adhikari	Vyas N.P -10	District Administration office	Service	9846043090	30	M
24	Harka Man Shrestha	Vyas N.P 10 Damauli		Agriculture	6040036	58	M

S.No.	Name	VDC, Ward	Office Organization	Profession,Level	Contact no.	Age	Sex
25	Nil Bahadur Thapa	Vyas N.P 10 Damauli	Neplai Congress	social worker	560532	56	M
26	Narhari khanal	Vyas N.P 11		Social worker		51	M
27	Badri Hari Bhattarai	Vyas N.P 11		Social worker	560475	60	M
28	Bishnu Maske	Vyas N.P 11	Tanahu Awaj Weekly	Journalist	560812	21	M
29	Santosh Bhattarai	Vyas N.P 11	School	Student	560089	20	M
30	Arjun Poudel	Vyas N.P 11	Vyas N.P Municipality	Service		25	M
31	Baikuntha Neupane	Vyas N.P 11	ManShantiNikunja	Service	9846027394	46	M
32	Yuv Raj Neupane	Vyas N.P 11		Agriculture	560797	62	M
33	Laxman Kunwar	Vyas N.P 1Galbubeshi		Agriculture		21	M
34	Govinda Pantha	Vyas N.P 2	Nepal Bar Association, Tanahu	Advocate		42	M
35	Ram Hari Tirwari	Vyas N.P 2	Rajdhani Daily	Agriculture	9846040429	24	M
36	Khemraj Adhikari	Vyas N.P 2		Business		31	M
37	Madan Wagle	Vyas N.P 2	National News Agency	Journalist		28	M
38	Santa Bahadur Koirala	Vyas N.P 2	GorkhaPatra National Daily	Journalist		27	M
39	Balram Ghimire	Vyas N.P 2		Business	561496	41	M
40	Bum Bahadur Thapa Magar	Vyas N.P 2		Retired from service		48	M
41	Shiva Hari Dhital	Vyas N.P 2		Journalist	561551	20	M
42	Shiv Kumar Shrestha	Vyas N.P 2		Business	560627	50	M
43	Ram Nath Bhattarai	Vyas N.P 2		Teacher	561255	50	M
44	Thakur Prasad Pantha	Vyas N.P 2 Damauli		Agriculture	607034	64	M
45	Purna Bahadur Adhikari	Vyas N.P 3		Student	89460	21	M
46	Krishna Prasad Sharma	Vyas N.P 3		Student	53838	20	M
47	Salunu Godar	Vyas N.P 4	Nepali Congress,	First Secretary		54	M
48	Surendra Bahadur	Vyas N.P 4	Nepali communist Party, UML	Agriculture		35	M
49	Bhoj Raj Khanal	Vyas N.P 7		Agriculture		68	M
50	ShreePurna Chandra Khanal	Vyas N.P 8 Damauli	Nepali Congress,	congress district secreta	561180	52	M
51	Bhim Bahadur	Vyas N.P 9				30	M
52	Ram Chandra Pokharel	Vyas N.P 9	Ex-DDC President	Social worker		62	M
53	Samundra Poudel	Vyas N.P N. P- 10	Adarsa Samaj national daily	Journalist	9846046830	17	M
54	Ram Bahadur V. k	Vyas N.P N.P- 1		waged-basis		70	M
55	Prakash Bhattarai	Vyas N.P N.P -1	INSEC	Representative	561063	23	M
56	Basanta Kandel	Vyas N.P N.P- 1, Tan	Pokhara FM	Journalist	9846065190	25	M
57	Dr. Raghunath Neupane	Vyas N.P N.P -10	Civil society	Medicine	561123	56	M
58	Sandesh Raj Bhandari	Vyas N.P N.P 10 Dan	Bhanjyang Daily	Reporter	560907	21	M
59	Chabi Lal Shrestha	Vyas N.P N.P -11		contractor	560992	62	M
60	Mohan Kumar V.K	Vyas N.P N.P -2		Business	560136	45	M
61	Santosh Br. Stha	Vyas N.P N.P -2		Hotel	560143	29	M
62	Poshn Pandey	Vyas N.P N.P -2	DDC	Overseer		25	M
63	Padma Raj Khanal	Vyas N.P N.P -4	REDP	service	560435	32	M
64	Padma Raj Shrestha	Vyas N.P N.P -8		Agriculture	560697	46	M
65	Govind Lamsal	Vyas N.P N.P Damauli		Service	561522	39	M
66	Pratap Lal Shrestha	Vyas N.P N.P-1	Nepal Communist Party,Tanahu	Secretary	560134	46	M
67	Deepak Gurung	Vyas N.P N.P-1	REDP	service	560435	28	M
68	Tribhuwan Shrestha	Vyas N.P N.P-10	NGO Federation	Secretary	9846055272	32	M
69	Vishnu Prasad Aryal	Vyas N.P N.P-10	DADO	Executive Agriculture De	560130	50	M
70	Shankar Pandey	Vyas N.P N.P-10		Business	60683	41	M
71	Uttam Neupane	Vyas N.P N.P-11	Administaration	service	560583	36	M
72	Ghana Shyam Khadka	Vyas N.P N.P-11	Kantipur Publication	Journalist	560933	27	M
73	Lal Bahadur Ale	Vyas N.P N.P-2	Ex-army, British		560372	69	M
74	Jun Raj Shrestha	Vyas N.P N.P-2		Politics	560525	52	M
75	Brihaspati Dahal	Vyas N.P N.P-2		Agriculture	560551	71	M
76	Tul Bahadur Sapkota	Vyas N.P N.P-3		Driver	561052	24	M
77	Man Ballav	Vyas N.P N.P-3	write-read			22	M
78	Rabindra Acharya	Vyas N.P N.P-8		Agriculture		60	M
79	Shuk Dev Regmi	Vyas N.P-1	District Administration office	Service	9846029340	36	M
80	Shaligram Sharma	Vyas N.P-10		Agriculture		50	M
81	Udaya Pandey	Vyas N.P-10 Shanti Nagar		Service		36	M
82	Manish Lamsal	Vyas N.P11	School	Student	560089	20	M
83	Krishna Giri	Vyas N.P-7	District Administration office	Service	9846055659	40	M
84	Les Bahadur Pathak	Vyas		Agriculture		38	M
	Other VDCs						
1	Dhan Singh Thapa	Arundaya VDC 6		Agriculture		45	M
2	Dev Maya Thapa	Bhakyam 1		Agriculture		45	F
3	Raju Acharya	Bhanu VDC 3,Tanahu		Journalist	9851007190	29	M
4	Lila Bahadur	Dhorfirdi VDC				37	M
5	Govinda B. Bhujel	GhansiKuwa VDC -1		waged-basis		31	M
6	Basanta Jwarchan	DuleGauda VDC		Business		42	M
7	Bhakta Bahadur Ranabhat	Ramjhakot VDC 4		Agriculture		68	M
8	Hari Raj Kandel	Ramjhakot VDC 5		Agriculture	561278	38	M
9	Chandra kanta Wagle	Kyamine VDC		Staff		33	M
10	Kamal Mohan Ghimire	Khairenitar VDC	Damauli college	Vice Principal		28	M
11	Basanti Bastola	Khairenitar VDC- 7		Journalist		20	F
12	Bishnu Prasad Dhakal	Sunhdhara VDC 3		Advocate	9846020184	32	M
13	Shankar Prasad Gaire	Sapung-2	write-read		560442	28	M
14	Bum Bahadur Thapa	Setang 3		Agriculture		53	M
15	Khem Bahadur Tilani	Setang 3		Agriculture		48	M
16	Ashok Baral	Lamjung	I.D.E	Engineer		27	M
17	Kapil Dev Gyawali	Mulmi-7	REDP	Staff	560435	30	M
18	Ram Bahadur Ale	Naraynpur 8		Agriculture		48	M
19	Ram Bahadur Thapa	Panamdi 8 Gunadi		Agriculture		43	M
	Local Offices						
1	Bishnu Prasad Dhakal	DDC, Tanahu	DDC	LDO	9856027533	44	M
2	Moti prasad Paudel	BBMC	BBMCBelchautara	Campus Chief	570240	48	M
3	Bimala Wagle		Women Development office		560142	34	F

S.No.	Name	VDC, Ward	Office Organization	Profession,Level	Contact no.	Age	Sex
4	Surya Prasad Adhikari		DEO, Tanahu	Service		44	M
5	Chiva Thapa					36	M
6	Janak Kumar Shrestha	Kathmandu	Media		9841343519	25	M
7	Arjun Prasad Subedi	District Administration	DAO	(kayam Mukayam) CDO	560109	43	M
8	Muktinath Pandit	District Health office	District Health office	Service	560119	48	M
9	Udaya B. Panta	District Police Office		Police	560133	43	M
10	Ir. Bishnu Hari Thapa	District Police office,	District Police offfice	Service	560199	39	M
11	Rajendra Kumar Kunwar chetri	Kaski Pokhara	Drinking water supply and sanitation office			58	M
	NEA						
1	Vishnu Bahadur Singh	NEA	NEA/PDD	Chief	4370432	53	M
2	B. R. Regmi	NEA	NEA	G.M	4424363	53	M
3	Nasib M. Pradhan	NEA	NEA	Engineer		36	M
4	Radesh M. Pradhanang	NEA	NEA	Engineer		53	M
5	Narayan Bahadur Khadka	NEA	NEA	Vice Administrative offic	5580374	45	M
6	Keshav Shrestha	NEA	NEA	service		50	M
7	Giridhar Hada	NEA	NEA	service		42	M
8	Anu Raj Bhandari	NEA, ESSD	NEA	Environmental Engineer	4378074	44	F
9	Madhav P. Khakurel	MMHEP, NEA	NEA	Project Director	5552387	54	M
10	Ganesh Prasad Neupane	Kathmandu	NEA, Environment Departmen	Environmentalist	4251845	35	M
11	Shiv C. Jha	ESSD, NEA	NEA	Engineer	4226730	53	M
12	Amrit Gurung	FJv Lamjung	NEA	Driver		41	M
13	Satis Devkota	NEA	NEA	Economist		34	M
	JICA Study Team						
1	Yoshimasa Ishii	JICA	JICA Study Team	Team Leader		54	M
2	Hiroshi Murashige	JICA Study Team	JICA S/T	Engineer		46	M
3	Akio Kuwhara	JICA Study Team	JICA S/T	Engineer		31	M
4	Toshiko Shimada	JICA Study Team	JICA S/T	Social Development Consultant		35	F
5	Hironobu Nishimiya	JICA Study Team	JICA S/T	Engineer		40	M
6	Kanji Usni	JICA, Thailand	JICA Thailand	Advisor	6618489183	36	M
7	Kaonu Suzuki	JICA, Tokyo	JICA, Tokyo	JICA staff		40	M
8	Jyack P.	Australia	JICA Study Team	Consultant		67	M
9	Sourab Rana	Maharajgunj, KTM	JICA, Nepal	Program Manager	5552711	36	M
10	JIT Gopal Shrestha	Chapagaon	JICA	Driver		29	M
11	Pashupat Shrestha	Chapagaon	JICA	Driver		25	M
12	Toran Sharma	Kathmandu	NESS	Local Consultant		52	M
13	Arjun Poudel	Kathmandu	NESS	Local Consultant		48	M
14	Ram kumar sharma	Kathmandu	NESS	Local Consultant		53	M
15	Madan Koirala	Kathmandu	NESS	Local Consultant		50	M
16	Shushila Regmi	Kathmandu	NESS	Local Consultant		24	F
17	Pradip poudel	Kathmandu	NESS	Local Consultant		23	M

Program Schedule of First Stakeholder Meeting in Damauli

Program Scchedule of First Stakeholder Meeting in Damauli

- ✧ Chairperson: Local Development Officer (LDO)
- ✧ Master of Ceremony: Mr. Ganesh Neupane (NEA staff member)

No.	Time	Hrs	Program	Presenters
	10:30-11:00	0:30	Registration	
1	11:00-11:15	0:15	Opening address & Background of the Project	NEA
2	11:15-11:30	0:15	Review of EIA conducted by NEA	NEA
3	11:30-11:45	0:15	Overview of the JICA Study (Upgrading Feasibility Study)	JICA Study Team
4	11:45-12:05	0:20	Project layout under the JICA Study	NEA
5	12:05-12:35	0:30	EIA Scoping and issues under the JICA Study	JICA Study Team
6	12:35-12:55	0:20	Comments from line agencies	—
7	12:55-13:55	1:00	Comments from VDCs/Municipality and other representatives	—
8	13:55-14:10	0:15	Snacks	
9	14:10-15:10	1:00	Discussion	—
10	15:10-15:20	0:10	Vote of thanks	NEA
11	15:20-15:30	0:10	Closing remarks	LDO

Brochure of First Stakeholder Meeting

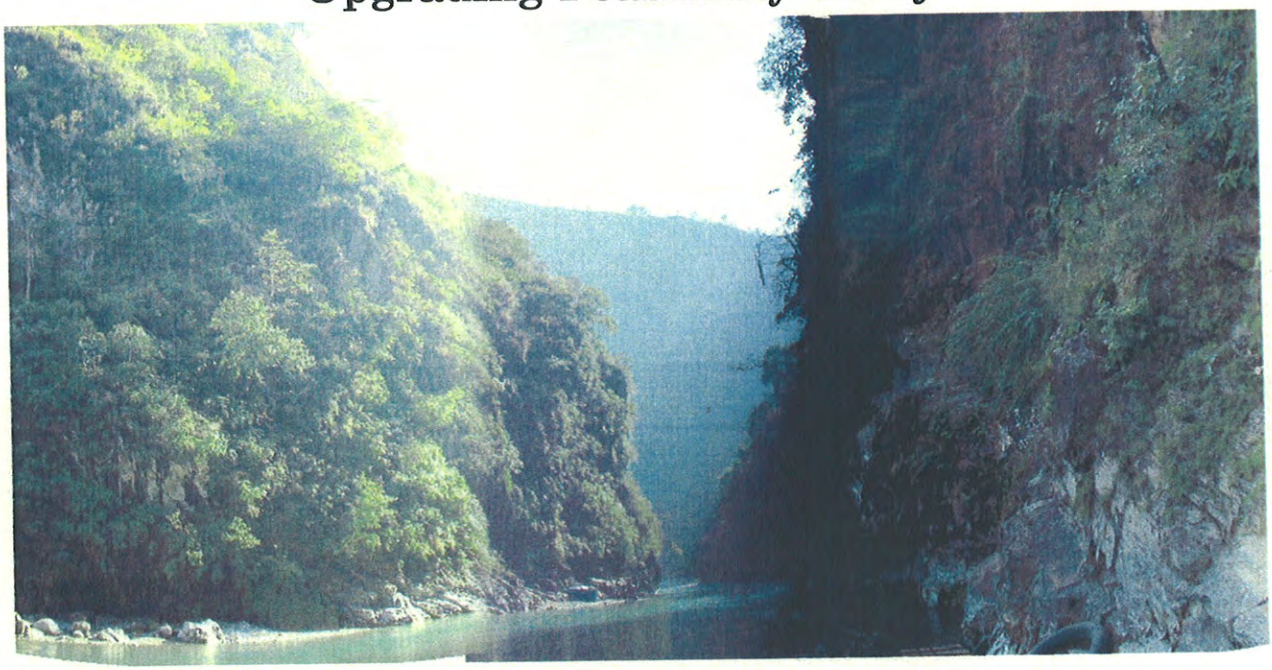
Brochure of First Stakeholder Meeting

The Upper Seti (Damauli) Storage Hydroelectric Project

1st Stakeholder Meeting

for

Upgrading Feasibility Study



Damauli, Tanahu District
June 2 2006/Jesth 19 2063

Kathmandu
June 7 2006/Jesth 24 2063

Nepal Electricity Authority (NEA)
Japan International Cooperation Agency (JICA)

1. Background of the Project

The Government of Nepal is implementing rural electrification and hydroelectric development projects by using its abundant water resource in the Tenth Plan (2002-2007) to support for poverty reduction. Present total installed capacity in Nepal is 614MW as of July 2005. Hydropower's share is 90 % of the total installed capacity which is 99 % of annually generated energy. On the other hand, power demand in the country has been growing approximately at a rate of 8 % per annum in recent ten year period (1995 to 2005).

The run-off-river (ROR) type hydropower plants dominate the Nepal's hydro capacity. Because ROR type hydropower plants can only marginally regulate river discharge for power generation, Nepal has been suffering from shortage of power in the dry season. Hence, Nepal Electricity Authority (NEA) has considered that it is necessary to develop storage type of hydropower plants which can seasonally regulate river discharge for generation in the dry period.

NEA conducted studies on storage type hydropower projects and identified ***Upper Seti Storage Hydroelectric Project*** as a potential one. The Government of Nepal requested the Government of Japan to implement an upgrading feasibility study (hereinafter referred to the Study) under the technical assistance of Japan International Cooperation Agency (JICA). The Study commenced by JICA Study Team in February 2005.

Outline of the Upper Seti Storage Hydroelectric Project (NEA's Study)

- Located in Tanahu District
- A dam height of 136 m
- Design Discharge 141m^3/s
- Installed capacity of 122 MW
- A storage Project with a reservoir length of 27.5KM and an area of 7.6km^2 located on the Seti River
- Underground Powerhouse

2. Objective of the Study

The Study aims at formulating the optimum plan for development and assessing the technical economical and financial, and environmental viabilities of the Project.

3. Schedule of the Study

The Study commenced in February 2005 and it to be completed by June 2007.

4. Status of NEA Environmental Impact Assessment (EIA)

An Environmental Impact Assessment (EIA) for the Project was conducted by the NEA including a one-day Public Hearing in Damauli on January 25, 2004. The EIA report has been formally issued and is in the process of review by Ministry of Water Resources (MOWR). After review by MOWR, it will be submitted to the Ministry of Environment, Science and Technology (MOEST) for its approval. This approval is expected to be within 2006 which will complete the formal EIA process for Nepal.

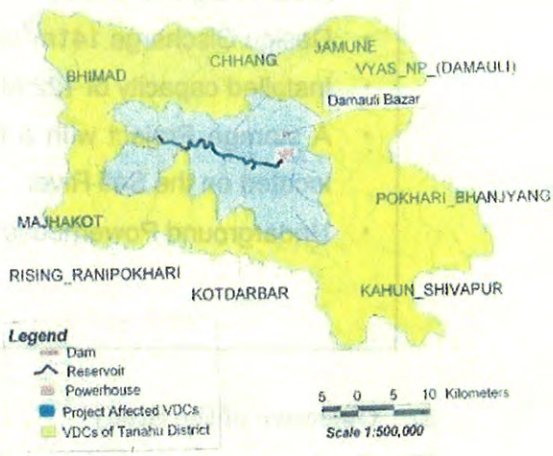
Survey works are presently underway by a NEA consultant on the Project's 220kV, 45 km Transmission Line from Damauli to Bharatpur. Initial Environmental Examination will be conducted by the JICA Study Team. A full-scale EIA will be carried out by Environment and Social Studies Department of NEA from late 2006 to early 2007.

5. Range of the Study Area

The Study area of the Upper Seti Hydroelectric Storage Project is located in Tanahu District in Central Nepal while the transmission line route is from the powerhouse site to the existing main transmission lines in Bharatpur. The Study area is assumed as follows:

- ✧ The Watershed: Approx. 1,502 km2
- ✧ The Reservoir area and its vicinity: Approx. 120 km^2

The Project in the phase of construction and operation is likely to bring about direct and indirect impacts to the following areas:



- The *dam site and associated access roads and camps* (i.e. location of powerhouse, construction facilities)
- The *Lower Reservoir(downstream part of the reservoir)*, an approximately 15 km Seti River stretch that has limited habitation, is forested, and has narrow gorges, and
- The *Upper Reservoir(upstream part of the reservoir)*, an approximately 12 km Seti River stretch that are relatively flat elevated and irrigated rice terraces and lower fertile Seti River front lands and land adjacent to tributary streams scattered settlements and the semi-urban of Bhimad Bajar community

- *Downstream of the dam site,* including river front lands of the main Seti River with limited access, through changes in river flows on a daily basis

6. Existing Environmental and Socio-economic and Cultural Condition

Based on the EIA Study Report of NEA, the existing environmental and socio-economic and cultural conditions in the project area are recognized as follows.

6-1. Physical Environment

- The project is located in the Seti River and the dam is about 3 km upstream from the confluence with Madi.
- The total catchment area of the Seti River basin down to the dam site is 1,502 km^2
- An average maximum temperature in the Project Area ranges from 25 to 32 degree centigrade and an average minimum temperature from 3 to 17 degrees in centigrade
- The average annual precipitation of the Project Area is approximately 2,973 mm
- The average annual run-off of the Seti River at the dam site is at 107.2 m^3/s
- The eroded riverbank material in the Middle Mountains is the source of high sediment flow in the Seti River.
- No industry or heavy traffic in the Project Area

6-2. Biological Environment

- Different types of forest exist within the project area include National and Community Forest.
- Vegetative cover is good on the left bank of the inundated area and at the higher elevations above the proposed inundation levels.
- Dominant plant species along the Seti River banks are Khair, Saj, Simal, Khirro, Karam, Bot dhayero, Dabdab and Khaniyo.
- Six Community Forests and few Orchards of Bamboo and Sisoo exist in the Reservoir Area
- Various habitat for mammals, birds, reptiles and amphibians exist in forested areas
- 32 species of fish are in the Seti River including torrent minnows, Copper Mahseer, Mahseer, Stonerollers and Baghi
- Approximately 11,440 kg of fish are caught by local Bhote and part time fishermen, some 85 percent of which for sale locally and 15 percent for self-consumption
- 35 species of phytoplankton, 13 species of zooplankton, and 23 species of insects were recoded along the Seti River within the Project Area

6-3. Socio-economic and Cultural Environment

- Located in Tanahu District with a population of 315,237
- The Project Area extends into eight VDC namely Bhimad, Majhakot, Chhan, Rani Pokhari, Jamune, Kot Darbar, Kahun Shivapur, Pokhari Bhanjyang, and one municipality, i.e., Vyas (Damauli) Municipality
- The predominant ethnic group is Magars (33%), followed by Brahmins (18%) and Newars (14%). The remaining are Gurung, Chetri and minority groups.
- Minority groups including Bhote, and Dalit such as Kami and Damai are present in the project affected area.
- Irrigated and wet season agriculture and livestock are the mainstays of the large majority of the population in Project Area
- Vyas (Damauli) Municipality is the main market in the Project Area, while Bhimad Bajar is the primary market center at the upstream end of the proposed reservoir
- Access tracks to the main highway exist including four suspension bridges across the Seti River.

7. Potential Impacts to be investigated under the Study

During February 2005 and again in March, 2006, the JICA Study Team completed a review of the EIA and prepared a revised Scoping Document as per the JICA Guidelines on Environmental and Social Considerations. A separate supplemental EIA study into environmental and social implications including resettlement has been initiated with a local environmental consultant. The separate supplemental EIA study focuses on the following issues.

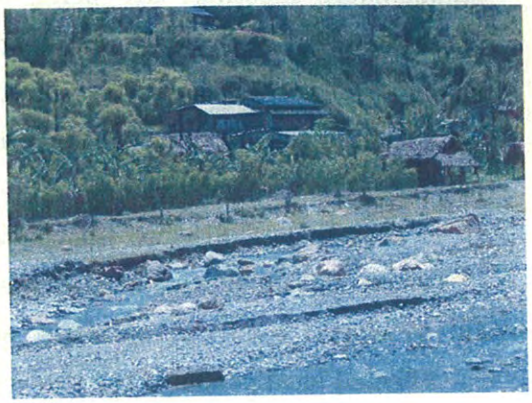
7-1. Natural Environment

- Impacts on the topography and land use due to creation of reservoir
- Impact on the topography and land use due to construction of permanent and temporary structures
- Impacts on the downstream by the reservoir operation
- Impacts on the water quality
- Impacts on vegetation and forestry
- Impact on wildlife resources

- Impacts on aquatic ecology and fisheries

7-2. Socio-economic and Cultural Environment

- Involuntary resettlement
- Loss of arable land
- Impacts on livelihood
- Impacts on the social and cultural aspect in the reservoir area
- Impacts on vulnerable groups
- Impact on the social activity in the downstream of the dam site due to release of the water



8. Supplemental Studies

The supplemental environmental study will be carried out in accordance with the requirement of the JICA Guidelines. The main items of the supplemental study are described below:

8-1 Natural Environment

- Examination of possibility of eutrophication in the reservoir
- Grasp of the overall conditions of the watershed and preparation of watershed management plan
- More extensive vegetation and forestry studies
- More extensive wildlife studies
- More extensive aquatic ecology and fishery studies
- Survey on transmission line routes
- Preparation of the framework for environmental management plan

8-2 Socio-economic and Cultural Environment

- Study for further development of the resettlement action and social action plans
- Study on the impacts of social and cultural aspects
- Survey on transmission line route
- Preparation of the framework for environmental management plan

9. Stakeholder Meetings

In accordance with the JICA's Guidelines on Environmental and Social Consideration, stakeholders meetings are being arranged through the offices of NEA with the assistance of JICA Study Team. Stakeholder Meetings include discussions with the local people in the project affected area and with the institutional representatives in Kathmandu. The objectives of stakeholders meetings are as follows:

(i) to explain and disclose information regarding the Study and environmental and social aspects and report on current progress on various Project activities
(ii) to obtain concerns, opinions, suggestions and feedbacks particularly from the affected local people of the Project Area

The Stakeholders Meetings will be conducted three times in Damauli and Kathmandu respectively as per the schedule given in the following table.

	Venue	Date	Venue	Date	Program highlight
1st	Damauli	June 2 (Jesth 19)	Kathmandu	June 7 (Jesth 24)	Outline of the Study
2nd	Damauli	November (Kartik /Mansir)	Kathmandu	November (Kartik/ Mansir)	Results of the surveys
3rd	Damauli	February (Mag/Fagun)	Kathmandu	February (Mag/Fagun)	Preliminary design, Environmental management Plans, and Resettlement Plans

Presentation Material in Damauli

Background of Upper Seti (Damauli) Storage Hydroelectric Project

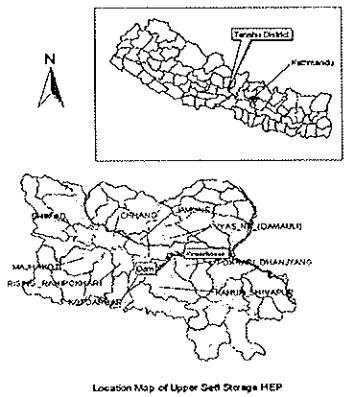
1

- At present the Integrated Nepal Power System (INPS) has a capacity of 610 MW out of which about 80% is from hydro.
- Hydropower projects in Nepal are mostly of run off the river type or having a small peaking capacity.
- Shortage of power in dry season
- Identification and Feasibility of Storage Projects was done to select potential storage type of hydropower projects

2

- The feasibility study of Upper Seti Storage Hydroelectric Project was completed in 2001.
- Additional studies were conducted in 2004.
- An agreement was signed between Japan International Cooperation Agency (JICA) and NEA to conduct **Upgrading** feasibility study of this project under its technical assistance.
- The agreement was signed on 5th of October, 2004 in Kathmandu. The upgrading feasibility study is being done and is expected to completed by May,2007.

3



Location Map of Upper Seti Storage HEP

4

Salient features of the Project

Dam type	:	Roller Compacted Concrete
Dam Height	:	136 m
Full Supply Level	:	425.00 masl
Minimum Operating Level	:	370.00 masl
Tail-water Level	:	308.20 masl
Gross Storage	:	331.7 Million m3
Live Storage	:	270.3 Million m3
Diversion Flood	:	1435 m3/sec (1 in 5 years flood)
Headrace Tunnel	:	84 m long 8 m diameter
Design Discharge	:	141 m3/sec
Installed Capacity	:	122 MW
Annual Generation	:	605 GWh
Estimated Cost	:	215.13 Millions US$
Transmission line	:	220 kV, 43 Km long up to New Bharatpur Substation

5

Upper Seti Storage Hydro Power Project

Review of EIA prepared by NEA

6

1.0 METHODOLOGY

- The EIA process has been prepared in accordance to the Environment Protection Rule, 1997, Environment Protection Act, 1997 and National EIA guidelines, 1993.
- World Bank Directives for environmental assessment have been also referred as guidelines.

2.0 SCOPING DOCUMENT AND TERMS OF REFERENCE

Scoping Document and Terms of references wasprepared and approved in January 2003. (2059/9/22)

7

Category A High Impact Zone	Category B Moderate Impact Zone	Category C Low Impact Zone
Reservoir area (contour level FSL 425+10 m), dam site and powerhouse site, access road and construction sites, borrow areas	Adjoining villages near to the places mentioned in category A	Bhimad VDC, Kahun Shivpur VDC, Risin Rani Pokhari VDC, Jamune VDC, Kotdurbar VDC, Majhkot VDC and Chhan VDC, Pokhari bhanjyan VDC) Vyas Municipality
	5 km downstream from the powerhouse site (Vyas Municipality, Kahun Shivpur and Pokhari bhanjyan VDC)	

8

3.0 Baseline data collection

Multidisciplinary team conducted Extensive Field work in January 2003, which included three weeks of household survey.

3.1 Physical Environment

- Extensive field survey (walkover) conducted
- Hydrology information was taken from Data recorded by the 24 meteorological stations in and around the project area. Climatological data have been summarized from Index station at Khairenitar.
- Water Sampling conducted in four stations

9

3.2 Biological Environment

- Walkover survey along the access road as well as in and around the dam site and powerhouse sites.
- Vegetation and forest types were identified based on species composition and dominance.
- The forest sampling done with a quadrate size of 20 m x 20 m by species area curve method.
- Information on forest resources was also collected by an anthropological field technique similar to RRA (Rapid Reconnaissance Appraisal).
- Indirect evidences such as droppings, pugmarks, footprints and scales of the animals were used for identification of fauna in the project area.
- Birds were also identified by their calls.
- Local people from the project area were also interviewed using a semi-structured questionnaire

10

Fisheries

- The Fisheries component of the EIA was sub-contracted to a Nepali Expert.
- An extensive field investigation was done by the expert to establish baseline data on the aquatic ecosystem, the impact on the fish habitat and populations and provide preliminary recommendations

11

3.3 Socio-economic and Cultural Environment

Baseline information was gleaned during two weeks field survey conducted by using the following techniques:

- **Questionnaire interviews,**
- **Checklists,**
- **Focus group discussions,**
- **Observation of the sites.**

Households (113) were surveyed using structured questionnaires to obtain the baseline information

12

4.0 EXISTING BASELINE CONDITIONS

4.1 PHYSICAL ENVIRONMENT

- The Upper Seti Storage Project is located in the Gandaki River Basin in western development Region of Nepal.
- The total catchment of the basin up to the intake site is 1501 km2 in which about 129 km2 is covered with snow. Glaciers lakes are not identified on this basin.
- The general condition of the watershed of the Tanahu district is indicated as moderate in the GIS Data Base document published by the ICIMOD.
- Although the watershed of the Seti River is relatively stable around the impact area and mostly along the reservoir stretch, the areas at some places along the reservoir area like Bhimad Bazaar, along the tributary of Wanten Khola is very poor.
- Surface geology of these critical areas appears to be very poor and mainly consists of cemented gravel with sandy to silty matrix

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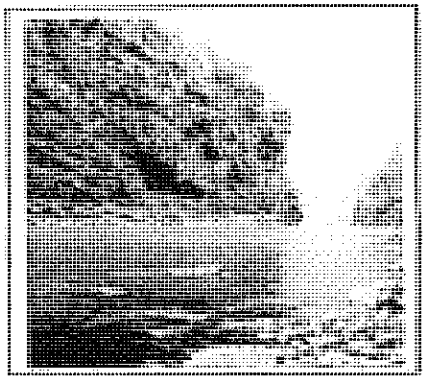
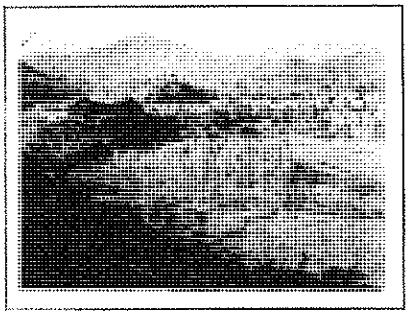


Location of the dam

14



Settlements under risk of slope failure along the bank of Seti river near Bhimad Bazar

15

4.2 Biological Environment

- The Upper Seti Storage Hydroelectric Project lies in the sub-tropical region of the middle mountains physiographic zone and host different types of forest.
- The forest vegetation of the Project area has been categorized mainly into national and community forest.
- The dominant plant species recorded in the project area (reservoir, dam, powerhouse, access road) are Khair (*Acacia catechu)* in association with Saj (*Terminalia alata*), Simal (*Bombax ceiba*), Khirro (*Sapium insigne*), Karam (*Adina cordifolia*), Bot dhayero (*Lagerstroemia perviflora*), Dabdabe (*Garuga pinnata),* Khaniyo (*Ficus semicardata*) etc Bel (*Aegle marmelos*), Simal (*Bombax ceiba*), Khalluk (*Diospyros malabarica*), Dumri (*Ficus racemosa*), Bot Dhayero (*Lagerstroemia perviflora*), Rohini (*Mallotus philippensis*), etc.

16

Continued

- The forest types in the project area Riverine *Acacia catechu, Terminalia alata* and *Shorea Robusta* forest
- There are six community Forests in the reservoir area .
- 14 species of mammals exists in the project area.
- The EIA study of the fish fauna revealed that there are 32 species of fish. Copper Mahseer and Mahseer, Stoneroller and Baghi are the common species found.
- Out of 32 species recorded or reported from Seti River 5 were long distance migrant, 6 were midrange migrant and 21 were residents in habit.

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Sparse sal/asna forest on the upper slopes of the Seti river

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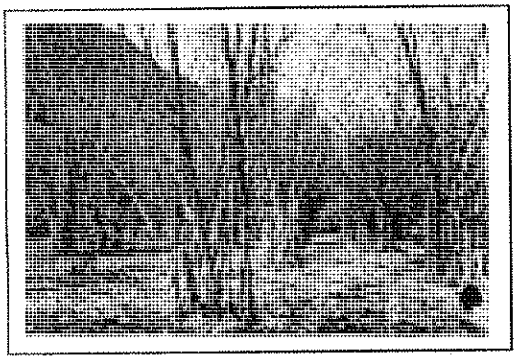


Bamboo plantation at the upstream of Damsite to be inundated

19

4.3 Socio-economic and Cultural Environment

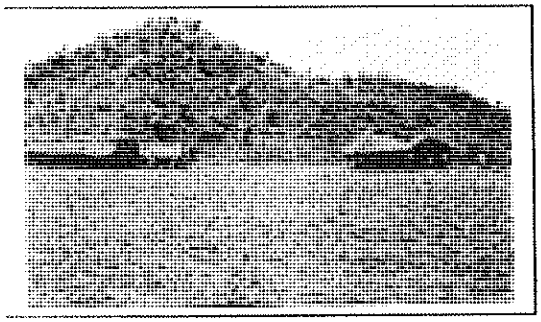
- The Upper Seti Hydropower Project lies in the Tanahu District of Western Development Region. The district has an area of 1546 km2
- The main project facilities and the reservoir will extend into eight VDCs of Tanahu district namely Bhimad VDC, Kahun Shivpur VDC, Kotdarbar VDC, Majhkot VDC, Chhan VDC, Risin Rani Pokhari VDC, Jamune VDC and Vyas Municipality. The Pokharibhanjyan VDC will be affected by the peaking flow variations.

20

Continued

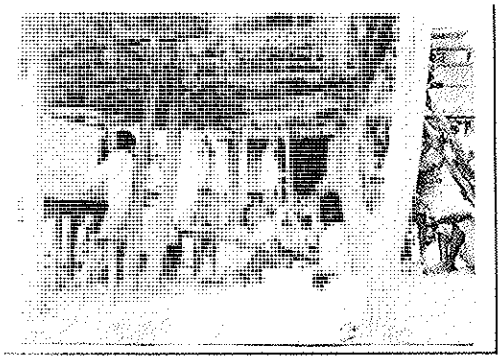
- Magars are the dominant caste followed by Brahmin and Newars. Other ethnic/caste groups in the project area are Gurung, Chhetri and other occupational castes like Kami, Damai and Kumal.
- The overall literacy rate of the sampled population is estimated at 78%.
- .Agriculture and livestock is the main stay of a large majority of the people in the project area providing both employment and livelihood.
- The project area is comparatively well endowed with good social infrastructure (health posts, police posts, schools, campuses).

21



A settlement of Bandarkuna to be completely resettled

22



The environmental team interviewing the relocates

23

5.0 IMPACT ASSESSMENT

5.1 Physical Environment

- **The project will permanently acquire total area of 917 ha out which 162 ha is agriculture land and 230 ha of forest.**
- **Peaking discharges will substantially change the natural daily flows from 141 m3/s for six hours in dry season to no flow condition during remaining hours of the day.**
- **The fluctuation of the reservoir water levels of up to 55 m create will increase the existing risk of stability and shoreline erosion. (Vulnerable areas are Bhimad Bazaar, Risin Patan and Jaruwapani)**

24

5.2 Biological Environment

- **Site clearing activities at the project site and creation of reservoir will result in the loss of 460 ha of vegetation consisting of 230 ha of forest and 230 ha of shrubland and greybeard area. Out of 230.5 ha of inundated forestland , 25 ha. of good riverian Khair forest, 18 ha. Terminalia forest, 40 ha. Open mixed forest, 142 ha Deciduous riverian forest and 5.5 ha sisoo plantation.**
- **Altogether 28 ha of six Community forest will be inundated**
- **32 species of fish is found in the Seti river will be affected by the project construction.**
- **Compensation flow of 2.4 m3/s (10% minimum average flow) will have to be released downstream of the dam during non-peak hours for the survival of aquatic ecosystem.**

25

5.3 Socio-economic and Cultural Environment

- The primary adverse environmental impact will be form the relocation of 45 (SPAF) households, which will have to be resettled.
- Approximately 162 ha of agricultural land will be inundated which will lead to loss of crop production, which amounts to 770 tones per year
- This will affect another 324 households.

26

Beneficial Impacts

The main benefits are:

- job creation;
- opening the area to market forces and goods mobility;
- provision of electrical power for modernization of industry and services;
- provision of the revenue benefit as per prevailing market price.
- Share in Revenue Benefit as per prevailing Acts and Rules (The DOED deposits 90 percent of the royalty in the government's revenue account in Nepal Rastra Bank and the remaining 10% is made available to the respective districts.)
- uplift of rural economy

27

6.0 ENVIRONMENTAL MITIGATION MEASURES

6.1 Physical Environment

- Minimisation of Landake
- Slope protection measures (bioengineering techniques, constructing revetment walls gabion walls, check dams, benches or terraces, riprap and spurs)
- Watershed management of the catchment area to limit slope erosion and sedimentation in the reservoir and constructing check dams in tributaries, which may be transporting sediment into the reservoir.

28

6.2 Biological Environment

- Revegetation of disturbed slopes (compensatory plantation has been suggested in 1: 25 ratio
- Minimization of Site Clearing and Revegetation of Cleared Sites
- Protection of Forest Resources
- Community Forest Support Program
- Control of Hunting and Trapping
- Environmental Awareness for Conservation (EAC)
- Open water stocking of exotic and indigenous carps

29

6.3 Socio-economic and Cultural Environment

- Suitable Compensation program
- Employment opportunities for the local people
- Agricultural enhancement programs for the loss of agricultural products

30

7.0 PUBLIC INVOLVEMENT

Public hearing was held on January 25, 2004 at Vyas (Damauli) Municipality, Tanahun. More than 200 people participated in the hearing. Inquiries and responses of the local people mostly focused on:

- Process of land acquisition and compensation
- Fixation of price be liberal
- Downstream impacts
- Down stream release
- Infrastructure development (viz. road, electrification, drinking water irrigation, communication etc.)
- Employment opportunity for displace and other project affected family
- Rural electrification to the surrounding villages.

31

8.0 ENVIRONMENTAL MANAGEMENT PLAN

- Upper Seti Environment Unit will be formed which will consist of experts from Ministry, local administrators and other qualified personnel from the local market.
- A separate project compensation Unit will also be established under the Upper Seti Environmental Unit to oversee that compensation aspects are handled with the required care by the project company.
- Environmental Monitoring Activities will also be performed by this unit

32

Continued

- Enhancement Programs like watershed management programs, Fresh Vegetable Farming Training Program, Improved Agricultural Farming Training Programme, and Rural Electrification
- The total cost for implementing the Environmental Management Plan is estimated to be NRs 72,06,24,000 or US $ 10 million. The total Environmental Management Cost amounts to approximately 5% of the total project cost

33

9.0 RECOMMENDATIONS

- A detailed Environmental Management Plan should be prepared during the Detailed Design stage
- Further social investigation especially confirmation of the houses to be relocated and the land to be acquired
- Further investigation is recommended to assess the impact due to impoundment especially in critical areas like Bhimad Bazaar, Jaruwapani and Risin Patan and the settlements around the reservoir, which are on the vertical cliff next to the Bank. These areas may be affected due to the slope failures in the long run and have to be confirmed whether they need relocation.

34

Continued

- Assessment of downstream impacts due to peaking releases.
- Water quality modeling (eutrophication model)
- Further Fish migration study and design of fish hatchery is recommended during the detailed design study.
- Detailed survey and documentation of the forest resources, community managed forest and mapping of the ecologically sensitive area

35

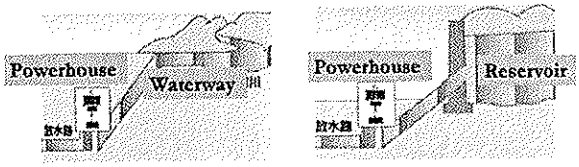
1

Type of Hydropower Plant

- Need Storage Hydropower Plant to Stable Power Supply in Dry Season
- In Dry Season, Run-of-River Type Hydropower Plants Decrease Due to Low Capacity

2

Type of Hydropower Plant



Run-off-River Type　　Storage Type

3

NEA & JICA Study

NEA: Feasibility Study in July 2001
Upgrading F/S in July 2004

Request
Nepalese Gov. ⟹ Japanese Gov.
Technical Assistance by JICA

Stakeholder Meeting: 3 times by NEA with assistance of JICA Team

Purpose of Study

Regarding Upper Seti Hydroelectric Project

- Formulate the optimum plan
- Assess its environmental, technical, economical and financial viabilities

5

Scope of Study

JICA Study consists the three stage

- Preliminary Study Stage
- Detailed Investigation Stage
- Upgrading Feasibility Design Stage

6

Scope of Study

Preliminary Study Stage

1. Review of existing data & information
2. Preparation of plan on detailed field survey by JICA Team to supplement NEA's investigations

Scope of JICA Study

- Detailed Investigation Stage

1. Field investigations by JICA Team (Mapping, Geology & Environment)
2. Data analysis on investigation results
3. Environmental impact assessment

Scope of JICA Study

- Upgrading Feasibility Design Stage

1. Optimization of development scheme and layout
2. Upgrading feasibility design
3. Project cost estimation
4. Economic & financial analysis
5. Conclusions & Recommendations including justification of the Project & environmental mitigation measures

Schedule of Study

Study: started in February 2005
completed in June 2007

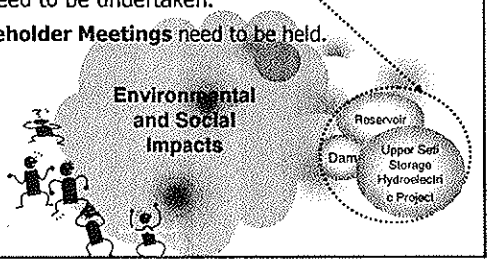
Present progress:
Started field investigations by JICA Study Team
(Detailed investigation Stage)

Project Stage:
JICA Study ➡ Detailed Design ➡ Bidding ➡ Construction ➡ Operation

According to "*JICA's Guidelines on Environmental and Social Consideration*",

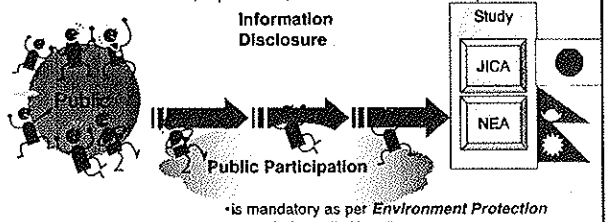
The Project is likely to have **significant impacts on the environment and society.**

- The **studies on environmental and Social impacts** need to be undertaken.
- The **Stakeholder Meetings** need to be held.



What are the objectives of the Stakeholder Meetings?

- to explain and disclose information regarding the Study and environmental and social aspects on the Project
- to obtain concerns, opinions, feedback from the public



- is mandatory as per *Environment Protection Regulations* (in Nepal)
- is a requirement for the JICA Study in accordance with *JICA's Guidelines on Environmental and Social Considerations*

Overview of Stakeholder Meetings in Damauli

	Tentative Schedule	Venue	Prospective Participants (Number of Participants)	Tentative Main Agenda
❶	June 2 - Jesth 19	Damauli	Local People Local government Local Line agencies NGOs/CBOs (200)	•Background, objective, scope and schedule of the Study •Project Layout •JICA guidelines for environmental and social consideration •SIA scoping and issues
❷	November 2006	Damauli	Local People Local government Local Line agencies NGOs/CBOs (200)	•Necessity of the Project •Examination of alternatives •Layout and scale of the Project •Natural and social environment assessment •Environment management and resettlement plan
❸	February 2007	Damauli	Local People Local government Line agencies NGOs/CBOs (200)	•Preliminary design •Implementation schedule •Project cost and economic analysis •Environmental management and monitoring plans •Resettlement plans •Compensation for the land acquisition

Lay-Out Study

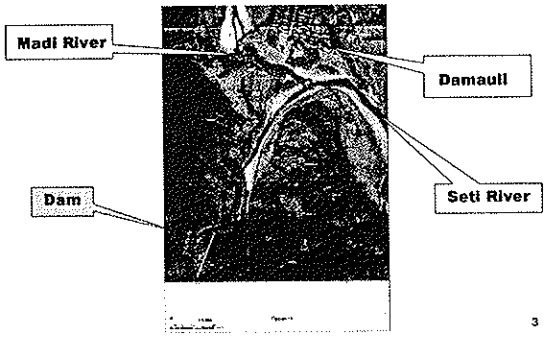
1

Keys of Layout Options

- Option-I : P/S embeded in Dam
- Option-II : Dam and Waterway with Underground type P/H
- Option-III a : Same as Op-II. Tailrace location is more downstream.
- Option-III b : Another waterway route from Op-III a.
- Option-IV : P/H is located left embankment

2

Option-I Birds' eye-View



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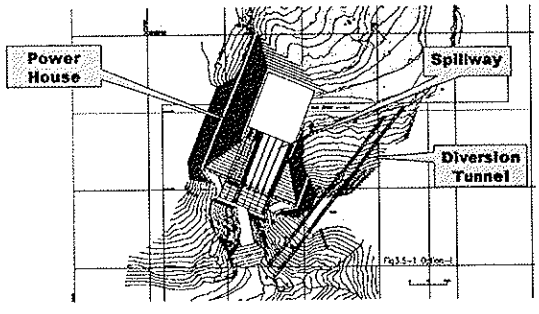
Option-I General Plan



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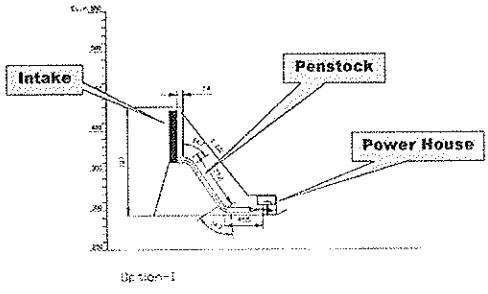
Option-I Vertical Section



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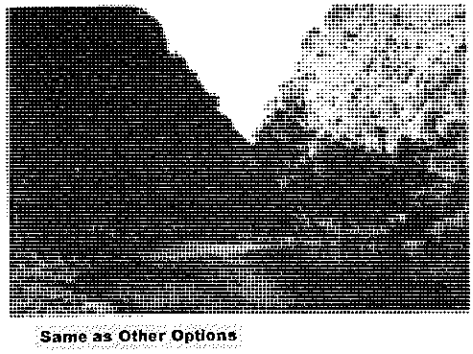
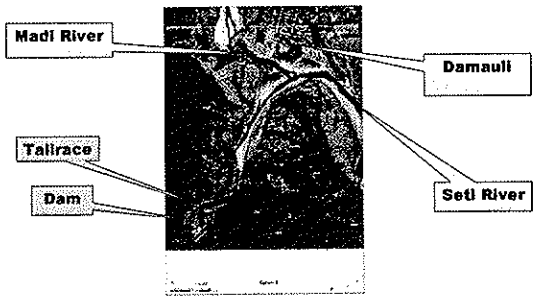
Dam-site from Upstream



Same as Other Options

6

Option-II Birds' eye-View



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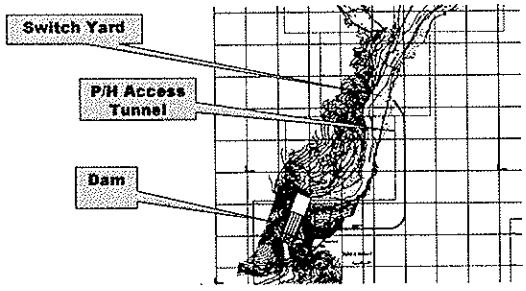
Option-II General Plan



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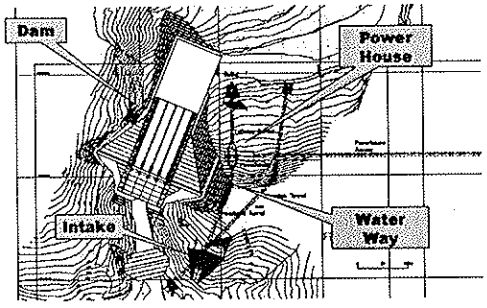
Option-II General Plan 2



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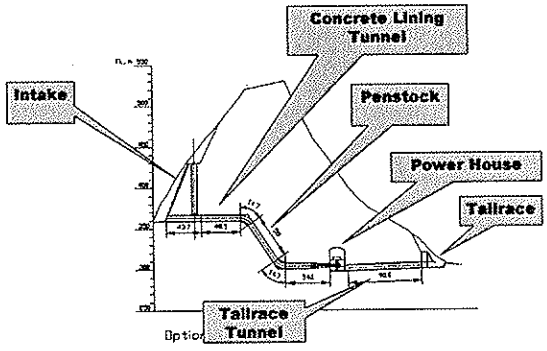
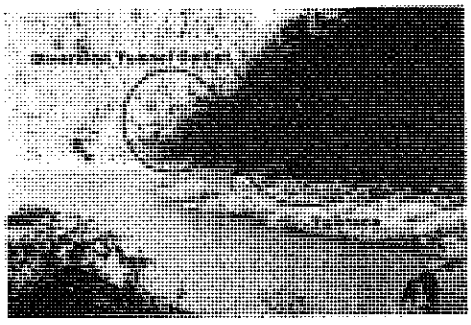
Option -II Vertical Section



Intake site (Intake of Option-II)

11

Tailrace Site Area



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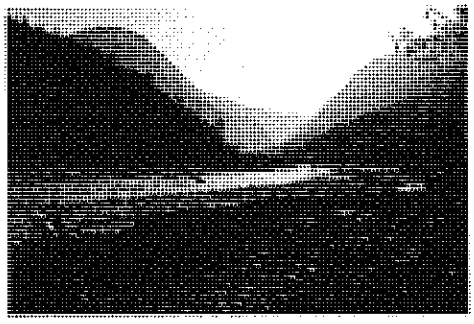
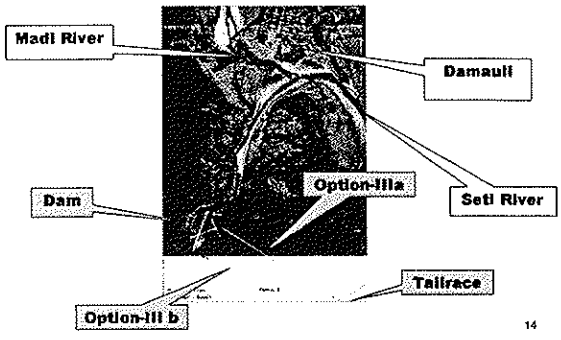
Proposed site for Switchyard and Access tunnel entrance



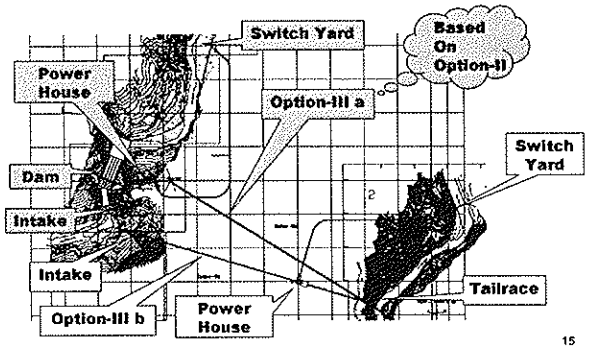
13

Option-III Birds' eye-View



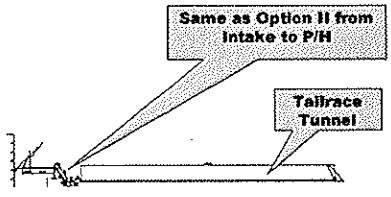
14

Option-III General Plan



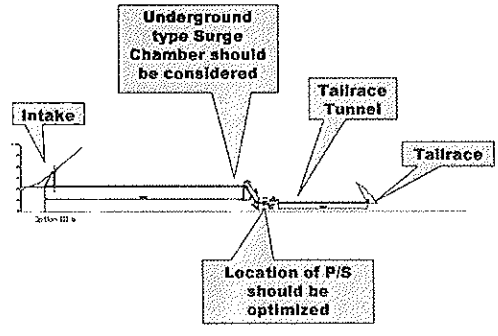
15

Option-III a Vertical Section



16

Option-III b Vertical Section

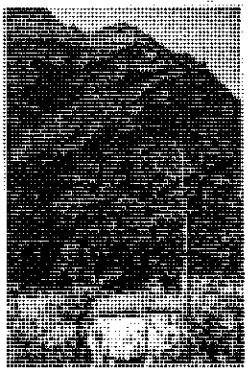


17

Intake site for Option-III b

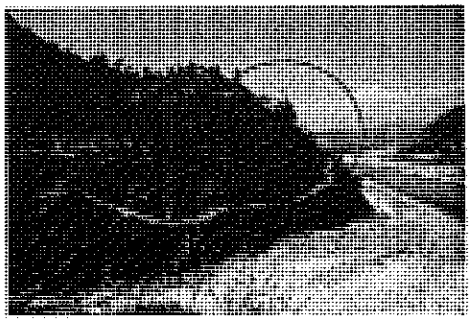
18

Tailrace Site for Option III b



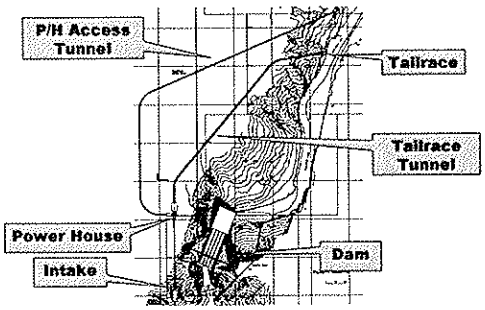
19

Switch Yard and Access Tunnel Entrance Site for Option III b



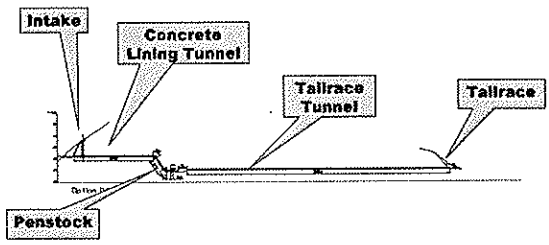
20

Option-IV General Plan



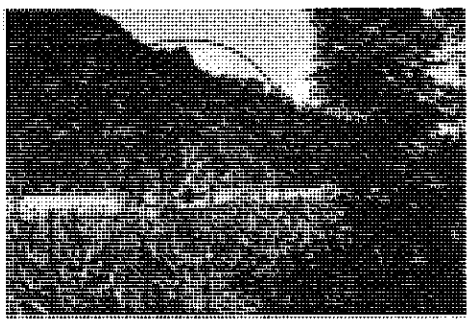
21

Option-IV Vertical Section



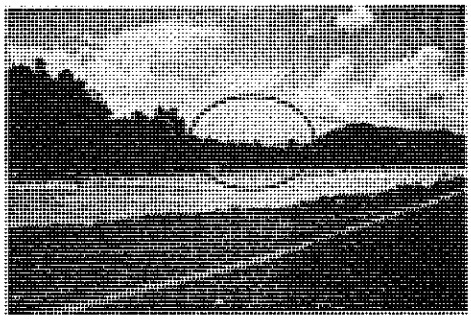
22

Option-IV Tailrace Site



23

Option-IV Switch Yard Site



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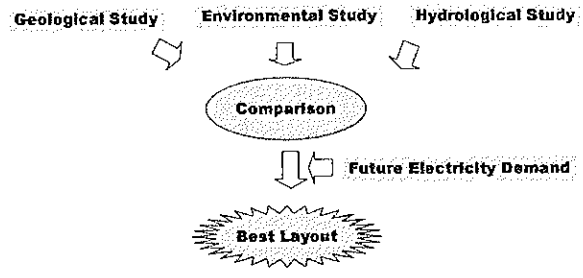
How to decide Layout?



Upper Seti (Damauli) Storage Hydroelectric Project

EIA Scoping and Issues under the JICA Study

1st Stakeholder Meeting in Damauli for Upgrading Feasibility Study

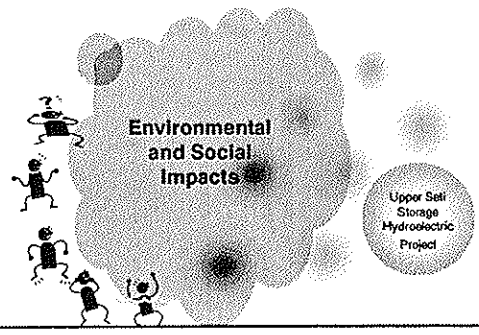
on June 2 2006/Jesth 19 2063

organized by NEA and JICA Study Team

1

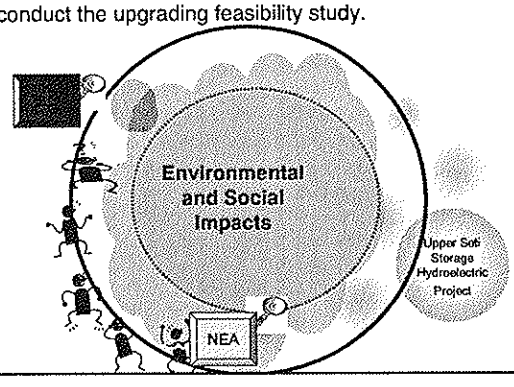
Why the Study is needed before the Implementation of the Project?

The Project sometimes may trigger environmental and social impacts, and affect the people living there.

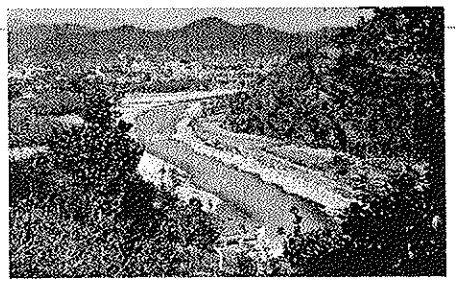


What is the current status of the Study?

In response to the request of the Government of Nepal, Japan International Cooperation Agency (JICA) decided to conduct the upgrading feasibility study.



Impacts on Natural Environment to be assessed under the JICA Study



4

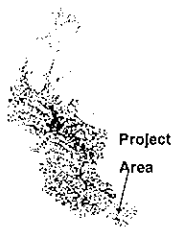
New GIS Survey & Maps

Watershed Area

- 1,502 km2 at 1:25,000 Scale & 20m Contour
- Use for Watershed Management Plan

Reservoir Area

- 120 km2 at 1:5,000 Scale & 5m Contour
- Use for forestry, erosion, land losses & new resettlement sites



GIS Land Use Map

5

Water & Fisheries

(1) Impacts on Reservoir Water Quality

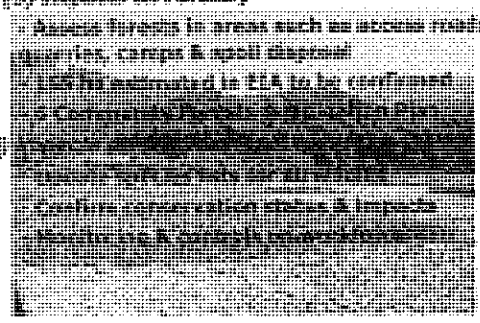
- **Collect water samples at 4 sites**
- **Study effects on groundwater**
- **Reassess NEA – EIA results**

(2) Impacts on Aquatic Ecology & Fisheries

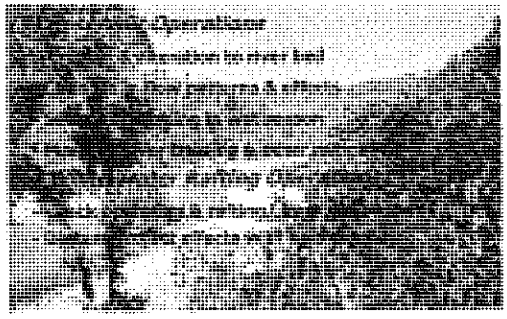
- **Sampling downstream, reservoir area & upstream**
- **Collect data from KGA & BFRS**
- **Plans for reservoir & local fisheries**

6

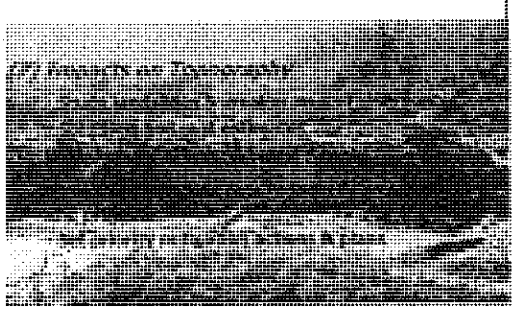
Forestry & Wildlife



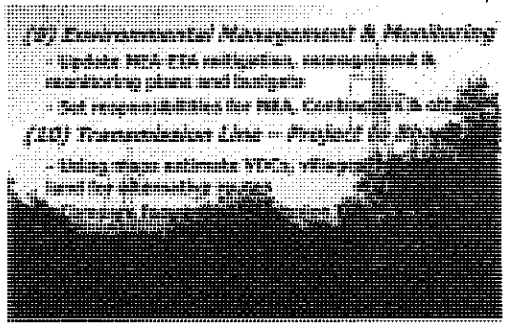
Downstream Impacts



Impacts on Topography & Watershed Management Study



EMMP & Transmission Line



Compare Alternatives- JICA

(11) Comparison of Environmental and Social Impacts of Project Alternatives

- Compare Without Project & Thermal Options
- Compare 5 Alternative layouts via Table as to effects on local natural & social environments
- Emphasize any reservoir erosion and operational period problems eg backwater effects
- Try to minimize & mitigate problems

Social Impacts to be assessed under the JICA Study

Possibly Affected Household

NEA EIA based on field survey in 2001

- 45 houses in Bhimad, Chhan, Jamunem Majhkot, Ranipokahri will be relocated, and 917 ha of land will be acquired.

JICA Study in 2006 will investigate

✓How many and which households will be affected?

✓How much the land will be acquired?

JICA Study in 2006 will prepare

✓The framework of **Resettlement Action Plan including mitigation measures**

Possible Loss of Arable Land

NEA EIA based on field survey in 2001

- 162 ha of arable land will be affected.
- The total lost crop production per annum will be 769 tones.

JICA Study in 2006 will investigate

✓How much arable land will be affected?

✓How much crop production will be lost?

JICA Study in 2006 will prepare

✓The framework of **Resettlement Action Plan including mitigation measures**

Possible Loss of Livelihood of Fishermen

NEA EIA based on field survey in 2001

- The livelihood and income of farmers/fishermen families, namely Bhote and Kami living around the riverside villages will be affected.

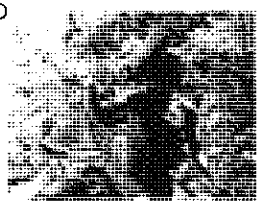
JICA Study in 2006 will investigate

✓How many fishermen families will be affected?

✓How much the livelihood of fishermen families will be lost?

JICA Study in 2006 will prepare

✓The framework of **Social Action Plan including mitigation measures**



Possibly Affected Religious, Historical and Archeological Sites

NEA EIA based on field survey in 2001

- One small temple on the right bank of Seti River near Bhimad bazzar and three cremation site will be inundated.

JICA Study in 2006 will investigate

✓How much temples and cremation sites will be affected?

JICA Study in 2006 will prepare

✓The framework of **Social Action Plan including mitigation measures**

Possibly Affected Infrastructure

NEA EIA based on field survey in 2001

- Four suspension bridges in Jamune and Chan VDC will be submerged.
- Access tracks to the main highway will be affected.

JICA Study in 2006 will investigate

✓What types of infrastructure will be affected?

✓How many infrastructure will be affected?

JICA Study in 2006 will prepare

✓The framework of **Social Action Plan including mitigation measures**

Construction Impact and Vulnerable Groups

NEA EIA based on field survey in 2001

- HIV/AIDS and other infectious disease are possible impacts of the construction with the influx of workers
- New opportunities may be found in the influx of workers.

JICA Study in 2006 will investigate

✓What will the influx of a large number of workers adversely bring about? (e.g. spread of infectious disease, trafficking, child labors,etc)

✓What type of opportunities will be created?

JICA Study in 2006 will prepare

✓The framework of **Social Action Plan including mitigation measures**

Minutes of First Stakeholder Meeting in Damauli

Minutes of First Stakeholder Meeting in Damauli

Project: Upper Seti Storage Hydroelectric Project
Venue: Hotel Malla, Lainchaur, Kathmandu, Nepal
Date: June 7, 2006
Time: 9:15 hrs

The first stakeholders' consultation meeting on the proposed upper Seti storage hydroelectric project under the upgrading feasibility study initiated by the JICA study team was held on 7nd June 2006 in Kathmandu. The meeting was attended by about 60 people representing from different sectoral ministries, donor agencies, non-government organizations, members of parliament, and professionals from project area and people from different walks of life (*Annex 1*).

Mr. Satish Chandra Devkota, Economist, Environment and Social Studies Department of Nepal Electricity Authority was the Master of Ceremony. Mr. Devkota invited following guests to take their seat in the dais.

Mr. Bhoj Raj Regmi, General Manager, Engineering Services, NEA (Chairperson)
Mr. Ramchandra Poudel, Member of Parliament, Tanahun (Chief Guest)
Mr. Govinda Raj Joshi, Member of Parliament, Tanahun (Guest)
Mr. Tuk Raj Sigdel, Memebr of Parliament, Tanahun (Guest)
Mr. Amar Raj Kaini, Former Memebr of Parliament, Tanahun (Guest)
Mr. Uttar Kumar Shrestha, Acting Managing Director, NEA
Mr.Shiv Chandra Jha, Director, Environment and Social Studies Department, NEA
Mr. Yoshimasa Ishii, JICA Study Team, Team Leader

The meeting was chaired by Mr. Bhoj Raj Regmi, General Manager, Engineering Services, Nepal Electricity Authority and the chief guest was Mr. Ram Chandra Poudel former Deputy Prime Minister and the Member of Parliament, Tanahun. The meeting proceeded with dissemination of project information and findings of the past studies including environmental impact assessment study conducted by Nepal Electricity Authority and the proposed activities under the upgrading feasibility study to be conducted by the JICA study team followed by deliberations from high dignitaries, open floor discussions, questions and answers with clarification.

Brief account of the deliberation by key persons from the dais is presented below:

Mr. Uttar Kumar Shrestha, Acting Managing Director, Nepal Electricity Authority, is his welcome remarks briefed on the present hydropower generation capacity and informed that 80 percent of the total electricity generation is from hydropower project in Nepal. He highlighted the presently

available electricity quantity and compared with the demand and load shedding situation in the country. Mr. Shrestha pointed that the decrease in the power generation during the dry seasons from run-of-the-river power projects has compelled NEA to think and develop a storage type hydropower project, which could augment the short of supply of electricity during the dry seasons of the year. He also mentioned that after Kulekhani no other hydropower projects are of storage types in Nepal. In this context, the proposed upper Seti storage hydroelectric project seemed to be attractive one. In the year 2001 NEA identified the project and conducted a feasibility study. Based on the study findings, Government of Nepal requested Government of Japan to provide assistance for developing the project in the year 2004. The Government of Japan kindly consent the request of Government of Nepal and initiated upgrading feasibility study of the project through the mobilization JICA study team. He informed that the upgrading feasibility study will be completed by mid of 2007 and hoped that the project will be commissioned in due course of time. Mr. Shrestha is his remarks also pointed out that NEA is very desirous to expand the power distribution by increasing power generation capacity in the country. He advised the study team to incorporate the suggestions made by stakeholders in their study which in his opinion will help to develop a technically feasible, cost effective and socially and environmentally sound project.

Mrs. Annu Rajbhandari, Environmental Engineer, Environment and Social Studies Department, Nepal Electricity Authority presented salient features of the project and environment impact assessment study findings based on the study conducted by Nepal Electricity Authority during the feasibility study phase in 2001. She highlighted on the study area, EIA process adopted, basis of classification of project areas for environmental impact identification and assessment and significant environmental impacts both positive and negative ones to be emerged by the implementation of the project. She categorically briefed on impacts with regard to physical, biological and social, economic and cultural environments and also mentioned on the proposed mitigation measures to minimize and/or to eliminate the environmental impacts. Mrs. Rajbhandari also pointed out on the environmental management plan recommended for implementation by the study during the presentation of the study findings. She assured that the study conducted by NEA in the year 2001 is in compliance with Environmental Protection Act 2053 and corresponding regulations. However she further emphasized on the need for additional in-depth studies with regard to the impacts due to impoundment especially in critically areas and settlements around the reservoir area. Presentation of Annu Rajbhandari is annexed as *Annex 2.*

Mr. Yoshimasa Ishii, JICA Study Team, Team Leader and *Ms. Toshiko Shimada*, Sociologist, JICA Study Team jointly presented the overview of the JICA study and described on the scope of work, objectives and the proposed time period to conduct the upgrading feasibility study of the proposed hydroelectric project. The presenters described on the type of hydroelectric project viz. impoundment and the run-of-the-river type and mentioned on the relative advantages amongst different type of

hydroelectric projects.

During the deliberation Mr. Ishii mentioned on the study conducted by NEA in the year 2001 and the request made by the Government of Nepal to the Government of Japan to carry out upgrading feasibility study. Following the request of Government of Nepal, Government of Japan under the technical assistance of JICA initiated upgrading feasibility study through the mobilization of the study team in 2004. During the study period three numbers of stakeholders' meeting at the local and central levels each shall be conducted by NEA. Mr. Ishii pointed that the objective of the present study is to assess and evaluate the project options in terms of environmental, technical, economic and financial aspects and come up with the best project alternative for implementation. He mentioned that the JICA study will accomplish the study in three different stages with the activities to be undertaken under each of the stages. Three different stages of study include preliminary study stage, detailed investigation stage and upgrading feasibility study stage. Mr. Ishii also mentioned the time period required for the study and the stages to be followed before the initiation of implementation activities under the project. He informed that the present study is scheduled to complete by mid 2007.

Ms. Shimada focused her presentation on the JICA guidelines for environmental and social considerations and provisions of the JICA guidelines. She also briefly mentioned on the objectives, principles and procedures to be adopted for carrying out the studies for the proposed project. Presentations of both experts of the study team are annexed as *Annex 3.*

Mr. Murasire, Project Engineer, JICA Study Team, described on four different alternatives of the project layout considered during the study. The alternatives mainly vary with different configuration of power house, intake structures, penstock, tunnel, tailrace and switchyard. As per the proposition third alternative consists of two options with one option each for the remaining ones. He mentioned that the findings of geological, environmental and hydrological studies will be the basis of comparison to decide the best option project layout. Presentation of Mr. Murasire is annexed as *Annex 4.*

Mr. Jack Procer, Environmentalist and *Ms. Toshiko Shimada*, Sociologist, JICA Study Team presented on details of investigations to be carried out with regard to the natural environment and social environment under the upgrading feasibility of the upper Seti storage hydroelectric project. Both the presenters presented on methodologies of study to be adopted during the accomplishment of the assignment.

Mr. Jack Prosser briefed that the investigation will focus on aspects that help to predict impacts on reservoir water quality, aquatic ecology and fisheries, vegetation and forestry, wildlife resources, topography and land use due to reservoir, downstream impacts of reservoir operations and white-water rafting operations. He also mentioned that the present study includes watershed

management as well. Mr. Procer said that an environmental management and monitoring plan will also be formulated and recommended for implementation. Meanwhile he also mentioned that study will cover initial environmental examination level study on transmission line for a stretch of Damauli to Bharatpur. In addition the study will include a comparative assessment of environmental and social impacts for different alternatives considered during the design of the project.

Ms. Shimada presenting study methodology with regard to social and environmental investigations, mentioned that areas to focus during the period of study include involuntary resettlement, social and cultural aspects, downstream impacts due to release of water and impacts on vulnerable groups. During the period social environmental investigations on transmission line will also be carried out to the extent as mentioned under the natural environment investigations. An environmental management plan will be framed and recommended for implementation. As of the natural environmental investigations, social aspects study will also include a comparative assessment for different alternatives.

Mr. Amar Raj Kaini, Former Member of Parliament, Tanahun, highlighted on the national hydropower generation potential and generated capacity till present. He mentioned on the need to provide electricity facility to the rural inhabitants, which is not being covered yet. Mr. Kaini reiterated on the fact that after the restoration of democracy in 1990, the government provided high priority in infrastructure sector and made significant progress in this regard. But due to political obstruction in the recent years the pace of development was slowed down. In the recent changed context, he was of the opinion that the pace of infrastructure development will again get momentum. Hydropower projects will impart both positive and negative environmental impacts. But the positive environmental impacts will overweigh the negative ones. He suggested the study team to find a combination of project components in such a way that the negative environmental impacts will be kept at minimum level simultaneously by maximizing the positive ones. He further suggested to workout a realistic plan which will not lead for cost and time over run of the project. He assured to provide full support for the implementation of the project. Lastly, Mr. Kaini thanked the organizer for inviting and providing him an opportunity to say few words about the project.

Mr. Tuk Raj Sigdel, Member of Parliament, Tanahun in his deliberation also pointed to the national hydropower generation potential and the generated capacity till date. He cited the electricity load shedding situation and pointed on the importance of early implementation of the proposed project. He said that the feasibility study phase of project preparation is very vital and the study team is required to com up with a realistic plan which emerges minimum degree of variation during the period of implementation of the project. He reiterated to the need of rural electrification and to provide electricity facility to the people residing in rural settlements of the district. Past experience shows that the locals have not been benefited to the extent that could have been provided by the project. He also

suggested interacting with the local people and getting feedback in order to address their concerns and feelings. He also asked the study team to take into account on grazing land, agricultural land and the relocated people and make provision for alternative mitigation measures. Mr. Sigdel pointed on the potential impacts of GLOF, and earthquake to the dam structure and siltation problem in the reservoir also. He also assured full support for the implementation of the project and thanked the organizer for inviting and providing an opportunity to put his ideas and views with regard to project implementation.

Mr. Govinda Raj Joshi, Member of Parliament, Tanahun, expressing his views mentioned that the common people do not understand the feasibility study and other project preparation activities. However they understand project operation in totality. He also highlighted the total power generation potentiality in the country and the present situation of total power generation. Owing to the national power generation capacity, ever increasing electricity demand and uncovered rural area with the facility he commented that the proposed project development will be highly useful in the sector. He emphasized on the need to maximize the benefit to the local people by the project. Mr. Joshi cited examples of the past and on-going hydroelectric projects especially Kaligandaki-A and middle Marsyangdi with cost and time overrun scenarios and requested the study team to conduct detailed study, which ensures minimum and/or no variations during implementation in the proposed project. During the deliberation Mr. Joshi questioned that why we have not been able to generate electricity at low price adopting cheaper alternative means. He also suggested to draw the real benefit to the local people. These are the areas which in his opinion needs further discussion and requested the team to do so during the period of study. Study findings should prove that the alternative chosen is the best and realistic amongst the alternatives considered. He reiterated that the distribution of revenue should not be limited to the paper only. The distributed revenue should be used for meeting the demands of local people. Mr. Joshi also mentioned that only completion of the project will not fulfill our problem. We need to think for equitable distribution as well. The major thrust of the study needs to be laid on formulating a cheap project, which provides maximum benefit to the local people. Mr. Joshi requested the study team and NEA to develop a model project and assured to support on his behalf as a resident and representative of Tanahun. He also thanked the organizer for inviting in the meeting and providing him an opportunity to say something during the meeting.

Ms. Neera Shrestha, Pradhan, Representative from WWF, Kathmandu Office, raised some environmental concerns with regard to project development and operation. As presented before, it's a category A-type dam under the JICA environment guideline. It is denoted that the environmental impacts will not be limited to only socio economic impacts but also the project will impart impacts on biodiversity. The study team is requested to take account seriously on biodiversity especially on fish species and other biodiversity related matters during the study period. She also pointed that WWF is not against development however she opined that both development and environmental concern

should be taken hand-in- hand. She emphasized on the need of implementation of mitigation measures also. She also mentioned to the need to use revenue on environmental management. She expressed best wishes for the successful implementation of the project.

Dr. Jagadish Chandra Pokharel, sharing his experiences, pointed that we the professionals are very good in collecting data and information however we normally do not emphasize on analysis part seriously. He suggested the study team to be equally serious on analysis and interpretation on impacts envisioned due to the implementation of the project. He cited examples on settlement and associated factors with it. Again he requested to review the lessons learned from the past project and incorporate the ones that have been really been fruitful. He emphasized the need for timely compensation to the project affected families and those people who lose their occupation. Dr. Pokharel also suggested the study team to read the audit reports of earlier EIAs that may help to develop realistic EIA report in this project. Focusing of the reservoir area he mentioned that due to fragile geological conditions bank erosion will be significant. He pointed out that Bhimad area seems to be more vulnerable and needs to be addressed especially. He also mentioned to the need of mitigation measures to minimize impacts on migratory fishes as well. Dr. Pokharel also mentioned that the area is very rich in culture. Especially Magar and Bote ethnic groups are very rich culturally and he requested the study team to provide sufficient time to deal in detail in such issues and come up with pragmatic measures in order to minimize the degree of environmental impacts. Dr. Pokharel suggested the study team to treat issues related to children and old aged people separately. He also reiterated to keep the cost at the minimum level as possible. He thanked NEA and JICA study team for inviting him in the meeting and providing an opportunity to express his ideas and views in the meeting. Dr. Pokharel expressed good wishes for successful implementation of the project.

Mr. Satish Chandra Devkota with the permission of the chairperson opened the floor for discussion.

Mr. Reshmi Raj Dhital, Fishery Expert, Fishery Development Office, Balaju, Kathmandu, doubted on the number of fish species reported in the report is low. In his opinion fish species should be more than 32 in numbers and he said that the number of species varies with the change in season. He requested to conduct studies seriously and also pointed to the need of in-depth study as the river stretch belongs to the fish gene-bank. He reiterated that fish hatchery simply will not be enough and he pointed to make provision of regular outlet for fishes in the river.

Mr. Shiva Dhaudel, Representative Ministry of Agriculture and Cooperatives, put his concern on the additional environmental issues raised under the present studies and incorporation of them in the previous EIA study report that is about to get approval from MOEST. He also pointed out that the discussions could have been more fruitful presenting the issues raised by the local stakeholders during the local level consultation meeting by the organizer.

Following the discussion, Mr. Satish Chandra Devkota, master of ceremony with the permission of the chairperson requested to Mrs. Rajbhandari and the members of JICA study team for clarification in issues raised by the participants.

Mrs. Annu Rajbhandari clarified that environmental impact assessment study conducted by NEA is in accordance with the provision of Environmental Protection Act 2053 and corresponding regulation whereas the present study is being undertaken under the provisions of the JICA guidelines. She assured that the comments made on the draft EIA report submitted to MOEST for approval will be incorporated as per the requirements.

Dr. Toran Sharma, Team Leader, Local Consulting Team clarified issues raised with regard to fisheries and relocation of affected households and assured to consider issues raised by the participants during the period of study.

Ms. Toshiko Shimada Sociologist, JICA study team, presented a summary of issues raised at Damauli consultation meeting. She appreciated the issues raised by the participants and assured them to consider during the study.

After clarification on issues raised by the participants, Mr. Devkota invited the chief guest for his deliberation.

Mr. Ram Chandra Poudel, the Chief Guest, Member of Parliament, started his deliberation offering thanks to the organizer for inviting him and providing him an opportunity to say something with regard to the proposed project. Mr. Poudel, in his remarks mentioned that after the political change in the country the situation has changed and everyone needs to be changed. He requested to control the cost on unnecessary items and keep the project cost to the minimum extent. He also assured that there will be no unnecessary demand with the contractor from the local stakeholders during construction period. He pointed that the cost on construction of luxurious residences and procurement of vehicles can be substantially reduced. He further stressed that the quarter could be rented out in stead of constructing for a short period of time.

He said that the proposed dam site is very appropriate for hydropower generation as it is very narrowed with sparse settlements and less agricultural land area. Bhimad Bazaar is the only densely populated area in the project vicinity and needs protection. Mr. Poudel requested the donor to focus study that support to generate hydroelectricity at cheaper rate. During his deliberation he also pointed out the problems of local people that need to consider during the study. For fish protection and development he suggested using Phewa Lake and Madi River. But he cautioned that the destructive

fishing (explosives and electric shocks) needs to control for sustaining fishes in natural water bodies.

Mr. Poudel suggested to maintain transparency and communication with the people and requested the proponent to regularly interact and disseminate study findings and other project related matters to the stakeholders. Any deficiency in transparency and communication, the people will take action to the defaulters. He assured that after the successful completion project personnel will be felicitated nationally as well as locally. He welcomed the donor in their area and assured full support on behalf of the local stakeholders. Mr. Poudel suggested make provision for free flow of vehicular traffic from dam site in order to provide facility of transport and to mitigate effects envisioned due to the inundation of trail bridges presently located at different locations due to impoundment. Lastly he expressed best wishes for the successful implementation of the project and the participants of the meeting.

Mr. Shiva Chandra Jha, Chief Environment and Social Studies Department, Nepal Electricity Authority delivered the vote of thanks to all participants including the chief guest, Members of Parliament, former Member of Parliament, representatives of donor agencies, government agencies, non-government agencies and participants. He informed that the stakeholder meeting is the first and will be followed by two more meetings each at local and central levels in the future. He also thanked for the active participation of the participants and hoped to be continued in the days to come during the project preparation and implementation phases of project development.

Mr. Bhoj Raj Regmi, the Chairperson, General Manager, Engineering Services, Nepal Electricity Authority in his concluding remarks briefed the project background and the need of the project in the present context. Mr. Regmi informed that the upgrading feasibility study of the project will be completed by early next year. He briefly mentioned on the type of the project and the volume of storage reservoir. He described on the type of artificial reservoir and storage capacity. He told that the proposed storage hydropower project is after Kulekhani project which was also built with the assistance of JICA. The total storage capacity of the reservoir will be of 331 million m^3 which greater than the capacity of Kulekhani reservoir (70 million m^3). Mr. Regmi informed that the EIA study report is already submitted to the Ministry of Environment, Science and Technology for approval and is in a process of approval.

Mr. Regmi during his deliberation informed the participants that the JICA study team will prepare the upgrading feasibility study of the project and is scheduled to complete by mid of 2007. He informed that two more consultation meetings each at the field and central level will be conducted during the study period. He expressed the view that the discussions are very useful and assured that the issues raised here in the meeting will be considered by the study team. Mr. Regmi thanked and expressed his gratitude to all the participants for their participation and cooperation extended in the meeting and

hoped the same level of cooperation in days to come. Lastly he extended his sincere gratitude to JICA for providing assistance to conduct upgrading feasibility study of the proposed project.

List of Invited Institutions/Persons of First Stakeholder Meeting

in Kathmandu

List of Invited Institutions/Persons of First Stakeholder Meeting in Kathmandu

S.No.	Name	Address	Number of Participants
1	Ministry of Environment Science and Technology	Singa Durbar	1
2	Ministry of Water Resource	Singa Durbar	1
3	Department of Electricity Development	Anamnagar	1
4	Ministry of Forest and Soil Conservation	Singa Durbar	1
5	Ministry of Agriculture	Singa Durbar	1
6	Ministry of Land Reform	Babarmahal	1
7	Ministry of Women and Social Welfare	Lainchour	1
8	Fisheries Development Directoriate	Balaju	1
9	IUCN	Bakhundol, Lalitpur, Nepal	1
10	Nepal Forum of Environmental Journalist	Thapathali	1
11	Embassy of Japan	Panipokhari, Kathmandu	0
12	JICA	Pulchok, Lalitpur, Nepal	2
13	JBIC	Mr. Krishna Manandhar, Local Representative, JBIC, Kathmandu. Phone No: 98510-42147 (M), 4422667 ®	0
14	ADB	Kamaladi, Kathmandu, Nepal	1
15	The World Bank	Durbar Marga, Kathmandu, Nepal	1
16	Engineering Association of Nepal	Pulchok	1
17	EIA Association of Nepal	SchEMS	1
18	NGO Federation	Buddha Nagar	1
19	Local NGO Representative	Tanahu	1
20	Water Nepal (Ajay Dixit)	Patan	1
21	NAST	Sadhabato	1
22	Radio Sagarmatha	Babarmahal	1
23	The Kathmandu Post	Tinkune	1
24	The Himalaya Times		1
25	The Raising Nepal	New Road	1
26	IMAGE Channel	Singa Durbar	2
27	Kantipur TV	Tinkune	2
28	JICA Study Team		5
29	NESS Consult		5
30	Project Office		5
31	NEA-ESSD		5
32	Planning NEA		1
33	NORAD	Bakhundol, Lalitpur, Nepal	1
34	KfW	New Baneshwor, Kathmandu	0
35	ICIMOD	Sadhabato, Lalitpur, Nepal	1
36	WWF	Maharajung, Kathmandu	1
37	Winrock International	Bakhundol, Lalitpur, Nepal	1
38	Members of the Parliament from Tanahaun District		3
39	Jagidish Chandra Pokhrel	Kupondel Nepal	1
40	Amar Raj Kaini	Former Member of Parlyament from Tanah	1
41	Ram Chandra Pokhrel	FormerChairman of Tanahaun DDC	1
42	Shyam Bahadur Shrestha	General Manager, NEA	1
43	Shyambhu Prasad Upadhaya	General Manager, NEA	1
44	Balaram Shrestha	General Manager, NEA	1
45	Dipak Upadhayay	Deputi Managing Director, NEA	1
46	Ram Prasad Adhikari	Deputi Managing Director, NEA	1
47	Uttar Kumar Shrestha	Acting Managing Director, NEA	1
48	NEA Directors		9
49	NEA Managers		3
50	NEA-Trade Unions		4
51	Mr. Y. Ozaki	JICA Expert for NEA	1
Total Number of Participants			**82**

Participants Registered in the First Stakeholder Meeting

at Kathmandu, June 7, 2006

Participants Registered in the First Stakeholder Meeting at Kathmandu, June 7, 2006

S.NO	Name	Address	Organization	Occupation	Phone No.	Age	Sex
1	Govinda Raj Joshi	Tanahu	M.P	M.P	4419578		M
2	Lok Man Maikey	NEA	NEA	NEA	4246013	57	M
3	Umesh Rauniyar	Koteshwor	The Rising Nepal	Journalist	9841269563	25	M
4	J.N. Pokharel	MOWCSW	MOWCSW	Government service	4219064	50	M
5	Dhruba Upreti		NEA	Assistant Manager	4227398	45	M
6	J.M.Pradhan	NEA Sys Planing	NEA	Director	4228212	55	M
7	Mrigendra Shrestha	NEA	NEA	NEA	4355836	54	M
8	Shyam Bhandari	NEAEU	NEA	Adm. Office	4228212		M
9	S.P. Upadhpyay	NEA Gen	NEA	occupation	4226370	57	M
10	Kanji Usni	JICA	JICA	Advisor		36	M
11	Harak S. Dhami	Shantinagar	NEA	Research	9841224612	33	M
12	Prabin K. Dhungel	NEA/Planning	Corporate Planning	Engineer	4220449	30	M
13	Ram K. Sharma	NESS	NESS	Socio-economist			M
14	Madan Koirala	NESS	NESS	Ecologist	4244989	49	M
15	Tuka Raj Sigdel	Tanahu	M.P	Social worker	5544083	49	M
16	Dr. Jagadish C. Pokhrel	Tanahu	DRMN	Env. Planning	5521663		M
17	H.K Shrestha	NEA	NEA		4225473	47	M
18	S.S. Rajbhandari	NEA	NEA,SRCL	Engineer	4376860	50	M
19	S.K. Pradhan	NEA	NEA, REDTP	Project coordinator(Director)	482573	55	M
20	R.K. Sharma	NEA	NEA				M
21	V.B.Singh	NEA	NEA/PDD	Chief	4370432	54	M
22	Ganesh Pd. Neupane	Samakhusi	NEA	Job	4231845	35	M
23	Satis Chandra Devkota	NEA-ESSD	NEA	job	4226730	34	M
24	Rajeshwor Sulpy	NEA-PTD	NEA	Service	4228128	49	M
25	Dr. Jivendra Jha	NEA	NEA	Service	4227039	55	M
26	Kumar K.C	Lazimpat	Image Channel	Cameraman	4433141	21	M
27	Shankar R. Pandey		KFW	Rep.	5523228		M
28	Radhesh M. Pradhananga	NEA	NEA	Engineer	4248851	53	M
29	Ram Chandra Poudel		M.P	M.P			M
30	Rajan Baral	FIT Nepal	FIT Nepal	Engineer	2030399	24	M
31	Sunil Dhoubadel		Ministry of Agriculture	Agri-economist	4226050	32	M
32	B.R Regmi	NEA	NEA				M
33	Jagadish	TAnahu			4361644		M
34	Akio Kunahara	JICA Study Team	JICA Study team	Engineer		31	M
35	Jack Prosser	JICA Study Team	JICA Study team	Environmentalist		67	M
36	Toshiko Shimada	JICA Study Team	JICA Study team	Social Development		35	F
37	Sourab Rana	KTM Panipokhari,	JICA Nepal	Program Officer	5552711	36	M
38	Amar Raj Kaini	KTM Panipokhari,	NC(D)	Central C. Member	4452119	56	M
39	Rabindra C	NEA Env. Dept	NEA	Dep Manager	4226730	39	M
40	Thakur Raj Pandey	NEA	NEA	Director	4445642	55	M
41	Shiv Chandra Jha	NEA, ESSD	NEA	Engineer	4226730	53	M
42	R.P. Adhikari	NEA	NEA	DMD	4264779	57	M
43	Y. Ozaki	NEA	JICA Expert		4229648	54	M
44	Shahid Parwez	ADB, KTM	ADB	Economist	4227779	32	M
45	Hari Krisna s	union Democratic	NEA	Service	9841303422	39	M
46	Bikash Sangraula	Kathmandu	The Kathmandu Post	Journalist	4480100	28	M
47	Anu Rajbhandari	NEA	NEA	Engineer	9851033933	44	F
48	Neera S. Pradhan	WWF, Baluwatar	WWF	Fresh Water Officer	4434820	35	F
49	Resham Raj Dhital	Directorate of Fisher	Govt. of Nepal	Chief Prog.	4350662	54	M
50	Shreesti Shakya	Lazimpat	Image Channel	Reporter	4412283	24	F
51	Birendra K. Pathak	NEA,KTM	NEA	Director	4225321	48	M
52	Hiroshi Murasige	JICA Study Team	JICA Study team	Engineer		46	M
53	Hironobu Nishimiya	JICA Study Team	JICA Study team	Engineer		40	M
54	Yoshimasa Ishii	JICA Study Team	JICA Study team	Engineer		53	M
55	T. Sharma	NESS	NESS	Env. Manager	4244989	52	M
56	Arjun Paudel	NESS	NESS	Environmentalist			M

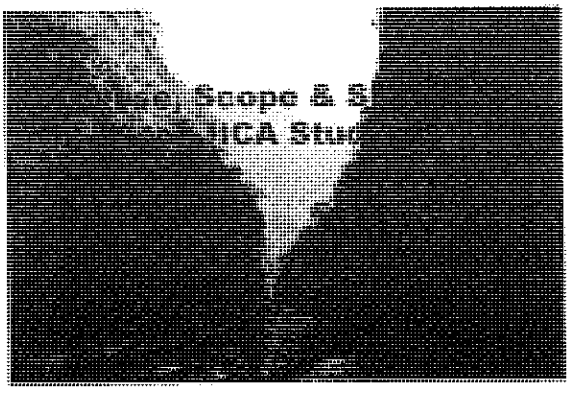
Program Schedule of First Stakeholder Meeting in Kathmandu

Program Scchedule of First Stakeholder Meeting in Kathmandu

- ✧ Chairperson: Managing Director, NEA
- ✧ Master of Ceremony: Mr. Satis Chandra Devkota (NEA staff member)

No.	Time	Hrs	Events	Presenters
	8:30-9:00	0:30	Registration /Tea	
1	9:00-9:15	0:15	Opening address & Background of the Project	NEA
2	9:15-9:30	0:15	Review of EIA conducted by NEA	NEA
3	9:30-9:45	0:15	Overview of the JICA Study (Upgrading Feasibility Study)	JICA Study Team
4	9:45-10:05	0:20	Project Layout under the JICA Study	JICA Study Team
5	10:05-10:25	0:20	EIA Scoping and issues under the JICA Study	JICA Study Team
6	10:25-11:05	0:40	Comments from MOWR, MoEST, MoFSC, DoED and donor agencies	—
7	11:05-12:05	1:00	Discussion	—
8	12:05-12:20	0:15	Vote of thanks	NEA
9	12:20-12:30	0:10	Closing remarks	NEA
10	12:30-13:30	1:00	Lunch	

Presentation Material in Kathmandu



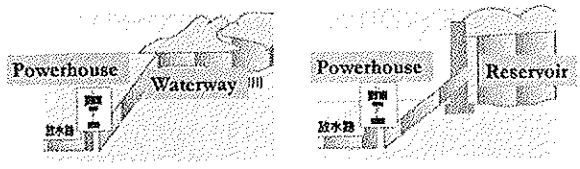
1

Type of Hydropower Plant

- Need Storage Hydropower Plant for Stable Power Supply in Dry Season
- In Dry Season, Run-off River Type Hydropower Plants Decrease Generation Capacity

2

Type of Hydropower Plant



Run-off-River Type　　Storage Type

3

NEA & JICA Study

NEA: Feasibility Study in July 2001
Upgrading F/S in July 2004

Nepalese Gov. —Request→ Japanese Gov.
Technical Assistance by JICA

Stakeholder Meeting: 3 times by NEA with assistance of JICA Team

Purpose of Study

Regarding Upper Seti Hydroelectric Project

- Formulate the optimum plan
- Assess its environmental, technical, economical and financial viabilities

5

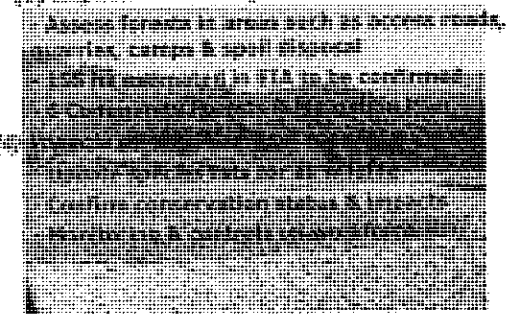
Scope of Study

JICA Study consists the three stage

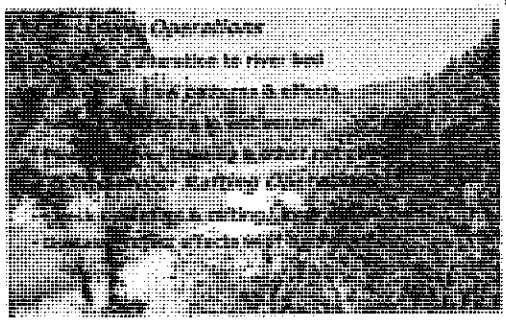
- Preliminary Study Stage
- Detailed Investigation Stage
- Upgrading Feasibility Design Stage

6

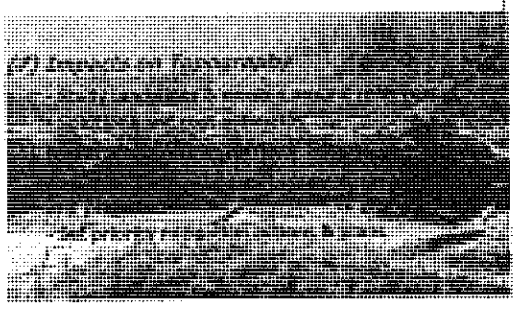
Forestry & Wildlife



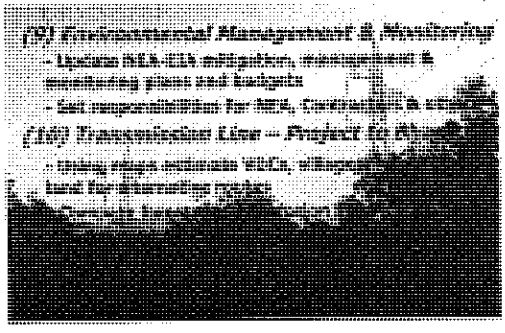
Downstream Impacts



Impacts on Topography & Watershed Management Study



EMMP & Transmission Line



Compare Alternatives- JICA

(11) Comparison of Environmental and Social Impacts of Project Alternatives

- Compare Without Project & Thermal Options
- Compare 5 Alternative layouts via Table as to effects on local natural & social environments
- Emphasize any reservoir erosion and operational period problems eg backwater effects
- Try to minimize & mitigate problems

Social Impacts to be assessed under the JICA Study

Possibly Affected Household

NEA EIA based on field survey in 2001

- 45 houses in Bhimad, Chhan, Jamunem Majhkot, Ranipokahri will be relocated, and 917 ha of land will be acquired.

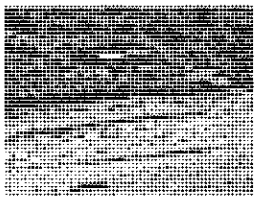
JICA Study in 2006 will investigate

✓How many and which households will be affected?

✓How much the land will be acquired?

JICA Study in 2006 will prepare

✓The framework of **Resettlement Action Plan including mitigation measures**



Possible Loss of Arable Land

NEA EIA based on field survey in 2001

- 162 ha of arable land will be affected.
- The total lost crop production per annum will be 769 tones.

JICA Study in 2006 will investigate

✓How much arable land will be affected?

✓How much crop production will be lost?

JICA Study in 2006 will prepare

✓The framework of **Resettlement Action Plan including mitigation measures**

Possible Loss of Livelihood of Fishermen

NEA EIA based on field survey in 2001

- The livelihood and income of farmers/fishermen families, namely Bhote and Kami living around the riverside villages will be affected.

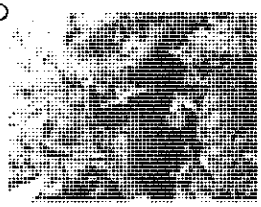
JICA Study in 2006 will investigate

✓How many fishermen families will be affected?

✓How much the livelihood of fishermen families will be lost?

JICA Study in 2006 will prepare

✓The framework of **Social Action Plan including mitigation measures**



Possibly Affected Religious, Historical and Archeological Sites

NEA EIA based on field survey in 2001

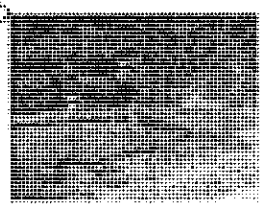
- One small temple on the right bank of Seti River near Bhimad bazzar and three cremation site will be inundated.

JICA Study in 2006 will investigate

✓How much temples and cremation sites will be affected?

JICA Study in 2006 will prepare

✓The framework of **Social Action Plan including mitigation measures**



Possibly Affected Infrastructure

NEA EIA based on field survey in 2001

- Four suspension bridges in Jamune and Chan VDC will be submerged.
- Access tracks to the main highway will be affected.

JICA Study in 2006 will investigate

✓What types of infrastructure will be affected?

✓How many infrastructure will be affected?

JICA Study in 2006 will prepare

✓The framework of **Social Action Plan including mitigation measures**

Construction Impact and Vulnerable Groups

NEA EIA based on field survey in 2001

- HIV/AIDS and other infectious disease are possible impacts of the construction with the influx of workers
- New opportunities may be found in the influx of workers.

JICA Study in 2006 will investigate

✓What will the influx of a large number of workers adversely bring about? (e.g. spread of infectious disease, trafficking, child labors,etc)

✓What type of opportunities will be created?

JICA Study in 2006 will prepare

✓The framework of **Social Action Plan including mitigation measures**

Scope of Study

Preliminary Study Stage

1. Review of existing data & information
2. Preparation of plan on detailed field survey by JICA Team to supplement NEA's investigations

Scope of JICA Study

- Detailed Investigation Stage

1. Field investigations by JICA Team (Mapping, Geology & Environment)
2. Data analysis on investigation results
3. Environmental impact assessment

Scope of JICA Study

- Upgrading Feasibility Design Stage

1. Optimization of development scheme and layout
2. Upgrading feasibility design
3. Project cost estimation
4. Economic & financial analysis
5. Conclusions & Recommendations Including justification of the Project & environmental mitigation measures.

Schedule of Study

Study: started in February 2005
completed in June 2007

Present progress:
Started field investigations by JICA Study Team
(Detailed investigation Stage)

Project Stage:
JICA Study ➡ Detailed Design ➡ Bidding ➡ Construction ➡ Operation

JICA Guidelines for Environmental and Social Considerations

Objectives

- Encourage **the recipient governments** to take appropriate considerations of environmental and social factors
- Incorporate the appropriate environmental and social considerations into **JICA's cooperation** such as *Development Studies, Technical Cooperation Projects, Preliminary Studies of Grant Aid Projects*

JICA Guidelines for Environmental and Social Considerations

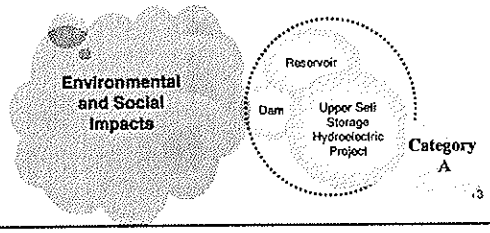
Key Principles

- Consider a **wide range** of environmental and social impacts
- Address environmental and social factors at **early stage** of projects
- Ensure **accountability** and **transparency**
- Involve **stakeholders**
- Disclose **information on environmental and social considerations**

JICA Guidelines for Environmental and Social Considerations

Category A project

- **Dam and Reservoir Projects in the Hydropower** Sector are given "Category A" status.
- Category A projects are likely to have **significant adverse impacts on the environment and society.**



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JICA Guidelines for Environmental and Social Considerations

Category A

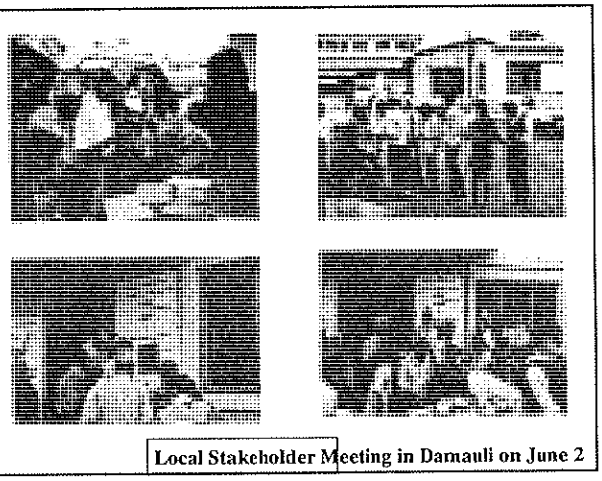
Procedures

1. Prepare draft **EIA scoping**
2. Consult with **local stakeholders regarding draft EIA scoping**
3. Incorporate the feedback into draft EIA scoping and conduct **EIA-level environmental and social studies**
4. Consult with **local stakeholders regarding the results of studies**
5. Incorporate the feedback into the results of studies and prepare the **draft final report**
6. Consult with **local stakeholders regarding the draft final report**
7. Incorporate the feedback and prepare the **final report**
8. Disclose the **final report**

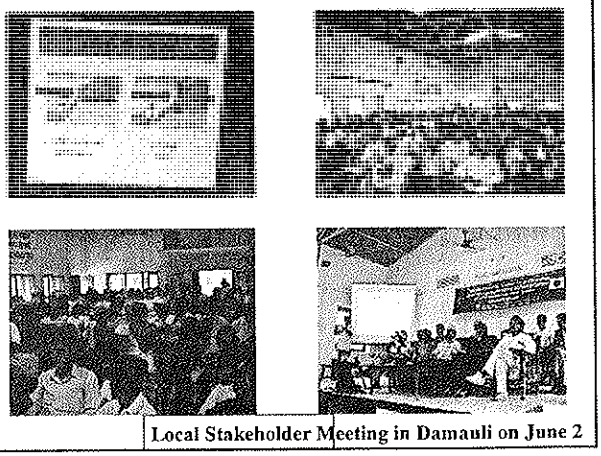
14

Overview of Stakeholder Meetings

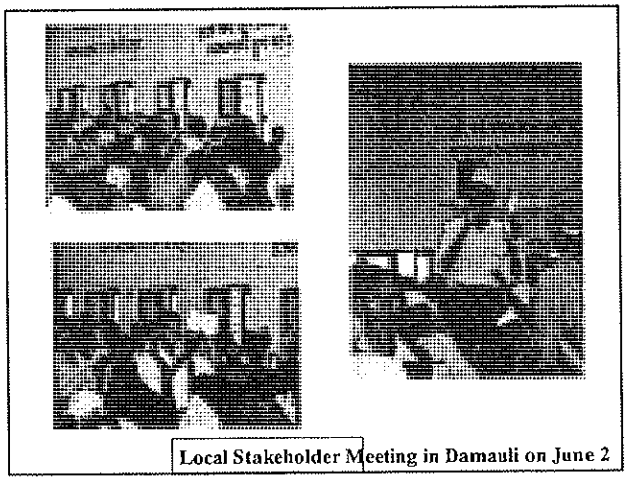
	Tentative Schedule	Venue	Prospective Participants (Number of Participants)		Tentative Main Agenda
①	June-2 Jesth 19	Damauli	Local People Local government Line agencies NGOs/CBOs	(200	•Background, objective, scope and schedule of the Study •Project Layout •JICA guidelines for environmental and social consideration •EIA scoping and issues
	June 7 Jesth 24	Kathmandu	Central government Intellectuals Donor agencies	(50)	
②	November	Damauli	Local People Local government Line agencies NGOs/CBOs	(200	•Necessity of the Project •Examination of alternatives •Layout and scale of the Project •Natural and social environment assessment •Environment management and resettlement plan
	November 2006	Kathmandu	Central government Intellectuals Donor agencies	(50)	
③	February 2007	Damauli	Local People Local government Line agencies NGOs/CBOs	(200	•Preliminary design •Implementation schedule •Project cost and economic analysis •Environmental management and monitoring plans •Resettlement plans •Compensation for the land acquisition
	February 2007	Kathmandu	Central government Intellectuals Donor agencies	(50)	



Local Stakeholder Meeting in Damauli on June 2



Local Stakeholder Meeting in Damauli on June 2

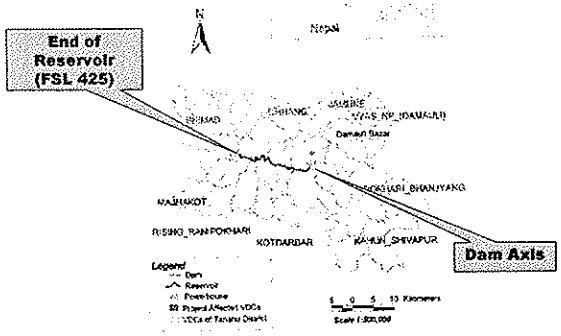


Local Stakeholder Meeting in Damauli on June 2

Lay-Out Study

PROJECT LOCATION

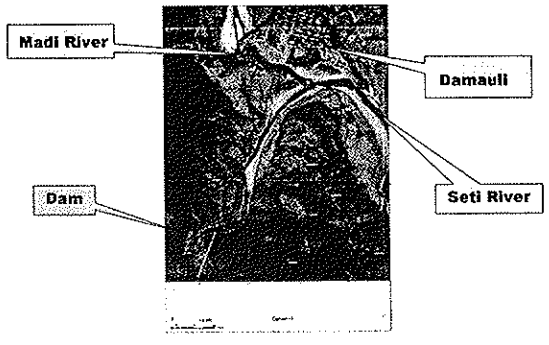
Reservoir Area



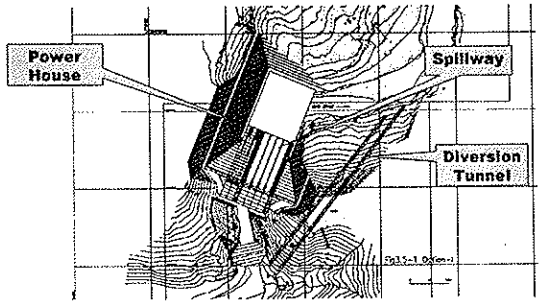
Keys of Layout Options

- Option-I : P/S embeded in Dam
- Option-II : Dam and Waterway with Underground type P/H
- Option-III a : Same as Op-II. Tailrace location is more downstream.
- Option-III b : Another waterway route from Op-III a.
- Option-IV : P/H is located left embankment

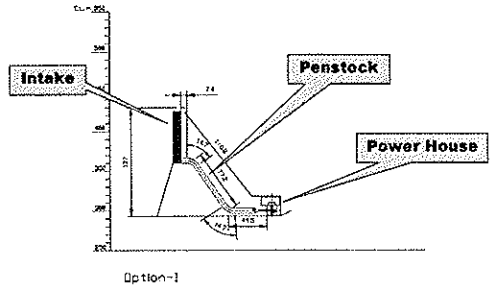
Option-I Birds' eye-View



Option-I General Plan



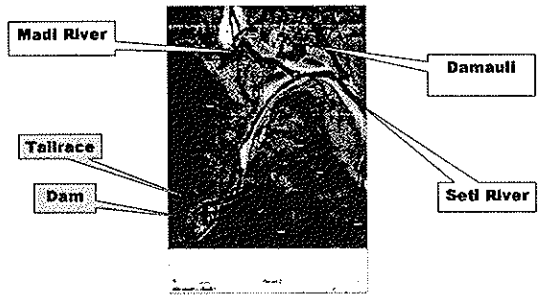
Option-I Vertical Section



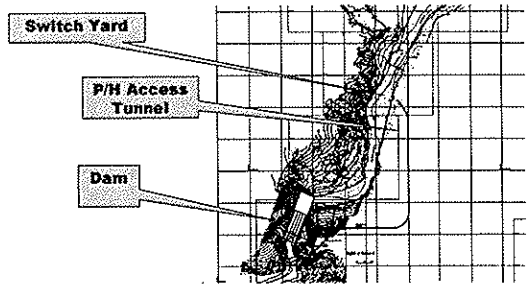
Dam-site from Upstream

Same as Other Options

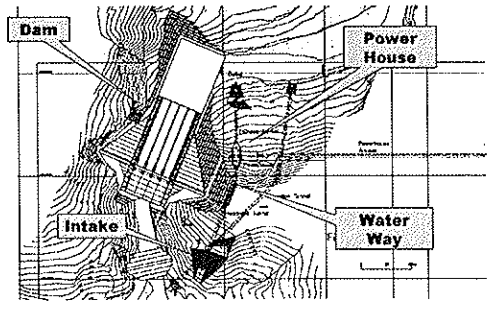
Option-II Birds' eye-View



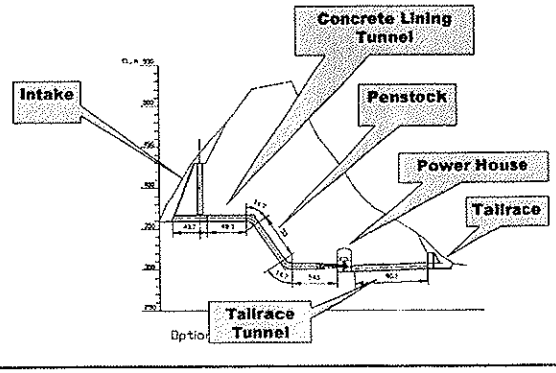
Option-II General Plan



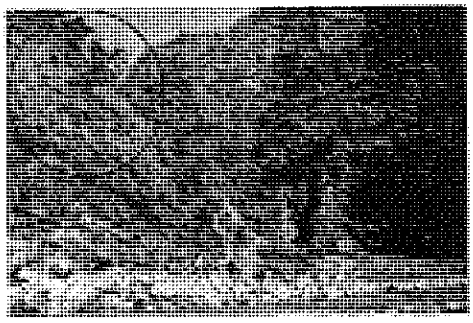
Option-II General Plan 2



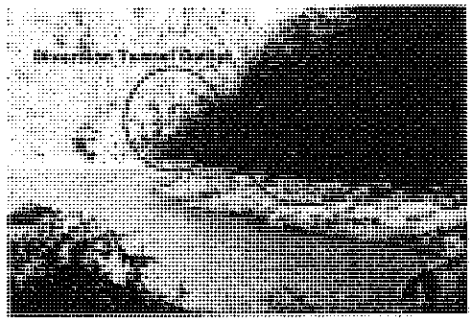
Option -II Vertical Section



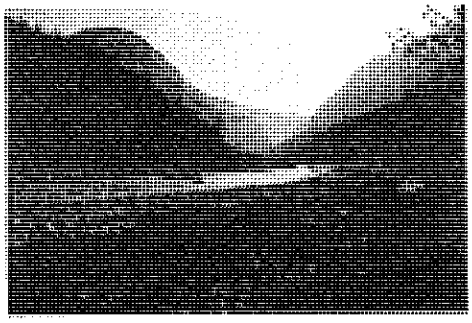
Intake site (Intake of Option-II)



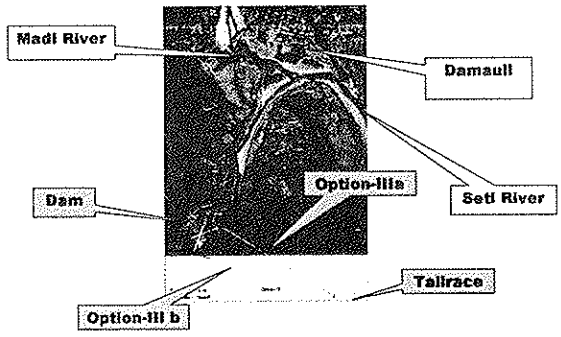
Tailrace Site Area



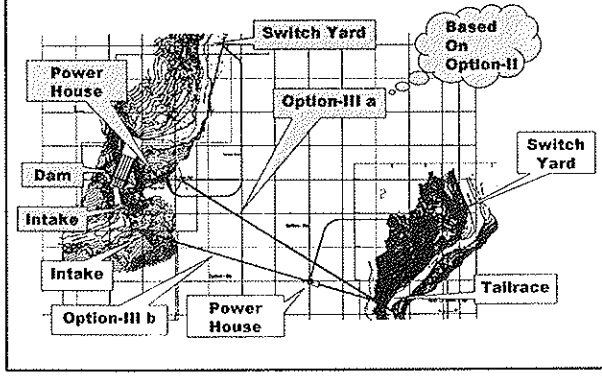
Proposed site for Switchyard and Access tunnel entrance



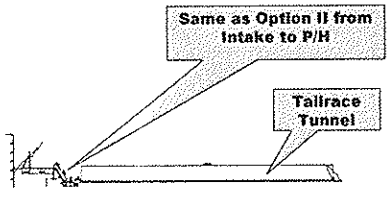
Option-III Birds' eye-View



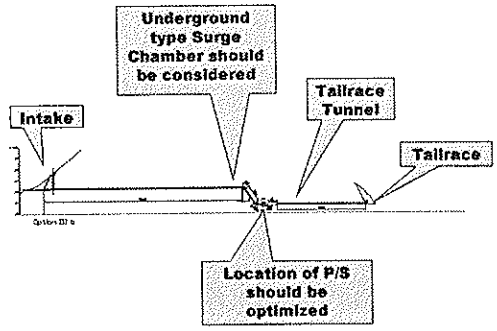
Option-III General Plan



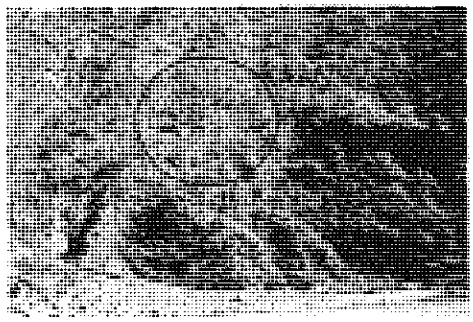
Option-III a Vertical Section



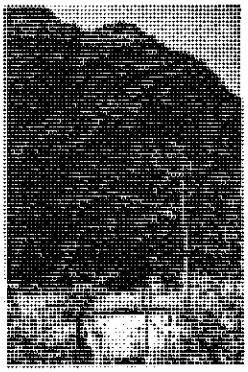
Option-III b Vertical Section



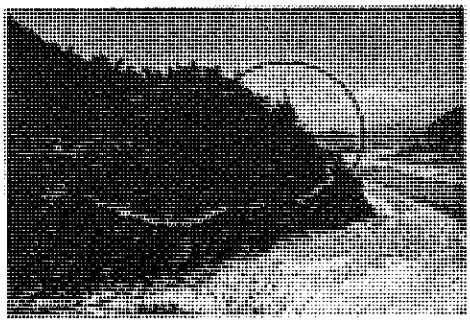
Intake site for Option-III b



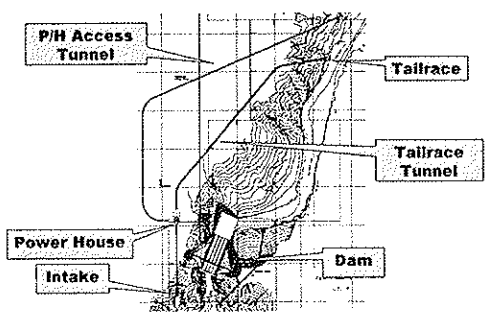
Tailrace Site for Option III b



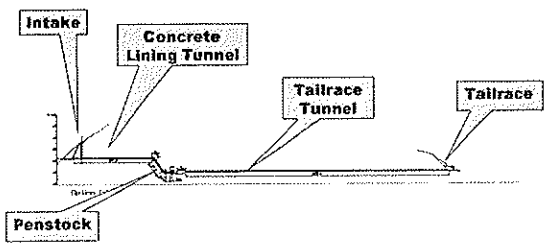
Switch Yard and Access Tunnel Entrance Site for Option III b



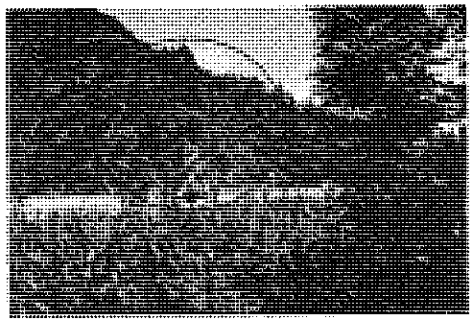
Option-IV General Plan



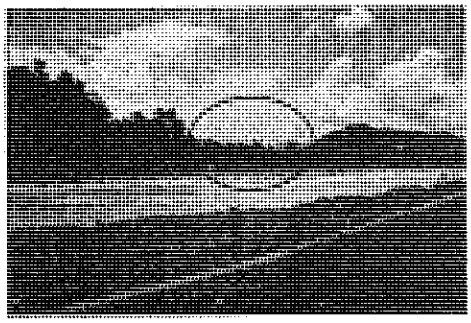
Option-IV Vertical Section



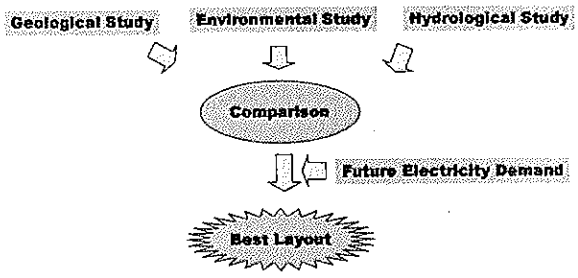
Option-IV Tailrace Site



Option-IV Switch Yard Site



How to decide Layout?



Natural Environmental Investigations

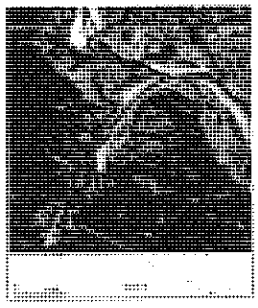
— Draft EIA Scoping under the JICA Study —

GIS Survey & Maps

Watershed and Reservoir Areas

Item	Watershed Area	Reservoir & Works Area - Detailed
Uses of GIS	· Assess conditions of watershed · Basis of watershed management plan · Basis of environmental management & monitoring plans	· Assess forestry and habitats · Assess resource conditions as compared to purpose · Social impact assessments of different reservoir levels · Assessing land losses by land use · Target areas for resettlement sites and prepare basic plans
Coverage area	1,502 km²	120 km² (3 km x 40 km)
Map scale	1:25,000	1:5,000
Satellite images	ASTER	QuickBird
Other maps	· Existing 1:25,000 topographical maps · Geology and soil maps · Forestry & vegetation/ forest maps · Rivers, lakes and stream maps · Land use maps · Erosion hazard maps · Transport infrastructure maps	Cadastral maps
GIS data layers usage analyses	Land use, 20 m contour lines, barren lands, land slides & collapses, glaciers	Land use, 5 m contour lines, rivers and streams, bridges, suspension bridges, roads and tracks, other infrastructures & products
GIS data layers other information	Administrative boundaries, villages, roads, rivers lakes, soil classification	Cadastral data, VDC and ward boundaries, local roads rivers & stream names, villages and other location names existing and proposed infrastructure including project

Examples of Images



Example of Air Photo

1:25,000 Watershed Map

Natural Environment Investigations

- Based on existing EIA Report, discussions with NEA counterparts and JICA Scoping for Supplementary Environmental Surveys will

(1)

- dry

Natural Environment Investigations

(2) Impacts on Aquatic Ecology and Fisheries

- Review of existing EIA
- Additional sampling in rainy season (August) and dry season (October) in reservoir area and upstream and downstream
- Re-evaluate benthic organisms & crustacean fauna
- Assess local fishermen's present use & future options
- Collect data from KGA Project & Begnas Fisheries Research Station (BFRS)
- Revise plans for reservoir fisheries based on catch & transfer, [illegible] catch, stage culture, and institutional strengthening including local Bhote, Kami, Kumar etc

Natural Environment Investigations

(3)Impacts on Vegetation and Forestry

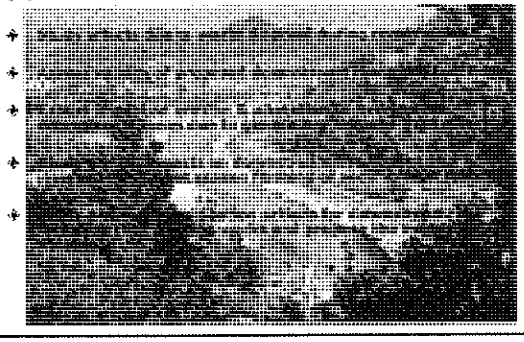
Natural Environment Investigations

(4) Impacts on Wildlife Resources

- Undertake research & investigations into riverine species such as birds, amphibians, reptiles & mammals (e.g. otters)
- Update the wildlife descriptions of existing EIA
- Evaluate associated terrestrial wildlife habitats
- Potential impacts of the Project confirming species and extent of impacts, giving due recognition to their conservation & protected status – CITES & IUCN Redlist
- Revise and document appropriate mitigation and monitoring plans for all wildlife resources
- Emphasize control measures needed for Contractor's employees to protect wildlife resources

Natural Environment Investigations

(5) Downstream Impacts of Reservoir Operations



Natural Environment Investigations

(6) White-water Rafting Operations

- **Confirm the exact number of operators and patterns for affected sector of Seti River**
- **Specify differences in use of Seti River downstream of Damauli to Devighat and any use of Project area**
- **Inform the operators for the proposed stakeholders meetings**
- **Discuss any mitigation measures with Nepal River Conservation Trust (NRCT), which is the "white-water rafting organization" and others**

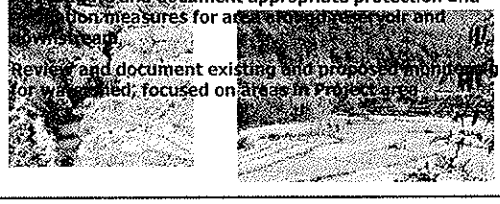
Natural Environment Investigations

(7) Impacts on Topography & Land Use due to Reservoir

Natural Environment Investigations

(8) Watershed Management Study

- **Investigate overall features of the Seti River watershed using GIS maps and other data (e.g. Annapurna Conservation Area)**
- **Identify ecologically sensitive area and prioritize these**
- **Investigate and document appropriate protection and mitigation measures for area around reservoir and downstream**
- **Review and document existing and proposed watershed for watershed, focused on areas in Project area**



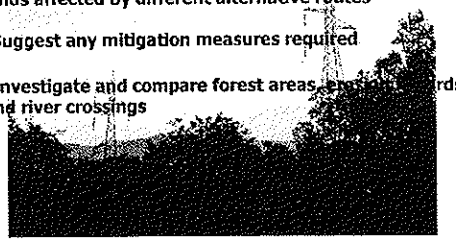
Natural Environment Investigations

(9) Environmental Management & Monitoring

Natural Environment Investigations

(10) Transmission Line -Initial Environmental Evaluation

- Estimate numbers of VDCs, villages, households and lands affected by different alternative routes
- Suggest any mitigation measures required
- Investigate and compare forest areas, [illegible]rds and river crossings



Natural Environment Investigations

(11) JICA Guidelines – Comparison of Environmental & Social Impacts of Alternatives

- Examine the "Without the Project" and the "Thermal Option"
- Compare five (5) alternatives of layout and comment on preferred alternative
- Compare main natural environmental effects
- Compare numbers of affected households with various options and related main social effects
- Review and highlight all social impacts of reservoir erosion and any "backwater effects"

Social and Environmental Investigations

—Draft EIA Scoping under the JICA Study—

1

Social Environmental Investigations

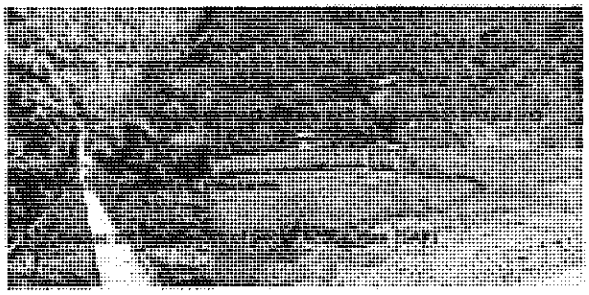
1 Involuntary resettlement

- Estimate **Affected Persons (AP)** in detail by using GIS data based on 1/5000 scale digitized map
- Undertake field surveys regarding the **socioeconomic status of AP**
- Study **compensation for resettlement effects** including specification of houses, assets, area of land, infrastructure and livelihood
- Suggest **candidate resettlement areas** based on GIS study and field surveys
- Refer to **ADB policy on Involuntary Resettlement and other relevant cases of resettlement** in Hydro Electric projects and other projects of Nepal
- Prepare the **framework of Resettlement Action Plan (RAP)'s program** in accordance with JICA guidelines

2

Social Environmental Investigations

2 Impacts on Social and Cultural Aspects



3

Social Environmental Investigations

3 Impacts on Vulnerable Groups

- Assess the adverse impacts of construction with the influx of workers on **vulnerable groups - Dalits, ethnic minorities, women and children.** The adverse impacts include girls trafficking/prostitution, child exploitation, communicable disease and so on.
- Assess the **new opportunities** such as new employment and business opportunities
- Plan **mitigation actions** for these vulnerable groups
- Prepare the **Social Action Plan (SAP)** considering the necessary requirements of such an Ethnic Minorities Development Plan (EMDP)

4

Social Environmental Investigations

4 Downstream Impacts due to Release of the Water

- Assess the impacts of **the downstream area due to discharges** during peaking operations of power generation
- Confirm **any impacts on the Damauli Municipality population** living near the Seti River bank
- Confirm the **impacts on the white-water rafting and kayaking business**
- Suggest the **mitigation measures** such as a siren warning system, fencing, or appropriate community action programs, if required

5

Social Environmental Investigations

5 Transmission Line Route

- Undertake **Initial Environmental Examination**
- Estimate **numbers of VDCs, households and lands** affected by different alternative routes
- Suggest any **mitigation measures** required

6

Social Environmental Investigations

Framework Environmental Management Plan (EMP)

- Summarize **the natural and social environmental impacts** of the Project based on the review of existing EIA and the findings of the Study
- Revise **mitigation and enhancement measures** for natural and social environmental impacts including estimated budget
- Revise and update **the environmental monitoring plan** on natural and social environmental impacts
- Clarify **the roles and responsibility of proposed "Upper Seti Environment Unit"** to implement the environment management plan
- Prepare **the framework of the Environmental Management Plan (EMP)** including updates of the Project

7

Social Environmental Investigations

Comparison of Social Impacts of Alternatives

- Examine **the Without Project** and **the Thermal Power Generation Option**
- Compare **five alternatives of layout and scale of operations, full supply levels** and comment on **preferred alternative**
- Compare **numbers of affected households with various options and related main social effects**
- Review and highlight **all social impacts of reservoir erosion and back water effects**

8

Thank you very much!

9

Minutes of First Stakeholder Meeting in Kathmandu

Minutes of First Stakeholder Meeting in Kathmandu

Project: Upper Seti Storage Hydroelectric Project
Venue: Hotel Malla, Lainchaur, Kathmandu, Nepal
Date: June 7, 2006
Time: 9:15 hrs

The first stakeholders' consultation meeting on the proposed upper Seti storage hydroelectric project under the upgrading feasibility study initiated by the JICA study team was held on 7nd June 2006 in Kathmandu. The meeting was attended by about 60 people representing from different sectoral ministries, donor agencies, non-government organizations, members of parliament, and professionals from project area and people from different walks of life (*Annex 1*).

Mr. Satish Chandra Devkota, Economist, Environment and Social Studies Department of Nepal Electricity Authority was the Master of Ceremony. Mr. Devkota invited following guests to take their seat in the dais.

Mr. Bhoj Raj Regmi, General Manager, Engineering Services, NEA (Chairperson)
Mr. Ramchandra Poudel, Member of Parliament, Tanahun (Chief Guest)
Mr. Govinda Raj Joshi, Member of Parliament, Tanahun (Guest)
Mr. Tuk Raj Sigdel, Memebr of Parliament, Tanahun (Guest)
Mr. Amar Raj Kaini, Former Memebr of Parliament, Tanahun (Guest)
Mr. Uttar Kumar Shrestha, Acting Managing Director, NEA
Mr.Shiv Chandra Jha, Director, Environment and Social Studies Department, NEA
Mr. Yoshimasa Ishii, JICA Study Team, Team Leader

The meeting was chaired by Mr. Bhoj Raj Regmi, General Manager, Engineering Services, Nepal Electricity Authority and the chief guest was Mr. Ram Chandra Poudel former Deputy Prime Minister and the Member of Parliament, Tanahun. The meeting proceeded with dissemination of project information and findings of the past studies including environmental impact assessment study conducted by Nepal Electricity Authority and the proposed activities under the upgrading feasibility study to be conducted by the JICA study team followed by deliberations from high dignitaries, open floor discussions, questions and answers with clarification.

Brief account of the deliberation by key persons from the dais is presented below:

Mr. Uttar Kumar Shrestha, Acting Managing Director, Nepal Electricity Authority, is his welcome remarks briefed on the present hydropower generation capacity and informed that 80 percent of the total electricity generation is from hydropower project in Nepal. He highlighted the presently available electricity quantity and compared with the demand and load shedding situation in the country. Mr. Shrestha pointed that the decrease in the power generation during the dry seasons from run-of-the-river power projects has compelled NEA to think and develop a storage type hydropower project, which could augment the short of supply of electricity during the dry seasons of the year. He also

mentioned that after Kulekhani no other hydropower projects are of storage types in Nepal. In this context, the proposed upper Seti storage hydroelectric project seemed to be attractive one. In the year 2001 NEA identified the project and conducted a feasibility study. Based on the study findings, Government of Nepal requested Government of Japan to provide assistance for developing the project in the year 2004. The Government of Japan kindly consent the request of Government of Nepal and initiated upgrading feasibility study of the project through the mobilization JICA study team. He informed that the upgrading feasibility study will be completed by mid of 2007 and hoped that the project will be commissioned in due course of time. Mr. Shrestha is his remarks also pointed out that NEA is very desirous to expand the power distribution by increasing power generation capacity in the country. He advised the study team to incorporate the suggestions made by stakeholders in their study which in his opinion will help to develop a technically feasible, cost effective and socially and environmentally sound project.

Mrs. Annu Rajbhandari, Environmental Engineer, Environment and Social Studies Department, Nepal Electricity Authority presented salient features of the project and environment impact assessment study findings based on the study conducted by Nepal Electricity Authority during the feasibility study phase in 2001. She highlighted on the study area, EIA process adopted, basis of classification of project areas for environmental impact identification and assessment and significant environmental impacts both positive and negative ones to be emerged by the implementation of the project. She categorically briefed on impacts with regard to physical, biological and social, economic and cultural environments and also mentioned on the proposed mitigation measures to minimize and/or to eliminate the environmental impacts. Mrs. Rajbhandari also pointed out on the environmental management plan recommended for implementation by the study during the presentation of the study findings. She assured that the study conducted by NEA in the year 2001 is in compliance with Environmental Protection Act 2053 and corresponding regulations. However she further emphasized on the need for additional in-depth studies with regard to the impacts due to impoundment especially in critically areas and settlements around the reservoir area. Presentation of Annu Rajbhandari is annexed as *Annex 2.*

Mr. Yoshimasa Ishii, JICA Study Team, Team Leader and *Ms. Toshiko Shimada*, Sociologist, JICA Study Team jointly presented the overview of the JICA study and described on the scope of work, objectives and the proposed time period to conduct the upgrading feasibility study of the proposed hydroelectric project. The presenters described on the type of hydroelectric project viz. impoundment and the run-of-the-river type and mentioned on the relative advantages amongst different type of hydroelectric projects.

During the deliberation Mr. Ishii mentioned on the study conducted by NEA in the year 2001 and the request made by the Government of Nepal to the Government of Japan to carry out upgrading feasibility study. Following the request of Government of Nepal, Government of Japan under the technical assistance of JICA initiated upgrading feasibility study through the mobilization of the study team in 2004. During the study period three numbers of stakeholders' meeting at the local and central levels each shall be

conducted by NEA. Mr. Ishii pointed that the objective of the present study is to assess and evaluate the project options in terms of environmental, technical, economic and financial aspects and come up with the best project alternative for implementation. He mentioned that the JICA study will accomplish the study in three different stages with the activities to be undertaken under each of the stages. Three different stages of study include preliminary study stage, detailed investigation stage and upgrading feasibility study stage. Mr. Ishii also mentioned the time period required for the study and the stages to be followed before the initiation of implementation activities under the project. He informed that the present study is scheduled to complete by mid 2007.

Ms. Shimada focused her presentation on the JICA guidelines for environmental and social considerations and provisions of the JICA guidelines. She also briefly mentioned on the objectives, principles and procedures to be adopted for carrying out the studies for the proposed project. Presentations of both experts of the study team are annexed as *Annex 3.*

Mr. Murasire, Project Engineer, JICA Study Team, described on four different alternatives of the project layout considered during the study. The alternatives mainly vary with different configuration of power house, intake structures, penstock, tunnel, tailrace and switchyard. As per the proposition third alternative consists of two options with one option each for the remaining ones. He mentioned that the findings of geological, environmental and hydrological studies will be the basis of comparison to decide the best option project layout. Presentation of Mr. Murasire is annexed as *Annex 4.*

Mr. Jack Procer, Environmentalist and *Ms. Toshiko Shimada*, Sociologist, JICA Study Team presented on details of investigations to be carried out with regard to the natural environment and social environment under the upgrading feasibility of the upper Seti storage hydroelectric project. Both the presenters presented on methodologies of study to be adopted during the accomplishment of the assignment.

Mr. Jack Prosser briefed that the investigation will focus on aspects that help to predict impacts on reservoir water quality, aquatic ecology and fisheries, vegetation and forestry, wildlife resources, topography and land use due to reservoir, downstream impacts of reservoir operations and white-water rafting operations. He also mentioned that the present study includes watershed management as well. Mr. Procer said that an environmental management and monitoring plan will also be formulated and recommended for implementation. Meanwhile he also mentioned that study will cover initial environmental examination level study on transmission line for a stretch of Damauli to Bharatpur. In addition the study will include a comparative assessment of environmental and social impacts for different alternatives considered during the design of the project.

Ms. Shimada presenting study methodology with regard to social and environmental investigations, mentioned that areas to focus during the period of study include involuntary resettlement, social and cultural aspects, downstream impacts due to release of water and impacts on vulnerable groups. During the period social environmental

investigations on transmission line will also be carried out to the extent as mentioned under the natural environment investigations. An environmental management plan will be framed and recommended for implementation. As of the natural environmental investigations, social aspects study will also include a comparative assessment for different alternatives.

Mr. Amar Raj Kaini, Former Member of Parliament, Tanahun, highlighted on the national hydropower generation potential and generated capacity till present. He mentioned on the need to provide electricity facility to the rural inhabitants, which is not being covered yet. Mr. Kaini reiterated on the fact that after the restoration of democracy in 1990, the government provided high priority in infrastructure sector and made significant progress in this regard. But due to political obstruction in the recent years the pace of development was slowed down. In the recent changed context, he was of the opinion that the pace of infrastructure development will again get momentum. Hydropower projects will impart both positive and negative environmental impacts. But the positive environmental impacts will overweigh the negative ones. He suggested the study team to find a combination of project components in such a way that the negative environmental impacts will be kept at minimum level simultaneously by maximizing the positive ones. He further suggested to workout a realistic plan which will not lead for cost and time over run of the project. He assured to provide full support for the implementation of the project. Lastly, Mr. Kaini thanked the organizer for inviting and providing him an opportunity to say few words about the project.

Mr. Tuk Raj Sigdel, Member of Parliament, Tanahun in his deliberation also pointed to the national hydropower generation potential and the generated capacity till date. He cited the electricity load shedding situation and pointed on the importance of early implementation of the proposed project. He said that the feasibility study phase of project preparation is very vital and the study team is required to com up with a realistic plan which emerges minimum degree of variation during the period of implementation of the project. He reiterated to the need of rural electrification and to provide electricity facility to the people residing in rural settlements of the district. Past experience shows that the locals have not been benefited to the extent that could have been provided by the project. He also suggested interacting with the local people and getting feedback in order to address their concerns and feelings. He also asked the study team to take into account on grazing land, agricultural land and the relocated people and make provision for alternative mitigation measures. Mr. Sigdel pointed on the potential impacts of GLOF, and earthquake to the dam structure and siltation problem in the reservoir also. He also assured full support for the implementation of the project and thanked the organizer for inviting and providing an opportunity to put his ideas and views with regard to project implementation.

Mr. Govinda Raj Joshi, Member of Parliament, Tanahun, expressing his views mentioned that the common people do not understand the feasibility study and other project preparation activities. However they understand project operation in totality. He also highlighted the total power generation potentiality in the country and the present situation of total power generation. Owing to the national power generation capacity, ever

increasing electricity demand and uncovered rural area with the facility he commented that the proposed project development will be highly useful in the sector. He emphasized on the need to maximize the benefit to the local people by the project. Mr. Joshi cited examples of the past and on-going hydroelectric projects especially Kaligandaki-A and middle Marsyangdi with cost and time overrun scenarios and requested the study team to conduct detailed study, which ensures minimum and/or no variations during implementation in the proposed project. During the deliberation Mr. Joshi questioned that why we have not been able to generate electricity at low price adopting cheaper alternative means. He also suggested to draw the real benefit to the local people. These are the areas which in his opinion needs further discussion and requested the team to do so during the period of study. Study findings should prove that the alternative chosen is the best and realistic amongst the alternatives considered. He reiterated that the distribution of revenue should not be limited to the paper only. The distributed revenue should be used for meeting the demands of local people. Mr. Joshi also mentioned that only completion of the project will not fulfill our problem. We need to think for equitable distribution as well. The major thrust of the study needs to be laid on formulating a cheap project, which provides maximum benefit to the local people. Mr. Joshi requested the study team and NEA to develop a model project and assured to support on his behalf as a resident and representative of Tanahun. He also thanked the organizer for inviting in the meeting and providing him an opportunity to say something during the meeting.

Ms. Neera Shrestha, Pradhan, Representative from WWF, Kathmandu Office, raised some environmental concerns with regard to project development and operation. As presented before, it's a category A-type dam under the JICA environment guideline. It is denoted that the environmental impacts will not be limited to only socio economic impacts but also the project will impart impacts on biodiversity. The study team is requested to take account seriously on biodiversity especially on fish species and other biodiversity related matters during the study period. She also pointed that WWF is not against development however she opined that both development and environmental concern should be taken hand-in- hand. She emphasized on the need of implementation of mitigation measures also. She also mentioned to the need to use revenue on environmental management. She expressed best wishes for the successful implementation of the project.

Dr. Jagadish Chandra Pokharel, sharing his experiences, pointed that we the professionals are very good in collecting data and information however we normally do not emphasize on analysis part seriously. He suggested the study team to be equally serious on analysis and interpretation on impacts envisioned due to the implementation of the project. He cited examples on settlement and associated factors with it. Again he requested to review the lessons learned from the past project and incorporate the ones that have been really been fruitful. He emphasized the need for timely compensation to the project affected families and those people who lose their occupation. Dr. Pokharel also suggested the study team to read the audit reports of earlier EIAs that may help to develop realistic EIA report in this project. Focusing of the reservoir area he mentioned that due to fragile geological conditions bank erosion will be significant. He pointed out that Bhimad area seems to be more vulnerable and needs to be addressed especially. He

also mentioned to the need of mitigation measures to minimize impacts on migratory fishes as well. Dr. Pokharel also mentioned that the area is very rich in culture. Especially Magar and Bote ethnic groups are very rich culturally and he requested the study team to provide sufficient time to deal in detail in such issues and come up with pragmatic measures in order to minimize the degree of environmental impacts. Dr. Pokharel suggested the study team to treat issues related to children and old aged people separately. He also reiterated to keep the cost at the minimum level as possible. He thanked NEA and JICA study team for inviting him in the meeting and providing an opportunity to express his ideas and views in the meeting. Dr. Pokharel expressed good wishes for successful implementation of the project.

Mr. Satish Chandra Devkota with the permission of the chairperson opened the floor for discussion.

Mr. Reshmi Raj Dhital, Fishery Expert, Fishery Development Office, Balaju, Kathmandu, doubted on the number of fish species reported in the report is low. In his opinion fish species should be more than 32 in numbers and he said that the number of species varies with the change in season. He requested to conduct studies seriously and also pointed to the need of in-depth study as the river stretch belongs to the fish gene-bank. He reiterated that fish hatchery simply will not be enough and he pointed to make provision of regular outlet for fishes in the river.

Mr. Shiva Dhaudel, Representative Ministry of Agriculture and Cooperatives, put his concern on the additional environmental issues raised under the present studies and incorporation of them in the previous EIA study report that is about to get approval from MOEST. He also pointed out that the discussions could have been more fruitful presenting the issues raised by the local stakeholders during the local level consultation meeting by the organizer.

Following the discussion, Mr. Satish Chandra Devkota, master of ceremony with the permission of the chairperson requested to Mrs. Rajbhandari and the members of JICA study team for clarification in issues raised by the participants.

Mrs. Annu Rajbhandari clarified that environmental impact assessment study conducted by NEA is in accordance with the provision of Environmental Protection Act 2053 and corresponding regulation whereas the present study is being undertaken under the provisions of the JICA guidelines. She assured that the comments made on the draft EIA report submitted to MOEST for approval will be incorporated as per the requirements.

Dr. Toran Sharma, Team Leader, Local Consulting Team clarified issues raised with regard to fisheries and relocation of affected households and assured to consider issues raised by the participants during the period of study.

Ms. Toshiko Shimada Sociologist, JICA study team, presented a summary of issues raised at Damauli consultation meeting. She appreciated the issues raised by the participants and assured them to consider during the study.

After clarification on issues raised by the participants, Mr. Devkota invited the chief guest for his deliberation.

Mr. Ram Chandra Poudel, the Chief Guest, Member of Parliament, started his deliberation offering thanks to the organizer for inviting him and providing him an opportunity to say something with regard to the proposed project. Mr. Poudel, in his remarks mentioned that after the political change in the country the situation has changed and everyone needs to be changed. He requested to control the cost on unnecessary items and keep the project cost to the minimum extent. He also assured that there will be no unnecessary demand with the contractor from the local stakeholders during construction period. He pointed that the cost on construction of luxurious residences and procurement of vehicles can be substantially reduced. He further stressed that the quarter could be rented out in stead of constructing for a short period of time.

He said that the proposed dam site is very appropriate for hydropower generation as it is very narrowed with sparse settlements and less agricultural land area. Bhimad Bazaar is the only densely populated area in the project vicinity and needs protection. Mr. Poudel requested the donor to focus study that support to generate hydroelectricity at cheaper rate. During his deliberation he also pointed out the problems of local people that need to consider during the study. For fish protection and development he suggested using Phewa Lake and Madi River. But he cautioned that the destructive fishing (explosives and electric shocks) needs to control for sustaining fishes in natural water bodies.

Mr. Poudel suggested to maintain transparency and communication with the people and requested the proponent to regularly interact and disseminate study findings and other project related matters to the stakeholders. Any deficiency in transparency and communication, the people will take action to the defaulters. He assured that after the successful completion project personnel will be felicitated nationally as well as locally. He welcomed the donor in their area and assured full support on behalf of the local stakeholders. Mr. Poudel suggested make provision for free flow of vehicular traffic from dam site in order to provide facility of transport and to mitigate effects envisioned due to the inundation of trail bridges presently located at different locations due to impoundment. Lastly he expressed best wishes for the successful implementation of the project and the participants of the meeting.

Mr. Shiva Chandra Jha, Chief Environment and Social Studies Department, Nepal Electricity Authority delivered the vote of thanks to all participants including the chief guest, Members of Parliament, former Member of Parliament, representatives of donor agencies, government agencies, non-government agencies and participants. He informed that the stakeholder meeting is the first and will be followed by two more meetings each at local and central levels in the future. He also thanked for the active participation of the participants and hoped to be continued in the days to come during the project preparation and implementation phases of project development.

Mr. Bhoj Raj Regmi, the Chairperson, General Manager, Engineering Services, Nepal Electricity Authority in his concluding remarks briefed the project background and the need of the project in the present context. Mr. Regmi informed that the upgrading feasibility study of the project will be completed by early next year. He briefly mentioned on the type of the project and the volume of storage reservoir. He described on the type of artificial reservoir and storage capacity. He told that the proposed storage hydropower project is after Kulekhani project which was also built with the assistance of JICA. The total storage capacity of the reservoir will be of 331 million m^3 which greater than the capacity of Kulekhani reservoir (70 million m^3). Mr. Regmi informed that the EIA study report is already submitted to the Ministry of Environment, Science and Technology for approval and is in a process of approval.

Mr. Regmi during his deliberation informed the participants that the JICA study team will prepare the upgrading feasibility study of the project and is scheduled to complete by mid of 2007. He informed that two more consultation meetings each at the field and central level will be conducted during the study period. He expressed the view that the discussions are very useful and assured that the issues raised here in the meeting will be considered by the study team. Mr. Regmi thanked and expressed his gratitude to all the participants for their participation and cooperation extended in the meeting and hoped the same level of cooperation in days to come. Lastly he extended his sincere gratitude to JICA for providing assistance to conduct upgrading feasibility study of the proposed project.

Media Coverage of First Stakeholder Meeting

Media Coverage of First Stakeholder Meeting

Published in the national newspaper "The Rising Nepal" 8th June 2006 (English)

The Rising Nepal

THE FIRST AND THE FOREMOST

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No. 6

Experts discuss upgrading of Upper-Seti hydro project

By Our Correspondent

KATHMANDU, June 7: First stakeholder meeting for upgrading feasibility study of the Upper Seti (Damauli) Storage Hydroelectric Project was jointly organised by Nepal Electricity Authority (NEA) and Japan International Cooperation Agency (JICA) Wednesday.

NEA conducted studies on storage type hydropower projects and identified Upper Seti (Damauli) Storage Hydroelectric Project as a potential one. The Government of Nepal requested the Government of Japan to implement an upgraded feasibility study under the technical assistance of JICA.

Recognising the 122 MW capacity in Seti River situated in Tanahun district of western development region, Upgrading Feasibility Study was conducted in the year 2005. The estimated cost of the project was $ 215.13 million.

The Government of Nepal is implementing rural electrification and hydroelectric development projects by using its abundant water resource in the Tenth Plan (2002-2007) to support poverty reduction. Present total installed capacity in Nepal is 614 MW as of July 2005.

Hydropower's share is 90 percent of the total installed capacity, which is 99 percent of annually generated energy. Power demand in the country has been growing approximately at a rate of 8 per cent per annum in the recent ten-year period (1995-2005).

The run-off-river (ROR) type hydropower plants dominate Nepal's hydro capacity. Since the ROR type hydropower plants can only marginally regulate river discharge for power generation, Nepal has been suffering from shortage of power in the dry season. Hence, NEA has considered that it is necessary to develop storage type of hydropower plants which can seasonally regulate river discharge for generation in the period.

The study aims at formulating the optimum plan for development and assessing the technical economical and financial, and environmental viabilities of the project. The study, which was commenced in February, 2005, is to be completed by June 2007.

The NEA including a one-day Public Haring in Damauli on January 2004 conducted an Environmental Impact Assessment (EIA) for the Project. The EIA report has been formally issued and is in the process of review by Ministry of Water Resources (MOWR). After review by MOWR, it will be submitted to the Ministry of Environment, Science and Technology (MOEST) for its approval. This approval is expected to be within 2006 which will complete the formal EIA process for Nepal.

Survey works are presently underway by a NEA consultant on the Project's 220 KV, 45 km transmission line from Damauli to Bharatpur. Initial Environmental Examination will be conducted by the JICA study team. Environmental and Social Studies Department of NEA from late 2006 to early 2007 will carry out a full-scale EIA.

According to the impact assessment on physical environment- the project will permanently acquire total area of 917 ha out of which 162 ha is agriculture land and 230 ha is forest. Peaking discharge will substantially change the natural daily flows from 141 m³/s for six hours in dry season to no flow during remaining hours of the day. The fluctuation of the reservoir water levels of up to 55 m will create increase the existing risk of stability and shoreline erosion (vulnerable areas are Bhimad Bazzar, Risin Patan and Jaruwapani).

Similarly impact assessment on biological environment- site clearing activities at the projects site and creation of reservoir will result in the loss of 460 ha of vegetation consisting 230 ha of forest and 230 ha of shrubland and graybeard areas. Out of 230.5 ha of inundated forestland, 25 ha of good riverian Khair forest, 18 ha Terminalia forest, 40 ha open mixed forest, 142 ha deciduous riverian forest and 5.5 ha sisoo plantation.

Altogether 28 ha of six-community forest will be inundated. Thirty two species of fish found in the Seti River will be affected by the project construction. Compensation flow of 2.4 m³/s will have to be released downstream of the dam during non-peak hours for the survival of aquatic ecosystem.

Likewise impact assessment on socio-economic and cultural environment- the primary adverse environment impact will be from the relocation of 45 households, which will have to be resettled. Approximately 162 ha of agricultural land will be inundated which will lead to loss of crop production, which amounts to 770 tons per year. This will affect another 324 households.

The beneficial impact of the project is- job creation, opening the area to market forces and goods mobility. There are also provisions of electrical power for modernization of industry and services and provision of the revenue benefits as per prevailing market price. Ten- percent share in revenue benefits goes to the respective district.

Speaking at the meeting, Ram Chandra Poudel, former deputy Prime Minister said that as a local resident he would support such a model project but in the changed political context NEA should also change its methodology to work.

"It is shameful for us that living in a county like Nepal which is rich in water but still we are paying high rate for electricity," said Poudel.

He further said that the project must be completed in time and within the allocated budget, unnecessary flow of money and corruption must be checked. He said we must learn from our bitter past before starting the project.

Govinda Rajwoshi, MP and leader of Nepali Congress, said that the project is different than the previous one but mistakes should not be repeated like in the past. He added that the project must provide the benefit to the local people and must compensate the affected people directly and also do the work for uplifting their socio-economic condition.

Dr. Jagadish Chandra Pokherel, former vice chairman of National Planning Commission said that being a local resident he welcomes the project.

"We are good at collecting data but we fail to analyse them to suit our convenience," said Dr. Pokherel.

"Not learning from our past lapses is our greatest weakness." He said that we should think of resettling the affected people as a unit, as a dynamic organ. He also added that the environmental aspects should also be taken under consideration.

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JICA conducts U-Seti feasibility study

KATHMANDU, June 7 (PR)- A team of Japan International Cooperation Agency (JICA) has conducted an upgrading feasibility study of the proposed 122 megawatt Upper Seti project.

In a project stakeholder meeting that took place in Kathmandu Wednesday, the JICA team proposed preliminary layout and design options for the project that will be located in Tanahun district.

Addressing the meet, Shiva Chandra Jha, director of NEA's Environment and Social Study Department, said the government of Japan has indicated support for the project. Similarly, Uttar Kumar Shrestha, acting managing director of Nepal Electricity (NEA) said that Upper Seti is one of the most attractive projects in the 10 feasible projects selected by NEA.

While the JICA team proposed two design options for the project - run of river or storage - NEA has been pushing for the latter as there is only one storage project, Kulekhani, in the country, which was also built under Japanese grant.

The estimated cost of Upper Seti is 215 million dollars. If things go smoothly, construction work should start in 2008 and will take four years to complete.

Experts however pointed out that the project will have a lot of environmental impacts, including inundation of large swathes of land and affect on over 30 species of fish.

Second Stakeholders Meeting

Advance Notification of Second Stakeholders Meeting

in Camauli and Kathmandu

Advance Notification of Second Stakeholder Meeting in Damauli and Kathmandu

1. Public notice published in the national newspaper "Kantipur" 27 November 2006 (Nepali)

माथिल्लो सेती (दमौली) जलाशययुक्त जलविद्युत आयोजनाको

अपग्रेडिङ (Upgrading) सम्भाव्यता अध्ययनका विविध पक्षहरु उपर सरोकारवालाहरुसँग हुने छलफल कार्यक्रममा

सहभागी हुन सम्बन्धि सूचना

पश्चिमाञ्चल विकास क्षेत्रको तनहुँ जिल्ला स्थित सेती नदिमा पहिचान भएको १२२ मेगावाट क्षमताको माथिल्लो सेती (दमौली) जलाशययुक्त जलविद्युत आयोजनाको अपग्रेडिङ (Upgrading) सम्भाव्यता अध्ययन कार्य जापान अन्तेराष्ट्रिय सहयोग नियोग जाईका (JICA) को प्राविधिक सहयोगमा सन् २००५ देखी शुरु गरिएको छ। यस अध्ययनको मूख्य उद्देश्य प्राविधिक, आर्थिक तथा वातावरणीय दृष्टिकोणले उपयुक्त योजना तयार गर्नु हो।

यस आयोजनाको उपग्रडिङ (Upgrading) सम्भाव्यता अध्ययनको क्रममा आयोजनाका विविध पक्षहरु, जस्तै आयोजनाको परिचय, अध्ययनको उद्देश्य, क्षेत्र, कार्यविधि तथा समय तालिका बारे राय सुझाव संकलन गर्न JICA अध्ययन टोलीको सहयोगमा नेपाल विद्युत प्राधिकरणले यहि मिति २०६३।८।१५ गते शुक्रवारको दिन बिहान १०:३० बजे तनहुँ जिल्ला विकास समितिको सभा कक्ष दमौलीमा आयोजनाका सरोकारवालहरुसँग दोस्रो छलफल कार्यक्रमको आयोजना गर्ने भएको छ। यस छलफल कार्यक्रममा सो आयोजनाबाट प्रत्यक्ष प्रभावित हुने तनहुँ जिल्लाका भिमाद बजार, माझकोट, छाङ, रानीपोखरी, जामुने, कोट दरबार र काहुँ शिवपुर गा.वि.स.हरु तथा व्यास नगरपालिका तथा तल्लो तटिय क्षेत्रमा पर्ने पोखरी भञ्ज्याङ गा.वि.स. का सम्बन्धित सबै सरोकारवालाहरु तथा अन्य इच्छुक संघ संस्था तथा व्यक्तिहरुलाई उक्त कार्यक्रममा उपस्थित भई आ-आफ्नो राय सुझाव उपलब्ध गराई.दिनु हुन अनुरोध गरिन्छ। यस सम्बन्धि लिखित राय सुझाव भए निम्न लिखित ठेगानामा पठाउनु सकिने व्यहोरा समेत अनुरोध छ।

आयोजक

वातावरण तथा सामाजिक अध्ययन विभाग
नेपाल विद्युत प्राधिकरण,
अद्वैतमार्ग, काठमाडौं
फोन नं.: ४२२६७३०, ४२५१८४५
फ्याक्स नं.: ४२२५२४८

जापान अन्तराष्ट्रिय सहयोग नियोग (JICA)
C/O जाईका नेपाल कार्यालय
पो.ब.नं.: ४५०, काठमाडौं, नेपाल
कर्मचारी संचय कोष भवन
हरिहर भवन, ललितपुर
फोन नं.: ५५५२७११, फ्याक्स नं.: ५५५२२८४

व्यासनगर तनहुँबाट प्रकाशित दैनिक

पहिलो

अभ्युदय

राष्ट्रिय दैनिक

तनहुँ महोत्सव हाम्रो आधार, आर्थिक-सामाजिक विकासको पूर्वाधार

तनहुँ महोत्सव शुरू हुन अब

२१ दिन बाँकी

माथिल्लो सेती (दगौली) जलाशययुक्त जलविद्युत आयोजनाको

अपग्रेड (Upgrading) सम्भाव्यता अध्ययनका विविध पक्षहरु उपर सरोकारवालाहरुसँग हुने छलफल कार्यक्रममा सहभागी हुने सम्बन्धी सूचना ।

परिचमाञ्चल विकास क्षेत्रको तनहुँ जिल्ला स्थित सेती नदीमा पहिचान भएको १२२ मेगावाट क्षमताको माथिल्लो सेती (दगौली) जलाशययुक्त जलविद्युत आयोजनाको अपग्रेडिङ (Upgrading) सम्भाव्यता अध्ययन कार्य जापान अन्तरराष्ट्रिय सहयोग नियोग जाईका (JICA) को प्राविधिक, आर्थिक तथा वातावरणीय दृष्टिकोणले उपयुक्त योजना तयार गर्नु हो ।

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आयोजक

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फ्याक्स नं. : ४२२५२४८

जापान अन्तरराष्ट्रिय सहयोग नियोग (JICA)
C/O जाईका नेपाल कार्यालय
पो.ब.नं. ४५०, काठमाडौं, नेपाल
कर्मचारी संचय कोष भवन
हरिहर भवन, ललितपुर
फोन नं. : ५५५२७११ फ्याक्स : ५५५२२८४

3- Translation into English for Public notices described 1 and 2 above.

Kantipur National Daily
27th November 2006 (11 Mangsir 2063), Monday

Bhanjyang National Daily, (Published from Vyas Nagar Tanahu)
1 Dec, 2006, Friday (year 25, No: 214) (15 Mangsir 2063)

Notice

For participation of the stakeholders of
Upper Seti (Damauli) Storage Hydroelectric Project
Second Stakeholder Meeting for Upgrading Feasibility Study

Japan International Cooperation Agency (JICA) is conducting Upgrading Feasibility study of the estimated capacity of 122 MW of Upper Seti (Damauli) Storage Hydroelectric Project.. The project is located in Western Developmental region's Tanahu District. The aim of the study is to prepare technically, economically and environmentally feasible project.

With the support of JICA, NEA is going to conduct Second Stakeholder's meeting on 2063/08/15 (1 Dec, 2006), Friday at 10:30 Am in District Development Committee's (DDC's) hall to collect the concerns on different aspects of the upgrading feasibility study. The different aspects of the discussions are: Introduction about the project, Objective of the study, Scope, Working Methodology and the schedule of the study. In this meeting, all the stakeholders of the project are requested to participate. The directly affected project region are Upstream regions : Bhimad Bajar, Majhkot, Chhang, Ranipokhari, Jamune, Kotdurbar and Kahun Shivapur VDCs and Vyas Municipality and Downstream region: Pokhari Bhanjyang. Line agencies and other interested people and organization are also requested to participate in the meeting. Participants are requested to provide their written concerns to the following Address.

Organizer

Environment and Social Study Department
Nepal Electricity Authority
Adwit Marg, Kathmandu
Phone No: 4226730, 4251845
Fax No: 4225248

Japan International Cooperation Agency (JICA)
C/O JICAA Nepal Office
PO Box No: 450, Kathmandu Nepal
Civil Servant Fund Collection Building (Karmachari Sanchaya Kosh Bhawan)
Harihar Bhawan , Lalitpur
Phone No: 5552711
Fax No: 5552284

List of Invited Institutions/Persons of Second Stakeholder Meeting

in Damauli

List of Invited Institutions/Persons of Second Stakeholder Meeting in Damauli

S.No.	Name	Address
1	District Development Committee	Damauli, Tanahaun
2	District Administrative Office	Damauli, Tanahaun
3	District Police Office	Damauli, Tanahaun
4	Women Development Office	Damauli, Tanahaun
5	NGO Federation	Damauli, Tanahaun
6	District Agricultural Office	Damauli, Tanahaun
7	District Forest Office	Damauli, Tanahaun
8	District Public Health Office	Damauli, Tanahaun
9	Six Community Forest Offices	Affected VDCs, Letter were Given through District Forest Office
10	ACAP	Pokhara, Nepal
11	Lee Bird, National Level NGO	Pokhara, Nepal
12	Inland Fisheries Research Center, Nepal Agricultural Research Council (NARC)	Begnas, Pokhara, Nepal
13	Nepali Congress, District Execuative Committee	Damauli, Tanahaun
14	CPNUML, District Executive Committee	Damauli, Tanahaun
15	Nepali Congress Democratic, District Executive Committee	Damauli, Tanahaun
16	Janamorcha Nepal (One of the Communist Party), District Executive Committee	Damauli, Tanahaun
17	Nepal Communist Party Maoist, District Executive Committee	Damauli, Tanahaun
18	Machha Puchere FM	Pokhara, Nepal
19	Bhanjyung National Daily (Newspaper)	Damauli, Tanahaun
20	Reporter, Nepal Samachar Patra	Damauli, Tanahaun
21	Reporter, The Rising Nepal	Damauli, Tanahaun
22	Reporter, Kantipur	Damauli, Tanahaun
23	Reporter, Annapurna Post	Damauli, Tanahaun
24	Journalist Association	Damauli, Tanahaun
25	Reporters Club	Damauli, Tanahaun
26	Consumers Federation	Damauli, Tanahaun
27	Chairman, Civil Society	Damauli, Tanahaun
28	Vyas Municipality	Damauli, Tanahaun
29	Chhan VDC	Chhan
30	Bhimad VDC	Bhimad
31	Rani Pokhari VDC	Rani Pokhari
32	Kot Darbar VDC	Kot Darbar
33	Kahun Shivpur VDC	Kahun Shivpur
34	Secretaries of all the Affected VDCs	Tanahaun
35	Representative of Women Group	Number of Group 13
36	Campus Chief	Bhanu Bhakta Campus, Khairani Tar, Tanahaun
37	Members of the Parliament	3 Persons from Tanahaun District
38	Ministry of Environment, Science and Technology	Singa Durbar, Kathmandu
39	Ministry of Water Resource	Singa Durbar, Kathmandu
40	Department of Electricity Development	Anam Nagar, Kathmandu

Participants Registered in the Second Stakeholder Meeting

at Damauli, December 1, 2006

Participants Registered in the Second Stakeholder Meeting at Damauli, December 1, 2006

SN	Name	Cast	VDC, Ward No	Office/Organization	Occupation	Age	Sex	Contract No.
	Bhimad VDC							
1	Babu Ram Ruyal	Sarki	Bhimad-1		Business	28	M	
2	Bau Bdr. B. K.	Dalit	Bhimad-1	Business		40	M	
3	Bidhisara Rana Magar	Magar	Bhimad-1		Agriculture	48	F	
4	Bishmani Bhandari	Braman	Bhimad		Journalist	59	M	560907
5	Bishnu Bhakta Suvedi	Braman	Bhimad-1		Agriculture	35	M	
6	Bishnu Pd. Gautam	Braman	Bhimad-1		Agriculture	31	M	
7	Buddhi Ram Lamsal	Braman	Bhimad-1		Social Worker	51	M	
8	Chakrapani Suvedi	Braman	Bhimad-1		Agriculture	69	M	
9	Dev Datta Bhandari	Braman	Bhimad-2		Agriculture	42	M	
10	Dhurva Raj Bhandari	Bhandari	Bhimad VDC-2		Staff	25	M	
11	Dol Raj Basyal	Dalit	Bhimad-5		Agriculture	33	M	65570457
12	Ful Maya Sunar		Bhimad-1		Agriculture	30	F	
13	Him Bdr Thapa	Magar	Bhimad-1		Social Worker	56	M	
14	Hom Bdr Baniya	Chhetri	Bhimad-1		Business	83	M	
15	Januka Suvedi	Bhraman	Bhimad-1		Agriculture	60	F	
16	Jyoti Pariyar	Damai	Bhimad-1		Student	22	M	
17	Kamal Kanta Khanal	Bhraman	Bhimad-1		Formal Teacher	73	F	
18	Kazi Man Shrestha	Newar	Bhimad-1		Business	56	M	
19	Kesar Bdr. Sunar		Bhimad-1		Business	45	M	
20	Krishna Aryal	Bhraman	Bhimad-2		Agriculture	33	M	
21	Krishna Bhandari	Bhraman	Bhimad ward no-1		Agriculture	27	M	
22	Krishna Kumar Shrestha	Newar	Bhimad-1	Formal DDC President	Social Worker	58	M	
23	Krishna lal B. K.	Dalit	Bhimad-1	Bhimad Cable Net Wor	Propriter	44	M	
24	Mahendra Bdr. Ale	Magar	Bhimad-1		Agriculture	36	M	
25	Mahendra Resmi	Magar	Bhimad-1		Agriculture	38	M	
26	Maya Magarni	Magar	Bhimad-2		Agriculture	45	F	
27	Mukti Narayan Shrestha	Newar	Bhimad		Agriculture	55	M	
28	Nabin Kumar Shrestha	Newar	Bhimad		Business	31	M	
29	Padha Raj Subedi		Bhimad-1		Business	49	M	
30	Prakash Kalkal	Newar	Bhimad-1		Social Worker	45	M	
31	Prakash Suvedi	Braman	Bhimad-1		Agriculture	28	M	65690417
32	Raju Khanal	Bhraman	Bhimad	Tanahu	Business	31	M	9846064531
33	Renu Khanal	Bhraman	Bhimad-1		Student	25	F	
34	Rup Bdr. Shahi	Newar	Bhimad-1		Social Worker	43	M	
35	Rup Narayan Shrestha	Newar	Bhimad-1	Vision Hotel	Business	42	M	570138
36	Rup Sing Gurung	Gurung	Bhimad		Business	61	M	
37	Santa Bdr Pariyar		Bhimad-1		Business	50	M	
38	Shiva Kumar Shrestha	Newar	Bhimad-1		Business	53	M	
39	Subash Kayastha	Newar	Bhimad-1		Business	43	M	9846025641
40	Suk Bdr. Pariyar		Bhimad-1		Business	43	M	
41	Surya Bhakta Suvedi	Braman	Bhimad		Agriculture	22	M	9846038793
42	Tek Bdr. Kumal	Kumal	Bhimad ward no-1		Agriculture	40	M	
43	Tirtha Lal Shrestha		Bhimad-1		Agriculture	33	M	9846055689
	Chhang VDC							
44	Amrita Shrestha	Newar	chhang-9		Agriculture	60	F	
45	Bijay Gurung	Gurung	chhang-7		Student	18	M	
46	Chitra Bdr. Thapa	Magar	Chaang-4		Agriculture	44	M	
47	Chitra Bdr. Thapa	Magar	chhang-4			44	M	
48	Chundamani Dhakal	Braman	chhang-9		Agriculture	64	M	
49	Dan Bdr Ale	Magar	chhang Chokre-4		Agriculture	58	M	
50	Dan Bdr. Gurung	Gurung	chhang-7		Agriculture	24	M	
51	Dhankali Thapa	Magar	chhang-9		Agriculture	55	M	
52	Dharma Raj Khanal	Bhraman	chhang-Patan-8		Agriculture	59	M	
53	Durga Padhya	Braman	chhang-2			49	M	
54	Gaj Bir Ale	Magar	chhang Chokre-4		Agriculture	62	M	
55	Himal Gurung	Gurung	chhang-7		Student	18	M	
56	Hom Bdr. Gurung	Gurung	chhang-7		Agriculture	55	M	
57	Khadka Bdr. Gurung	Gurung	chhang Jhakash-7		Agriculture	27	M	
58	Kimananda Wagle	Bhraman	chhangpahu			31	M	
59	Lekh Narayan Shrestha	Newar	Chhang-4		Agriculture	63	M	
60	Lekh Narayan Shrestha	Newar	chhang-4			62	M	
61	Man Narayan Shrestha	Newar	chhang-7		Agriculture	44	M	
62	Nanda Bdr. Thapa	Magar	chhang Chowk-4		Agriculture	54	M	
63	Nanda Lal Shrestha	Newar	chhang-7		Business	55	M	
64	Nindra Kala Paudel	Bhraman	chhang-8		Agriculture	70	F	
65	Padam Bdr. Gurung	Gurung	chhang-7		Agriculture	50	M	
66	Padam Kumari Adhikari	Bhraman	chhang-8		Agriculture	60	F	
67	Padam Mani Wagle	Bhraman	chhangpahu		Agriculture	49	M	
68	Purna Bdr		chhang-9		Agriculture	63	M	
69	Ratna Bdr. Pathak	Chhetri	chhang Patan-8		Agriculture	45	M	
70	Som Bahadur Gurung	Gurung	chhang		Agriculture	24	M	
71	Sumel Gurung	Gurung	chhang-7				M	
72	Tara Bdr. Pathak	Chhetri	chhang-8		Technician	40	M	
73	Tara Raj Rana	Magar	chhang-6 Tanahu				M	9846040379
74	Tek Gurung	Gurung	Chhang - 7		Agriculture	53	M	
75	Tirtha Raj Wagle	Wagle	chhang-4				M	
76	Uttar Kumar Gurung	Gurung	chhang Jhakash-7		Agriculture	55	M	
77	Youb Raj Wagle	Braman	chhang-8		Agriculture		M	
78	Chandra Bdr. Gurung	Gurung	Jhakash-7		Agriculture	44	M	
	Jamune VDC							
79	Baal Krishna Gimire	Braman	Jamune-7	Formal VDC	Chairman	42	M	
80	Bal Hari Ghimire	Bhraman	Jamune-6		Agriculture	50	M	
81	Bed Pd. Shrestha	Newar	Jamune		Business	50	M	
82	Bhola Prashad Khanal	Braman	Jamune-7		Agriculture	53	M	

83	Binod Khanal	Braman	Jamune-1		Business	40	M	
84	Bir Bdr. Thapa	Thapa	Jamune-6	Tanahu	Agriculture	34	M	
85	Bishnu Pd Khanal	Brahmin	Jamune-2		Agriculture	55	M	
86	Bishnu Thapa	Magar	Jamune-6		Agriculture	35	M	9846063553
87	Dhan Bdr. Sunar	Sunar	Jamune-5		Farming	32	M	9846024196
88	Dharma Raj	Ghimire	Janume-6			27	M	
89	Dharma raj Ghimire	Braman	Jamune-7	School	Teacher	39	M	9846037462
90	Dhup Bdr. Saru	Magar	Jamune-6		Agriculture	32	M	9846021936
91	Dirga Bdr Thapa	Magar	Jamune-6		Agriculture	60	M	
92	Farak Thapa	Magar	Jamune-1		Agriculture	45	M	
93	Ghanashyam Gimire	Braman	Jamune-7		Agriculture	60	M	6553456
94	Ghirin Bdr. Saru	Magar	Jamune-6		Agriculture	32	M	
95	Govinda Shrestha	Newar	Jamune		Business	31	M	984604314
96	Guru Datta Ghimire	Braman	Jamune-6	Tanahu	Job	31	M	
97	Hari Nath Khanal	Braman	Jamune-1	DDC	Service		M	
98	Hem Chandra Khanal	Braman	Jamune-1		Pension	68	M	9856023590
99	Hum Bdr. B.K	Kami	Jamune-7		Carpenter	45	M	
100	Kalidas Bhattrai	Bhraman	Jamune-7		Teacher	62	M	
101	Kamal Thapa	Magar	Jamune-6		Agriculture	31	M	
102	Lakki Thapa	Magar	Jamune-6		Agriculture	38	F	
103	Laxman Adhikari	Bhraman	Jamune		Social Service	45	M	
104	Madhu Maya Thapa	Magar	Jamune -6		Agriculture	38	F	
105	Mati Khanal	Bhraman	Jamune-2			50	M	
106	Min Raj Gimire	Bhraman	Jamune-6		Agriculture	41	M	
107	Mohan Lal Shresth	Newar	Jamune-6		Agriculture	74	M	
108	Murari Koirala	Braman	Jamune		Teacher	43	M	
109	Narayan Dutta Khanal	Braman	Jamune=2	DDC,Tanahu	Service	56	M	
110	Om Bdr. Thapa	Magar	Jamune-6		Agriculture	43	M	
111	Post Bdr. Malla Thakuri	Thakuri	Jamune-6	Aimi Pharma	MR	45	M	
112	Pradeep Gimire	Braman	Jamune-1			50	M	
113	Purna Bdr Sakh	Nepali	Jamune-1		Agriculture	66	M	
114	Purna Bdr. Ranabhat	Magar	Jamune-3			82	M	9846040338
115	Purna Chandra Sunar	Sunar	Jamune			32	M	
116	Rabi Chandra Pande	Braman	Jamune-7	Hamsha Bahini	Teacher		M	
117	Rabi Chandre Paudel	Braman	Jamune-7		Service	34	M	
118	Rabi Gimire	Braman	Jamune-7	DDC	Driver	26	M	
119	Raghu Nath Khanal	Braman	Jamune -1			35	M	9846064136
120	Rakesh Thapa	Magar	Jamune-6		Agriculture	38	M	9846056818
121	Ram Chandra Gimire	Braman	Jamune-7	Bhanjayang Dally	Journalist	36	M	
122	Rebdi Bdr. Thapa	Magar	Jamune-2		Agriculture	40	M	
123	Santa Kumari Sharu	Thapa Maga	Jamune-6		Agriculture	35	M	560907
124	Shree Bdr. Darlami	Magar	Jamune-6		Agriculture	53	M	9846055944
125	Shree Krishna B.K.	Kami	Jamune-7		Carpenter	43	M	
126	Shree Prasad Shrestha	Newar	Jamune		Social Worker	33	M	
127	Sunita Shrestha	Newar	Jamune -6		Business	24	F	
128	Tej Bdr Thakuri	Chetri	Jamune-6	Social Worker		46	M	
129	Udya Raj Neupane	Braman	Jamune-7		Agriculture	32	M	
130	Upendra Ghimire	Braman	Jamune-7		Agriculture	55	M	
	Majhkot VDC							
131	Bal Krishna Gaire	Braman	Majhkot-7		Agriculture	49	M	
132	Bal Ram Marasini	Bhraman	Majhkot-9		Teacher	45	M	
133	Durga Pd. Gaire	Braman	Majhkot-9		Teacher	34	M	
134	Gopal Pd. Bhandari	Braman	Majhkot-6	University	Lecturer	49	M	
135	Krishna Prasad Gaire	Bhraman	Majhkot-9		Agriculture	50	M	
136	Radha Krishna Bashyal	Braman	Majhkot-9		Agriculture	33	M	
137	Ram Babu Gaire	Braman	Majhkot-9		Agriculture	42	M	
138	Ram Saran Gaire	Braman	Majhkot -3	Janjyoti HSS	Teacher	54	M	
139	Ram Sharan Gaire	Braman	Majhkot	Sarada L.S School	Teacher	48	M	
140	Ramesh Sharma	Braman	Majhkot-9		Agriculture	33	M	
	Rising Ranipokhari VDC							
141	Arjun Pd. Gaire	Braman	Ranipokhari-9		Agriculture	44	M	
142	Baburam Gaire	Braman	Ranipokhari		Agriculture	53	M	
143	Bam Bdr. Tilami	Magar	Ranipokhari-7		Agriculture	34	M	
144	Bhakti Pd. Gaire	Braman	Rani Pokhari-9		Agriculture	60	M	
145	Bir Bdr. B.K	Kami	Ranipokhari-9		Agriculture	47	M	570359
146	Bishnu Bdr. Thapa	Magar	Ranipokhari-9		Agriculture	31	M	
147	Bishnu Hari Gaire Jaise	Bhraman	Rising patan-9		Agriculture	55	M	
148	Bishwa Prakash Sharma	Bhraman	Ranipokhari-9	Deepak Ma.Vi	Teacher	42	M	
149	Chandra Nath Pandit	Braman	Ranipokhari		Service	40	M	
150	Deepak Kumar Shrestha	Newar	Rising patan-9		Student	25	M	
151	Dev Bdr Thapa	Magar	Ranipokhari-7		Agriculture	39	M	
152	Dev Bdr. Thapa	Magar	Ranipokhari-7		Teacher	27	M	
153	Dhan Bdr. Thapa	Magar	Ranipokhari-7		Agriculture	22	M	
154	Dil Bdr Thapa	Magar	Ranipokhari-9		Agriculture	53	M	
155	Diwakar	Bhraman	Ranipokhari-9		Agriculture	51	M	
156	Dul Raj Shrestha	Newar	Ranipokhari-9		Agriculture	52	M	
157	Durga Bdr. Karki	Chhetri	Rising Patan	Nepal Bank Ltd.	Service		M	
158	Gopi Krishna Basyal	Braman	Rising Patan-9	Office	Professional	35	M	9841335656
159	Hari Bamsha Gaire	Braman	Ranipokhari-9		Agriculture	45	M	
160	Hari Kumar Thapa	Magar	Ranipokhari-7		Agriculture	37	M	
161	Hari Maya Suvedi	Bhraman	Rising Patan-9		Agriculture	34	F	
162	Hasta Bahadur Thapa	Magar	Ranipokhari-8		Agriculture	59	M	
163	Janardhan Gaire	Bhraman	Rising-Patan-9		Agriculture	60	M	
164	Jit Bdr. Thapa	Magar	Ranipokhari-7		Agriculture	55	M	
165	Kalika Gaire	Bhraman	Rising Patan-9		Agriculture	62	F	
166	Krishna Pd. Gaire	Braman	Ranipokhari-9		Agriculture	30	M	
167	Lal Bdr. Shrestha	Newar	Ranipokhari-9		Agriculture	50	M	
168	Lal Bdr. Thapa	Magar	Ranipokhari		Agriculture	47	M	
169	Min Bdr.Karki	Chhetri	Rising Patan		Teacher		M	

170	Muna Thapa	Magar	Ranipokhari-7		Agriculture	18	F	
171	Naresh Raj Gaire	Braman	Ranipokhari		Business	35	M	
172	Netra Lal Shrestha	Newar	Rising patan-9		Agriculture	63	M	
173	Nir Kumari Thapa	Magar	Ranipokhari-9		Agriculture	50	F	
174	Padam Bdr. Thapa	Magar	Rising Patan-9		Agriculture	40	M	
175	Prashu Ram Gaire	Braman	Ranipokhari-9		Teacher	37	M	
176	Prem Bdr. Chhetri	Chhetri	Ranipokhari-9		Agriculture	53	M	
177	Pushpa Gaire	Braman	Rising Patan-9		Agriculture	18	M	
178	Pushpa Raj Gaire	Braman	Ranipokhari-9		Agriculture	50	M	560367
179	Raj Kumar Shrestha	Newar	Ranipokhari-8		Agriculture	36	M	
180	Ram Bhgat Sharma	Braman	Rishipatan-9		Agriculture	35	M	
181	Ram Chandra Gaire	Braman	Rishipatan-9		Emplyee	34	M	
182	Ram Nath Suvedi	Braman	Ranipokhari-9	NEA	Service	46	M	561116
183	Rekh Bdr Thapa	Magar	Ranipokhari-9		Agriculture	53	M	
184	Rishi Ram Ale	Magar	Rising Patan-9		Business	38	M	
185	Rok Bdr. Gurung	Gurung	Ranipokhari-9		Agriculture	55	M	
186	Santa B.K	Kami	Rising-Patan-9		Agriculture	57	M	
187	Santa Maya Thapa	Magar	Ranipokhari-9		Agriculture	35	F	
188	Santosh Thapa	Magar	Ranipokhari-9		Agriculture	15	M	
189	Shiva Bdr. Chhetri	Chhetri	Ranipokhari	NCP UML	Agriculture	47	M	
190	Sita Gaire	Bhraman	Rising Patan-9		Agriculture	34	F	
191	Som Pd. Shrestha	Newar	Ranipokhari-9		Agriculture	42	M	
192	Tej Bdr. Thapa	Magar	Ranipokhari-7		Agriculture	37	M	
193	Til Bdr Thapa	Magar	Ranipokhari-7		Agriculture	48	M	
194	Tirtha Raj Gaire	Brahmin	Ranipokhari-9		Agriculture	42	M	
195	Tul Bdr Thapa	Magar	Ranipokhari-9		Agriculture	29	M	
196	Tulasi Shrestha	Newar	Ranipokhari-9		Agriculture	35	M	
197	Uttam Kumar B.K	Kami	Ranipokhari-7		Agriculture	36	M	
	Kot Durbar VDC							
198	Bir Bdr. Thapa	Magar	Kot Durbar-7		Teacher	33	M	
199	Bishnu Bdr. Thapa	Magar	Kot Durbar-7		Agriculture	16	M	
200	Hari Bdr. Thapa	Magar	Kot Durbar-7		Agriculture	51	M	
201	Harka Bdr. Thapa	Magar	Kot Durbar-7			51	M	
202	Harsha Bdr Ale	Magar	Kot Durbar- 2		Agriculture	52	M	
203	Indra Bdr. Ale	Magar	Kot Durbar-6		Teacher	31	M	560161
204	Jhul Bdr. Aale	Magar	Kot Durbar-6		Agriculture	55	M	
205	Khadka Bdr. Ale	Magar	Kot Durbar-7		Agriculture	56	M	
206	Min Bdr. Sharu	Magar	Kot Durbar-7		Agriculture	36	M	
207	Nar Bdr Thapa	Magar	Kot Durbar-7		Agriculture	50	M	
208	Nar Bdr. Thapa	Magar	Kot Durbar-7		Agriculture	56	M	
209	Netra Bdr. Thapa	Magar	Kot Durbar-1	Lima Khola Hydroelectr	Agriculture	5	M	
210	Nil Bdr Thapa	Magar	Kot Durbar-4	Nepali Congress		55	M	560532
211	Padam Bdr. Ale	Magar	Kot Durbar-1	Lima Khola Hydroelectr	Agriculture	45	M	
212	Padam Bdr. Thapa	Magar	Kot Durbar-7		Agriculture	29	M	
213	Purna Bdr. Thapa	Magar	Kot Durbar-7		Business	30	M	065-560941
214	Sir Bdr. Thapa	Magar	Kot Durbar-7		Agriculture	32	M	
215	Surya Thapa	Magar	Kot Durbar-7			57	M	
	Kahun Shivapur VDC							
216	Asha Bdr BK		Kahun-Shivapur-1			48	M	
217	Asis Thapa	Magar	Kahun Shivapur-1		Agriculture	24	M	
218	Baburam Karki	Karki	Kahun Shivapur VDC-4	Kahu VDC	Chairman	53	M	
219	Bal Bdr. Ranabhat	Magar	Kahun shivapur-1		Agriculture	50	M	
220	Baliraya Thapa	Chhetri	Kahun Shivapur		Agriculture	28	M	
221	Balisara Thapa	Magar	Kahun Shivapur-1		Agriculture	20	F	
222	Bam Thapa	Magar	Kahun Shivapur - 2		Agriculture	20	M	
223	Basanta Bdr. Thapa	Magar	Kahun Shivapur-1		Agriculture	33	M	
224	Bhim Kumari Sharu	Magar	Kahun Shivapur-1		Agriculture	39	F	
225	Bhim Nath Paudel	Braman	Kahun Shivapur-7		Agriculture		M	560358
226	Bir Bdr Thapa	Magar	Kahun Shivapur-1		Agriculture	20	M	
227	Bir Bdr Thapa	Magar	Kahun Shivapur-1		Agriculture	63	M	
228	Bisha Ale	Magar	Kahun-Shivapur-1		Agriculture	63	F	
229	Bishnu Parajuli	Braman	Kahun Shivapur-6		Service	22	M	9846065470
230	Bom Bdr. Thapa	Magar	Kahun-Shivapur-1		Agriculture	32	M	
231	Buddhi Bdr. Rana	Magar	Kahun Shivapur-1		Agriculture	52	M	
232	Chakra Bdr Adhikari	Braman	Kahun Shivapur-1	RP	Service	49	M	560509
233	Chij Kumari Thapa	Magar	Kahun-Shivapur-1		Agriculture	45	F	
234	Dhal Bdr. Thapa	Magar	Kahun shivapur-1		Agriculture	25	M	
235	Dhan Bdr. Aale	Magar	Kahun Shivapur -1			29	M	
236	Dhan Kumari Saru	Magar	Kahun-Shivapur-1		Agriculture	36	F	
237	Dhoi Bdr Thapa	Magar	Kahun Shivapur-1		Pension	73	M	
238	Dil Bdr. Aale	Magar	Kahun Shivapur-1			60	M	
239	Dil Bdr. Thapa	Magar	Kahun Shivapur-4		Business	30	M	
240	Durga Bdr. Garja Magar	Magar	Kahun Shivapur -1	Agriculture		42	M	
241	Haribhakta Wagle	Braman	Kahun Shivapur-8	DDC	Service	40	M	560534
242	Hem Thapa	Magar	Kahun Shivapur		Agriculture	33	M	
243	Jagat Bdr Thapa	Magar	Kahun Shivapur-1		Agriculture	44	M	
244	Jit Bdr. Rana	Magar	Kahun Shivapur -1		Agriculture	54	M	
245	Juna Sharu	Magar	Kahun Shivapur-1		Agriculture	35	F	
246	Kamal Thapa	Magar	Kahun Shivapur-1		Agriculture	38	F	
247	Khum Bdr. Thapa	Magar	Kahun Shivapur		Agriculture	20	M	
248	Krishna Ale	Magar	Kahun Shivapur-1		Agriculture	32	M	
249	Krishna Bdr. Ale	Magar	Kahun Shivapur-1	DDC	Service	22	M	
250	Kul Bdr Thapa	Magar	Kahun Shivapur-1	DDC	Service	22	M	
251	Kumari Thapa	Magar	Kahun Shivapur-1		Agriculture	38	F	
252	Laxman Thapa	Magar	Kahun-Shivapur-1		Agriculture	22	M	
253	Madhu Maya Rana	Magar	Kahun Shivapur-1		Agriculture	32	F	
254	Mahadev Thapa	Magar	Kahun Shivapur-1			23	M	
255	Makar Bdr. Thapa	Magar	Kahun Shivapur-1		Agriculture	27	M	
256	Min Bdr. Thapa	Magar	Kahun Shivapur-1		Service	54	M	

257	Mohan Bdr. Ale	Magar	Kahun Shivapur-1		Agriculture	28	M	561708
258	Mohan Sing Garja	Magar	Kahun Shivapur-1		Agriculture	34	M	
259	Nar Bdr. Rana	Magar	Kahun Shivapur-1	DDC	Service	22	M	
260	Om Bdr. Thapa	Magar	Kahun Shivapur -5		Agriculture	49	M	9846065048
261	Om Bdr. Thapa	Magar	Kahun Shivapur-1		Agriculture	58	M	
262	Padam Bdr. Thapa	Magar	Kahun Shivapur-1			23	M	
263	Prem Bdr Ale	Magar	Kahun Shivapur-1		Agriculture	25	M	
264	Prem Kumari Thapa	Magar	Kahun Shivapur-1		Agriculture	35	F	
265	Purni Maya Thapa	Magar	Kahun Shivapur-1		Agriculture	32	F	
266	Rahemaya Sahkhi	Newar	Kahun-Shivapur-1		Agriculture	59	F	
267	Ram Nepali	Sarki	Kahun Shivapur-1		Student	23	M	
268	Ramesh Sigdel	Bhraman	Kahun Shivapur -4		Student		M	
269	Rim Bdr. Pulami	Magar	Kahun Shivapur-1		Agriculture	36	M	
270	Shiva Lal Thapa Magar	Magar	Kahun Shivapur-1		Agriculture	52	M	
271	Shree Prasad Aale	Magar	Kahun Shivapur-1		Agriculture	28	M	
272	Som Bhadur	Bika	Kahun-Shivapur-1		Agriculture	33	M	
273	Som Thapa	Magar	Kahun Shivapur-4		Student	19	M	
274	Somante Aale	Magar	Kahun Shivapur -1		Agriculture	61	M	
275	Tek Bdr Garja	Magar	Kahun Shivapur-1		Agriculture	36	M	
276	Tek Bdr. Acchami	Nepali	Kahun shivapur-1		Agriculture	52	M	
277	Tul Bahadur Ale	Magar	Kahun-Shivapur-1		Agriculture	30	M	561001
278	Yam Bdr. Sabha	Magar	Kahun Shivapur-1		Agriculture	48	M	
279	Yam Bdr. Thapa	Magar	Kahun Shivapur-1		Agriculture	32	M	
280	Yam Maya Thapa	Magar	Kahun Shivapur-1		Agriculture	40	F	
281	Yaman Sing Nepali	Damai	Kahun Shivapur-1		Agriculture	57	M	
282	Krishna Pd Dhital	Braman	Belbas	DDC	Service	48	M	
283	Govinda Acharya	Braman	Belbas	DDC	Service	30	M	
284	Nabin Tiwari	Braman	Belbas		Agriculture	35	M	
285	Bishnu Raj Tiwari	Braman	Belbas-1		Business	32	M	
286	Kesh Bdr. Pariyar	Pariyar	Belbas-1		Service	30	M	
287	Asha Thapa	Magar	Belbas-1		Business	50	F	
288	Krishna Kumari Malla	Thakuri	Belbas-1		Business	55	F	
289	Dan Bdr Malla	Thakuri	Belbas-1		Agriculture	70	M	
290	Indra Bdr. Thapa	Magar	Belbas-1		Agriculture	50	M	
291	Baburam Thapa	Magar	Belbas-1		Agriculture	40	M	
292	Mahindra Bdr.	Thakuri	Belbas-1		Agriculture	59	M	
293	Hem Raj Chanda		Belbas-1		Agriculture	63	M	
294	Jagannath Acharya	Brahmin	Belbas-1		Agriculture	63	M	
295	Bijuli Prasad Tiwari	Brahmin	Belbas-1		Agriculture	51	M	
296	Madhu Man Thapa	Magar	Jhapputar-1		Agriculture	50	M	
297	Purna Bdr. Thapa	Magar	Jhaputar-1		Agriculture	35	M	
	Vyas Municipality							
298	Aausha Shrestha	Newar	Vyas-3			16	F	
299	Amar Raj Lohoni	Braman	Vyas-2		Journalist	25	M	65560931
300	Amrit Bdr. Raut	Chhetri	Vyas-11			31	M	9846040450
301	Amrit Chhetri	Chhetri	Vyas		Agriculture	43	M	
302	Arjun Kumar Shrestha	Newar	Vyas-2		Business	30	M	
303	Arjun Poudel	Braman	Vyas-10		Student	18	M	
304	Arun Kafle	Braman	Vyas-2	Gorkhapatra	Reporter	21	M	560461
305	Babu Ram Koirala	Braman	Vyas-5	DDC	Service	45	M	
306	Baburam		Vyas-10		Business	36	M	
307	Baburam Kafle	Braman	Vyas-10		Business	45	M	
308	Bal Bdr. Chhetri	Chhetri	Vyas-10	District Administration C	Job	27	M	9846043611
309	Barun Poudel	Braman	Vyas -10			26	M	
310	Bhadri Prasad Pandit	Braman	Vyas-2		Agriculture	84	M	
311	Bharat B. K.	Dalit	Vyas-2			31	M	9846065324
312	Bhim Bdr Adhikari	Braman	Vyas-10			31	M	
313	Bhim Bdr. Bote	Bote	Vyas-5		Agriculture		M	
314	Bhim Bdr. Gurung	Gurung	Vyas-11		Formal Indian Army	42	M	
315	Bhoj Raj Parajuli	Braman	Vyas-10		Agriculture	56	M	560928
316	Bhol Ram Bhandari	Newar	Vyas-10		Business	34	M	9846043414
317	Bir Bdr. Thapa	Magar	Vyas-7		Social Worker	32	M	
318	Bishwa Bote	Bote	Vyas-5			40	M	
319	Bishwa Prakash Suvedi	Braman	Vyas-7		Agriculture	24	M	
320	Bom Bdr. Thapa	Chhetri	Vyas-10		Agriculture	50	M	561636
321	Brishpati Dhital	Brahmin	Vyas-2		Agriculture	70	M	
322	Buddha Singh Thapa	Magar	Vyas-10		Business	51	M	
323	Buddhi Kumar Batas	Newar	Vyas-10		Agriculture	73	M	
324	Chandra Bahadur Thapa	Thapa	Vyas. -10	District Administration C	Job	47	M	9846055940
325	Chandra Bdr Kunwar		Vyas-11	Nepal Army	Service	34	M	
326	Chandra Kala Baral	Bhraman	Vyas-10		Agriculture	58	F	65560746
327	Chandra Kumar Shrestha	Newar	Vyas-2		Business	80	M	
328	Chitra Bdr. Magar	Magar	Vyas-7	Shiva Shankar Pra. Vi	Staff	36	M	
329	Chuda Ram Paieda		Vyas-1			49	M	065-61149
330	Dal Bdr. BK	Kami	Vyas-10		Business	67	M	
331	Damodar Bimali	Braman	Vyas-1		Agriculture	56	M	
332	Deepak Ojha	Bhraman	Vyas-11	NEA Tanahu	Staff	28	M	9846043330
333	Dev Niddhi Panta	Panta	Vyas-11 Damauli		Agriculture	62	M	560961
334	Dhan Maya Gauli	Newar	Vyas-10		Business	45	M	
335	Dhan Raj Nepali		Vyas-1		Business	35	M	
336	Dhanu Maya Nepali	Dalit	Vyas-10	Women Development C	Service	38	F	65560142
337	Dhol Bdr. Bauki		Vyas-1		Agriculture	63	M	
338	Dhol Raj Chhetri	Chhetri	Vyas-11		Agriculture	51	M	
339	Dhruba Laudari	Braman	Vyas-2		Student	29	M	9846062115
340	Dhurba Raj Gautum	Braman	Vyas -10		Agriculture	49	M	
341	Dr. Raghu Nath Neupane	Bhraman	Vyas-11	Shrijansil Samajha, Tar	Doctor	59	M	9846043142
342	Durga Bhakta Adhikari	Bhraman	Vyas-1		Agriculture	51	M	
343	Durga Bhakta Wagle	Braman	Vyas -8	Shree Sarawati Priman	Headmaster	40	M	
344	Durga Nidhi Lohani	Bhraman	Vyas-11			51	M	

345	Durga Prasad Pandit	Braman	Vyas -10	District Agricultural Dev	Officer	42	M	
346	Fadindra Aryal	Chhetri	Vyas-8			55	M	560367
347	Fal Bdr Thapa	Magar	Vyas-11		Teacher	40	M	9846055858
348	Hari Bhakta Marasini	Bhraman	Vyas-10		Social Service	61	M	
349	Hari Prasad Kiran		Vyas-1	Vyas Muncipality	Staff	53	M	065-560233
350	Harka Man Shrestha	Newar	Vyas-10		Agriculture	58	M	563437
351	Harkha Man Shrestha	Newar	Vyas ward no -10		Agriculture	58	M	60437
352	Hem Kanta	Braman	Vyas-11			56	M	56560089
353	Hem Paudel	Braman	Vyas-7		Agriculture	44	M	
354	Hira Thapa	Magar	Vyas		Student	27	M	9846027881
355	Hom Raj Thapa	Magar	Vyas-7		Agriculture	53	M	
356	Indira Hadkhale	Chhetri	Vyas-1		Student	24	M	560947
357	Jagat Bahadur	Baniya	Vyas-2			53	M	560841
358	Jaya Bharati Giri	Giri	Vyas-7	DWO	Service	40	F	65560119
359	Jit Bdr. Shrestha	Newar	Vyas -11		Agriculture		M	9846055244
360	Jun Raj Shrestha	Newar	Vyas-2			53	M	9846055655
361	Jyoti Raman Khanal	Braman	Vyas-8		Teacher	40	M	
362	Kamal Gimire	Braman	Vyas-10		Contractor	25	M	
363	Kapil Dev Gyawali	Braman	Vyas-1	REDP	EDO	32	M	
364	Keshar Bdr Thapa	Magar	Vyas-5		Agriculture	65	M	
365	Keshav Wagle	Braman	Vyas-10		Business	36	M	561662
366	Khim Bdr Thapa	Magar	Vyas-8			28	M	9846062007
367	Kopila Mani Paudel	Braman	Vyas-10		Business	57	M	560417
368	Krishna		Vyas-7		Agriculture	48	M	
369	Krishna Basnet	Braman	Vyas-5		Agriculture	21	M	
370	Krishna Bhandari	Chhetri	Vyas-1		Business	42	M	
371	Krishna Dhungana	Braman	Vyas-10		Business	36	M	
372	Krishna Gautam	Braman	Vyas-2	Nepali Congress		49	M	560244
373	Krishna Hari Panta	Bhraman	Vyas-6	Gramin Bikash Sewa		38	M	560159
374	Krishna Narayan Shrestha	Newar	Vyas-7		Contractor	36	M	
375	Krishna Raj Wagle		Vyas-10			54	M	
376	Lal Bdr. Ale	Magar	Vyas-2		Agriculture	70	M	
377	Laxman CK	Chhetri	Vyas-10		Student	20	M	
378	Laxmi Bhakta Khanal	Braman	Vyas-11		Student	23	M	
379	Madan Raj Sharma	Bhraman	Vyas-7		Agriculture	53	M	
380	Madan Wagle	Braman	Vyas -2	Reporters Club, Tanahu	Chairman	28	M	9846026230
381	Madhav Adhikari	Bhraman	Vyas-11			50	M	
382	Mahendra Thapa	Magar	Vyas-7		Agriculture	62	M	
383	Man Ballav Khanal	Braman	Vyas-3		Student	22	M	
384	Man Bdr. Gurung	Gurung	Vyas-1		Agriculture	62	M	561642
385	Mangal Prasad Shrestha	Newar	Vyas-2		Business	61	M	
386	Maya Devi Soti		Vyas-10		literature	39	F	
387	Mira Joshi		Vyas-2		Social Worker	47	F	
388	Mun Bdr.	Darai	Vyas-3	DDC	Service	43	M	560534
389	Nanda Lal Sharma	Bhraman	Vyas-10			55	M	
390	Nar Bdr Rana Magar	Magar	Vyas-7		Agriculture	41	M	
391	Nar Bdr.	Magar	Vyas-2		Agriculture		M	9846043484
392	Nar Bdr. Sharma	Bhraman	Vyas-2		Agriculture	52	M	
393	Nirmal Kafle	Braman	Vyas-2	Tanahu, Aawaj	Reporter	20	M	561007
394	Pabitra Paudel	Bhraman	Vyas-10	Social Worker		48	F	
395	Padam Bdr	Godar	Vyas-2		Agriculture	65	M	
396	Padam Kumar Shrestha	Newar	Vyas -2		Business	57	M	
397	Padam Raj Khanal	Braman	Vyas-4		Student	23	M	
398	Padam Raj Shrestha	Newar	Vyas-8		Agriculture	46	M	560697
399	Parsu Ram Giri	Giri	Vyas-7		Teacher	45	M	9846055231
400	Prakash Chandra Bhattarai	Braman	Vyas-1	INSEC	Service	23	M	65561705
401	Prakash Pariyar		Vyas-5		Student	21	M	
402	Prakash Sharma Oli	Braman	Vyas-2		Student	28	M	9846062066
403	Prem Bdr. B.K		Vyas-5	Shree Chandi Devi	Student	24	M	
404	Prem Bdr. Rana		Vyas-10		Business	50	M	
405	Prem Paudel	Braman	Vyas-10	Lokbani Saptahik	Journalist	35	M	
406	Puja Shrestha	Newar	Vyas-3			19	F	
407	Punya Pd. Paudel	Braman	Vyas	Irrigation Office	Service	50	M	65560114
408	Purna Bdr. B. K		Vyas-9		Agriculture	36	M	
409	Purna Man Shrestha	Newar	Vyas-11		Agriculture	60	M	
410	Purosuttam Kafle	Braman	Vyas-10		Agriculture	64	M	
411	Rabi Chandra Aryal	Braman	Vyas-8			61	M	561306
412	Rabin Paudel	Braman	Vyas-2	RSS	Reporter	21	M	561758
413	Radha Wagle	Bhraman	Vyas-11	Women Development C	Service	30	F	9846043237
414	Raghu Nath Poudel	Braman	Vyas -10	Damauli Hospital	Emplyee	29	M	9846046282
415	Raj Kumar		Vyas-11				M	
416	Raj Kumar Shrestha	Newar	Vyas-1	Ji. Shi. Ka. Tanahu	Job	37	M	9846040463
417	Raj Kumar Shrestha	Newar	Vyas-10	Community Forest Con	Agriculture	49	M	65560975
418	Rajendra Khanal	Braman	Vyas-7		Teacher	39	M	
419	Rajendra Sharma	Braman	Vyas-11	Gandaki Technical	Service	22	M	
420	Rajendra Suvedi	Braman	Vyas-7		Agriculture	30	M	
421	Rajeshwor Hadkhale	Bhraman	Vyas-1		Service	34	M	
422	Ram Chandra Tiwari	Braman	Vyas-2	District Educational Offi	Service	26	M	65560644
423	Ram Kumar Thapa	Magar	Vyas-10		Business	45	M	
424	Ram Nath Bhattarai	Braman	Vyas-2	Human Rights	Service	50	M	
425	Ram Nath Rimal	Braman	Vyas-2			37	M	
426	Ram Prasad Bhattarai	Braman	Vyas-11		Agriculture	64	M	
427	Ramchandra Paudel	Braman	Vyas-2	Nepal Tarun Dal	Member	34	M	9846040408
428	Ramji Laudari	Braman	Vyas-2	Nepal Kishan Song	President	49	M	
429	Ranjit Giri	Bhraman	Vyas-7		Agriculture	66	M	
430	Resham Lal Chhetri	Chhetri	Vyas-10		Business	89	M	
431	Ril Bdr. Rajkoti	Magar	Vyas -2		Business	56	M	
432	Rudra Gurung	Gurung	Vyas-2		Agriculture	63	M	
433	Rudra Narayan Shrestha	Newar	Vyas-9		Agriculture	73	M	

434	Salinam Giri	Giri	Vyas-2			58	M	560507
435	Sambhu Lal Shrestha	Newar	Vyas-10		Business	62	M	490132
436	Samundra Godar	Chhetri	Vyas-4	Nepali Congress Democracy			M	
437	Sangam Sapkota	Bhraman	Vyas -10		Student	31	F	9846062355
438	Santa Bdr. Koirala	Dalit	Vyas-2			28	M	065-560013
439	Santa GC		Vyas-11		Agriculture	40	F	
440	Santi Kumari Bhugel		Vyas-10		Business	45	F	
441	Santosh Wagle	Bhraman	Vyas-1		Student		M	
442	Sarad Raj Khanal		Vyas-8	Shree Deepak Ma. Vi	Teacher	39	M	
443	Sarita Sharma	Bhraman	Vyas-2		Agriculture	41	F	
444	Shankar Bdr. Pande	Chhetri	Vyas-10		Business	40	M	560683
445	Shiva Hari Dhital	Braman	Vyas-2			30	M	065-561551
446	Shree Bdr. Saru	Magar	Vyas-6		Agriculture	42	M	
447	Shree Lal CK	Chhetri	Vyas-10		Student	20	M	
448	Shyam Lal Goseli	Newar	Vyas -2	Business	Social Worker	60	M	
449	Sujit Narayan Shrestha		Vyas-10		Business	30	M	
450	Suresh Ale	Magar	Vyas-7		Student	22	M	561253
451	Suresh Gimire	Braman	Vyas-2		Carpentar	27	M	
452	Surya Bdr. Thapa	Chhetri	Vyas-10		Agriculture	45	M	
453	Surya Bhakta Bhandari	Braman	Vyas-10		Agriculture	46	M	56232
454	Surya Gaire	Braman	Vyas-11	Shree Deepak High Sch	Teacher	39	M	
455	Surya Pd. Kafle	Braman	Vyas-2		Agriculture	65	M	560210
456	Tara Bdr. Thapa	Magar	Vyas-10		Agriculture	58	M	
457	Tej Bdr. Gurung	Gurung	Vyas-1		Agriculture	46	M	
458	Tek Bdr. Gurung	Gurung	Vyas -11		Agriculture	76	M	
459	Thakur Pd. Panta		Vyas-2		Agriculture	63	M	
460	Tikaram Shrestha	Newar	Vyas-10	Hotel	Business	59	M	
461	Til Bdr. Gurung	Gurung	Vyas-2		Agriculture	68	M	
462	Tirtha Pd. Sharam	Braman	Vyas-3		Agriculture	50	M	
463	Tol Bdr. Aale	Magar	Vyas-2		Business	45	M	
464	Top Bdr. Saru	Magar	Vyas-6		Agriculture	59	M	
465	Tribhuwan Shrestha	Newar	Vyas-10				M	9846055272
466	Uma shankar Parel		Vyas-2		Chairman	38	M	
467	Upnil Pande	Chhetri	Vyas-10		Student	28	M	9846024716
468	Vhoj Raj Khanal	Braman	Vyas--7		Agriculture	68	M	560252
469	Yagya Prasad Khanal	Bhraman	Vyas-8		Agriculture	40	M	
470	Yub Raj Nepali		Vyas-11			60	M	
471	Indra Pd. Wagle		Beni Patan		Agriculture	53	M	
472	Ajaya Shrestha	Newar	Patan		Business	48	M	
473	Babu Lal Shrestha	Newar	Patan -7		Agriculture	51	M	
	Pokhari Bhanjyang VDC							
474	Amar Bdr Ale		Pokhari Bjanjayang-1		Agriculture	66	M	
475	Arjun Suvedi	Braman	Pokhari Bhanjayang-1		Student	20	M	
476	Bal Ram Tiwari	Braman	Pokhari Bhanjayang-1		Agriculture	24	M	
477	Bhanu Rana	Magar	Pokhari Bhanjang-1		Student	19	M	
478	Bhishwa Nath Bakila	Braman	Pokhari Bhanjang-1	Nepal Bar Association	lawyer	35	M	
479	Bin Bahadur Sahi		Pakhari-Bhanjhyang		Agriculture	40	M	
480	Chet Bdr. Rana		Pokhari Bjanjayang-1		Agriculture	49	M	560009
481	Dil Bdr Thapa	Magar	Pokhari Bhanjayang-1		Business	32	M	
482	Diwa Satiwari	Bhraman	Pokhari-Bhanjhyang	Belbas Sahakari	Administrator	24	M	
483	Govinda Prasad Neupane		Pokhari Bhanjhang		Agriculture	66	M	
484	Krishna Neupane	Bhraman	Pakhari-Bhanjhyang		Agriculture	34	M	
485	Laxmi Kanta Mishra	Braman	Pokhari Bhanjang -1	Shree Sidha Beni LSS	Headmaster	41	M	
486	Lekh Bdr. Rana	Magar	Pokhari Bhanjayang-	Nepali Congress	Social Worker	48	M	
487	Nabin Tiwari	Bhraman	Pokhari-1		Student	20	M	
488	Nar Bdr. Ramjam		Pokhari Bhanjayang-1		Technician	53	M	
489	Naresh Giri	Giri	Pokhari-Bhanjhyang	Union of Nepal Student	Politician	21	M	
490	Rajendra Bdr Sedhai	Chhetri	Pokhari Bhanjayang-1		Agriculture	28	M	
491	Ram Bdr. Hamal		Pokhari Bhanjayang-1		Agriculture	61	M	9841533374
492	Rekh Bdr Thapa		Pokhari Bjanjayang-1		Business	39	M	065-560337
493	Shak Bdr. Rana	Magar	Pokhari Bhanjang Jal devi		Teacher	43	M	9846055546
494	Sujan Thapa	Magar	Pokhari Bhanjang-1		Student	19	M	9846055196
495	Yam Bahadur Ale	Magar	Pokhari-Bhanjhyang		Agriculture	52	M	
	Others							
496	Bil Bdr. Thapa	Magar	Aapkatar-1		Agriculture	53	M	
497	Mekh Thapa	Magar	Arunodaya		Agriculture	35	M	9846063424
498	Ganesh Thapa	Magar	Bag Gaun			41	M	
499	Adhum Prasad Kafle	Bhraman	Bandipur-2		Agriculture	59	M	
500	Giri Bdr. Thapa	Magar	Bandipur-2		Agriculture	58	M	
501	Tek Bdr. Chhetri	Chhetri	Bandipur-2		Agriculture	52	M	
502	Balkrishna Khatri	Braman	Bar Bhanjayang		Teacher	41	M	
503	Tanka Bahadur B.K		Bhirkot		Agriculture	53	M	
504	Bhok Bdr.	Nepali	Bhirkot		Agriculture	36	M	
505	Gopi Krishna Thapa	Magar	Bhagabatipur-3		Agriculture	53	M	
506	Jukta Raj Wagle		Bhanjhang-1			58	M	
507	Laxmi Pd. Acharya	Braman	Bhanu	Nepali Congress	Agriculture	50	M	
508	Jit Bdr. Gharti	Gharti	Bhanu-3		Agriculture	35	M	
509	Bhupal Tamang		Chowk Chisapani-9		Agriculture	45	M	
510	Tek Bdr. Gurung	Gurung	Keshabtar-8		Agriculture	70	M	
511	Nav Raj Bagale	Braman	Pokharipatan-1	Rural & Alternative (P)	Office Assistant	29	M	065-560573
512	Chan Narayan Shrestha	Newar	Purkot VDC	Purkot VDC	VDC Secretary	46	M	065-529315
513	Thakur Pd. Sigdel	Braman	Raipur	Hamsha Bahini	Teacher	32	M	9846029106
514	Buddhi Man Rana Magar	Magar	Ramjakot-1		Agriculture	28	M	
515	Megha Nath Bastakoti	Braman	Ramjakot-5		Agriculture	37	M	
516	Padam Bdr. Thapa	Magar	Ramjakot-7		Formal Chairman	53	M	
517	Tek Bdr. Thapa	Magar	Ramjakot-7				M	
518	Nok Bdr. B.K	B.K	Ramjhakot-5		Politician	50	M	460134
519	Govinda Paudel		Risti-1		Student	25	M	
520	Lal Bdr. Lama	Lama	Rupakot		Agriculture	70	M	

521	Ram Bdr. BK	Dalit	Rupakot-1		Student	27	M	
522	Pabitra BK	Dalit	Rupakot-1		Teacher	36	F	
523	Bimal Joshi		Rupakot-3		Business	29	M	
524	Mohan Adhikari	Chhetri	Rupakot-4		Agriculture	30	M	
525	Mana Hari Adhikari	Braman	Rupakot-4	DDC	Service	31	M	
526	Hom Bdr. BK	Dalit	Sanga Bhanjayang-3		Agriculture	50	M	
527	Rafique Miya	Miya	Satisuwara-5	Formal VDC	Chairman	41	M	
528	Chiranjivi Kafle	Braman	Shyamgh-8	Nepali Congress			M	
529	Bimala Wagle	Bhraman	Tanahu	Ma.Bi.Ka. Tanahu	Staff	34	F	560142
530	Krishna Bdr. Thapa	Magar				50	M	
531	Buddhi Man Rana	Magar			Agriculture	40	M	
532	Bhim Thapa	Magar			Agriculture	67	M	
533	Shree Krishna Thapa	Magar			Agriculture	39	M	
534	Dipendra Aryal	Bhraman			Teacher	31	M	
535	Burja Bdr. Malla					58	M	
536	Narayan Dhakal	Bhraman		Tanahu	Job		M	
537	Sita Devi Poudel	Bhraman			Business	33	F	9846038322
538	Ram Kumar Shrestha	Newar				35	M	
539	Dhurva Raj Tiwari	Bhraman			Agriculture	35	M	
540	Narayan Kafle	Braman	Kathmandu		Agriculture	45	M	
541	Harishchandra Aryal	Bhraman	Dhorkimi			43	M	9846027123
542	Yam Prasad Bhattarai	Braman	Dorferdi	Sabhar	Social Worker	38	M	9846061582
543	Sabita Rashaeli	Sunar	Dulegauda -8		Teacher	29	F	
544	Gopal Adhikari		Dumre	Nepali Congress	Social Service	52	M	
545	Hom Bdr Thapa	Magar	Faputar		Agriculture	34	M	
546	Pradeep Chumi Magar	Magar	Faputar		Agriculture	19	M	
547	Dibakar Bhandari	Braman	Gajarkot		Student	16	M	
548	Danda Pani Kaini		Ghasikuwa		Agriculture	63	M	
549	Guna Nidhi Sharma	Braman	Ghasikuwa-1			54	M	560367
550	Tilak Kaini	Braman	Ghasikuwa-3		Agriculture	40	M	
551	Padam Raj Lohoni	Braman	Ghasikuwa-4		Agriculture	44	M	65561077
552	Ramji Lamichane	Braman	Gorkha	DWSS	Service	42	M	560110
553	Kedar Sigdel	Bhraman	King-7	Nepal Comuniest Party	District Community	48	M	460134
554	Prabin Raj Aryal	Bhraman	Ktm	Ministry of Water Resou	Job	41	M	4211501
555	Prabin Raj Aryal	Bhraman	KTM	Ministry of Water Resou	staff		M	4211501
556	Chatur Bdr. Shrestha	Newar	KTM	Department of Electricit	Job		M	4480425
557	Tej Kumar Shrestha	Newar	KTM		Consultant	55	M	4279748
558	Lip Bdr. Aale	Magar	Kye VDC	Byabasahi Mancha	Chairman	36	M	9846024635
559	Nav raj Nagila	Braman	Lawyer	Pragatisil Law Form			M	
560	Shankar Babu Baral	Braman	Lekhnath-3		Business	32	M	
561	Dilli Ram Adhikari	Braman	Thaprek	Nepali Congress	Agriculture	54	M	
562	Rudra Narayan Khanal	Braman	Thaprek	Nepali Congress	Agriculture	44	M	60930
563	Uma Kant Acharya		Thaprek	Ne. Ka		27	M	560689
564	Khem Raj Adhikari	Bhraman	Thaprek-1		Agriculture	40	M	
565	Thakur Pd. Paudel		Thaprek-5		Service	43	M	
566	Govinda Raj Joshi				M.P Member		M	
567	Kashi Raj Marashini						M	
568	Bal Bdr. Thapa				Staff	48	M	
569	Raj Bdr. Rahut	Rahut	District Forest Office		Staff	47	M	
570	Damodar Suvedi				Agriculture	54	M	
571	Krishna Giri	Giri			Agriculture	63	M	9846055733
572	Bishnu Prasad Khanal	Bhraman	D.D.C	D.D.C Tanahu		45	M	065-560174
573	Lalan Kundasi	Braman	DDC, Tanahu	DDC, Tanahu	Officer	35	M	
574	Chatur Bdr. Shrestha	Newar	Department of Electric I	Department of Electric I	Job	40	M	4480425
	JICA							
575	Kozuki Kasahori		Jica Tokyo		Jica Staff	30	M	
576	Saukha Rana	Chhetri	KTM	JICA Nepal Office	JICA Staff	37	M	5552711
577	Sayako Tokuda		JICA Team	JICA Nepal Office	JICA Staff	32	M	5552711
	NEA							
578	Bhoj Raj Regmi	Braman	NEA	NEA			M	
579	Bishnu Bdr. Singh	Chhetri	NEA	NEA Kathmandu	Job	53	M	4370432
580	Bishnu Dash Joshi	Newar	Kathmandu	NEA	Engineer	45	M	270252
581	Hari Pandy	Bhraman	NEA	NEA Tanahu	Engineer	34	M	
582	Jagannath Acharya	Braman		NEA	Service	40	M	
583	Narayan Bdr. Khadka	Chhetri	Lalitpur	NEA	Job	45	M	5580374
584	Nashin Man Pradhan	Newar	Kathmandu	NEA	Engineer	37	M	4225411
585	Radesh Man Pradhanga	Newar	Kathmandu	NEA	Engineer	54	M	4243287
586	Rajan Rishi Kandel	Braman	NEA	NEA	Service	37	M	
587	Rajan Rishi Roa	Bhraman	KTM	NEA	NEA/Staff	37	M	491502
588	Shiva Chandra Jha	Braman	Kathmandu	NEA	Engineer	55	M	4279217
589	Umesh Bista		KTM	NEA	NEA/Staff	33	M	
	JICA Study Team							
590	Yoshimasa Ishii		JICA Team		Team Leader		M	
591	Tetsuya Hirahara		JICA Team		Economist		M	
592	Hironobu Nishimiya		JICA Team			40	M	
593	Hiroshi Murashige		Jica Study Team			46	M	
594	Jack Prosser		JICA Team			67	M	
595	Takahira Kato		Kanagwa, Japan	J-POWER	Ditto		M	
596	Tomoo Aoki		Tokyo, Japan	Nippon Koei	JICA Study Team		M	
597	Toshiko Shimeda		Jica Study Team			35	F	
598	Dr. Toran Sharma	Braman	Kathmandu	NESS	Consultant		M	
599	Dr. Madan Koirala	Bhraman	Thapathali	NESS	Consultant	50	M	4244989
600	Mahadev Prasad Jaisi	Bhraman	Thapathali	NESS	Consultant	39	M	4244989
601	Pradeep Poudel	Braman	Kathmandu	NESS		23	M	9841382529
602	Surendra Lamsal	Braman	Kathmandu	NESS			M	

Brochure of Second Stakeholder Meeting

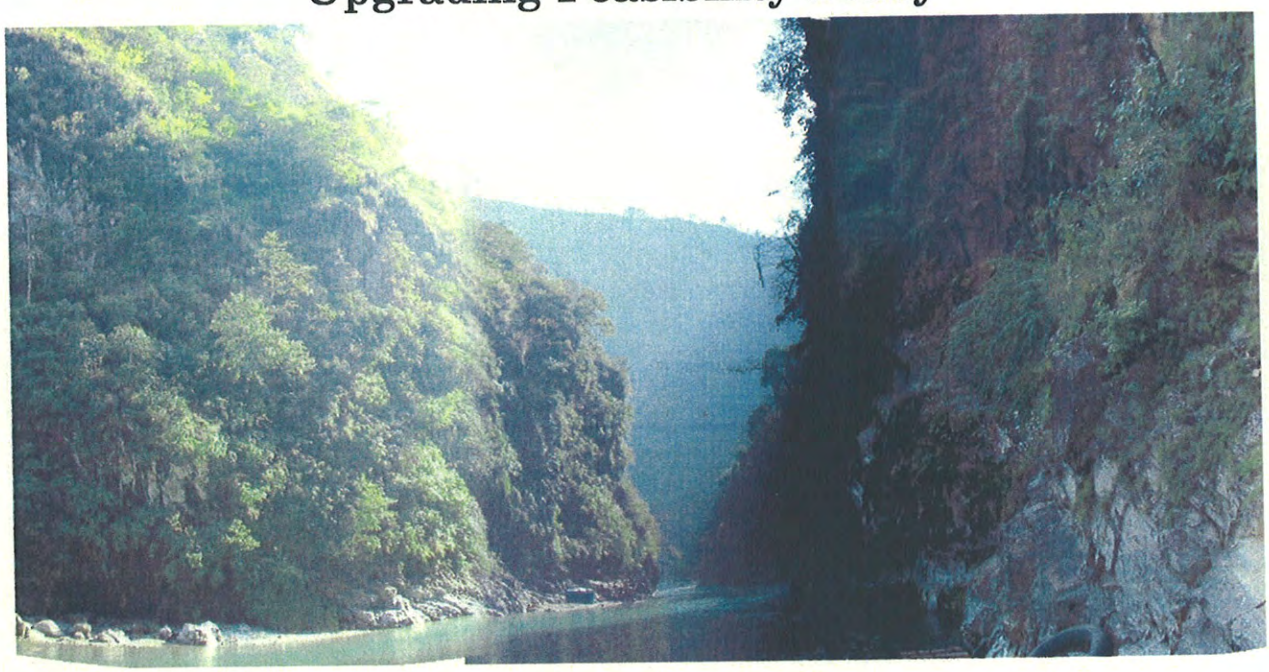
Brochure of Second Stakeholder Meeting

The Upper Seti (Damauli) Storage Hydroelectric Project

2nd Stakeholder Meeting

for

Upgrading Feasibility Study



Damauli, Tanahu District
December 1 2006/Mangsir 15 2063

Kathmandu
December 6 2006/Mangsir 20 2063

Nepal Electricity Authority (NEA)
Japan International Cooperation Agency (JICA)

1. Background of the Project

In order to support poverty reduction efforts in Nepal, Government of Nepal has been implementing rural electrification and hydroelectric development projects by using its abundant water resource particularly in its Tenth Plan (2002-2007). The present total installed capacity in Nepal is 614 MW as of July 2006. Hydropower's share is 90 % of the total installed capacity which is 99 % of annually generated energy. On the other hand, power demand in the country has been growing approximately at a rate of 8 % per annum in recent ten years period (1995 to 2005).

The run-of-river (ROR) type of hydropower plants dominate the Nepal's hydro capacity. Since ROR type of hydropower plants can only marginally regulate river discharge for power generation, Nepal has been facing shortage of power in the dry season. Hence, Nepal Electricity Authority (NEA) has felt the necessity to develop storage type of hydropower plants which can seasonally regulate river discharge for generation in the dry period.

NEA conducted studies on storage type of hydropower projects and identified ***Upper Seti Storage Hydroelectric Project*** as a potential one. The Government of Nepal then requested the Government of Japan to implement an upgrading feasibility study (hereinafter referred to the Study) under the technical assistance of Japan International Cooperation Agency (JICA). The JICA Study team commenced the Study in February 2005.

2. Objective of the Study

The Study aims at formulating the optimum plan for development and assessing the technical economical and financial, and environmental viabilities of the Project.

3. Schedule of the Study

The Study commenced in February 2005 and it will be completed by June 2007.

4. Range of the Study Area

The Study area of the Upper Seti Hydroelectric Storage Project is located in Tanahu District in Central Nepal and the transmission line route is from the powerhouse site at Damauli to the existing main transmission lines in Bharatpur. The Study area is assumed as follows:

- ✧ The Watershed: Approx. 1,502 km^2
- ✧ The Reservoir area and its vicinity: Approx. 120 km^2

The Project in the phase of construction and operation is likely to bring direct and indirect impacts to the following areas:

- The *dam site, powerhouse site and associated access roads, camps and construction facilities*

- The *Lower Reservoir(downstream part of the reservoir)*, an approximately 15 km Seti River stretch that has limited habitation, is forested, and has narrow gorges, and
- The *Upper Reservoir(upstream part of the reservoir)*, an approximately 12 km Seti River stretch which consists of relatively flat elevated and irrigated rice terraces, lower fertile land of Seti River, scattered settlements and the semi-urban of Bhimad Bazaar community
- *Downstream of the dam site,* low land of the Seti River banks which will be affected by the peaking flow

5. Optimum Project Layout and Scale

The JICA Study Team conducted an optimization study to select the most technically and economically feasible development plan which will have less impact on natural, socio-economic and cultural environment.

The optimization study was carried out based on data and information supplied by NEA, and the results of the following surveys/studies performed by the JICA Study Team;

- ✧ Supplementary environmental survey results including mitigation
- ✧ Geological investigation results
- ✧ Hydrological study results
- ✧ Power demand in the country

Based on the above data, Project cost including construction cost, compensation cost, mitigation cost and necessary cost for each case has been estimated. Its benefit based on an alternative thermal power plant has been also estimated. Hence, the ratio of benefit and cost is an index of economical evaluation for each case in consideration of environmental mitigation.

In the comparison study, the following factors were compared systematically;

- ✧ Five layouts which were introduced in the 1st stakeholder meeting conducted in June 2006
- ✧ Full supply water level in the reservoir between EL. 395 m to 435 m

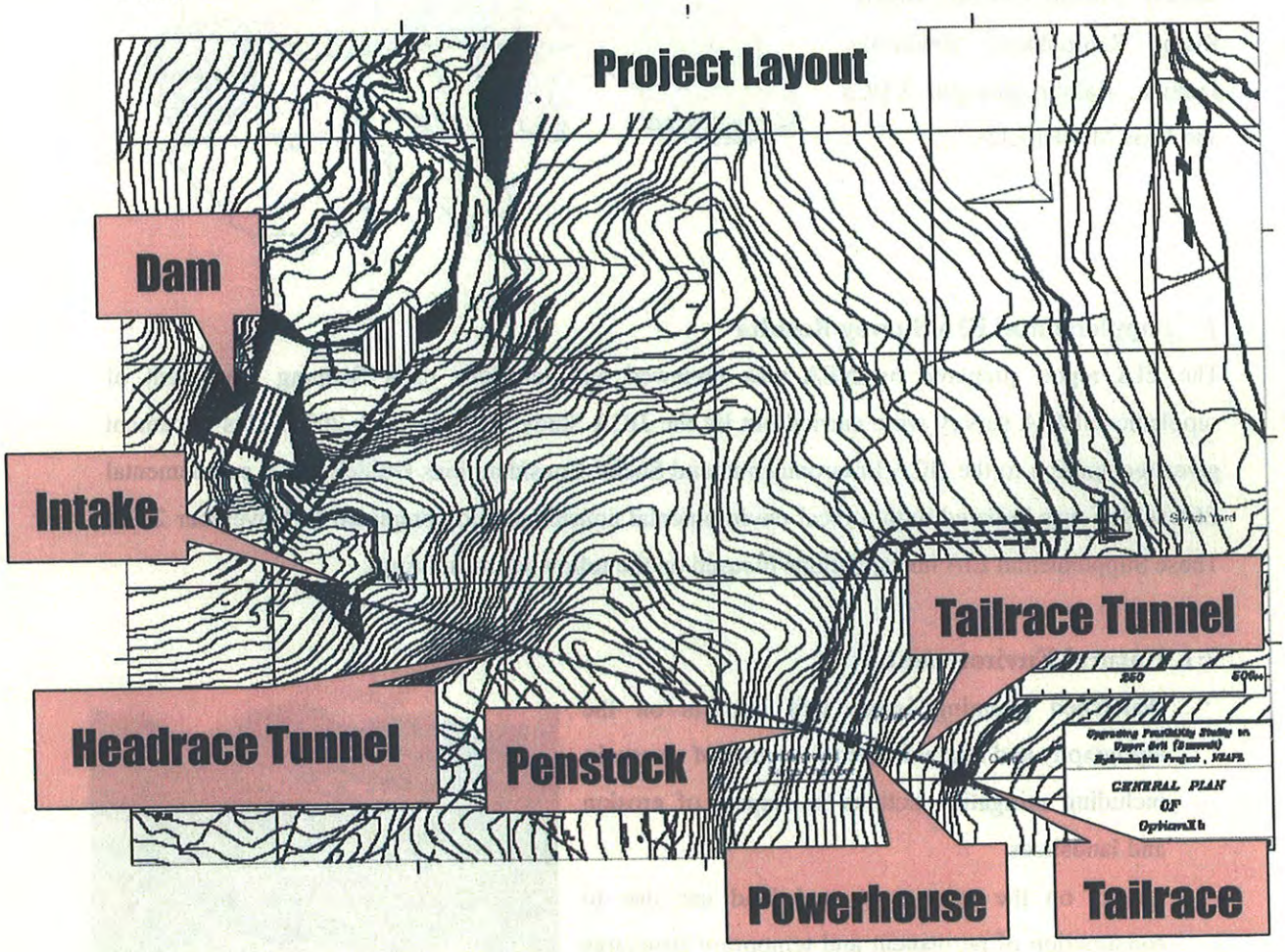
More than 300 cases were compared, and the optimum case from the current study was selected which has the following features.

- ✧ Layout of Tailrace located at downstream of confluence of Seti River and Madi River
- ✧ A storage project with an installed capacity of 132 MW, reservoir length of 27 km, Full Supply Level of 420 m and reservoir area of approximately 7.9 km^2 located on Seti River. However, Fully Supply Level might be changed considering other

environmental indicators.

- ✧ An underground powerhouse

The JICA Study Team will continue this study, and design the Project at Upgraded feasibility study level, estimate project cost, and conduct overall economic and financial analysis by the time of completion of the Study. After the JICA Study, NEA will continue with the process for construction such as detailed design, tendering for construction works, and will implement the construction works.



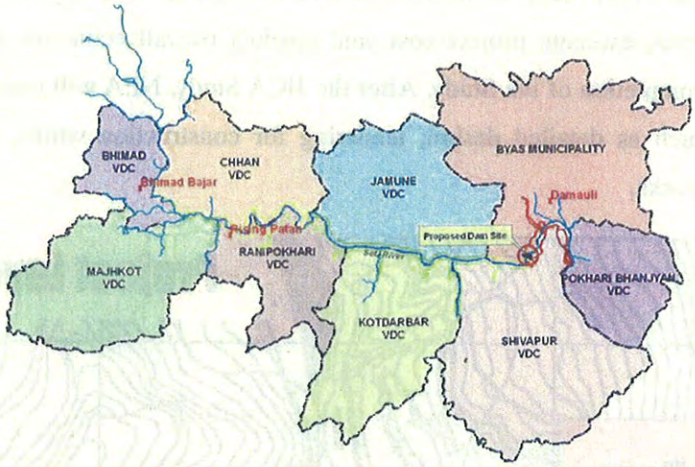
6. Project Affected Area

The affected areas are categorized into the four areas as follows;

1	Reservoir areas	Bhimad, Chhang, Majkot, Rising Ranipokhari, Kotdurbar, Jamune, Kahun Shivapur VDCs, Vyas Municipality
2	Dam, powerhouse, tailrace and switch yards	Kahun Shivapur, Vyas Municipality
3	Project facility structures (access roads, camps, batching yards and spoil disposal	Kahun Shivapur, Vyas Municipality

	yards)	
4	Downstream areas	Kahun Shivapur, Pokhari Bhanjyang, Keshavtar, Dharampani, Baidi, Chhipchhipe, Devghat, Deurali VDCs

Particularly, the project will affect reservoir areas and project facility structure sites covering 7VDCs, namely Bhimad, Chhang, Majkot, Rising Ranipokhari, Kotdurbar, Jamune, Kahun Shivapur VDCs and Vyas Municipality.



7. Supplemental EIA Survey Results

The EIA report prepared by NEA was reviewed and revisions of a Scoping Document of supplemental EIA survey were carried out by the JICA Study Team in early 2006. This document gives recognition to the JICA Environmental and Social Considerations Guidelines. A supplemental EIA survey was initiated with a local environmental consultant and completed in November 2006. These Supplemental EIA investigations focused on the following main issues.

7-1. Natural Environment

- Watershed planning issues and impacts on the topography and land use due to creation of reservoir, including mitigation actions in respect of erosion and landslides
- Impact on the topography and land use due to construction of permanent and temporary structures on both sides of the Seti River near its confluence with the Madi
- Impacts on the downstream Seti River due to reservoir water regulation and daily fluctuations in the flow of the river
- Impacts on reservoir water quality due to "algae blooms" requiring mitigating actions
- Alternative actions for the loss of 456 ha of National Protected and Community Forests
- Impact on wildlife resources, with over 16 species of mammals indicated as protected under present CITES Appendices and IUCN Red Data List, and this aspect to be confirmed and

mitigation actions to be proposed

- Impacts on aquatic ecology and fisheries including a serious impact which is difficult to mitigate and which will require construction of a fish hatchery with stocking of local species both in the reservoir area and in upstream zones of the Seti River, as per Kali Gandaki A HEP and with assistance of the Begnas Lake Fish Hatchery operation
- An Initial Environmental Evaluation of the Project's 38.4 km long 220 kV transmission line from the powerhouse at Damauli to Bharatpur was carried out which indicated acceptable impacts.

7-2. Socio-economic and Cultural Environment

- Impacts on cultivated area including some 166 ha in reservoir area
- Impacts on infrastructure such as 7 stretches motorable gravel road, 1 bridge, 7 suspension bridges, 22 foot trails, 1 causeway, 2 irrigation canals and 4 electric distribution line routes
- Impacts on community structures including 1 temple, 6 resting places and 1 ghat (cremation site)
- Impacts on annual agricultural production loss of 854 Metric ton
- Impacts on approximately 1057 household landowners in terms of land acquisition (reservoir areas and project facility sites)
- Impacts on structures to be acquired including houses, cow sheds, toilets of 155 households (reservoir areas and project facility sites)
- Some 122 households require relocation as their residential structures are affected (from Chhang, Rising Ranipokhari, Jamune, Kahun Shivapur VDC, and Vyas municipality), out of which 32 households are without legal land holdings
- The framework of Resettlement Plan including compensation and rehabilitation, and Social Action Plan are to be proposed

8. Stakeholders Meetings

In accordance with the JICA's Guidelines on Environmental and Social Consideration, stakeholders meetings are being arranged through the offices of NEA with the assistance of JICA Study Team. Initial Stakeholder Meetings were held in June 2006 which included intensive discussions with the local affected people in Damauli and with the concerned institutional representatives in Kathmandu. The 2nd stakeholder meetings will also be held in Damauli and Kathmandu in December 1 and 6

respectively. The objectives of this stakeholder meeting are as follows:

(i) to explain and disclose information regarding the Study and environmental and social aspects and report on current progress on various Project activities

(ii) to obtain concerns, opinions, suggestions and feedbacks particularly from the affected local people of the Project Area

The final Stakeholder Meetings are scheduled to be held in April or May 2007 in Damauli and Kathmandu to discuss about the final design, mitigation measures and enhancement programs.

Program Schedule of Second Stakeholder Meeting in Damauli

Program Scchedule of Second Stakeholder Meeting in Damauli

Date: December 1, 2006 (Mangsir 15, 2063)

Time: 10:30-15:30

Venue: District Development Committee, Damauli, Tanafu District

Program Schedule

No.	Time	Hrs	Program	Presenters
	10:30-11:00	0:30	Registration	
1	11:00-11:10	0:10	Opening Address	NEA
2	11:10-11:20	0:10	Background of the Project	NEA
3	11:20-11:30	0:10	Study progress and necessity of the Project	JICA Study Team
4	11:30-12:00	0:30	Optimization of development plan	JICA Study Team
5	12:00-12:20	0:20	Physical and biological environment impact	JICA Study Team
6	12:20-12:40	0:20	Socio-Economic and cultural environment impact	JICA Study Team
7	12:40-13:00	0:20	Comments from line agencies	
8	13:00-13:50	0:50	Comments from VDCs/municipality and other representatives	
9	13:50-14:00	0:10	Snack and Tea Break	
10	14:00-15:00	1:00	Discussion	
11	15:00-15:05	0:05	Vote of thanks	NEA
12	15:05-15:15	0:10	Closing Address	LDO

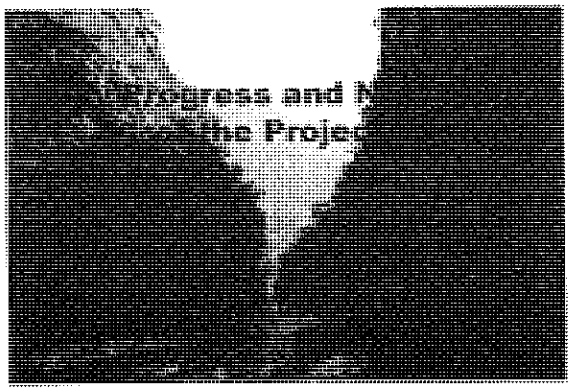
Contact Address

- Nepal Electricity Authority Environmental and Social Studies Department Engineering Services Advait Marg, Kathmandu Tel :4226730 Fax:4225248
- JICA Study Team c/o. JICA Nepal Office

  P.O. Box 450, Kathmandu, Nepal Karmachari Sanchaya Kosh Bldg, Hariharbhavan, Lalitpur

  Tel: 5552711 Fax:5552284

Presentation Material in Damauli



1

Study Progress

Preminiinary Study Stage
1. Review of existing documents and data
2. Preparation of alternative layout
3. Preparation of investigation plan
4. Power Sector Survey

Detailed Investigation Stage
1. Investigation
   by Subcontracting
   by Study Team
2. Environmental assessment
3. Optimization of Development Plan

Fesbibility Design Stage
1. Design at F/S level
2. Preparation of construction plan
3. Project cost estimation
4. Economic & financial analysis

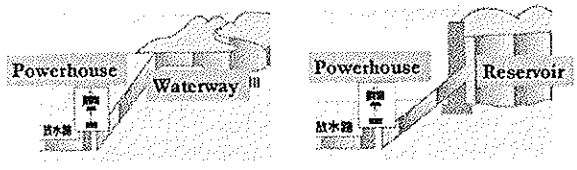
2

Presentation

Results of Study on
- Study progress and necessity of the Project
- Optimization of development plan
- Physical and biological environment impact
- Socio-economic and cultural environment impact

3

Necessity of Project-Type of Hydropower Plant



Run-off-River Type Storage Type

4

Necessity of Project

Results of Power Sector Survey:

Storage project is necessary for stable power supply in the country
- Supply power during peak time (around 5:00 p.m. to 10:00 or 11:00 p.m.)
- Especially supply power during dry season, because of decrease river water

Conclusion:

Upper Seti storage project is necessary

5

Project Stage

Project Stage:

JICA Study

↓

Detailed Design

↓

Bidding

↓

Construction

↓

Operation

6

Optimization of Development Plan for Upper Seti Hydropower Project

December, 2006

JICA Study Team

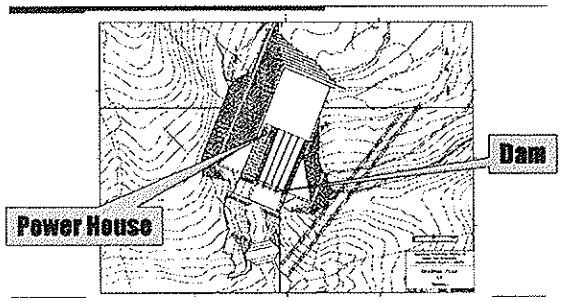
Contents

1. Layout Options
2. Keys of Project Planning
3. Comparative Study Method
4. Optimized Development Plan
5. Basic Design of Proposed Development Plan

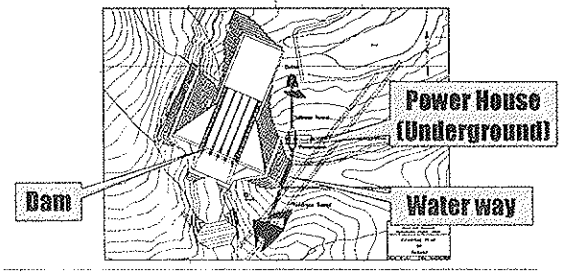
1. Layout Options

Layout alternatives are shown here.

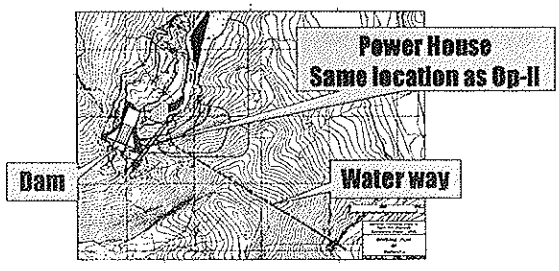
Option I



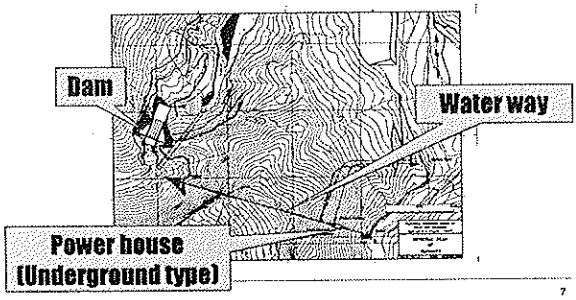
Option II



Option IIIa



Option IIIb



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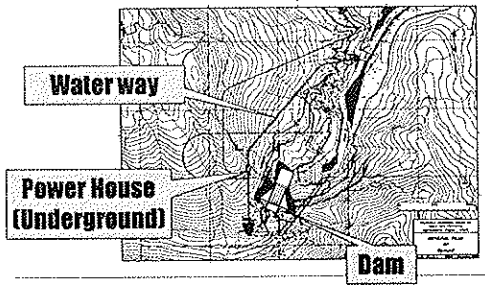
Option IV



8

2. Keys of Project Planning

Technical outcomes through Studies

9

Main technical aspects for Upper Seti project

- ☐ Treatment of Sedimentation
- ☐ Geological conditions of project layouts
- ☐ Role of Upper Seti project as power source
- ☐ Environmental Issue

10

Large amount of Sedimentation

FSL should be obliged to be higher by large dead capacity of reservoir.

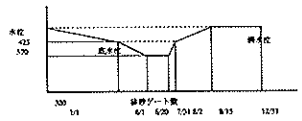
11

Keys of Treatment of sedimentation

1. Flushing is essential to maintain role of reservoir against high sedimentation
2. Sand drain valve will be installed at dam to maintain long life of reservoir
3. Sedimentation volume not flown out of reservoir will be required for reservoir dead storage based upon design standard in Japan

12

Sedimentation Volume for 100 years



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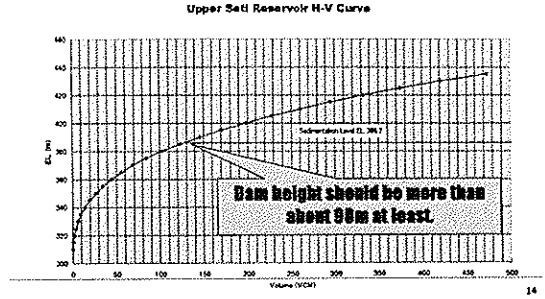
Sedimentation Level by H-V Curve



14

Geological conditions of project area

Summary of Geological investigation

15

Outcomes by geological investigation

- Geological conditions at dam basis will be suitable to construct dam with about 140m height.
- Excavation work for underground type power house should be difficult at this vicinity area. (Option-II, IIIa)
- Geological conditions of waterway route and power house of Option IIIb seems to be sound, according to site reconnaissance

16

Role of Upper Seti project as power source

"kW" capacity should be maintained, especially for dry season.

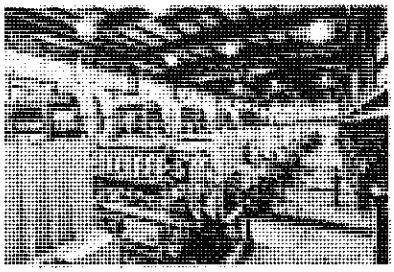
17

Keys for Role of Upper Seti project

- 6 hours peak power should be supplied, according to Power demand forecast.
- Peak power supply for dry season, especially
- Diesel power plant was applied to Alternative thermal plant whose annual idle time is so long, and fuel cost should be raising.
- High effective head should be essential for project layout such as Op III a and b to supply high capacity, even in dry season.

18

Diesel power Plant example



19

Environmental Issue

Only essential matters for project optimization study

20

Keys for Environmental Issues

- Cost for compensation and resettlement is estimated for each FSL
- Slope protection work against erosion by water drawdown of reservoir operation in some reservoir area is taken into consideration for environmental cost.

21

Layout comparison from Technical Aspect

	Option I	Option II	Option IIIa	Option IIIb	Option IV
Geological Conditions	Mid	Fair	Fair	Good	Good
Role of Power source	Mid	Mid	Good	Good	Mid
Environmental issue	Mid	Mid	Mid	Mid	Mid

22

4. Study Result at Present

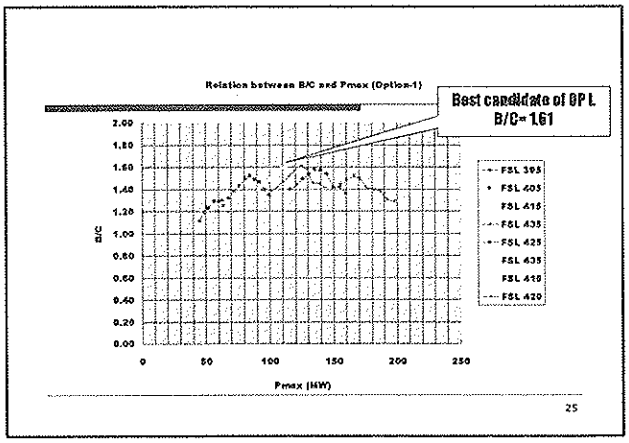
Which layout and development scale should be the most effective for investment at present?

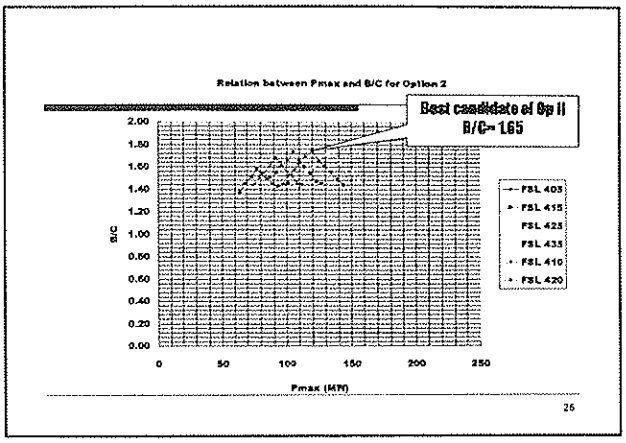
23

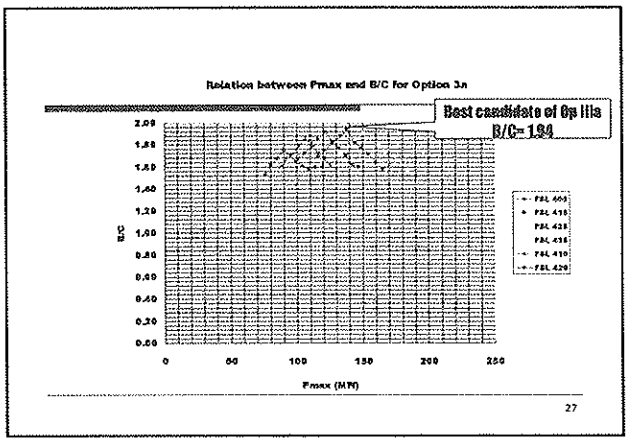
Keys of Comparison study of Project Layout

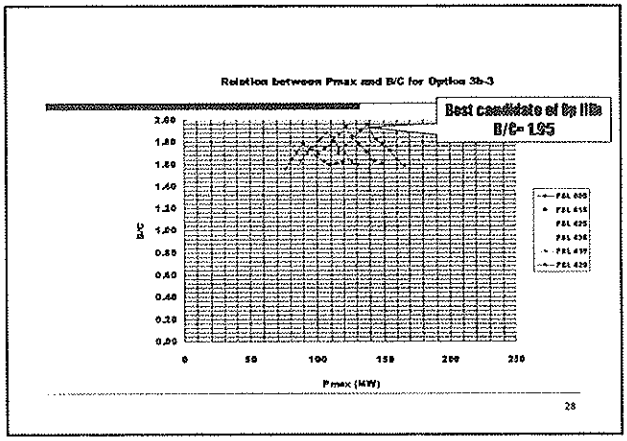
- Ratio of Benefit and Cost is the index for comparative study.
- Benefit is determined by value of firm capacity and primary energy, and unit value of diesel power plant for firm and peak.
- Based on reservoir volume and river discharge, there are 10 candidates for maximum discharge for power facility.
- Based on maximum discharge, project layout and FSL, there are 265 project candidates.

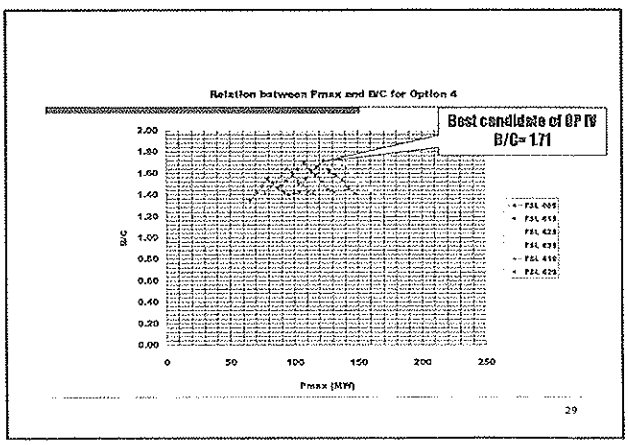
24











Conclusion

- Option IIIb at FSL 420m (B/C=1.95) should be the most optimum project.

30

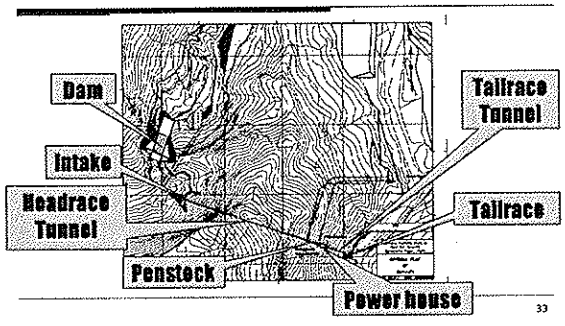
Present Proposed Development Plan

Reservoir FWL	420	m
Reservoir LWL	400.4	m
Effective volume	131.4	MCM
Peak operation time	6	hours
Maximum discharge	121.3	m^3/s
Intake Water level	414.9	m
Tailrace Water Level	289.1	m
Effective head	121.9	m
Installed Capacity	132	MW
Annual generated Energy	635.55	GWh

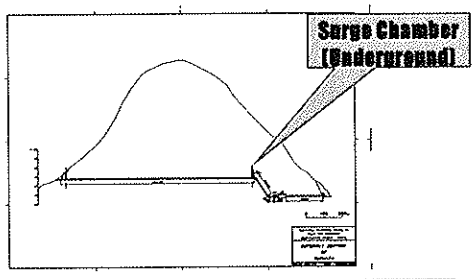
5. Basic Design of Proposed Development Plan

Project layout
Waterway profile
Land utilization plan

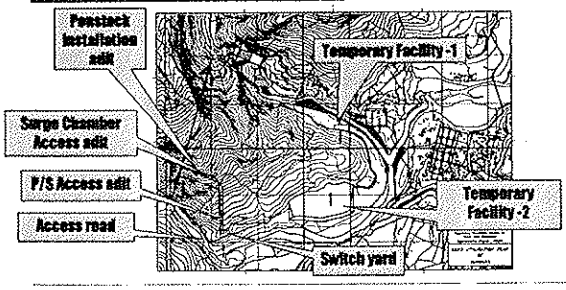
Option IIIb Project Layout



Option IIIb Waterway profile



Option IIIb Land-utilization plan



Epilogue

Project design at Feasibility Study Level will come soon.
To be continued

Upper Seti Storage Hydro-electric Project

NATURAL ENVIRONMENT

Damauli – December 1, 2006

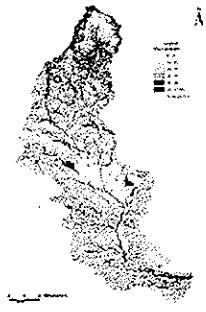
1

NESS Environment Surveys
Natural Environment

- Watershed Planning & Reservoir Area
- Water Quality & Eutrophication
- Biological Environment
  - Forestry & Vegetation
  - Wildlife Aspects
  - Fisheries & Aquatic Ecology
- Mitigation Measures and Costs
- Monitoring Programs and Costs
- Environmental Management Plan

2

WATERSHED PLANNING



	Slope	% age Instability	%age of WS Class
1	0-15°	30	30
2	15-25°	36	43
3	25-35°	17	23
4	35-45°	14	4
5	>45°	2	0
	Total	100	100

Slope Gradient Map of Seti Catchment

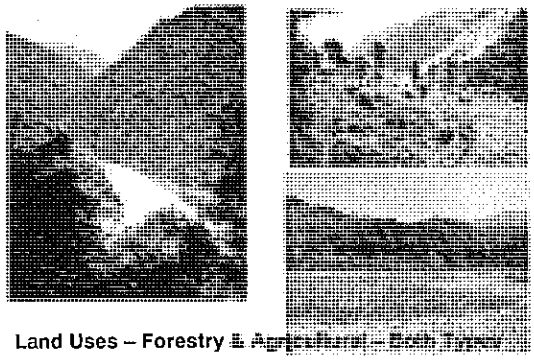
3

Land Use of Project Areas

SN	Land use Types	Land Use Category -ha						
		FSL 420 m	Access roads	Backing yard	Spoil dump	Base camp	Switch yard	Total
1	Cultivation	89.125	9.10	3.78	15.59	0.74	0.19	89.125
2	Built up	1.095	0.53	0.85	0	0	0	1.095
	Total cultivation/built up	90.22	9.63	4.63	15.59	0.74	0.19	121
3.1	Grazing Land	93.575	6.49	3.12	0	0	0.05	93.575
3.2	Shrubs	23.06	0.67	0.09	0.02	0	0	23.06
	Total grazing/shrub	116.635	7.16	3.21	0.02	0	0.05	127.075
3.3	Hill Sal Forest	36.55	22.04	0	0	0	0	36.55
3.4	Khair/Sissoo Forest	56.795	0	0	5.1	0	0	56.795
3.5	Mixed Open Forest	288.34	15.11	0	4.15	0	0	288.34
	Total Forest	381.685	37.15	0	9.25	0	0	428.085
4	Barren Land	0.855	0	0	0	0	0	0.855
5	Escarpment	7.04	0	0	0	0	0	7.04
6	River	94.945	2.99	0	0	0	0	94.945
7	Sand	120.14	1.93	0.01	0	0	0	120.14
	Total Other Lands	222.98	4.92	0.01	0	0	0	227.91
	Grand Total	811.52	58.86	7.85	24.86	0.74	0.24	904.07

4

Physical Environment
Reservoir Area



Land Uses – Forestry & Agricultural – Both Types

5

Physical Environment
Mitigation Measures

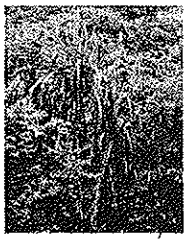
- Reduce "footprint of project"on Forestry by relocation of facilities & select reservoir level
- Solve "erosion prone areas" around reservoir – Bhimad Bazaar & Wanten Khola areas
- Air Quality – Suppression of dust & masks
- Water Quality – Controls on runoff from works areas & sanitation and solid waste management
- Protect land instabilities on roads
- Spoil disposal controls with bunds & ditches
- Funds for vibration & water supply systems

6

Biological Environment
FORESTRY & VEGETATION

	FSL 420 m	Project Facility Sites
Hill Sal Forest	36.55	22.04
Khair/Sisso Forest	56.795	5.1
Mixed Open Forest	288.34	19.26
Total	381.685	46.4

- One of Biggest Impacts of Project on Biological Resources
- Accounts for approximately 47% OR 381.6 ha in the reservoir area out of Total Area of 904 ha
- 27 Sampling Plots (Mapped) and 209 Wild Species Recorded
- A few species under the conservation category including Screw Pine and 4 Orchids
- Approach as Used by Department of Forestry in Evaluating Impacts



Biological Environment
FORESTRY & VEGETATION

- Estimated Volume of Wood in Reservoir Area & Project Facility Sites

	Reservoir at FSL 420 m	Project Facility Site
Government Forest	39926 m3	10231 m3
Community Forest (11 community forests)	14672 m3	919 m3
Private Forest	667 m3	81 m3
Total	55265 m3	11231 m3

-98% of Total Species made up of

- 30% Sal (*Shorea robusta*), 23% Saj (*Terminalia alta*) & 45% of 5 Other Species are the Main Species Affected

8

Biological Environment
Wildlife Aspects

- Field Observations & Group Discussions
- 27 Mammals Recorded
- 17 Reptiles & Amphibians Recorded
- 62 Birds Recorded
- 46 Butterflies & Moths Recorded
- Wildlife Habitat Losses with Project
- Will generate concern among "conservation NGOs
- NEEDS FURTHER CONSIDERATION

9

Biological Environment
Fisheries & Aquatic Life

- 36 Species Recorded – 2 Times X 6 Stations
- A few species under the conservation category

Biological Environment
Fisheries & Aquatic Life

MAIN IMPACTS ON FISH & AQUATIC LIFE

- Construction Controls on River Diversion & Spoil Disposal
- Barrier Impacts of Dam Low Down in Catchment
  - By Far the Most Serious Biological Impact of USSHEP
- Downstream Impact of Dewatering to Seti &Madi Rivers
- Daily Regime Changes Downstream to Trisuli River
- Long Distance Migrants like Mahseer Affected
- Several Breeding & Maturation Habitats Affected
- Fish Protection Works Required at All Intakes and Outlets
- Reservoir of Limited Value to Fish – Sediment Flushing

11

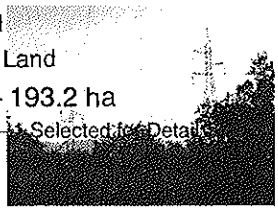
Biological Environment
Mitigation for Fisheries & Aquatic Life

- FISH HATCHERY RECOMMENDED AS BEST MITIGATION OPTION
- **STOCKING OF FINGERLINGS In RESERVOIR AREA & UPSTREAM ZONE**
- **7 Species being Produced at Kali Gandaki A Project**
- **Options of Local Pond Culture to be Considered**
- **Possible Trial Stocking of Algal Feeding Fish in Reservoir from Begnas Hatchery BUT Issue of Introduction of Exotics Not Yet Discussed**
- **Cash Compensation is NOT PREFFERED for Fisheries Program Mitigation Planning**
- Feasible Species & Location & Costs Needs Inputs by NEA, Consultants & JICA Expertise

12

IEE TRANSMISSION LINE

- Covers 5 VDCs Tanahu District & 1 VDC & 1 Municipality of Chitwan District
- 220 kV Double Circuit Line with 60m ROW
- Length – 38.42 km & Tower Span – 300 m
- Land for Towers – Total 5.2 ha of which
  - 1.8 ha of Forest Land
  - 3.4 ha of Agricultural Land
- Land Use on ROW – 193.2 ha
- 3 Alternatives Investigated – 1 Selected for Detail



IEE TRANSMISSION LINE

- Alternative 1 Assessed & Is Preferred as:
  - Losses of Forests are minimized as 11 km of ROW follows existing 132 kV ROW through Narayani National Protected Forest at Bharatpur Substation End
  - It minimizes number of houses (18) & structures (14) affected – A Total of 32 along ROW
  - 21.6 km of Forested Land Affectd also Wildlife Habitat
  - Erosion & Land Stability of Concern at a Few Towers
- Good location survey & IEE strong basis for NEA- ESSD full EIA to be commissioned

Socio-Economic and Cultural Impacts

Findings of Supplemental EIA Survey/

JICA Study

December 1 2006
Damauli, Tanahu District

Objectives

- Review the general socio-economic and cultural situation of Tanahu district, affected VDCs and communities,
- Study the socio-economic and cultural impact due to the project activities,
- Prepare a framework of environmental management plan, and
- Develop a framework of Resettlement Plan and Social Action Plan

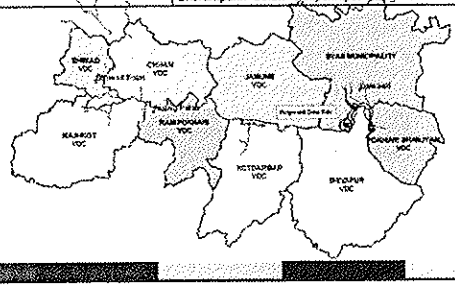
Methodologies

- **Literature Search**
- **Field Survey** including structure inventory survey by using GIS Map, Cadastral Map, and Filed Book
- **Household Survey** targeting 399 households who live below FSL 425m
- **Focus Group Discussion** targeting 190 people in 13 affected communities

1. Affected Areas

Affected 7 VDCs & 1 Municipality

❶ Reservoir areas	Bhimad, Chiang, Majkot, Kotdurbar, Jamune , Kahun Shivapur VDCs, Vyas Municipality
Dam, powerhouse, tailrace, & switchyards	Kahun Shivapur, Vyas Municipality
❷ Project facility structures	Kahun Shivapur, Vyas Municipality
❸ Downstream areas	Kahun Shivapur , Pokhari Bhanjyang , Keshavtar , Dharampani, Baldi, Chhipchhipe, Deyghat, DeuraliVDCs

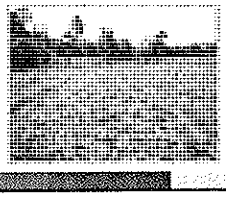


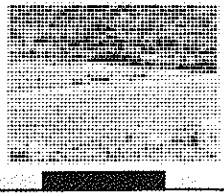
Affected total land area FSL 420m+10m

Reservoir area	Project facility sites	Total land area
1018.855 ha	92.55 ha	1111.405 ha

Affected cultivated area FSL 420m+10m

Reservoir area
166 ha





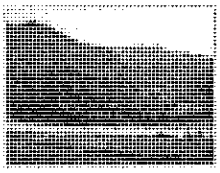
Affected production loss FSL 420m+10m

(metric ton)

Irrigated land	Paddy	369.41
	Wheat	44.565
	Maize	77.4
	Early paddy	94.525
Upland	Maize	195.455
	Millet	37.525
	Pulses	35.18
Total		854.06

Affected infrastructure FSL 420m+10m (number)

Motorable road gravel	Suspension bridges	Foot trail	Causeway
7 stretches	7	22	1
Irrigation canal	Electricity distribution	Bridge	
2	4	1	



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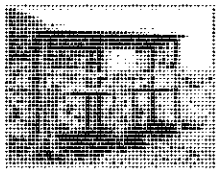
Affected structures FSL 420m+10m (number)

Private structures(houses, cowshed, toilet, hut etc)		
449		
Community structures		
Resting places	Temple	Ghat
6	1	1



8

Affected private land owners

FSL420m+10m

1057 households

Affected structure owners FSL 420m+10m

155 households

Affected residential structure owners who need to be relocated FSL 420m+10m

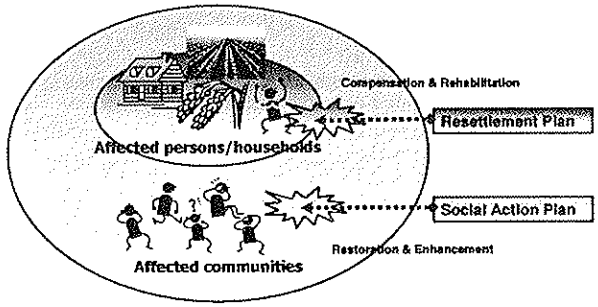
Chhang, Rising Ranipokhari, Jamune, Kahun Shivapur VDCs, Vyas Municipality	122 households

Affected residential structure owners without legal holdings FSL 420m+10m

32 households

9

Resettlement Plan & Social Action Plan



10

Proposed Framework of Resettlement Plan

- It is based on the existing legal provisions, the JICA Guideline, and the lessons learned from the similar hydroelectric development projects.
- Land acquisition and involuntary resettlement shall be avoided where feasible or minimized through the incorporation of social consideration into project design options.
- Where population displacement is unavoidable, individuals, households and community losing their assets, livelihood and other resources shall be informed and consulted.

11

Proposed Framework of Resettlement Plan

- Affected persons (APs) shall be compensated at replacement rates for all losses and damaged assets.
- APs shall be fully compensated and resettled before their houses and demolished and their land and facilities are required.
- A resettlement plan shall be prepared, consulted with APs and implemented in advance of the implementation of the project.

12

Proposed Social Action Plan

- It is designed to mitigate adverse impacts on the communities particularly in affected 7 VDCs and Vyas municipality.
- Social programs will be formulated through consultation with local stakeholders including affected community people **at the next stakeholder meeting which is to be scheduled in April –May 2007.**
- Proposed social programs may include restoration of affected infrastructure, skill enhancement, agricultural development, women development, rural electrification, community's initiative support and so on.

Minutes of Second Stakeholder Meeting in Damauli

Minutes of Second Stakeholder Meeting in Damauli

Time: 10.30

Date: December 1, 2006; Mangsir, 15, 2063

Venue: District Development Committee Meeting Hall, Damauli, Tanahu

Nepal Electricity Authority Japan International Cooperation Agency

Master of Ceremony: Rishi Kanel, NEA

Chairperson: Mr. Bishnu Prasad Dhakal, Local Development Officer, Tanahu

Guest: Mr. Govinda Raj Joshi, Member of Parliament
Mr. Kashinath Marasini, Chief District Officer
Mr. Dil Bahadur Thapa, N.C., Tanahu
Mr. Kedar Sigdel, CPN(UML), Tanahu
Mr. Samudra Gulab N.C. Democratic, Tanahu
Mr. PushpaRaj Gairhe, UDF, Nepal, Tanahu
Mr. Keshar B. Thapa, Janamukti Party, Tanahu
Mr. HarshaMan Shrestha, JanaShakti Party, Tanahu
Mr. Pravin Aryal, Senior Division Engineer, Water Resource Ministry
Mr. Chatur Lal Shrestha, Nepal Electricity Department
Mr. Bhoj Raj Regmi, General Manager, Nepal Electricity Authority
Mr. Shiva Chandra Jha, Chief, Environment and Social Study Division
Mr. Bishnu B.Singh, Project Development Division
Mr. Yoshi Ishi, Team Leader, JICA Study Team
Mr. Masanori Kozuki, JICA Tokyo
Ms. Sayoko Tokuda, JICA Nepal Office

Close to 600 people participated in the meeting. More than 60 written concerns were filed by the people in the meeting.

The program was started with the welcome speech delivered by **Mr. Bhoj Raj Regmi, General Manager, Engineering Services** of Nepal Electricity Authority. Mr. Regmi highlighted the importance of the project from national perspective. He announced that the proposed project is a priority project of NEA. In the context of increasing demand of electricity during late hours especially in winter season there is no alternative other than Kulekhani for peak electricity generation. Proposed reservoir project could be a lifeline to the consumers in this context. Based upon the past experiences we realize that only the Run-of-River projects can't get rid of the increasing demand of electricity in

winter season. Thus reservoir project of an optimum scale is a must in the present scenario. In this context, Upper Seti reservoir project is an ideal project to initiate. The upgrading feasibility initiated after June 2006, and the findings to date have shown that the proposed 122 MW capacity could be increased 132 MW simply after adding a tunnel without increasing the dam height. This suggestion will be duly incorporated in the report before finalization of the project upgrading feasibility. It will have various direct and indirect benefits to the district dwellers. Since, it is a hydroelectric project, some impacts upon the natural environment might happen. It is also clear that it is difficult to fulfill all the aspirations of the district population. All the concerns of the participating individuals in this stakeholders meeting will be given due consideration. The valuable suggestions will be incorporated in the EIA report. The aspirations could not be fulfilled by the project will be reported to concerned agencies for adequate attention.

Bishnu Bahadur Singh, Chief **of the Project Development Division** of NEA stated that NEA had made the EIA study in the initial stage. This is the upgrading feasibility study conducted by the JICA study team. As per the JICA guidelines public hearing need to be done thrice during the study period and the present hearing is the second one. However, information has been disseminated about the project through different publication media. It is my pleasure to share the salient features of Upper Seti Storage Hydroelectric Project. It includes a tunnel structure in the previous design to add 20 meter of head worth additional 10 MW electricity generations. Out of the five different alternatives of the design stage alternative 3(b) where tunnel is proposed after the dam with underground powerhouse construction is the best alternative. Major construction structures are 140 m heigh dam and 220 kV transmission line. Initial Environmental Examination of 220 kV transmission line has already completed by JICA study team and NEA is conducting the EIA study of the transmission line. The proposed reservoir will inundate areas of seven VDCs namely Bhimad, Chhang, Jamune, Rhising Ranipokhari, Kot Durbar, Majhkot, and Kahun Shivapur and onr Byas municipality. Mr. Singh requested the stakeholders to show active participation and contribute their suggestion in both written and oral form.

Team Leader of the JICA Study team, Mr Ishi explained the progress and status of the study. He stated the study progress in three different stages viz.

Mr. Ishi observed that the reservoir type project is to supplement the requirement of Hydro electric power during dry/winter season. In the present scenario power demand is increasing by 8% every year and is forecasted to be so till 2015 A.D. Peak demand growth could be met by storage type projects only, especially during 18.00 – 23.00. Reservoir type project is very beneficial and have a comparative advantage in the context of meeting peaking demand of electricity in winter season.

Govinda Raj Joshi, Member of Parliament from Tanahu district and former Water Resource

Minister, started his deliberation acknowledging JICA study team and NEA for bringing the project at this stage. He thanked the participants in participating in the meeting and requested them to contribute to the project that is going to be constructed. He wished let the construction duration be shortened and accelerated. Lower Seti after confluence of Modi and Seti and Kaligandaki could be constructed at the scale of 400 to 500 MW. At the present stage storage project are needed most and are more useful. There are additional sites to be developed into Hydropower Projects in Tanahu district. Concerned issues if raised by the locals in time are easy to complete in time. Concerns could be raised by the local people without hesitation and would be supplemented by the MP as the representative.
Optimization of the Development Plan, Natural Environmental Impacts and Mitigation Measures, Social and socio-ecnomic environmental Impacts and Mitigation Measures of the proposed project was presented by **Dr. Toran Sharma, Managing Director of Nepal Environmental and Scientific Services** on behalf of the JICA Study team.

Pravin Aryal, Senior Divisional Engineer of Ministry of Water Resources stated that NEA had conducted the EIA of the proposed project on 2000/2001 and presently upgrading feasibility is being done by JICA. Its TOR had been passed in 2000, presently the design and EIA review is envisaged. It will facilitate in suggesting mitigation measures and minimizing the adverse impacts. Public hearing was held already during the EIA study period by NEA. Ministry of Water Resources is concerned with the minimization of the negative impacts on the physical, biological and socio-economic and cultural environments. Government has a policy to allocate 12% of the revenue generated by the specific project to the concerned DDC and 38% to the neighboring VDCs. While constructing similar projects lesson need to be learnt from the Middle Marsyangdi Hydro Electric Project. It will be better to collect enough information regarding the project development and not face disturbance during construction.

Various party representatives expressed their concerns on the public hearing meeting.
Mrs. Chandrakala Baral, Central Committee Member of the All Nepal Peasants Association reminded to be alert enough from the Middle Marsyangdi Hydro Electric Project (MMHEP). Let the Government facilitate in executing the project pragmatically. It will generate a number of employment opportunities. Thus let not oppose the noble cause without any reason. Let us sit and discuss together, anything that need to be opposed be lodged to the concerning agency in written form.

Mr Harsha Man Shrestha of Rastriya Janashakti Party expressed his view on sharing every one's effort to push the project ahead, including JICA. **Mr. Keshar Bahadur Thapa of Rastriya JanMukti Party** stated his party's principle to generate electricity from the running water and light the hill and mountains. He invited every body to participate in the noble effort and demanded proper compensation. He assured his party is willing to contribute on all aspect for the success of the project.

collected. They were in major 6/7 groups such as compensation, resettlement, infrastructure development, forestry and vegetation loss, conservation of ethnic population, and environmental management plan.

Mr. Yam Bahadur Ale of Pokhari Bhanjyang thanked JICA for adding the 10MW generation capacity of the project. He suggested in the renaming of the project depending upon the location of the hard rock in the dam site which is called as "nhung" means hard rock in local Magar language. He suggested 'Upper Seti (Nhung) Storage Hydro Electric Project, by replacing "Damauli". He urged the community to maintain transparency. He expressed his concern on discrimination of the Pokhari Bhanjyang area of the downstream of the project site. He asked clarification on defining the site as devoid of human settlement, expected the technology of cutting and filling of the rock, Japanese standard of sedimentation, whether fishing is possible in the reservoir, asked proper definition of the priority order of employment of local people. Finally he requested for a proper homework before start of the project.

Mr. Shivalal Thapa of Kahu, Shivapur urged the project to concentrate on affected human population rather than the lizards and toads. He urged let the affected 122 households be defined with proper delineation of the 32 proof less residents and include those who missed the opportunity to register themselves, during the inventory period. His concern was on the priority of the employment opportunity to those at least who fulfill the eligibility criteria for semi-skilled workers.

Mr. Bhakkta B. Gairhe of Rhising Ranipokhari proposed to include the affected population in the coordination committee to fix and distribute the compensation. The lost road stretches need to be connected.

Mr. Ram Nath Subedi of Rhising Ranipokhari made clear that there is no debate on the coming of the hydroelectric project. Local people are not aware about the 420 m FSL, thus the feasibility team is requested to acquaint the local people about the water level. Preference need to be given to the locals in order from village to district level. Stakeholder level meeting is needed to organize at the village level not in Damauli.

Mr. Krishna Kumar Shrestsha of Bhimad expressed happiness on the project to be constructed in the local area. Bhimad at presently being affected by bank cutting by the Seti River requested proper delineation of the inundation area due to the reservoir construction. General information disseminated through the local magazines is not enough to disseminate to the local level, thus requested for mass level stakeholders meeting at VDC level.

Mr. Laxman Adhikari of Jamune VDC expressed his dissatisfaction for not being exposed the

Mr. Pushpa Raj Gairhe Vice Chairman of United Democratic Front Tanahu district expressed his hope that the recent resolution of conflict will bring a number of development projects and will be implemented successfully. It is pathetic to be dependent on kerosene oil just for lighting purpose for the residents of a country that is rich in water resources. He was hopeful to the rescue of people from sufferings as indicated by the survey. He was very much positive with the proper compensation, tracks and trails construction and other facilities to be availed. He assured UDF is very much supportive for the construction and expressed hope of horticulture development through irrigation facility as a part of the project benefit, setting up of industries, so that the youths could be retained from out migration. Reviews of the previous treaties are equally important in using the water rights.

Mr. Samudra Gulab of NC (Democratic) stated that the electrification is the key to modern development. It becomes our duty to help the study team and learning lesson from MMHEP is equally important. Thirty meter sedimentation in 100 years duration is not clear, thus needs clarification. Impacts on natural environment need to be looked after. Issues such as package dealing to the ethnic communities, livelihood concerns, ecotourism, and employment to the local population are equally important, thus hoped to move ahead faster.

Mr. Kedar Sigdel, Joint Secretary CPN (UML), Tanahu believed that the development issue is above political debate. Realizing the importance of electrification, he urged each individual to come jointly. He reminded to learn lesson from MMHEP. Only the minute observation upon the issue of the local residents could solve the issue, rather the homework done at Kathmandu excluding the local can't solve the problem. In the changed context of democratic republic no one is interested to stop the development process. He suggested formulating a long term mechanism to assign 75% of the royalty to the Tanahu DDC. Similarly, employments to Tanahu citizens need to be ensured to 50% of the total employees on competitive basis. He expressed his heartfelt thanks to JICA and NEA. He ensured his party is positive and cooperative.

Mr. Dil Bahadur Thapa, Vice President NC,Tanahu felt that there is a mechanism of give and take in any business. We will be losing irrigation canals, forest and arable land, still electricity is must for development. He ensured the party supportive in the process. In the changed context of peace building every body need to participate. He demanded a just compensation mechanism and requested the fellow citizens to shift to industry from livestock rising. In Manedanda area, where people devote an hour for fetching a pitcher of drinking water need to be looked after through the project. A free water distribution system using the generated electricity from the proposed project will improve the quality of life. Suspension bridges inundating through the reservoir construction will be reconstructed in the proper area. Locals need to be given priority in terms of employment and other facilities.

In the second session of the public hearing almost 40 numbers of written recommendations were

major issue till now. The 10 km inundated area lying in Ranipokhari, Chhang and Jamune need to be properly considered. He demanded for the bridge construction that links the road between Rhising, Kot Darbar, Ramjakot, Jamune.

Mr. Bijaya Prakash Sharma, Rhising Ranipokhari expressed that only the Buduwaphat of Majhkot is going to be inundated. Arable land need to be saved from inundation. Public hearing need to be held at VDC level. Inundation area, and compensation need to be exactly defined. Education concern of the project need to be strictly defined and the affected land of the school need to be delineated.

Mr. Upendra Ghimire of Jamune demanded for the construction of 2.5 km motorable road. Local natural resource to be exported needs to be identified and estimated. Alternatives need to be looked after for the inundating suspension bridges. Ecotourism potential area needs to be identified and developed. Community forestry, grazing lands, need to be delineated. School need to be assigned 300 ropani of land, drinking water scheme, water source conservation, employment as per the skill, electrification, and compensation committee from the local level and the stakeholders meeting being held in Kathmandu need to be represented from the locals.

Mr. Ramesh Paudel, Kahu Shivapuri, expressed his view that Nepal is also dragged in the power (fuel) politics. He proposed the project to be constructed through the local (national) source rather from the donation or foreign support.

Mr. Kajiman Shrestha, former VDC Chairman of Bhimad wished for the successful completion of the project and warned let the local people not face sufferings. He urged the compensation need to be properly defined. A trip of outsiders in air conditioned vehicles doesn't support local people neither represent their voice, let the visitors be open minded to the local population.

Mr. Padma Raj Subedi, Bhimad, also had the similar concerns. Loss of vegetation and wildlife is not significant compared to the project that benefits human life. Project must come, but with proper compensation of the lost land. Possible inundation area needs to be delineated right now. The land occupied by Wangtang khola presently is under School's ownership and the land needs to be owned by the School itself. Employment need to be availed based on capacity, qualification and preference to the locals.

Mr. Biru Thapa, raised his concerns about the name (Nhung) of the project as proposed by Mr.Yam Bahadur Ale. Drinking water need to be accessed to the water scarce area. Preference should be given to the locals for employment.

Mr. Balkrishna Gaihre, Majhkot requested the team to clarify about the 420 FSL and extend the

public hearing program to the local level. Rudra Bahadur Ale of Kot Darbar also raised issues about the employment to the locals based upon skill and capacity. A networking coordination committee is essential for smooth running of the project and public hearing needs to be extended to local level.

Dr. Toran Sharma of NESS on behalf of the JICA Study team responded to the queries raised by the stakeholders apologizing for the inconvenience of the dissemination to the Pokhari Bhanjyang community. He emphasized that the compensation prediction is done as per the Local Development Act 2034.

Mr. Shiva Chandra Jha, Chief of the Environment and Social Study Division of NEA gave the vote of thanks to all the stakeholders making the program successful in Damauli.

Mr. Bishnu Prasad Dhakal, Local Development Officer concluded the session from the as a chairman of the programme. He assured that the concerns of the stakeholders will be addressed in different stages of the project. Human resource will be assigned from the local level so far available especially in the unskilled and semi-skilled sector. Information has been flown to the optimum level. He suggested for necessary correction to be made to the human habitant area that has been delineated as non human habitant area. Annual royalty of 10 – 20 Million NRs generated from the project will be spent for the betterment of the local area. Site specific public hearing program will be organized and stakeholders committee will be formulated before launching of the project. He expected that NEA will give due consideration for public participation.

Reply to Comments and Issue Raised by Stakeholders

at Second Stakeholder Meeting in Damauli

Reply to Comments and Issues Raised by Stakehodiers at Second Stakeholder Meeting in Damauli

S. N	Issue raised	Suggestions, Feedback and Comments from the Participants	Comments and Responses from Nepal Electricity Authority (NEA)
1	Needs for the Project	1) The Project is requisite and essential in terms of development in the country as well as in Tanahun District. 2) The development of this Project is very crucial to meet ever increasing demand for electricity and to utilize adequate water resources available in this region. 3) The Project should be implemented smoothly without any disturbances or any delay, which has been observed in other projects such as Middle Marsyangdi Hydro Electric Project (HEP).	1)-2) Following the first Local Stakeholder Meeting, the participation of the local people in 2nd Local Stakeholder Meeting and their response has been overwhelming. The suggestions and comments made by the local people will assist in formulating environmental mitigation programs during the Upgrading Feasibility Study supported by JICA. 3) The lessons learned and experiences from similar HEPs will be incorporated into the Draft Final Report under the Upgrading Feasibility Study.
2	Information dissemination and public consultation	1) Consultation meetings should be carried out in each affected VDCs and Vyas municipality to consult with the local people including the affected people more effectively. 2) More specific and detailed information on the inundated areas, the exact location at Full Supply Level and the procedures for compensation should be disseminated to the affected people. 3) Not only impacts on the	1) Focus Group Discussion was held during the EIA survey conducted by NEA and supplemental EIA supported by JICA to consult with the local people in several affected communities. VDC level consultation program for community support will be carried out during the project formulation and implementation phase. 2) Since the NEA and the JICA Study Team have been still

		environment and the society but also environmental mitigation measures should be provided to participants in the 3rd Stakeholder Meeting.	investigating the feasibility of the Project from various aspects, the information available on the basis of the current Study can be provided to the public during the Stakeholder Meeting. The potential affected or inundated areas will be visualized in the forthcoming Stakeholder Meeting in order to enable the local people to understand such information easily. The detailed procedures for compensation will be provided only during the detailed design phase. 3) Environmental mitigation measures will be proposed in the forthcoming Stakeholder Meeting.
3	Maximum benefit of the Project given to local people	1) Since the project site is located in Tanahun District, the first priority should be given to local people in Tanahun. 2) Some portion from NEA royalty should be handed over to the local organizations for implementation of the community or VDC development activities.	1) Various types of Social Action Programs are being considered to rehabilitate and enhance the affected communities. Affected Community's Initiative Support Program will be carried out, in which some development funds will be allocated to each of the affected VDCs and utilized by the affected people and communities based on their own needs or priorities for small-or middle scale development activities. 2) The hydropower policy requires that the licensee of a hydropower project pays royalty to the Government of Nepal through Ministry of Water Resources, 90

			percent of which is deposited in the government's revenue account while the remaining 10 percent is made available to the respective districts. This budget can be used for development programs in the affected district.
4	Compensation and Resettlement	1) Adequate and timely compensation for affected household should be given to the affected people. 2) The detailed compensation policies and provision need to be well informed to the affected people and communities. 3) The compensation cost should be fixed on the market price rather than on government price. 4) Land without legal holding paper should also be compensated. 5) The representative from the affected people needs to be member of Compensation Fixation Committee. 6) Before staring the project, compensation should be given to the affected people.	1) The framework of Resettlement Plan (RP) will be formulated under the Upgrading Feasibility Study. When formulating the framework of RP, the appropriate method of compensation will be considered in accordance with the JICA Guidelines, the prevailing government laws and regulation, and lessons learned and experiences from similar HEPs. 2) The outline of the framework of RP will be provided in the forthcoming Stakeholder Meeting. The detailed procedures on compensation and rehabilitation will be disseminated only during the detailed design phase. 3) The compensation cost will be decided by Compensation Fixation Committee (CFC) as per Nepal's legal provision considering the market price to ensure improvement of the standard of living among the affected people, or at least restoring them to pre-project levels.

			4) Land without legal holdings will be compensated as per the prevailing practices. 5) As per the Land Acquisition Act, a Compensation Fixation Committee (CFC) will be formed. Although this Act does not consider the representative of affected people as a member of CFC, NEA will recommend that they should be included in CFC in accordance with the previous practices. 6) The compensation will be provided to the affected people before the commencement of the Project.
5	Employment Opportunities	1) Local people should be employed by the Project as skilled labors and unskilled labors. 2) If skilled labors are not available in the areas, the training should be provided by the Project. 3) The detailed information of employment opportunities should be provided in the Stakeholder Meeting.	1) Wherever possible local people will be employed on the basis of skill and qualification during the construction period. 2) Skill Enhancement and Employment Program will be carried out for local interested and eligible people from affected families and communities. Training will be provided to them focusing on enhancement of skills required for the project employment. 3) In the Stakeholder Meeting, the above Skill Enhancement and Employment Program will be proposed. However, the detailed

			information of employment opportunities will be provided to the local people during the detailed design phase.
6	Roads Construction	1) The inundated road stretch needs be rerouted. 2) Motorable roads should be built from Bhimad, Rising Patan to dam site, and Damauli.	1) Alternative transport facilities including foot trails and stretches of the roads will be rerouted and constructed during the construction phase of the Project. 2) With regard to the upgrading of affected stretches of road, further examination will be undertaken from technical and financial aspects in coordination with District Development Committee and the concerned VDCs during the detailed design phase. In the project facility sites, the access road will be constructed and upgraded. Except for them, the construction of new roads outside the affected areas is out of the scope of the Project.
7	Suspension Bridges	1) For inundated suspension bridges, the alternatives need to be seriously considered.	1) Submerged suspension bridges will be rerouted and replaced under the Social Action Plan.

8	Erosion and landslide	1) The mitigation measures to protect Bhimad Bazaar from erosion should be seriously considered and undertaken. 2) The information about whether gabion walls will be constructed in the possible hazardous areas during the project construction should be provided to the local people.	1) Special protection measures against erosion will be taken for the cliff of Bhimad Bazaar. 2) Wherever needed, the mitigation measures such as Community-based Watershed Management and plantation along the buffer zones of reservoir areas will be carried out to protect the potential risk areas from erosion or land slides. These mitigation measures will be explained in the forthcoming Stakeholder Meeting.
9	Forest	1) The affected community forest and grazing lands need to be delineated. 2) The information about whether the proper compensation will be provided to the affected Forest User Groups should be informed. 3) Mitigation measures should be considered seriously.	1) In the forthcoming Stakeholder Meeting, the affected community forest and grazing lands will be delineated on the map. 2) Regarding the compensation for loss of forest, NEA has discussed with the JICA Study Team. Appropriate measures will be considered in accordance with the prevailing government laws and regulations in consultation with Department of Forest. 3) The mitigation measures will be considered seriously and proposed in the forthcoming Stakeholder Meeting.
10	Electrification	1) Electricity facility should be given to affected people and local people in Tanahun District at subsidized rate or cheaper rate.	1) The provision of rural electrification and appropriate extensions will be considered as part of Project's Social Action Plan

			for unconnected part of the affected VDCs.
11	Fisheries	1) Mitigation measures for fisheries should be addressed. Fisheries development activities should be carried out in reservoir areas.	1) Fish hatchery development and/or expansion of existing facilities and stocking of fingerlings in the upstream and downstream zones will be proposed as mitigation measures. Experimental stocking of fish in the reservoir area will be considered.
12	Various Development Needs	1) Water springs and sources of drinking water will be submerged. Thus, drinking water supply particularly in Jamune VDC through the use of electricity should be provided. 2) For the affected schools, support for improving school infrastructure needs to be provided.	1)-2) Affected Community's Initiative Support Program will be carried out in the Social Action Plan. This program is designed to allocate some amount of fund to each affected VDC. The affected communities can decide to utilize such fund for drinking water supply program and or renovation of school infrastructure by themselves. In the forthcoming Stakeholder Meeting, these social programs will be proposed to the local people.

List of Invited Institutions/Persons of Second Stakeholder Meeting

in Kathmandu

List of Invited Institutions/Persons of Second Stakeholder Meeting in Kathmandu

S.No.	Name	Address	Expect Number
1	Ministry of Environment Science and Technology	Singa Durbar	1
2	Ministry of Water Resource	Singa Durbar	1
3	Department of Electricity Development	Singa Durbar	1
4	Ministry of Forest and Soil Conservation	Singa Durbar	1
5	Ministry of Agriculture	Singa Durbar	1
6	Ministry of Land Reform	Babarmahal	1
7	Fisheries Development Directoriate	Balaju	1
8	IUCN	Bakhundol	1
9	Nepal Forum of Environmental Journalist	Thapathali	1
10	Embassy of Japan	Panipokhari	1
11	JICA	Pulchok, Lalitpur	2
12	JBIC	Mr. Krishna Manandhar Local Representative, JBIC, Kathmandu	1
13	ADB	Kamaladi, Kathmandu	1
14	The World Bank	Durbar Marga	1
15	Engineering Association of Nepal	Pulchok	1
16	EIA Association of Nepal	SchEMS	1
17	NGO Federation	Buddha Nagar	1
18	Local NGO Representative	Tanahu	1
19	Water Nepal (Ajay Dixit)	Patan	1
20	RONAST	Sadhabato	1
21	Radio Sagarmatha	Sanepa, Lalitpur	1
22	The Kathmandu Post	Subidhanagr, Kathmandu	1
23	The Himalaya Times	Ananmnagar, Kathmandu	1
24	The Raising Nepal	Dharampath, Kathmandu	1
25	IMAGE Channel	Lazimpat, Kathmandu	1
26	Kantipur TV	Subidhanagr, Kathmandu	1
27	JICA Study Team		8
28	NESS Consult		5
29	NEA-ESSD, Project Development, Engineer, other departments		35
30	NORAD		1
31	KfW	Bakhundol, Lalitpur	1
32	ICIMODE	New Baneshwor	1
33	WWF	Maharjung, Kathmandu	1
34	Winrock International	Bakhundol, Lalitpur	1
35	National Planing Commission	Singa Durbar	1
36	Napal Toursim Board	Exhibation Road	1
37	Department of Gelogy	Lazimpat, Kathmandu	1
38	Federation of Indigenus People	Sanepa, Lalitpur	1
39	Nepal Communist Party (Maost)	Kupondloe, Lalitpur	1
40	Nepal Communist Party (UML)	Balkhu, Kathmandu	1
41	Nepali Congress	Sanepa, Lalitpur	1
42	Nepali Congress Democratic	Maharjung, Kathmandu	1
43	Sadhabana Party (Anandadevi)	Tripureshwor	1
44	Nepal Peasant Party	Bhaktapur	1
45	Joint Peoples Movement of Nepal		1
46	Left Movement of Nepal		1
47	Ministry of Women and Social Welfare	Singa Durbar	1
48	Dr. J.C Pokharel	Vicechairman, NPC	1
49	MP Tukraj Sigdel (CPN UML)	Area No.3 Tanahun	1
50	MP Ram Chandra Poudel	Area No.3 Tanahun	1
51	MP Govinda Raj Joshi	Area No.1 Tanahun	1
52	Former MP Amar Raj Kainy (N.C.Democratic)		1
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Participants Registered in the Second Stakeholder Meeting

at Kathmandu, December 6, 2006

Participants Registered in the Second Stakeholder Meeting at Kathmandu, December 6, 2006

SN	Name	Cast	Address	Office/Organization	Occupation	Phone No.	Age	Sex
1	Keshav Nepal		United Left Front, CPN (ML)	CPN	Political activist	4443589	42	M
2	B.P Dhakal	Bhraman	Tanahu	DDC JV	LDO	065-560174	46	M
3	Resham Raj Dhital			Department of Fisheries	Director	4350662		M
4	Ram Pd. Adhikari		NEA	DHM	Administer	4264779	57	M
5	C.B Shrestha	Newar	Anamnagar	DoED	EG	4480425	39	M
6	Bhawani P Kharel		Bakhundole	IUCN	Sr. Program Officer	5528781	48	M
7	Sarita Maharjan	Newar	Chasal Kathmandu	Janmoorcha Nepal	Politician	4232682	46	F
8	Niru Dangol	Newar	Chasal Kathmandu	Janmoorcha Nepal	Politician	4232682	32	F
9	Krishma C. Manadhar	Newar	Thamel	JBIC	Consultant	4239726	54	M
10	Tetsuya Hirahara			JICA Study Team	Economist			M
11	Hiroshi Murashige			JICA Study Team	Engineer			M
12	Yoshimasa Ishii			JICA Study Team	Engineer			M
13	Jack Prosser			JICA Study Team	Environmentalist			M
14	Tomoo Aoki			JICA Study Team	Environment			M
15	Hironobu Nishimiya			JICA Study Team	Engineer			M
16	Toshiko Shimada			JICA Study Team	Social development			F
17	Sayako Tokuda		JICA	JICA	ARR	5552376	35	F
18	Saurab Rana		Puichowk	JICA	Service	5552711	36	M
19	Batu Uprety	Bhraman		MOEST	Env. Officer		57	M
20	Pravin Aryal	Bhraman	SinghaDurbar	MOWR	SDE	4211501	43	M
21	Amar Raj Kaini		NC (D)	NC	Politician	4352119	56	M
22	Bhoj Raj Regmi	Bhraman		NEA	Eng. Department head			M
23	Mrigendra Shrestha	Newar	Dhapasi	NEA	Engineer	4355836	54	M
24	Vishnu Bahadur Singh			NEA	Chief	4370432	54	M
25	Laxman Raj	Bhraman	Baneshwor	NEA	Engineer	16220478	57	M
26	Chandra Ghimire	Bhraman		NEA	Accountant	9.851E+09	38	M
27	Shyam Shrestha	Newar	NEA	NEA	General Manager	4214299		M
28	Mohan K. Uprety	Bhraman	NEA	NEA	Dir.	4220449	52	M
29	Surendra Bahadur Pandey	Bhraman		NEA	Service	4258338	45	M
30	Shanti Laxmi Shakya	Newar	NEA	NEA	Service	4258342	42	F
31	Balram			NEA	Service	4229455	40	M
32	Hari Krishna Shah		NEA	NEA	Service	4254657	40	M
33	Biswa D		NEA	NEA	Engineer		45	M
34	T.M Shakya	Newar	Lazimpath	NEA	Director	4226715	53	M
35	R M Sulpya		Durbar	NEA	Engineer	4288128	50	M
36	B.K Pathak		Baluwatar	NEA	Director/Engineer	4227039	49	M
37	Dr. Jivendra Jha			NEA	DND/Planning	4227976	56	M
38	H.M Palikhe			NEA	Director	4226889	55	M
39	Sitaram Thapa		Sundarijal	NEA	Unioist	9.841E+09	26	M
40	Kamal Raj Pandey	Bhraman	NEA	NEA	Director	44955642	56	M
41	K. Man Pradhan	Newar	NEA	NEA	Director	4228212	56	M
42	Nesis		NEA	NEA	Asst. Manager	4225499	36	M
43	Rishi Kesh Sharma		NEA	NEA	Manager	9.851E+09	49	M
44	Annu Rabhandari	Newar		NEA, ESSD	Deputy Manger	4226730		F
45	Lalit Joshi			NEA, ESSD	Sociologist	4431628	57	F
46	Janaki Sangraula			NEA, ESSD	Sociologist	4480150		F
47	Shiva Chandra Jha	Bhraman	Swyambhu	NEA, ESSD	Engineer	4279217	55	M
48	Ritu Duwal	Newar		NEA, ESSD	Engineer	4226730	35	F
49	Umesh Bista	Bhraman		NEA, ESSD	Comp. operator	4226730	33	M
50	S.B Bajracharya	Newar	NEA	NEA, ESSD	Director	4225321	54	M
51	Kiran Poudel	Bhraman		NEA, PDD,	Ast. Manager			M
52	Shasti S. Rajbhandari	Newar	SRCL,NEA	NEA, SRCL	Director	4376860	51	M
53	R.M. Pradhanga	Newar	Thapathali	NEA/PPD	Engineer	4243227	54	M
54	Bhairav Risal			NEFEJ				M
55	Mahendra B. Gurung	Gurung	Handu Gaun	Nepal Engineers Association	General Secretary	5550072	52	M
56	Toran Sharma	Bhraman		NESS	MD	4244989		M
57	Ram K. Sharma	Bhraman		NESS	socio-economist	4473444	52	M
58	Pradeep Poudel	Bhraman	NESS	NESS	Environmentalist	9.841E+09	23	M
59	Madan Koirala	Bhraman		NESS/JICA	Environmentalist	4244989	50	M
60	Jagdish C. Pandey		NPC	NPC	Planning	5321663	53	M
61	Manish K. Suman		NSP (A)	NSP(A)	Social Service	984137449	30	M
62	Jagsish Neupane		Tanahu	Social Work		4361644		
63	Razen Manandhar		Anamnagar	The Himalayan Times	Journalist	4771489	36	M
64	Ritu Raj Subedi		KTM	The Rising Nepal	Reporter	4220700		F
65	Proj Dev kumar	Newar	Kuleshwor	Tribhuwan Univ	Environment	4279748	55	M
66	Kourcer Sharma		Winrock	Winrock	S.R Officer	4476101	40	F
67	Sandeep Chamling Rai	Rai		WWF	Program Manager	4434820		M
68	Arjun K. Karki		NEA	NEA				M
69	Seshkant Khanal		Samakhusi		Service	4354109	51	M
70	Tuka RajSigdel		Tanahu		MP	5544083	51	M
71	Uttam S. Shrestha	Newar	Shantinagar Baneshwor		Lecturer	4480109	41	M
72	Dilli Ratna Shakya	Newar	Newroad		Engineer	9.851E+09	60	M
73	Ram Chandra Poudel	Bhraman			MP			M
74	Krishna		Samakhusi					M

Program Schedule of Second Stakeholder Meeting in Kathmandu

Program Scchedule of Second Stakeholder Meeting in Kathmandu

Date: December 6, 2006 (Mangsir 20, 2063)

Time: 9:00-1:00

Venue: The Malla Hotel, Lekhnath Marg, Kathmandu

Tel: 4418385/4410966 Fax:4418382

Chief Guest: *Honorable Vice Chairman of NPC, Dr. J.C Pokharel*

Chairperson: *Managing Director of NEA, Mr. Arjun Kumar Karki*

Program Schedule

No.	Time	Hrs	Events	Presenters
	8:30-9:00	0:30	Registration /Tea	
1	9:00-9:10	0:10	Opening Address	MD, NEA
2	9:10-9:20	0:10	Background of the Project	NEA
3	9:20-9:30	0:10	Study progress and necessity of the Project	JICA Study Team
4	9:30-9:50	0:20	Optimization of development plan	JICA Study Team
5	9:50-10:05	0:15	Physical and biological environment impact	JICA Study Team
6	10:05-10:20	0:15	Socio-Economic and cultural environment impact	JICA Study Team
7	10:20-11:00	0:40	Comment from MOWR, MoEST, MoFSC, DoED and donor agencies	JICA Study Team
8	11:00-12:00	1:00	Discussions	
9	12:00-12:05	0:05	Vote of thanks	NEA
10	12:05-12:15	0:10	Closing Address	Chief Guest
11	12:15-1:00	0:45	Lunch	

Contact Address

- Nepal Electricity Authority Environmental and Social Studies Department Engineering Services Advait Marg, Kathmandu Tel :4226730 Fax:4225248
- JICA Study Team c/o. JICA Nepal Office

  P.O. Box 450, Kathmandu, Nepal Karmachari Sanchaya Kosh Bldg, Hariharbhavan, Lalitpur

  Tel: 5552711 Fax:5552284

Presentation Material in Kathmandu

Background of Upper Seti(Damauli) Storage Hydroelectric Project

B.R. Regmi
General Manager,
Engineering Services,
Nepal Electricity Authority

Kathmandu
December 6, 2006

1.0 Background

The present total installed capacity in Nepal is 614 MW. The power demand in the country has been growing approximately at a rate of 8 % per annum in recent ten years period (1995 to 2005)

As per NEA Power Generation Expansion Plan 2004/2005 the targeted commissioning date of Upper Seti Storage HEP is 2012/2013.

Since ROR type of hydropower plants can marginally regulate river discharge for power generation, Nepal has been facing shortage of power in the dry season.

Hence, Nepal Electricity Authority (NEA) has felt the necessity to develop storage type of hydropower plants.

The technical team of Project Development Department of NEA undertook the initiative to identify the medium sized storage projects nation-wide.

The Study Consisted of three Phases:

Phase I: Coarse Screening and Ranking Study

A total of 102 potential projects in the range of 10 - 300 MW were identified during this study in February, 2000.

Phase II: Fine Screening and Ranking Study

During this study out of those 102 projects only 10 most attractive projects were selected and studied. (September, 2000).

Based on those studies 2 projects namely Upper Seti and Madi-Ishaneshwor Storage Projects were recommended for the Feasibility Study.

Phase III: Feasibility Study

The Feasibility Study of the Upper Seti was conducted and completed in FY 2057/2058 by NEA team.

2.0 JICA Study

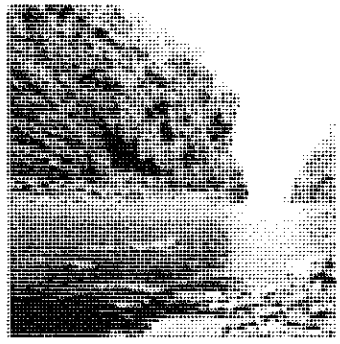
The Government of Nepal requested the Government of Japan to promote the Project by financing an Upgrading Feasibility Study under the technical assistance of Japan International Cooperation Agency (JICA). The JICA Study team commenced the Study in February 2005.

2.1 Objectives of the JICA Study

- To formulate the optimum plan for development
- To assess the technical, economical, financial and environmental viabilities of the Project.

3.0 Main Features of the Project:

Location of the project :	Tanahu, Western Development Region
Dam site :	3 km upstream of the confluence of the Seti and Madi river
Dam height:	136 m
Full Supply Level:	420 masl
Effective volume:	131.4 Mm^3
Design Discharge:	121.3 m^3/Sec
Installed Capacity:	132 MW
Annual Energy:	635.55 GWh
Powerhouse Site and Type :	underground powerhouse, located downstream of the Dam site



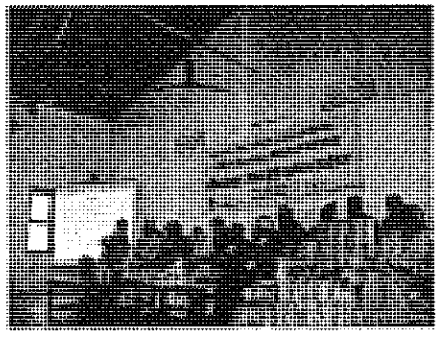
Dam Site of Upper Seti HEP

4.0 Environmental Study and Status

- Environmental Impact Study (EIA) is conducted by NEA and the report is in MoWR in the process of approval.
- Additional EIA is being conducted by JICA study Team as per the JICA Guidelines on Environmental and Social Consideration.
- Stakeholders meetings are being arranged through the Environment and Social Studies Department of NEA with the assistance of JICA Study Team.

- Initial Stakeholder Meetings were held in June 2006 which included intensive discussions with the local affected people in Damauli and with the concerned institutional representatives in Kathmandu.
- Second Stakeholder Meeting was conducted in Damauli on December 1, 2006 to solicit views, concerns and suggestions from affected local people.
- This Meeting is also a part of the Second Stakeholder Meeting with the concerned institutional representatives in Kathmandu.

Participants of First Stakeholders Meeting at Damauli



2nd Stakeholder Meeting at Damauli, DDC Hall

Participants of 2nd Stakeholder Meeting at Damauli, DDC Hall

5.0 Conclusions

The JICA Study Team will continue this study, and design the Project at Upgraded feasibility study level, estimate project cost, and conduct overall economic and financial analysis. The study will be completed by June,2007.

The final Stakeholder Meetings are scheduled to be held in April or May 2007 in Damauli and Kathmandu to discuss about the final design, mitigation measures, environmental management plan and enhancement programs.

The findings of the Upgrading Feasibility Study and the inputs from the stakeholders meetings received so far indicate that the project is technically and environmentally viable.

1

Study Progress

Premininary Study Stage
1. Review of existing documents and data
2. Preparation of alternative layout
3. Preparation of investigation plan
4. Power Sector Survey

Detailed Investigation Stage
1. Investigation
   by Subcontracting
   by Study Team
2. Environmental Impact
3. Optimization of Development Plan

Fesibility Design Stage
1. Design at F/S level
2. Preparation of construction plan
3. Project cost estimation
4. Supplemental EIA
5. Economic & financial analysis

2

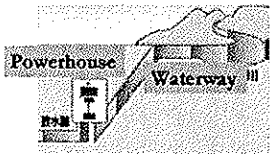
Presentation

Study Team's Presentation

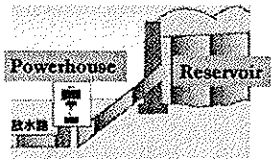
- Optimization of development plan
- Physical and biological environment impact
- Socio-economic and cultural environment impact

3

Necessity of Project-Type of Hydropower Plant



Run-off-River Type



Storage Type

4

Necessity of Project

Results of Power Sector Survey:

Storage project is necessary for stable power supply in the country

- Supply power during peak time (around 5:00 p.m. to 10:00 or 11:00 p.m.)
- Especially supply power during dry season, because of decrease river water

Conclusion:

Upper Seti storage project is necessary

5

Project Stage

Project Stage:

JICA Study

↓

Detailed Design

↓

Bidding

↓

Construction

↓

Operation

6

Minutes of Second Stakeholder Meeting in Kathmandu

Minutes of Second Stakeholder Meeting in Kathmandu

Project: Upper Seti Storage Hydroelectric Project
Venue: Hotel Malla, Lainchaur, Kathmandu, Nepal
Date: December 6,, 2006
Time: 9:00 hrs
Language: Basically Nepali except for presentation made by the JICA Study Team in English

The second stakeholders' consultation meeting on the proposed upper Seti storage hydroelectric project under the upgrading feasibility study assisted by the JICA study team was held on 6th December in Kathmandu. The meeting was attended by more than 75 people representing different sectoral ministries, donor agencies, non-government organizations, members of parliament, and professionals from project area and people from different walks of life (See *List of Participants*).

Mr. Kiran Paudyal, civil engineer from Project Preparation Department of Nepal Electricity Authority was the Master of Ceremony. Mr. Poudyal invited following guests to take their seat in the dice.

Dr. Jagadish Chandra Pokhrel, Vice Chairman, National Planning commission
Mr. Arjun Karki, Executive Director of NEA
Mr. Ram Chandra Paudel, seating Member of Parliament of Tanahu District and former Speaker of the Parliament;
Mr. Tuk Raj Sigdel, seating Member of Parliament of Tanahu District;
Mr. Amar Raj Kaini, former Member of Parliament of Tanahu District,
Mr. Yoshimasa Ishii, JICA Study Team, Team Leader
Mr. Bhoj Raj Regmi, General Manager, Engineering Services, NEA
Mr. Shiva Chandra Jha, Chief, Environment and Social Study Division, NEA

The program was chaired by **Mr. Arjun Karki**, Executive Director of NEA and the chief guest of the program was **Dr. Jagadish Chandra Pokherel**, Vice Chairman, National Planning commissions.

The program started with the opening address by **Mr. Shiva Chandra Jha,** Chief, Environment and Social Study Division, NEA. Highlighting on the objectives of the second stakeholders meeting in Katmandu, Mr Jha pointed out that the JICA guidelines requires such consultations with the stakeholders as a part of the project preparation. He also reminded that similar stakeholder meeting was conducted in Damauli during the EIA preparation phase by NEA. According to him the NEA prepared EIA is under evaluation by Ministry of Water Resources and will be soon forwarded to Ministry of Environment, Science and Technology for final approval. Since the preparation of EIA many additional information has been collected by the JICA study Team which will be incorporated in the NEA prepared report once this JICA study is accomplished. He requested to all the concerned to give their valuable comments and suggestions to the JICA study Team to make the environmental study comprehensive.

Mr. Bhoj Raj Regmi, General Manager, Engineering Services, NEA explained the background of the Upper Seti (Damauli) Storage Hydroelectric Project (See *Presentation 0*). He highlighted the project and described the need of the project by 2013 AD to meet the peak electricity demand of the country. In the context of present installed capacity, 614 MW and yearly demand increment by 8 to 10%, the Upper Seti Storage Project is essential to balance the existing demand and supply of electricity.

Explaining on how this project has been selected out of 102 potential projects, he stressed its role in meeting the electricity needs of the country. He reminded that the present study by JICA will prepare a bankable report on the technical, economical, financial and environmental aspects of the project for subsequent finding arrangements.

Regarding the environmental study and status, he briefed that EIA has been accomplished by NEA and the report is in Ministry of Water Resources in the process of approval. Upgrading EIA is also being conducted by JICA Study team in this stage. Stakeholders meetings are being held in this context to fulfill the JICA guideline requirements. The JICA team will conduct the final stakeholder meeting in April 2007. Local people participated in the 1st and 2nd stakeholders meeting with full enthusiasm and NEA expresses thanks to them. According to Regmi, the envisaged environmental impacts could be mitigated to acceptable degree and hence the project deserves implementation.

Mr. Yoshimasa Ishii, Team Leader, JICA Study Team, described the different project study stages, and their objectives and findings (See *Presentation 1*). Mr. Ishii explained the necessity of Project and elaborated 2 types of potential hydropower plants in Nepal. According to him Run Off the River hydropower plant doesn't regulate water seasonally and could not generate electricity required during peak demand period, whereas storage type hydropower plant could regulate water in the reservoir and this could be effectively used for electricity generation in the peak demand period. In the prevailing demand and supply situation of Nepal, to meet the energy demand in the peak demand period, the storage type hydropower plants are most suitable. In the above background, the Upper Seti (Storage) Hydroelectric Project is the necessity of the country.

Mr. Murashige, Civil Engineer, Member JICA Study Team presented the results of *Optimization of Development Plan for Upper Seti HP Project* (See *Presentation 2).* He explained the different alternative layout designs evaluated for the selection of the best alternative. He briefly summarized the results of comparative study of the different layout design from geological, environmental, technical, economic and financial aspects and explained the key criteria taken for the selection of the optimum development plan for the project. Lastly, he presented the salient design features of the selected alternative and its development plan.

Mr. Jack Prosser, Member of JICA Study Team presented the underlying environmental issues and impacts highlighting the candidate mitigation measures to avoid, minimize and

compensate the adverse environmental impacts (See *Presentation 3*). His presentation covered three major components of natural environment:

- Watershed Planning & Reservoir Area
- Water Quality & Eutrophication
- Biological Environment

On the watershed, he focused on the erosion features of the watershed and their potentials in the sediment contribution with brief account on the possible measures for watershed planning for erosion control. On water quality, he raised the concern of eutrophication in the reservoir and possible alternatives for the water quality enhancement measures. On the Biological environment, he presented the database on the forest resources, wildlife and wildlife habitat and fishery of the Seti River and the potential impacts on the above resources by the project. He briefly presented the nature of the impact (direct and indirect) and the list of measures which could be implemented to avoid, minimize and compensate the adverse impacts.

Mr. Prosser, also presented the findings of IEE level study of 220 kV Transmission Line linking the project with the sub-station at Bharatpur. A brief account of the affected areas and resources were also discussed during presentation highlighting the environmental characteristics of the selected alternative alignment. He strongly recommended for the EIA level study of the selected alignment.

Ms. Shimada, Member of JICA Study Team, presented the Socio-Economic and Cultural Impacts of the project. Her presentation covered following aspects of the study (See *presentation 4*):

- Study objectives
- Study Methodologies
- Affected Areas
- Framework of Resettlement Plan, and Social Action Plan

After highlighting the study objectives and methodologies, she presented the database on the affected land and property by the reservoir and project facility sites for the selected project alternative. She also presented the lists of the affected community infrastructures, community built structures, and the number of households and individuals whose land, structures, will be affected by the project directly. She also presented the number of households who may need relocation from their present dwellings due to the project.

As a measure for mitigation, she presented the framework of resettlement plan and social action plan. According to Ms. Shimada the resettlement plan will be based on the following key principles:

- Affected persons (APs) shall be compensated at replacement rates for all losses and damaged assets.
- APs shall be fully compensated and resettled before their houses and demolished and their land and facilities are required.

- A resettlement plan shall be prepared, consulted with APs and implemented in advance of the implementation of the project.

To rehabilitate the affected persons and communities, she stressed the preparation of Social Action Plan Framework including restoration of affected infrastructure, skill enhancement, agricultural development, women development, rural electrification, community's initiative support etc. as key components.

Mr. Pravin Aryal, Senior Division Engineer, MoWR expressed thanks to JICA for undertaking the assignment. He clarified that EIA report done by NEA is already with MoWR. He expressed hope that NEA team will incorporate the findings of upgrading EIA study of the JICA team and submit to concerned agency for approval very soon.. He suggested to the JICA team to incorporate the lessons learnt from KaliGandaki and Middle Marsyangdi Hydroelectric Project. An independent monitoring of the project may be very useful in the environmental management even involving local stakeholders in order to minimize the conflict during project implementation.

He pointed out the need of a policy from the government in matters related to conservation issues. Project of the size of Upper Seti, is bound to affect large areas of forest and other ecological habitats. Existing provisions guiding the institutional stakeholders for decision making are not adequate enough to deal these issues of development and conservation. Development and conservation policies often conflict. This has become one of the hindrances for project decision making. Project level EIAs could not address these issues and the Planning Commission should take initiatives to resolve these issues at high level policy making bodies

After presentation on the findings of supplementary EIA of the project by JICA Study team comments were invited from the stakeholders.

Mr. Batu Krishna Uprety, representing Ministry of Environment, Science and Technology commented that EIA study should present its findings based on inventory and not on sample. Many of the project EIA report are prepared as cut and paste of earlier reports, and such practiee should not be continued. MOEST is not compelled to approve the EIA report submitted by the proponent. The institutional stakeholders should be consulted as many of the decisions are made based on the provisions of policies and legislation of the stakeholders institutions such as Forestry. As the project affects a large area of forest, the representative of Ministry of Forest could have contributed more in these meetings. As Nepal is signatory to many of the international conventions such as CBD and Ramsar, their provisions should also be a part of the report. As I heard the EIA of the project is already in the approval process in the custody of the Ministry of Water Resources, I am afraid how the results of upgrading EIA will be incorporated in that EIA for approval. It is these things that delay in the approval process and conflict situation arise between proponent and approval authority.

Mr. Bhawani P. Kharel, representing IUCN pointed out that the report need to incorporate issues related to environmental flow. I hope this is included in the detail report. Similarly the health issues related to impounding of large area should also be part of the report. With the participation of NEA and other experts IUCN has framed strategies for the high dam construction for Nepal. Issues raised in that report should also be reviewed and incorporated in the upgrading EIA Report.

Mr. Mahendra Guruug, General Secretary, Nepal Engineering Association commented that the issues presented in stakeholders meeting deserve appreciation. In the context of Nepal, Engineering Association reiterates its focus that there is a development need in Nepal and such projects should be developed for national development. In the context of Nepal development should be given priority than conservation. Tree need to be embraced as well as used for construction. Our objective should be development for conservation. Let the development and conservation go pace to pace. Screening of project from a total of 102 to 2 is good However, the project scale covered was wide (10 – 300 MW). Further grouping into 10 to 100 and 100 to 300 MW would have been better. JICA team has really worked hard for the developing optimization plan.

Mr. Sandip Chandra Rai, WWF commented that Conservation and development should go side by side, for a win-win situation. Funds for compensation and rehabilitation measures could be derived from CDM mechanism. Carbon Trading is widely practiced and if applicable to the project, it will be a good measure. I request JICA team to look into these matters.

Mr. Bishnu Dhakal, LDO, Tanahu explained that there was encouraging participation of the affected population in Damauli on 1st December. He stressed the following local people demands and concerns to be incorporated in the upgrading EIA study:

- Safety of Bhimad Bazaar
- Mode of compensation for 399 households, amount, time line
- Employment to the local people,
- Ring road around the dam site for enhancement of livelihood especially promoting rural tourism.
- Impacts to cultural and religious sites such as Vyas birth place (Madi and Seti confluence)

Mr. T.M. Shakya, Technical Director, NEA raised his query on financial aspect of the project, cost per kilowatt or kWh for the project. He asked even the tentative price at the moment will be okay to clarify the price level. Further, he enquired that 220 kV transmission line doesn't exist with the NEA grid at Bharatpur sub-station, and how these things will be matched.

Mr. Bhairab Risal, NEFEJ representing himself as a consumer and concerned stakeholder of the project raised the issue of Development versus Conservation. During the Pharping hydroelectric project (first project in Nepal developed in 1910) there was no issue of conservation only development was prioritized. Now, conservation is an issue for

sustainable development of resources. And how do we address the issue of conservation in this development Project. During Arun III the stakeholder meeting was almost underground. The country is rather hungry for development. As conservation is concerned with the development, there should be some yardstick/ indicator/range for environmental loss in an interface of development. Conservation and development is very intricately interlinked and hence country like Nepal needs to formulate some guidelines. Major irreversible issues need to be considered with caution. Some thing need to be lost to gain something. What is the optimum range of acceptable loss, I hope should be addressed by the policy. Since this is a serious issue, alternatives must be conceived well in advance. Electricity is the need of the hour. Let the knowledgeable people in the sector sit together and try to find way out.

Mr. Resham Raj Dhital, Fishery Development Division, raised his concern on the functioning and operation of Kali Gandaki mitigation program for fishery. Hatchery need to be run, but should have a pre-defined objective and responsibility. In the previous study of Upper Seti only 32 species were reported now 36 species have been reported. Expert involved in the present study should be congratulated for identifying few more species in the river. I would request all concerned that fish biodiversity conservation be addressed properly for the project.

Mr. Uttam Sagar Shrestha, SchEMS, opined that the EIA report should also include beneficial impacts of the project. While preparing resettlement plan and social action plan, formation of committees at local level will be more beneficial in reflecting the people's resettlement and rehabilitation needs.

Mr. Sarita Maharjan, United Democratic Front, Central Committee Member and Treasurer, Kathmandu District expressed her view that project need to be considered at country perspective. Demand of the local people need to be concerned, project might fail if the concerns of the local people were not addressed properly. Resettlement of local people needs to be given due consideration. They should be compensated. Production loss needs to be incorporated while formulating the plans. Local stakeholders' participation in the construction committee needs to be ensured.

Dr. Toran Sharma, on behalf of the JICA Study team responded the queries raised by the participants. **Mr. Ishii** provided the tentative cost estimate of the project per KW.

Dr. Jagadish Chandra Pokhrel, Vice Chairman, National Planning Commission from the seat of Chief Guest commented that we must take lesson from the previous projects. Enrichment in experience and knowledge need to be added up or incorporated rather not ignored. Let us share the experiences learnt from the previous projects. Let's document both the pros and cons of each of the projects and decide how we can go ahead. Let us have a permanent Stakeholder Ministry Standing Committee to look into inter-sectoral issues. Policy formulated by one ministry need to be approved by another ministry.

However, participation and involvement of the inter-sectoral institutions is essential at all levels. If the member of one ministry is not involved at local level, they prefer to avoid

the participation at implementation stage. We have very many examples of such incidents. Hence let us not repeat the same mistake.

Resettlement is one of the issues to be looked after sensitively at all levels. Inclusiveness principles should be incorporated at all levels. Present state structure is quite different, thus we need to internalize the values that people are empowered and take the decisions. Indigenous population, women issues need to be revisited. Thirty three percent participation of the women at all level needs to be incorporated through networking at local level. Employment need to be incorporated at local level from unskilled, skilled to professional level.

The issues and concerned raised in the stakeholders meetings should be distributed to the stakeholders along with the measures that are considered to resolve the issues and concerns. If we have addressed all the issues (local, national, global) then the consultation is considered fruitful otherwise homework is not complete. Let the hidden fear not come out, technically we are sound; the trickiest part is environmental and social part. A consensus at working level is needed during implementation. Like cost we need to spell out total man months (unskilled, skilled, and professional). National Resettlement Policy has been framed out and is being sent to cabinet for approval.

Mr. Arjun K. Karki, Executive Director, and the chair person of the meeting concluded the meeting with the following remarks.

We have a total installed capacity is 614 MW in our grid. Most of the Projects are based on run off the river schemes. Kulekhani is the only storage project. This project is also highly dependent upon the monsoon rainfall. The rainfall in August 2006, has helped us to some extent to reduce the power cuts. If we do not have additional storage projects, situation harder than this will come, and we should be ready to face. It is because of this, it is important to develop a new storage project for hydropower generation.

Therefore, it is very important to develop an explicit Power Development Policy which can lead us ahead and meet the power requirement in future. At this juncture it is important to go for development friendly conservation policies.

At present, we are concerned with 2.5 hours load shedding to the 40 percent population who are enjoying the electricity. But NEA is equally concerned to facilitate access to those who are devoid of the electricity facility.

The Middle Marsyangdi hydroelectric Project is the only on going project. When commissioned, it will generate 70MW of electricity in the wet season. Currently our power demand is nearly 1000 MW. We don't have other projects under construction. Hence it is high time to make decisions on the new projects. If not, in the coming 5/6 years, Nepal will be known as the most power short country.

In the mean time we need to improve NEA's managerial and administrative capabilities. Past records reveal that NEA constructed projects are rather cheaper compared to the

projects constructed by private sectors. We are interested in the construction of Upper Tamakoshi Project. We don't have the financial resources for its construction. We pledge National Planning Commission to take the lead role to arrange financial resources for NEA.

Foreign exchange risk if shouldered to NEA and load handed over to it, we will be able to improve NEA's financial status. Upper Seti, if supplemented through such financing, we understand that available energy will then ensure the electricity demand even with the development of run off the river projects.

Compensation to the affected owners, who don't have legal landownership, need to be compensated; however, there is a need of guideline from the government. We know all the development needs of the local people could not be addressed by the project. Other sector's stakeholders also should participate equally, if we want to develop project in cheaper costs. I would personally request government of Japan to provide funding for the project implementation.

Media Coverage of Second Stakeholder Meeting

Media Coverage of Second Stakeholder Meeting

1- Published in the national newspaper "The Himalayan Times" 7th December 2006 (English)

Upper Seti project to inundate 811 ha

1,057 households, flora, fauna to be hit

Himalayan News Service

Kathmandu, December 6

The proposed Upper Seti Storage Hydro-electricity Project, which aims to produce 132 megawatts of electricity for Tanahun district, will sweep away 811 hectares of land, which includes forests, wetlands and also a habitat for hundreds of conserved wild species.

Jack Prosser, a member of an environment team that conducted a study in the area, today said that out of the total area to be covered by the project, 121 hectares is either uniler cultivation or has houses, 127 hectares form a grazing area, forests occupy 428 hectares and 227 hectares form other barren land. Prosser is a senior partner of the Environment Planning Associates and his study was part of the studies for the Japan International Cooperation Agency (JICA).

"The forest accounts for 42 per cent or 381.7 hectares in the reservoir area out of the total area of 904.1 hectares. The project area is a habitat for 27 mammals, 17 reptiles and amphibians, 62 birds and 46 butterflies and moths," he said. He was addressing a stakeholders' meeting in the capital. He said his team has also recorded 209 wild species of plants, some of which — including the Screw Pine and four types of orchids — are under the conservation category.

Prosser said that a supplementary Environment Impact Assessment is necessary to make a final decision on the project.

Toshiko Shimada, a member of the JICA study group, said the project would affect 166 hectares of cultivated land, causing a loss of 854 metric tonnes of food grain annually.

"This will also affect seven stretches of gravel road, seven suspension bridges, 22 foot trails, two irrigation canals, four electricity distribution lines, one bridge and one causeway," she said, adding that the project will also be a threat to 449 private constructions, six resting places, one temple and one ghat.

According to her, 1,057 households will lose their private land, 155 households will lose their structures and 122 households from Chhang, Rising Ranipokhari, Jamunie, Kahun Shivapur VDCs as well as from Vyas Municipality will also be affected. "We need to develop a strong resettlement and social action plan for the families that will be affected," she said.

Hiroshi Murashike, another member of the JICA team, presented four options for the construction of the project. She said the treatment of sedimentation, geological conditions of project layouts, the role of the project and environment issues should he taken into consideration while discussing the project.

Addressing the programme, Arjun Kumar Karki, the executive director of Nepal Electricity Authority, urged the government to come up with "power-friendly" plans to start projects in the pipeline.

2- Published in the national newspaper "The Rising Nepal" 7th December 2006 (English)

Upper-Seti plant essential for stable power supply

By A Staff Reporter

KATHMANDU, Dec. 6: Policy makers and stakeholders Wednesday said that the construction of Upper Seti storage hydro plant was essential for stable power supply during the dry season.

They were discussing on a feasibility study on the project jointly carried out by the Nepal Electricity Authority (NEA) and Japan International Cooperation Agency (JICA) at the 2nd stakeholders meeting organised in Kathmandu Wednesday.

"The upper Seti storage hydro project is not only financially and environmentally viable but also necessary to address country's growing electricity demand and meet its shortage caused by the decrease of water level in the dry season," said the report.

Majority of hydro plants are based on the Run-Off-the-River (ROR) that can only marginally regulate river discharge for power generation, thereby causing power shortage in the dry season.

In search of storage type of hydro project, the NEA identified Upper Seti hydro project as a potential one and commenced the study in February 2005 with the assistance of JICA.

The JICA team conducted a preliminary feasibility study that includes technical, geological, environmental and social aspects of the project. Located at Damauli in Vyas Municipality of Tanahu district, the project's construction is estimated to cost US$ 400 million and per unit of electricity at five cent.

It is expected to be completed by 2013 but the NEA is not in a sound financial position to build the 232-megawatt project.

"We have expected Japanese assistance in constructing the Upper Seti Storage Hydroelectricity Project," said Arjun Bahadur Karki, NEA Executive Director.

Karki said the construction of the project was timely as the country was witnessing power demand at the rate of 8 per cent annually.

The experiences have shown that the hydro plants constructed by the private sectors are more expensive than those built by the NEA, he said.

"The private sector is unable to provide cheap electricity that is accessible to the people."

He also urged the government to give priority to this sector by introducing power development friendly policy.

"The environmentalists should also focus on development friendly conservation policy."

Vice-chairman of National Planning Commission Dr. Jagadish Chandra Pokharel stressed on sharing past experiences in constructing this project.

"We must take lesson from Kulekhani, Kaligandaki and Marsyangdi in order to avoid possible financial, legal and social problems while implementing the project," added Dr. Pokharel.

He also suggested forming a committee of representatives from in line agencies, ministries and stakeholders for the purpose.

The project implementation should be based on the concept of participatory and inclusive democracy, he added.

Local Development Officer of Tanahu district Bishnu Dhakal said that local people were highly encouraged by the project but they had expected compensation and employment after the completion of project.

Altogether 1,057 households will be affected while some 122 of them require relocation, as their residential structures will be demolished, he said. "The public support is the key to the success of project. Thus, the concerned body must address the problem of local people."

According to the report, the project impacts on cultivated area including 166 hectares of land in the reservoir area. Seven stretches motorable gravel roads, one bridge, 7 suspension bridges, 22-foot trails, one causeway, 2 irrigation canals and 4 electric distribution lines route will also be affected.

Bhoj Raj Regmi of NEA and Ishii Mayayoshi (team leader), Toshiko Shimada, Jack Prosser and Murasbige Hiroshi from the JICA made their presentations on different aspects of report at the programme.

The country has generated only 614 MW from its abundant water resources. More than 60 per cent population are deprived of electricity supply.

Third Stakeholders Meeting

Advance Notification of Third Stakeholders Meeting

1-1 Public notice published in the local newspaper "Seti Madi Daily" 2nd - 4th May 2007(Nepali).

माथिल्लो सेती जलाशययुक्त जलविद्युत आयोजनाको

अपग्रेडिङ्ग सम्भाव्यता अध्ययनका विविध पक्षहरु उपर सरोकारवालहरुसँग हुने छलफल कार्यक्रममा सहभागी हुने सम्बन्धी

सूचना

पश्चिमाञ्चल विकास क्षेत्रको तनहुँ जिल्ला स्थित सेती नदीमा पहिचान भएको १२८ मेगावाट क्षमताको माथिल्लो सेती जलाशययुक्त जलविद्युत आयोजनाको अपग्रेडिङ सम्भाव्यता अध्ययन कार्य जापान अन्तर्राष्ट्रिय सहयोग नियोग जाईकाको प्राविधिक सहयोगमा सन् २००५ देखि शुरु गरिएको छ । यस अध्ययनको मुख्य उद्देश्य प्राविधिक, आर्थिक तथा वातावरणीय दृष्टिकोणले उपयुक्त योजना तयार गर्नु रहेको छ ।

यस आयोजनाको अपग्रेडिङ सम्भाव्यता अध्ययनको क्रममा आयोजनाका विविध पक्षहरु, जस्तै आयोजनाबाट प्रभावित क्षेत्र, वातावरणीय प्रभाव न्युनिकरणका उपायहरु, समय तालिका, पनुर्वास तथा सामाजिक कार्य योजनाबारे सम्बन्धित सरोकारवालहरुसँग राय सुझाव प्राप्त गर्नु रहेको छ । जाईका (JICA) अध्ययन टोलीको सहयोगमा नेपाल विद्युत प्राधिकरणले ओजनाबाट प्रभावित तल्लो तटिय क्षेत्र व्यास नगरपालिका, काँहु शिवपुर, कोट दरबारको तल्लो भाग, तल्लो जामुने, पोखरीभञ्ज्याङ्ग क्षेत्रका सरोकारवालहरुको लागि मिति २०६४ वैशाख २१ गते शुक्रवार दिनको १:०० बजे काँहु शिवपुर गाविस स्थित श्री शुक्ला निम्न माध्यमिक विद्यालय हाताक्षेत्रमा र जलाशय संरचनाबाट प्रभावित रानीपोखरी, माथिल्लो जामुने, छाङ, भाभकोट, भिमाद र कोटदरबारको माथिल्लो खण्ड क्षेत्रका सरोकारवालाहरुको लागि मिति २०६४ वैशाख २२ गते शनिवार दिनको १०:३० बजे रिसिङ्ग रानीपोखरी गा.वि.स. स्थित श्री दीप ज्योति प्राथमिक विद्यालय हाताक्षेत्रमा हुने छलफल कार्यक्रममा सहभागी भई आ-आफ्नो राय सुझाव उपलब्ध गराईदिनु हुन सबै सरोकारवाला तथा अन्य इच्छुक संघ संस्था तथा व्यक्तिहरुलाई अनुरोध गरिन्छ । यस सम्बन्धी लिखित राय सुझाव भए निम्न लिखित ठेगानामा पठाउन सकिने व्यहोरा समेत अनुरोध छ ।

आयोजक

वातावरण तथा सामाजिक अध्ययन विभाग
नेपाल विद्युत प्राधिकरण
अद्वैतमार्ग, काठमाण्डौं, फोन : ०१-४२२६७३०, ४२५१८४५

जापान अन्तर्राष्ट्रिय सहयोग नियोग
सि/ओ जाईका (JICA) नेपाल कार्यालय
पो.ब. नं. ४५० काठमाण्डौं नेपाल

1-2 Public notice published in the local newspaper "Seti Madi Daily" 2nd - 4th May 2007(English).

NOTICE

PARTICIPATION IN THE STAKEHOLDERS' MEETING FOR DISCUSSION ON VARIOUS ASPECTS OF UPGRADING FEASIBILITY STUDY ON UPPER SETI STORAGE HYDROELECTRIC PROJECT

Upgrading Feasibility Study of 128 MW capacity Upper Seti Storage Hydroelectric Project in Western development region, Tanahun district is conducted since 2005 with the technical assistance of JICA. The main objective of the study is to prepare a technically, economically and environmentally optimum plan of the project.

The propose of the upgrading feasibility study is to prepare upgrading EIA report covering different aspects of the projects such as affected regions, environmental impacts, mitigation measures, resettlement framework, social action plan frame work and project time line.

Nepal Electricity Authority and the JICA study team requests the stakeholders (individuals and concerned organisaztions) of the project affected regions of the downstream areas of Byas Municipality, Kahun Shivapur, and lower part of Kotdurbar, lower part of Jamune, and Pokharibhanjyang VDC to participate and give their concerns and suggestion on the project at Shri Shukla Lower Secondary School premises, Kahu Shivapur VDC on 2064-01-21 Friday at 1 o'clock. For the stakeholders of reservoirs affected regions Ranipokhari, upper Jamune, Chang, Majhkot, Bhimad and upper part of Kotdurbar VDCs are requested for participation and give their concerns and suggestion on the project at Shri Deep Jyoti Higher Secondary School premises, Rishing Ranipokhari VDC on 206-01-22 Saturday at 10:30 AM. It is also requested to send written concerns and suggestions to the following addresses.

ORGANIZER
Department of Environmental and Social Study
Nepal Electricity Authority
Audiat Marga, Kathmandu,
Phone: 01-4226730, 4251845

Japan International Cooperation Agency
C/O JICA Nepal office
P.O. No. 450 Kathmandu, Nepal.

-Seti Madi National Daily
Wednesday, May 2,3, and 4th
2007

List of Invited Institutions/Persons of Third Stakeholder Meeting

Upper Seti (Damauli) Storage Hydroelectric Project
3rd Stakeholder Meeting, May 6, 2007/ Baishak 23, 2064.

List of Invited Institutions/Persons

S.No.	Name	Address
1	District Development Committee	Damauli, Tanahaun
2	District Administrative Office	Damauli, Tanahaun
3	District Police Office	Damauli, Tanahaun
4	District Women Development Office	Damauli, Tanahaun
5	NGO Federation	Damauli, Tanahaun
6	District Agricultural Office	Damauli, Tanahaun
7	District Forest Office	Damauli, Tanahaun
8	District Public Health Office	Damauli, Tanahaun
9	Six Community Forest Offices	Affected VDCs, Letter were Given through District Forest Office
10	ACAP	Pokhara, Nepal
11	Lee Bird, National Level NGO	Pokhara, Nepal
12	Inland Fisheries Research Center, Nepal Agricultural Research Council (NARC)	Begnas, Pokhara, Nepal
13	Nepali Congress, District Executive Committee	Damauli, Tanahaun
14	CPNUML, District Executive Committee	Damauli, Tanahaun
15	Nepali Congress Democratic, District Executive Committee	Damauli, Tanahaun
16	Janamorcha Nepal (One of the Communist Party), District Executive Committee	Damauli, Tanahaun
17	Nepal Communist Party Maoist, District Executive Committee	Damauli, Tanahaun
18	Machha Puchere FM	Pokhara, Nepal
19	Bhanjyung National Daily (Newspaper)	Damauli, Tanahaun
20	Reporter, Nepal Samachar Patra	Damauli, Tanahaun
21	Reporter, The Rising Nepal	Damauli, Tanahaun
22	Reporter, Kantipur	Damauli, Tanahaun
23	Reporter, Annapurna Post	Damauli, Tanahaun
24	Journalist Association	Damauli, Tanahaun
25	Reporters Club	Damauli, Tanahaun
26	Consumers Federation	Damauli, Tanahaun
27	Chairman, Civil Society	Damauli, Tanahaun
28	Vyas Municipality	Damauli, Tanahaun
29	Chhan VDC	Chhan
30	Bhimad VDC	Bhimad
31	Rani Pokhari VDC	Rani Pokhari
32	Kot Darbar VDC	Kot Darbar
33	Kahun Shivpur VDC	Kahun Shivpur
34	Secretaries of all the Affected VDCs	Tanahaun
35	Representative of Women Group	Number of Group 13
36	Campus Chief	Bhanu Bhakta Campus, Khairani Tar, Tanahaun
37	Members of the Parliament	3 Persons from Tanahaun District
38	Ministry of Environment, Science and Technology	Singa Durbar, Kathmandu
39	Ministry of Water Resource	Singa Durbar, Kathmandu
40	Department of Electricity Development	Anam Nagar, Kathmandu
41	Mr. Ramchandra Pokharel	Damauli, Tanahu
42	Rafting Association	Pokhara, Nepal
43	Pokhari Banjan VDC	Pokhari Banjan
44	Headmaster, Shree Deep Joyti Primary School	
45	Headmaster, Shree Shukula Lower Secondary School	

Brochure of Third Stakeholder Meeting

The Upper Seti Storage Hydroelectric Project

Upgrading Feasibility Study

Project Summary

for

Third Stakeholder Meeting

Nepal Electricity Authority (NEA)

Japan International Cooperation Agency (JICA)

NEA
Logotype

May 2007

JICA
ジャイカ

Background of the Project

Despite of various poverty reduction strategies implemented by the Government of Nepal from the past, approximately 32% of the population in the country is still living below the poverty line. Nepal has been facing the power deficit from the beginning of 2007 and that problem would be continued in the coming years basically in the dry season. In order to solve the problem of power shortage permanently and to support the poverty reduction efforts in Nepal, the Government of Nepal has proposed the various hydropower projects by using its abundant water resources particularly in its Tenth Plan (2002-2007). As of July 2006, total installed capacity of the country is 614 MW out of which 90% is contributed by hydropower. On the other hand, power demand in the country has been growing approximately at a rate of 8 % per annum in recent ten years period (1995 to 2005).

The run-of-river (RoR) type of hydropower plant dominates Nepal's hydro capacity. However, RoR type of hydropower plants can only marginally regulate river discharge for power generation. Thus, to cope the problem of power shortage in the dry season, Nepal Electricity Authority (NEA) has felt to develop the storage type of hydropower plants that can seasonally regulate river discharge for generation particularly in the dry season.

NEA has conducted studies on storage type of hydropower projects and identified ***Upper Seti Storage Hydroelectric Project*** as a potential one. The Government of Nepal then requested the Government of Japan to implement an upgrading feasibility study (hereinafter referred to the Study) under the technical assistance of Japan International Cooperation Agency (JICA). The JICA Study team commenced the Study in February 2005.

1. Objective of the Study

The Study aims at formulating the optimum plan for development and assessing the technical economical and financial and environmental viabilities of the Project.

2. Schedule of the Study

The study commenced in February 2005 and it will be completed by June 2007.

3. Range of the Study Area

The Study area of the Upper Seti Hydroelectric Storage Project is located in Tanahu District in Central Region and the transmission line route is from the powerhouse site at Damauli to the transmission lines in Bharatpur. The Study area is assumed as follows:

- ✧ The Watershed: Approx. 1,502 km^2
- ✧ The Reservoir area and its vicinity: Approx. 120 km^2

4. Optimum Development Plan

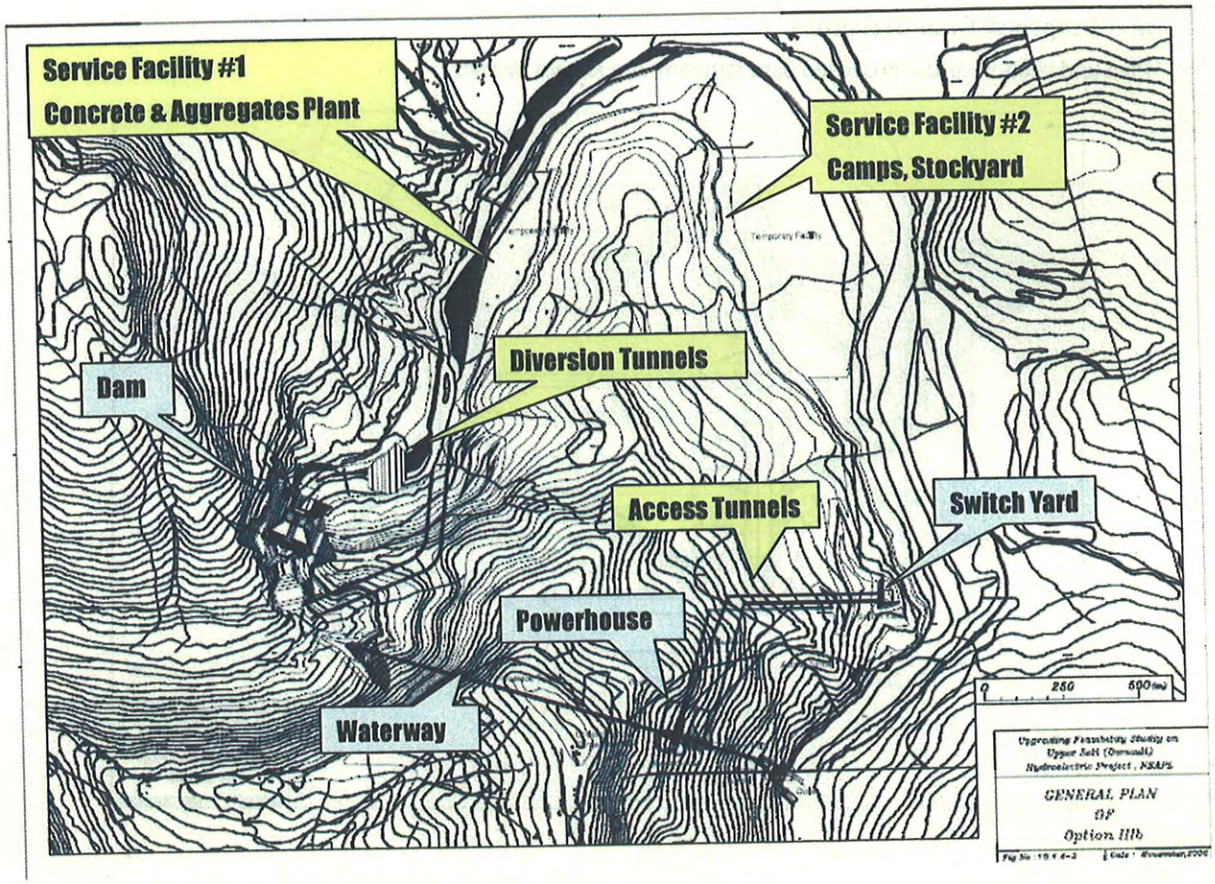
The optimization study was carried out based on data and information supplied by NEA, and the results of the following surveys/studies performed by the JICA Study Team;

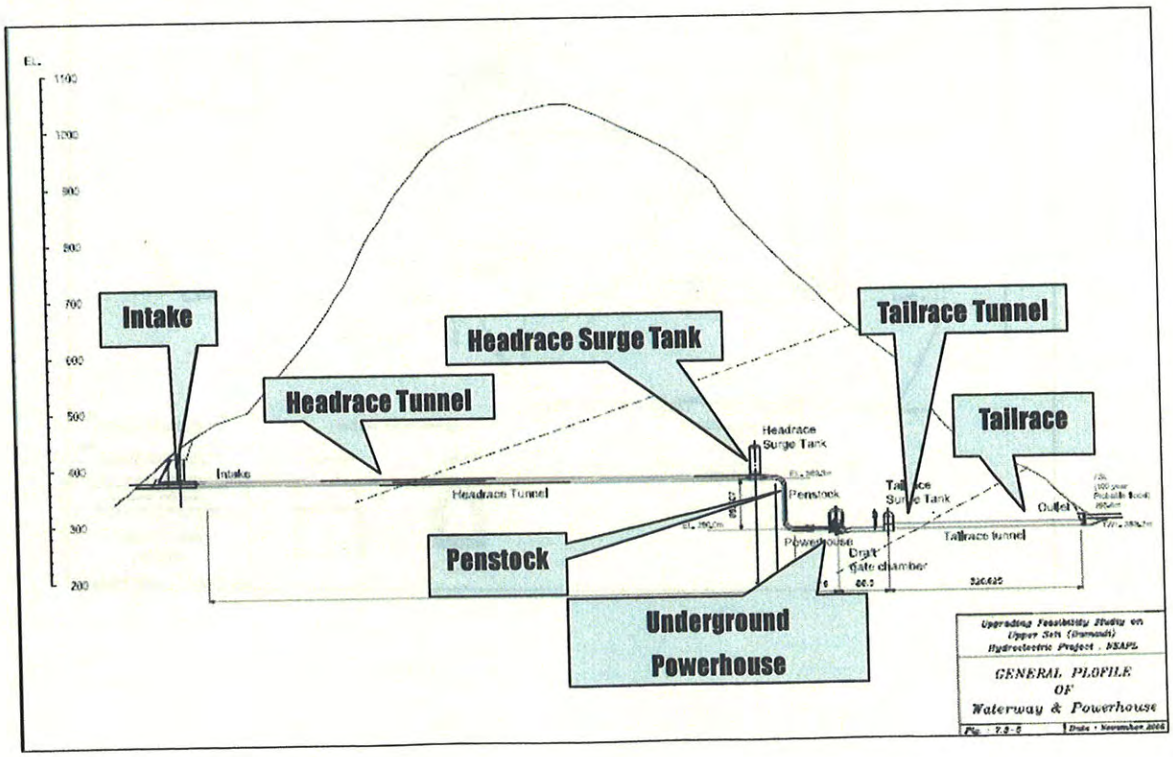
- ✧ Supplementary environmental survey results including mitigation measures
- ✧ Geological investigation results
- ✧ Hydrological study results
- ✧ Power demand in the country

Based on the above data, JICA Study Team compared various alternatives for layouts and the Full supply Levels to select the most technically and economically feasible development plan, which will have less impact on natural and socio-economic and cultural environment. As a result of optimization study, optimum full supply level is set at EL.415.0m.

The Upper Seti Project is planned as a reservoir type such as Kulekhani Hydropower Project. It will constantly supply 128 MW of peaking power throughout the year, which is 1.4 times the total capacity of the Kulekhani I and II hydropower stations.

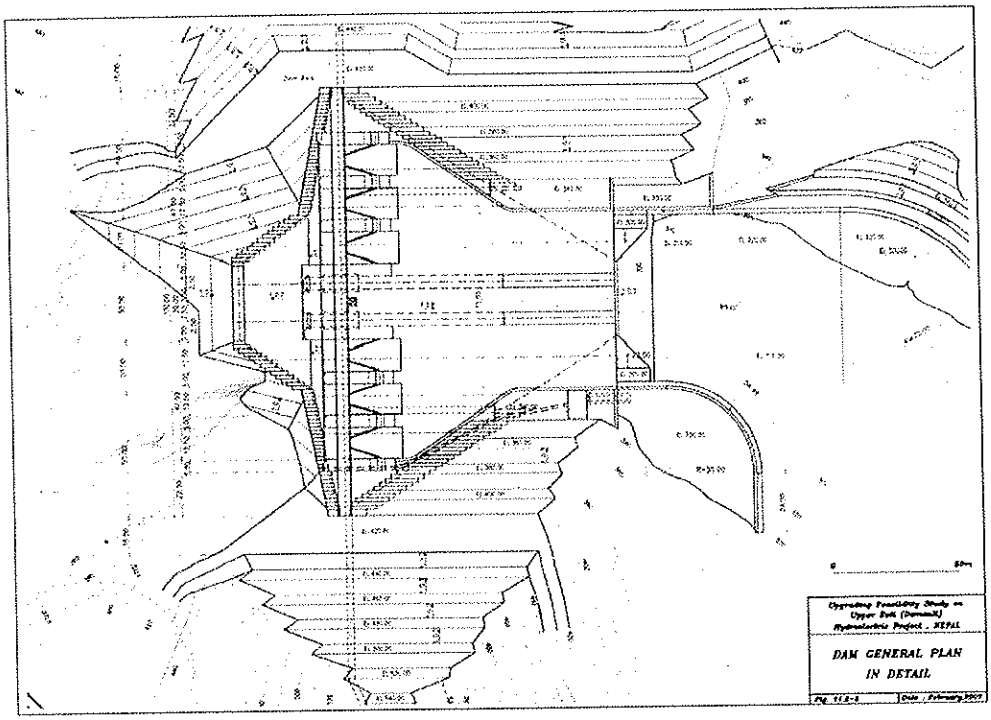
General plan of the project area including project facilities, general profile of the waterway and powerhouse, and main futures of the Project are shown below.

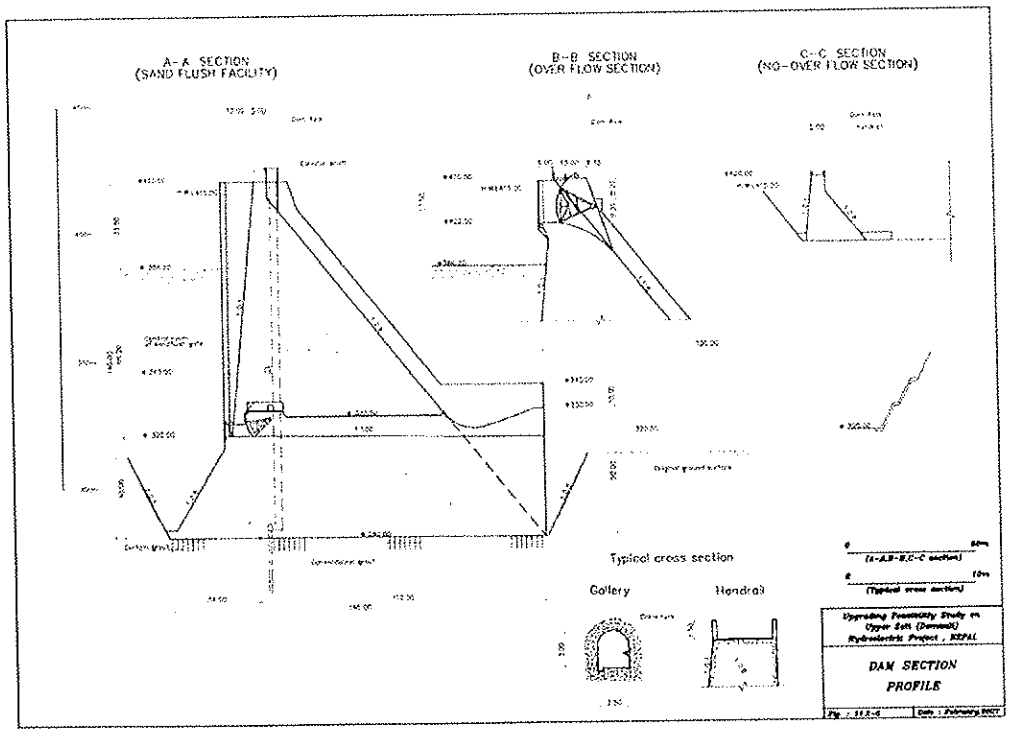

Service Facility #1
Concrete & Aggregates Plant
Service Facility #2
Camps, Stockyard
Diversion Tunnels
Dam
Access Tunnels
Switch Yard
Powerhouse
Waterway
GENERAL PLAN
OF
Option IIIb


Intake
Headrace Surge Tank
Headrace Tunnel
Tailrace Tunnel
Tailrace
Penstock
Underground
Powerhouse
GENERAL PLOFILE
OF
Waterway & Powerhouse

5. Proposed Dam Structure

Plan and section of the proposed dam structure are shown below.





6. Sediment Flush Operation

Sediment Flushing Operation is executed by Sand Flushing bottom outlets installed in Dam body.

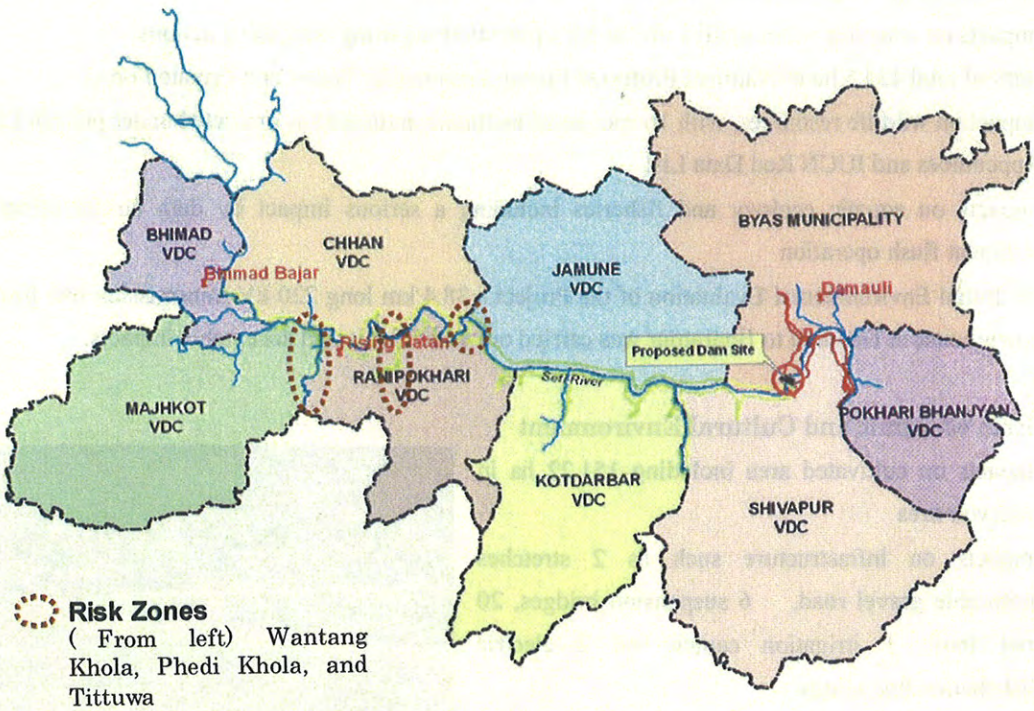
7. Project Affected Area

The affected area are categorized into the four area as follows listed into four categories:

1	Reservoir areas (FSL 415 m + 10m)	Bhimad, Chhang, Majkot, Rising Ranipokhari, Kotdurbar, Jamune, Kahun Shivapur VDCs, Vyas Municipality
2	Risk zones	i)Wantang Khola (Majkot-Rising Ranipokhari), ii)Phedi Khola (Rising Ranipokhari), and iii) Tittuwa (Rising Ranipokhari)
3	Project facility structures (access roads, camps, batching yards and spoil disposal yards)	Kahun Shivapur, Vyas Municipality
4	Downstream areas	Kahun Shivapur, Pokhari Bhanjyang, Keshavtar, Dharampani, Baidi, Chhipchhipe, Devghat, Deurali VDCs

The project will directly affect reservoir area and project facility structure sites covering 7VDCs, namely Bhimad, Chhang, Majkot, Rising Ranipokhari, Kotdurbar, Jamune, Kahun Shivapur VDCs and Vyas Municipality.

Affected VDCs/Municipality



8. Environmental Impact Identified in the Study

The EIA report prepared by NEA was reviewed, and revisions of a Scoping Document of supplemental EIA survey were carried out by the JICA Study Team in early 2006. This document gives recognition to the JICA Environmental and Social Considerations Guidelines. In accordance with the scoping report, a supplemental EIA survey was initiated with a local environmental consultant and completed in November 2006. As a result of these Supplemental EIA investigations, the following impacts were expected due to the implementation of the Project.

8-1. Natural Environment

- Watershed planning issues and impacts on the topography and land use due to creation of reservoir, including mitigation actions in respect of erosion and landslides
- Impact on the topography and land use due to construction of permanent and temporary structures on both sides of the Seti River near its confluence with the Madi
- Impacts on the downstream Seti River due to reservoir water regulation and daily fluctuations in the flow of the river

Erosion-prone area of Bhimad Bazaar

- Impacts on reservoir water quality due to eutrophication requiring mitigating actions
- Loss of total 424.5 ha of National Protected Forest, Community Forest and Private Forest
- Impact on wildlife resources, with 16 species of mammals indicated as protected under present CITES Appendices and IUCN Red Data List
- Impacts on aquatic ecology and fisheries including a serious impact by dam barrier effect and sediment flush operation
- An Initial Environmental Evaluation of the Project's 38.4 km long 220 kV transmission line from the powerhouse at Damauli to Bharatpur was carried out which indicated acceptable impacts.

8-2. Socio-economic and Cultural Environment

- Impacts on cultivated area including 151.22 ha in reservoir area
- Impacts on infrastructure such as 2 stretches motorable gravel road, 6 suspension bridges, 20 foot trails, 1 irrigation canals and 2 electric distribution line routes
- Impacts on community structures including 1 temple, 5 resting places and 1 ghat (cremation site)
- Impacts on annual agricultural production loss of 660.77 Metric ton

Cultivated land in the reservoir area

- Impacts on approximately 838 household landowners in terms of land acquisition (reservoir areas and project facility sites)
- Impacts on structures to be acquired including houses, cow sheds, toilets of 110 households (reservoir areas and project facility sites)
- Altogether 86 households require relocation as their residential structures are affected (from Chhang, Rising Ranipokhari, Jamune, Kahun Shivapur VDC, and Vyas municipality), out of which one –third households are without legal land holdings

9. Stakeholders Meetings

In accordance with the JICA's Guidelines on Environmental and Social Consideration, stakeholders meetings are being arranged through the offices of NEA with the assistance of JICA Study Team. The objectives of this stakeholder meeting are as follows:

(i) to explain and disclose information regarding the Study including environmental and social aspects and report the current progress on various project activities

(ii) to obtain concerns, opinions, suggestions and feedbacks particularly from the affected local people of the Project Area

A glimpse of Stakeholder Meeting

The initial Stakeholder Meetings were held in June 2006 which included intensive discussions with the local affected people in Damauli and with the concerned institutional representatives in Kathmandu. The 2nd stakeholder meetings were held in Damauli and Kathmandu in December 1 and 6, 2006 respectively. 402 people and 574 people actively participated in the 1st and the 2nd Stakeholder Meetings held in Damauli respectively.

During these meetings, the participants made their comments and addressed their concerns on the following issues:

- The proposed project is requisite and essential in terms of development in the country as well as in Tanahu District.
- The proposed project needs to provide the maximum benefits to the local society. Particularly, the priority for provision of employment opportunities should be given to the directly affected families and the affected VDC people.
- Due consideration should be given to the compensation and resettlement issues.
- The alternative mode of transportation for inundated roads and affected suspension bridges should be considered.
- The mitigation measures to protect Bhimad Bazaar and other necessary areas from erosion should be seriously considered.

- The affected community forest and grazing lands need to be delineated and compensated.
- Various development needs such as electricity facility, drinking water and schools should be considered and undertaken.

Since there were requests from the local people to hold the stakeholder meetings at the site, the localized stakeholder meeting will be held in Rising Ranipokhari for upper reservoir areas and in Beltar for the project facility sites in the first and second week of May 2007 in Damauli and Kathmandu.

10. Proposed Mitigation Measures

The JICA Study Team analyzed the various natural and social impacts caused by the Project. Based on the analysis, the following mitigation measures have been proposed in the Study. Further detail study on the mitigation measures will be conducted in the detailed design stage.

10-1. Natural Environment

- To protect the erosion area in the vicinity of Bhimad Bazaar, protection embankment works with concrete blocks cover will be carried out.
- Risk zone of erosion prone is defined as the area above the Full Supply Level up to 10m high and the areas in the vicinity of the Wantang Khola, the Phedi Khola and Tittuwa. Land acquisition program and slope stabilization measures will be provided in the above risk zone.
- The area of sediment source in the watershed is identified in the Study. To reduce the inflow of the sediment in the reservoir, the civil engineering works such as the construction of check dam together with bio-engineering works are proposed in the framework of the watershed management plan
- To prevent algae bloom caused by the reservoir eutrophication, fraction fence will be provided in the reservoir.
- To mitigate the impact on the aquatic ecology in the downstream of the dam, environmental flow of 2.4m^3/s will be released from the dam throughout the year.
- To mitigate the impact on forestry and vegetation in the project area, plantation will be carried out in the spoil banks, slope cutting of the access road and the risk zone in the reservoir area. Compensation for the production loss of the Community Forest is proposed in the Study.
- To mitigate the impact on the fishery aspects, the extension of the fish hatchery at Kaligandaki A Project is considered, which will be improved so that the sufficient fish fingerlings can be transported and released in the Seti River
- To save endangered animals, rescue operation using boats during the filling of the reservoir and relocating them to compatible ecosystem in nearby forests are considered.

10-2. Socio-economic and Cultural Environment

The framework for proposed compensation procedures and framework for resettlement plan and social action plan were developed based on the review of the prevailing legal registration, similar type of Hydroelectric Development Projects in Nepal and the results of discussions in the previous stakeholder meetings.

The table below shows the framework of the basic compensation to be provided to each Affected Families/Affected Persons, communities and government agencies. Further details will be finalized during the detailed design study.

Entitle Matrix for compensation and rehabilitation

Types of APs	Type of Compensation/Rehabilitation									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Permanent loss of Land at replacement cost	Loss of crops and natural resources	Loss of house and other structures at replacement cost	Loss of community facilities and resources	Loss of government property	Grant for disturbance compensation to displaced households	Grant of transportation allowance to displaced households/ community structure	Grant of land plot	Loss of business	House rental allowance
Landowner	✔	✔								
Land tenant	✔	✔								
Structure owner			✔							
Business owner									✔	
Community		✔		✔			✔			
Government Agency		✔			✔					
Relocatees										
House and Lot owner	✔	✔	✔			✔	✔	✔	✔	✔
House owner tenant	✔	✔	✔			✔	✔	✔	✔	✔
Informal Settler			✔			✔	✔	✔	✔	✔
House occupant						✔	✔	✔	✔	✔

Note: Compensation to permanent land with tenant shall be halved between the owner and tenant as per Land Reform Act provisions. The loss of crops and natural resources on such land however shall be paid to the tenant only.

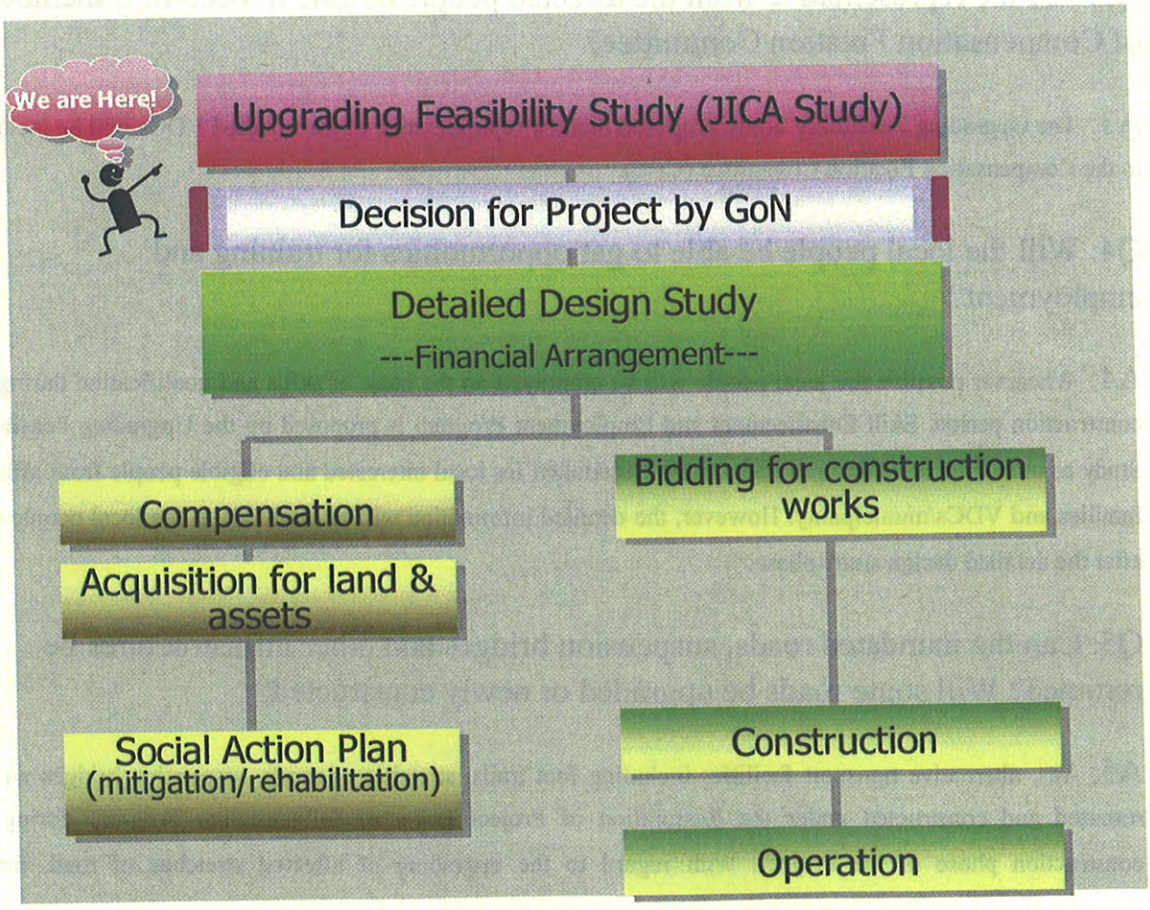
It is proposed that the eight social programs should be conducted to mitigate the socio-economic and cultural impacts on the affected communities and the affected persons, rehabilitate the quality of life of these communities and persons. The eight social programs are summarized below:

1. Restoration of Project Impacted Infrastructure Program
2. Affected Community's Initiative Support Program
3. Skill Enhancement and Employment Program
4. Agricultural Development Program
5. Community/Public Health and Education Enhancement Program
6. Women Development Program
7. Community-based Watershed Management Program
8. Rural Electrification Program

These programs are required to be further updated during the consultation with the local people in the Detailed Design Study.

11. Time-line of the Project

Neither the acquisition for land and assets nor the construction work for dam starts immediately after the Upgrading Feasibility Study. There are several steps to be taken for the implementation of the Project indicated below.



Frequently Asked Questions (FAQ)

This FAQ lists questions that are often addressed by the local people living in the affected VDCs/Municipality during the 1st and 2nd Stakeholder Meetings.

Q1: When, how, and how much we can get compensation for our land and other assets?

A1: The compensation cost will be decided by Compensation Fixation Committee (CFC) as per Nepal's legal provision. The detailed procedures for compensation will be provided only during the detailed design study phase after the finalization of the affected families and assets lost. (See also page 13).

Q2: Are the people without formal titles or rights to be assisted?

A2: Yes, if they are Affected Persons. The Upgrading Feasibility Study proposed that the land without legal holdings should be compensated as per the prevailing practices. However, the detailed procedures for compensation will be provided only during the design study.

Q3: Are the representative from the affected people be able to become a member of Compensation Fixation Committee?

A3: The Upgrading Feasibility Study proposed that the representative of the affected VDCs will be included in the Compensation Fixation Committee (CFC).

Q4: Will the local people be able to get opportunities for training and employment?

A4: Wherever possible the local people will be employed on the basis of skills and qualification during the construction period. Skill Enhancement and Employment Program is proposed by the Upgrading Feasibility Study as one of social action programs to be undertaken for local interested and eligible people from affected families and VDCs/municipality. However, the detailed information will be available to the local people only after the detailed design study phase.

Q5: Can the inundated roads, suspension bridges and other infrastructures be rerouted? Will some roads be upgraded or newly constructed?

A5: Yes, alternative transport facilities including foot trails, stretches of roads, suspension bridges will be rerouted and constructed under the Restoration of Project Impacted Infrastructure Program during the construction phase of the Project. With regard to the upgrading of affected stretches of road, further

examination will be undertaken from technical and financial aspects in coordination with the District Development Committee and the concerned VDCs during the detailed design study. In the project facility sites, the access road will be constructed and upgraded. Except for that, the construction of new roads outside the affected areas is out of the scope of the Project.

Q6: Are there any mitigation measures to protect the possible hazardous areas including Bhimad Bazaar from erosion?

A6: Yes, special protection measures against erosion will be considered for the cliff of Bhimad Bazaar (See page 10). Wherever needed, the mitigation measures such as Community-based Watershed Management and plantation along the risk zones of reservoir areas will be carried out as part of social action programs to protect the potential risk areas from erosion or landslides.

Q7: Which Community Forests will be affected? What are mitigation measures to these affected community forest?

A7: There are 8 Community Forests (CF) which will be affected, namely Banchare Danda CF, Sangu Pokhara CF, Beltar-Bachanganda CF, Ghumaune Danda CF, Shidhabatasan CF, Bansghari CF, Bajar Thumki CF, and Salbas CF. The Upgrading Feasibility Study proposed that the forestry compensation should be provided based on the prevailing forest policy, i.e., replacement of trees at 25:1. Furthermore, the fuel wood volumes and grazing lands for the Community Forest will be compensated.

Q8: What are the mitigation measures for fisheries?

A8: As the mitigation measures, fish fingerlings of the economic important fish species will be released in the upstream and downstream of the dam. To secure the sufficient number of the fish fingerlings, the extension of the fish hatchery at the Kaligandaki A Project is proposed.

Q9: Can the Project provide rural electrification facility in Tanahu District?

A9: Regarding electrification in Tanahu District the Royalty earned from the project can be utilized for rural electrification purposes by DDC. Only project affected areas can be electrified by the Project during the construction.

Q10: Can the Project meet the various development needs? If possible, what type of development needs can be met?

A10: The upper Seti Storage Hydroelectric Project will conduct some specific programmes, in the affected VDCs which are recommended by the Upgrading Feasibility Study Report. These programmes includes: drinking Water Supply Programme, Agriculture Development Program, Women Developrnent Program and Community/Public Health and Education Enhancement Program and Awareness Development Programme.

These programmes will be conducted as per the priority identified by the Upgrading Feasibility Study report at some specific location focusing on specific group of the society who suffers directly or indirectly by the project. Communities' participation of at least 25% in cash or kind of the estimated cost will be required for Drinking Water Supply Program. The other recommended programmes will be launched by the project at appropriate model as recommended by EIA.

General Profile

Main Features of the Upper Seti Storage Hydroelectric Project

1) Reservoir	
Full Supply Level	415.0 m
Gross Storage Volume	295.1 million m^3
Effective Storage Volume	167.0 million m^3
Reservoir Area	7.26 km^2
Reservoir Length	27.0 km
Drawdown Depth	27.8 m
Design Flood (PMF)	7,377 m^3/s
2) Dam	
Type	Concrete Gravity
Elevation of Dam Crest	EL.420 m
Height x Length of Crest	140 m (H) x 170 m (L)
Spillway Gate Type	Radial Gate
Size of Spillway Gate	12.5 m x 12.5 m x 6 nos.
3) Powerhouse	
Type	Underground
Width x Height x Length	22 m (W) x 42 m (H) x 90 m (L)
Turbine Type	Vertical Francis
Number of Turbine	Two (2) nos.
4) Generation	
Gross Head	115.8 m
Effective Head	113.0 m
Maximum Discharge	127.4 m^3/s
Installed Capacity	64MW x 2
Annual Energy Production	475.2 GWh
Secondary	209.8 GWh
Primary	265.4 GWh

Participants Registered in the Third Stakeholder Meeting

in Beltar, Rising Patan, Damauli

Participants Registered in the Third Stakeholders Meeting at Beltar, May 4th, 2007

SN	Name	Caste	Address	Office / organization	Profession /Grade	Phone	Age	Sex
	Vyas Municipality							
1	Shankar Parajuli	Brahmin	Vyas, 10		Student	560928	25	Male
2	Balram Shrestha	Newar	Vyas, 10	Gorakhakali	Job		38	Male
3	Mani raj Shrestha	Newar	Vyas-10		Agriculture		65	Male
4	Babu Lal Shrestha	Newar	VyasPatan-6		Agriculture		52	Male
5	Ganesh Bdr. Chhetri	Chhetri	Vyas-2		Teacher	562528	46	Male
6	Hom Raj Thapa	Magar	Vyas-7		Agriculture		53	Male
7	Mankaji Shrestha	Newar	Vyas-7		Agriculture		48	Male
8	Ranjit Giri	Magar	Vyas-7		Agriculture		66	Male
9	Jang Bdr. Majhi	Majhi	Vyas Benipatan-7		Agriculture		40	Male
10	Pradeep Kafle	Brahmin	Vyas-10	Nepal Forum Association	Journalist		33	Male
11	Samundra Poudel	Brahmin	Vyas-10	Rajdhani Ra.Dai.Machapuchre F.M	Journalist		19	Male
12	Basu Dev Chhetri	Chhetri	Vyas-10		Agriculture		65	Male
13	Ek Bdr. Ale]	Magar	Vyas-10		Labour		41	Male
14	Rabindra Shah	Thakuri	Vyas-7		Agriculture		40	Male
15	Jay Bdr. Darai	Darai	Vyas-10		Labour		60	Male
16	Bhugol Khanal	Brahmin	Vyas-7		Student		26	Male
17	Sher Bdr.Ale	Magar	Vyas-10		Contractor		42	Male
18	Santa Kumar Shrestha	Newar	Vyas-7		Agriculture		58	Male
19	khem Lal Giri	Giri	Vyas-7		Driver		39	Male
20	Lil Bdr. Thapa	Magar	Vyas-7		Agriculture		35	Male
21	Bir Singh Ale	Magar	Vyas7		Agriculture		67	Male
22	Purna Bdr. Shrestha	Newar	Vyas-7		Business		32	Male
23	Khim Bdr. Thapa	Magar	Vyas-2		Agriculture	065-5605455	57	Male
24	Dhan Kumar Shrestha	Newar	Vyas-10		Business	560927	23	Male
25	Jash Bdr. Gurung	Gurung	Vyas-1		Agriculture		43	Male
26	Bidhya Bdr. Gurung	Gurung	Vyas-1		Agriculture		46	Male
27	Tej Bdr. Gurung	Gurung	Vyas-1		Agriculture	9846055648	45	Male
28	Jun Raj Shrestha	Newar	Vyas-2		Social Service	9846055655	53	Male
29	Babu Ram Bagale	Brahmin	Vyas-10		Business		45	Male
30	Shankar Bdr. Pandey	Chhetri	Vyas-10		Business		40	Male
31	Arjun Khadka	Chhetri	Vyas-11		Business		25	Male
32	Hira Singh Ale	Magar	Vyas-10		Business		45	Male
33	Nar Bdr. Ranabhat	Chhetri	Vyas-7		Agriculture	65690693	41	Male
34	Mangali Thapa	Magar	Vyas-2		Housewife		31	Female
35	Thir Bdr. Adhikari	Chhetri	Vyas-1		Business		35	Male
36	Madhu Giri	Giri	Vyas-7		Agriculture		30	Male
37	Sunil Lama	Lama	Vyas		Agriculture	570507	22	Male
38	Omkar Tsena	Brahmin	Vyas-7		Job	9846055615	50	Male
39	Ramji Pariyar	Pariyar	Vyas-10			561059	41	Male
40	Santosh Bagale	Brahmin	Vyas-10		Driving	065-560236	27	Male
41	Kismat Kumar Shrestha	Newar	Vyas-10			055-560386	23	Male
42	Man Bdr. Thapa	Magar	Vyas-10		Agriculture	9846055239	49	Male
43	Parasu Ram Giri	Giri	Vyas-7		Business	560875	45	Male
44	Indra Bdr B.K	B.K	Vyas-10		Business		30	Male
45	Tek Bdr. Gurung	Gurung	Vyas-10				65	Male
46	Madan Raj Sharma	Brahmin	Vyas-Benipatan		Agriculture		52	Male
47	Amrit Thapa	Magar	Vyas-10		Business		18	Male
48	Ko Bdr. Ranbhat	Chhetri	Vyas-7		Agriculture	690971	65	Male
49	Ambika Sunar	Sunar	Vyas-10		Business		40	Female
50	Roshan Thapa	Magar	Vyas		Business		25	Male
51	Binod Kumar Shrestha	Newar	Vyas Patan-7		Agriculture		34	Male
52	Harihar Ghimire	Brahmin	Vyas-1		Business		62	Male
53	Shambhu Lal Shrestha	Newar	Vyas-10		Business		62	Male
54	Prithavi Narayan Shrestha	Newar	Vyas-10		Business		37	Male
55	Tara Bdr. Thapamagar	Magar	Vyas-10		Agriculture		58	Male
56	Sashil B.K	B.K	Vyas-10		Business		36	Female
57	Sumima B.K	B.K	Vyas-10		Agriculture		42	Female
58	Bidur Rana	Magar	Vyas-10		Service		36	Male
59	Jute Kumal	Kumal	Vyas-10		Agriculture		57	Male
60	Lil Kumar Shrestha	Newar	Vyas-2		Agriculture		35	Male
61	Gyan Prasad Shresthe	Newar	Vyas-10		Business		62	Male
62	Ajay Thapa	Mager	Vyas-10		Student		18	Male
63	Amrit Bdr. Adhikari	Chhetri	Vyas-10		Driving		52	Male
64	Babu Lal shrestha	Newar	Vyas-7		Agriculture & Business		34	Male
65	Krishna Prasad Soti	B.K	Vyas-10		Teacher		40	Male
66	Bishnu Maya Shrestha	Newar	Vyas-10		Business		75	Female
67	Sarada Neupane	Brahmin	Vyas-10		Business		45	Female
68	Dil Bdr. Sunar	B.K	Vyas-10		Agriculture		35	Female
69	Kaghi Sara Ale	Magar	Vyas-1				34	Female
70	Bal Krishna Shrestha	Newar	Vyas-1	Press	Operator		20	Male
71	Lekha Nath Shrestha	Newar	Vyas-7Benipatan		Agriculture		53	Male
72	Tirtha Lal Shrestha	Newar	Vyas Bhimad omalegar		Business		33	Male
73	Chakra Singn Thapa	Magar	Vyas-7		Agriculture		43	Male
74	Surya Poudel	Brahmin	Vyas-10		Teaching		34	Male
75	Maina B.K	B.K	Vyas		Daily Wage		50	Female
76	Asta Lal Shrestha	Brahmin	Vyas-7		Agriculture		62	Male
77	Buddha Singh Thapa Magar	Shrestha	Vyas-10		Business		51	Male
78	Hari Maya Ale	Magar	Vyas-1		Daily Wage		28	Female
79	Lal Bdr. Thapa	Magar	Vays -2		Service		35	Male
80	Suku Maya Bote	Dalit	Vyas Patan		Agriculture		22	Female
81	Dil Maya Bote	Bote	Vyas		Agriculture		25	Female
82	Rita Bote	Bote	Vyas		Agriculture		20	Female
83	Phul Maya Bote	Bote	Vyas		Agriculture		50	Female
84	Sumitra Bote	Bote	Vyas		Agriculture		52	Female
85	Hira Maya Bote	Bote	Vyas		Agriculture		50	Female

86	Bom Bdr. Bote	Bote	Vyas		Fishing/Agriculture	35	Male
87	Madhu Maya Malla	Thakuri	Vyas		Husabands Pension	73	Female
88	Yam Kumari Chand	Thakuri	Vyas		Agriculture/Housewife	35	Female
89	Putali Thapa	Magar	Vyas		Business	46	Female
90	Sita Giri		Vyas		Agriculture	34	Female
91	Gita Giri		Vyas		Agriculture	27	Female
92	Man Devi Malla	Newar	Vyas-2		Teaching	38	Female
93	Sunita Poudel	Brahmin	Vyas-2	Shri Sukla Ni. Ma. Vi	Teaching	38	Female
94	Sabita Gautam Poudel	Brahmin	Vyas-10	Shri Sukla Ni. Ma. Vi	Teaching	29	Female
95	Nirmala Bhandari	Chhetri	Vyas-10	Shri Sukla Ni. Ma. Vi	Teaching	26	Female
96	Sunita Budhathoki	Chhetri	Vyas-2	Shri Sukla Ni. Ma. Vi	Teaching	28	Female
97	Rina Thapa	Magar	Vyas-1	Shri Sukla Ni. Ma. Vi	Teaching	23	Female
98	Purnima Ale	Magar	Vyas-2	Shri Sukla Ni. Ma. Vi	Teaching	35	Female
99	Gil Bdr. Thapa	Magar	Vyas-7		Mistri	56	Male
##	Suk Bdr. Nepali		Vyas-11		Labour]	44	Male
##	Jai Ram Giri		Vyas-7		Service	40	Male
##	Mini Maya Ale	Magar	Vyas-7			28	Female
##	Rum Maya Rana	Magar	Vyas Hukse		Agriculture	31	Female
##	Sarawati Lamichane	Brahmin	Vyas-7		Business	40	Female
##	Laxmi Giri	Chhetri	Vyas-7		Household work	30	Female
##	Shanti Thapa	Magar	Vyas-7		Household work	31	Female
##	Dil Bdr. Poudel	Brahmin	Vyas-10		Business	46	Male
##	Indra Singh Gurung	Gurung	Vyas-10		Business	52	Male
##	Ghan Shyam Shrestha	Newar	Vyas-10		Agriculture	50	Male
##	Rudra Bdr. Thapa	Magar	Vyas-10		Business	37	Male
##	Manisara Thapa	Magar	Vyas-7		Carpenter	50	Female
##	Laxmi Thapa	Magar	Vyas-7			41	Female
##	Badri Kala Magar	Magar	Vyas-7			44	Female
##	Buddhibiwan Pulami	Magar	Vyas		Agriculture	50	Male
##	Duta Bdr. Thapa	Magar	Vyas		Agriculture	32	Male
##	Tika Ram Shrestha	Newar	Vyas Bisghare		Agriculture		Male

	Kahunshivapur VDC						
1	Buddhi Bahadur Saru Magar	Magar	Kahunshivapur-1		Agriculture	44	Male
2	Nar Maya Thapa	Magar	Kahunshivapur-1		Agriculture	49	Female
3	Nar Bahadur Thapa	Magar	Kahunshivapur-1		Agriculture	65	Male
4	Pahal Singh Ale	Magar	Kahunshivapur -1		Agriculture	44	Male
5	Basanti Thapa	Magar	Kahunshivapur -1		Agriculture	32	Female
6	Bal Bahadur Ranabhat	Chhetri	Kahunshivapur -1		Retyried	50	Male
7	Sam Maya Thapa	Magar	Kahunshivapur -1			52	Male
8	Dhan Bdr. B.K	B.K	Kahunshivapur -1		Agriculture	20	Male
9	Moti B. K	B.K	Kahunshivapur -1		Agriculture	38	Female
10	Kamala B.K	B.K	Kahunshivapur -1		Agriculture	38	Female
11	Som Maya B.K	B.K	Kahunshivapur -1		Agriculture	35	Female
12	Dil Maya Thapa	Magar	Kahunshivapur -1		Agriculture	55	Female
13	Chani Maya Magar	Magar	Kahunshivapur -1		Agriculture	36	Female
14	Sir Maya Thapa	Magar	Kahunshivapur -1		Agriculture	35	Female
15	Menuka Thapa	Magar	Kahunshivapur -1		Agriculture	28	Female
16	Til Bdr. Thapa	Magar	Kahunshivapur-1		Agriculture	53	Male
17	Lil Bdr. Ale	Magar	Kahunshivapur -1		Agriculture	60	Male
18	Ram Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture	50	Male
19	Durga Bdr. Ale	Magar	Kahunshivapur -1		Agriculture	52	Male
20	Hari Raj Hamal	Thakuri	Kahunshivapur -9		Agriculture	40	Male
21	Hasta Bdr. Wache	Chhetri	Kahunshivapur -1		Agruculture	58	Male
22	Til Bdr. B.K	Brahmin	Kahunshivapur -1		Agruculture	50	Male
23	Min Bdr. Thapa	B.K	Kahunshivapur -1		Agruculture	51	Male
24	Chabi Lal B.K	Magar	Kahunshivapur -1		Agruculture	49	Male
25	Puma Bdr. B.K	B.K	Kahunshivapur -1		Agruculture	45	Male
26	Kamal Bdr. Ale	Magar	Kahunshivapur -1		Labour	51	Male
27	Mohan Singh Garja	Magar	Kahunshivapur -1		Agriculture	29	Male
28	Cha Narayan Shrestha	Newar	Kahunshivapur -1		Agriculture	57	Male
29	Tek Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture	25	Male
30	Rajendra Thapa	Magar	Kahunshivapur -1		Agriculture	22	Male
31	Ganga Bdr. Sharu	Magar	Kahunshivapur -1		Labour	32	Male
32	Shri Jang Thapa	Magar	Kahunshivapur -1		Agriculture	68	Male
33	Shri Bdr. Thapa	Magar	Kahunshivapur -5		Agriculture	57	Male
34	Shiva Lal Thapa	Magar	Kahunshivapur -1		Agriculture	54	Male
35	Sagar Kumar Nepali	Sarki	Kahunshivapur -1		Agriculture	31	Male
36	Jit Bdr. Rana	Magar	Kahunshivapur -1		Agriculture	54	Male
37	Chiranjibi Ale	Magar	Kahunshivapur -1		Agriculture	67	Male
38	Dhol Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture	60	Male
39	Bhuwan Singh B.K	B.K	Kahunshivapur -1		Agriculture	70	Male
40	Hum Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture	60	Male
41	Bhim Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture	45	Male
42	Mandari Rana	Magar	Kahunshivapur -1		Agriculture	75	Female
43	Daumaya Rana	Magar	Kahunshivapur -1		Agriculture	26	Female
44	Shire Thapa Magar	Magar	Kahunshivapur -1		Agriculture	43	Male
45	Dhan Maya Thapa	Magar	Kahunshivapur -1		Agriculture	34	Female
46	Dil Maya Thapa	Magar	Kahunshivapur -1		Agriculture	31	Female
47	Manju Thapa	Magar	Kahunshivapur -1		Agriculture	25	Female
48	Yam Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture	52	Male
49	Yam Bdr. Saru	Magar	Kahunshivapur -1		Agriculture	48	Male
50	Khem Bdr. Rana	Magar	Kahunshivapur -1		Agriculture	44	Male
51	Karma Singh Thapa	Magar	Kahunshivapur -1		Agriculture	57	Male
52	Dhan Bdr. Garja	Magar	Kahunshivapur -1		Agriculture	57	Male
53	Rudra Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture	60	Male
54	Aash Bdr. B.K	B.K	Kahunshivapur -1		Agriculture	53	Male
55	Rim Bdr Dulami	Magar	Kahunshivapur -1		Agriculture	38	Male
56	Som Bdr. B.K	B.K	Kahunshivapur -1		Sikarmi	18	Male

57	Krishna Bdr. Nepali	Nepali	Kahunshivapur -1			Agriculture		26 Female
58	Bhim Ale	Ale	Kahunshivapur -1			Student		25 Female
59	Harkha Thapa	Thapa	Kahunshivapur -1			Student		29 Female
60	Bel Bdr. Thapa	Thapa	Kahunshivapur -1			Agruculture		22 Male
61	Dul Bdr. Thapa	Magar	Kahunshivapur -1			Agruculture		23 Male
62	Krishna Bdr. Thapa	Magar	Kahunshivapur -1			Agruculture		28 Male
63	Bhim Bdr. Thapa	Magar	Kahunshivapur -1			Agruculture		32 Male
64	Jhul Bdr. Thapa	Magar	Kahunshivapur -1			Agruculture		59 Male
65	Prem Bdr. Thapa	Magar	Kahunshivapur -1			Agruculture		60 Male
66	Hem Bdr. Saru	Magar	Kahunshivapur -1			Student		17 Male
67	Kamal Bdr. Thapa	Magar	Kahunshivapur -1			Agruculture		29 Male
68	Yam Rana	Magar	Kahunshivapur -8			Agriculture		62 Female
69	Donde Pulami	Magar	Kahunshivapur -1			Driver		32 Male
70	Rekha Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		45 Male
71	Makar Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		22 Male
72	Um Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		30 Male
73	Prem Bdr. Ale	Magar	Kahunshivapur -1			Agriculture		26 Male
74	Gyan Maya Ranabhat	Chhetri	Kahunshivapur -1			Agriculture		34 Female
75	Madhy Maya Rana	Magar	Kahunshivapur -1			Agriculture		40 Female
76	Lila Maya Thapa	Magar	Kahunshivapur -1			Agriculture		33 Female
77	Bhangali Nepali	Nepali	Kahunshivapur -1			Agriculture		25 Female
78	TeK Bdr. Ale	Magar	Kahunshivapur -1	Shree Sukla MA.Bi		Teacher		40 Male
79	Tul Bdr. Ale	Magar	Kahunshivapur -1				065-561001	32 Male
80	Tek Bdr. Thapa	Magar	Kahunshivapur -1	Shree Depak Pra. Bi		Teacher		39 Male
81	Hem Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture	9846065431	31 Male
82	Dunge Bdr. Garja Magar	Magar	Kahunshivapur -1			Agriculture		46 Male
83	Kush Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		22 Male
84	Bir Bahadur Baral	Brahmin	Kahunshivapur -1			Agriculture		55 Male
85	Buddha Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		48 Male
86	Mohan Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		41 Male
87	Nar Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		30 Male
88	Ram Bdr. Sunar	B.K	Kahunshivapur -1			Agriculture		48 Male
89	Bishnu Maya Sunar	B.K	Kahunshivapur -1			Agriculture		23 Male
90	Chandra Thapa Magar	Magar	Kahunshivapur -1			Agriculture		44 Male
91	Nar Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		60 Male
92	Neje Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		47 Male
93	Ajay B.K	B.K	Kahunshivapur -1			Mistri		28 Male
94	Khel Nath B.K	B.K	Kahunshivapur -1			Agriculture		34 Male
95	Bal Bdr. Nepali	Nepali	Kahunshivapur -1			Labour		57 Male
96	Ram Bdr. B.K	B.K	Kahunshivapur -1			Agriculture		34 Male
97	Dil Bdr. Nepali	Nepali	Kahunshivapur -1			Labour		51 Male
98	Govinda B.K	B.K	Kahunshivapur -1			Agriculture		17 Male
99	Raju B.K	B.K	Kahunshivapur -1			Mistri		24 Male
##	Santa Bdr. Nepali	Nepali	Kahunshivapur -1			Mistri		24 Male
##	Raju Thapamagar	Magar	Kahunshivapur -1			Agriculture		23 Male
##	Kamala Thapa	Magar	Kahunshivapur -1			Agriculture		37 Male
##	Kalimaya B.K	B.K	Kahunshivapur -1			Agriculture		52 Male
##	Balram B.K	B.K.	Kahunshivapur -1			Labour		23 Male
##	B.K	B.K	Kahunshivapur -1			Labour		67 Male
##	Padam B.K	B.K	Kahunshivapur -1			Labour		24 Male
##	Pem Kumari Thapa	Magar	Kahunshivapur -1			Agriculture	98460654031	25 Female
##	Aaeti Ale	Magar	Kahunshivapur -1			Agriculture		39 Male
##	Rup Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		35 Male
##	Puja Malla	Malla	Kahunshivapur Beltar-1			Agriculture		21 Female
##	Keshar Thapa	Magar	Kahunshivapur -1	Laliguras Pra. Bi		Teacher	9846065002	27 Male
##	Om Bdr. Thapa	Magar	Kahunshivapur -5			Retried		49 Male
##	Nol Man Thapa	Magar	Kahunshivapur i			Agriculture		56 Male
##	Purnima Thapa	Magar	Kahunshivapur i-1			Agriculture		30 Female
##	Uma Maya Thapa	Magar	Kahunshivapur i-1			Business		31 Female
##	Khadak Bdr. Garja	Magar	Kahunshivapur-Hukse			Agriculture		25 Male
##	Gangi Sar thapa	Magar	Kahunshivapur			Agriculture		48 Female
##	Buddhi Sara Ale	Magar	Kahunshivapur			Teacher		46 Female
##	Tul Bdr. Thapa	Magar	Kahunshivapur-Jhaputar-1			Business		56 Male
##	Indra Bdr. Ale	Megar	Kahunshivapur-Jhaputar-1			Agriculture		60 Male
##	Tek Bdr. Garja	Magar	Kahunshivapur-Jhaputar-1			Agriculture		38 Male
##	Lok Bdr. Thapa	Magar	Kahunshivapur-Jhaputar-1			Agriculture		39 Male
##	Karma Singh Thapa	Magar	Kahunshivapur-Jhap	Shree Ganesh Pra. Bi		Teacher		38 Male
##	Dev Bdr. Thapa	Magar	Kahunshivapur-Jhap	Deepak Pra. Bi		Teacher		38 Male
##	Chandra Bdr. B.K	B.K	Kahunshivapur-Jhaputar-1			Business		35 Male
##	Krishna Bdr. Ale	Magar	Kahunshivapur Jhaputar-1			Agriculture		38 Male
##	Man Bdr. Thapa	Magar	Kahunshivapur Jhaputar-1			Business		40 Male
##	Chet Bdr. Garja	Magar	Kahunshivapur -1			Agriculture		60 Male
##	Buddhi Bdr. Rana	Magar	Kahunshivapur -1			Agriculture		53 Male
##	Til Maya Pulami	Magar	Kahunshivapur -1			Agriculture		36 Female
##	Resham Magar	Magar	Kahunshivapur Beltar			Labour		37 Male
##	Dil Bdr. Thapa	Magar	Kahunshivapur Beltar			Agriculture		52 Male
##	Bishnu Maya Baral	Brahmin	Kahunshivapur -6			Business		25 Female
##	Hira Singh thapa	Magar	Kahunshivapur -1			Agriculture		58 Male
##	Bom Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		17 Male
##	Hom Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		18 Male
##	Harka Bdr. Saru	Magar	Kahunshivapur -2			Agriculture		25 Male
##	Kumari Thapa	Magar	Kahunshivapur -1			Agriculture		38 Female
##	Om Bdr. Magar	Magar	Kahunshivapur -1			Agriculture		37 Male
##	Deu Bdr. B.K]	B.K	Kahunshivapur -2			Agriculture		40 Male
##	Dhak Bdr. B.K	B.K	Kahunshivapur Beltar-1			Labour]		40 Male
##	Mithu B.K	B.K	Kahunshivapur Beltar-1			Agriculture		36 Female
##	Nar Bdr. Saru	Magar	Kahunshivapur -1			Agriculture		30 Male
##	Ram Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		28 Male
##	Yam Bdr. Thapa	Magar	Kahunshivapur -1			Agriculture		31 Male

##	Rekha Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture		20 Male
##	Nari Maya Thapa	Magar	Kahunshivapur -1		Agriculture		37 Female
##	Dinesh Kumar Thapa	Magar	Kahunshivapur -1		Business		18 Male
##	Amar Bdr. B.K	Magar	Kahunshivapur -1		Agriculture		47 Male
##	Som Bdr. B.K	Dalit	Kahunshivapur -1		Agriculture		32 Male
##	Buddhi sara B.K	B.K	Kahunshivapur -1		Agriculture		31 Female
##	Kopila Thapa	Magar	Kahunshivapur -5		Agriculture		25 Female
##	Juna Saru	Magar	Kahunshivapur -1		Agriculture		35 Female
##	Bishnu Maya Garja	Magar	Kahunshivapur -1		Agriculture		30 Female
##	Madhu Maya Thapa	Magar	Kahunshivapur -1		Agriculture		32 Female
##	Basanti Thapa	Magar	Kahunshivapur -1		Agriculture		33 Female
##	Khageshwori Nepali	Nepali	Kahunshivapur -1		Agriculture		69 Female
##	Hom Kumari Saru	Magar	Kahunshivapur -1		Agriculture		39 Female
##	Bim Maya Saru	Magar	Kahunshivapur -1		Agriculture		39 Female
##	Ganga Maya Garja	Magar	Kahunshivapur -1		Agriculture		35 Female
##	Ramesh Poudel	Magar	Kahunshivapur -7		Agriculture		Male
##	Kesh Bdr. Pariyar	Darji	Kahunshivapur -1		Operator		35 Male
##	Dal Bdr. Nepali	Nepali	Kahunshivapur -1		Service		35 Male
##	Dev Bdr. Gauli Chhetri	Chhetri	Kahunshivapur -1		Sikarmi		54 Male
##	Raj Kumar	B.K	Kahunshivapur -1		Sikarmi		30 Male
##	Hasna Bdr. Garja	Magar	Kahunshivapur		Agriculture		40 Male
##	Madhu Singh Thapa	Magar	Kahunshivapur -1		Teacher		38 Male
##	Dil Maya Lamichanne		Kahunshivapur		Business		35 Female
##	Bishnu Kumari Thapa	Magar	Kahunshivapur		Business		33 Female
##	Madhu Maya Thapa	Magar	Kahunshivapur		Business		42 Female
##	Bishnu Maya Nepali		Kahunshivapur		Business		46 Female
##	Lila Maya Nepali		Kahunshivapur				50 Female
##	Jun Devi Rana Bhat	Chhetri	Kahunshivapur		Service		30 Female
##	Santu Maya Ale	Magar	Kahunshivapur		Agriculture		30 Female
##	Mangali Maya Ale	Magar	Kahunshivapur		Agriculture		35 Female
##	Nur Maya Ale	Magar	Kahunshivapur		Agriculture		40 Female
##	Man Maya Ale	Magar	Kahunshivapur		Agriculture		27 Female
##	Manu Maya Wache	Magar	Kahunshivapur -1		Agriculture		28 Female
##	Reku Maya Thapa	Magar	Kahunshivapur -1		Agriculture		30 Female
##	Birura Ale	Magar	Kahunshivapur -1		Agriculture		63 Female
##	Lili Maya Thapa	Magar	Kahunshivapur -1		Agriculture		49 Female
##	Krishna Bdr. B.K	B.K	Kahunshivapur -1		Mistri		32 Male
##	Rudra Bdr. Thapa	Magar	Kahunshivapur -5		Business		25 Male
##	Maya Shakya	Newar	Kahunshivapur		Agriculture		59 Female
##	Pancha Maya B.K		Kahunshivapur -1		Agriculture		25 Female
##	Bir Maya B.K		Kahunshivapur -1		Household work		60 Female
##	Uma Garja	Magar	Kahunshivapur -1		Agriculture		24 Female
##	Tiak Maya Garja	Magar	Kahunshivapur -1		Agriculture		59 Female
##	Bhak Maya Rana	Magar	Kahunshivapur -1		Agriculture		60 Female
##	Dil Maya Garja	Magar	Kahunshivapur -1		Agriculture		19 Female
##	Ganga Garja	Magar	Kahunshivapur -1		Agriculture		20 Female
##	Mal Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture		21 Male
##	Shivaraj Khadka	B.K	Kahunshivapur -1		Agriculture		20 Male
##	Pabitra Thapa	Magar	Kahunshivapur		Agriculture		60 Female
##	Gita Rana	Magar	Kahunshivapur -1		Agriculture		30 Female
##	Nani Maiya Rana	Magar	Kahunshivapur -1		Agriculture		36 Female
##	Parwati Rana	Magar	Kahunshivapur		Agriculture		26 Female
##	Krishna Bdr. Thapa	Magar	Kahunshivapur Lokma		Agriculture		64 Male
##	Emaya Pulami	Magar	Kahunshivapur Lokma		Agriculture		58 Female
##	Manisara Thapa	Magar	Kahunshivapur Lokma		Agriculture		49 Female
##	Padam Prasad Ranabhat	Ranabhat	Kahunshivapur		Service		32 Male
##	Bal Bdr. Sunar	B.K	Kahunshivapur -1		Agriculture		64 Male
##	Mahadev Thapa	Magar	Kahunshivapur -1		Labour		24 Male
##	Bishnu Maya Thapa	Magar	Kahunshivapur -1		Agriculture		42 Female
##	Jagar Bdr Thapa	Magar	Kahunshivapur -1		Agriculture		44 Male
##	Shri Bdr. Thapa	Magar	Kahunshivapur -1		Agriculture		48 Male
##	Som Bdr. Saru	Magar	Kahunshivapur -1		Agriculture		32 Male
##	Kesh Bdr. Saru	Magar	Kahunshivapur -1		Agriculture		23 Male
##	Madhu Maya B.K	B.K	Kahunshivapur Dharapani-2		Agriculture		50 Female
##	Lok Bdr. Pulami	Magar	Kahunshivapur Malinga-1		Agriculture		24 Male

	Jamune VDC						
1	Laxman Adhikari	Brahmin	Jamune-7		Agriculture		45 Male
2	Ajay Kumar Shrestha	Newar	Jamune-7		Business		49 Male
3	Krishna Bdr. Raut	Brahmin	Jamune-7				65 Male
4	Upendra Ghimire	Brahmin	Jamune-7		Agriculture		57 Male
5	Dharma Raj Ghimire	M	Jamune-7		Agriculture		39 Male
6	Shailendra Ghimire	Brahmin	Jamune-7		Engineer	9804116540	21 Male
7	Bal Krishna Ghimire	Brahmin	Jamune-7		Agriculture		43 Male
8	Pushpa Khanal	Brahmin	Jamune-1	V.D.C			28 Male
9	Mani Bhadra Wagle	Brahmin	Jamune-1	V.D.C Technician	Assistant		36 Male

	Pokhari Bhanjyang VDC						
1	Prem Kumar Shahi	Thakuri	Pokhari Bhanjang-1		Agriculture		46 Male
2	Gam Bdr. Rana	Magar	Pokhari Bhanjang-1		Agriculture		46 Male
3	Hem raj Chand	Thakuri	Pokhari Bhanjang-1		Agricuture		63 Male
4	Rajendra Bdr. Sedhai	Chhetri	Pokhari Bhanjang-1		Agriculture		28 Male
5	Chudamani Thakuri	Thakuri	Pokhari Bhanjang-1				49 Male
6	Yam Bdr. Ale	Magar	Pokhari Bhanjang-1		Agriculture		52 Male
7	Rim Bdr. Nepali	Nepali	Pokhari Bhanjang-1		Foreign country		21 Male
8	Bishnu Sedhai	Brahmin	Pokhari Bhanjang-1		Agriculture		34 Male
9	Amar Bdr. Ale	Magar	Pokhari Bhanjang-1		Agriculture		68 Male
10	Harkha Bdr. Thapa	Magar	Pokhari Bhanjang-1		Agriculture		42 Male
11	Nar Bdr. Ramdam	Ramdam	Pokhari Bhanjang-1		Labour		54 Male

12	Hari Maya Thapa	Magar	Pokhari Bhanjang-1		Agriculture		33 Female
13	Chet Bdr. Rana	Magar	Pokhari Bhanjang-1		Agriculture		50 Male
14	Kusum Rana	Magar	Pokhari Bhanjang-1		Agriculture		35 Female
15	Taka Maya Pariyar	Darjui	Pokhari Bhanjang-1		Agriculture		40 Female
16	Chalimaya Rana	Magar	Pokhari Bhanjang-1		Agriculture		42 Male
17	Hira Singh Rana	Magar	Pokhari Bhanjang-1		Agriculture		35 Female
18	Bishnu Raj Tiwari	Brahmin	Pokhari Bhanjang-1		Agriculture		32 Male
19	Laxmi Kanta Mishra	Brahmin	Pokharibhanjang-1	Siddha Beni N. Ma. Vi	Teacher		42 Male
20	Dhurva Raj Tiwari	Brahmin	Pokhari Bhanjang-1		Agriculture		35 Male
21	Bijuli Prasad Tiwari	Brahmin	Pokhari Bhanjang-1		Agriculture		52 Male
22	Bal Bdr. Ale	Magar	Pokhari Bhanjang-1		Agriculture		42 Male
23	Indra Bdr. Thapa	Magar	Pokhari Bhanjang-1		Agriculture		51 Male
24	Lekha Nath Bastola	Brahmin	Pokhari Bhanjang-1		Agriculture		32 Male
25	Nava Raj Bagali	Brahmin	Pokharibhanjang-1		Service		30 Male
26	Nabin Parajuli	Brahmin	Pokharibhanjang-1	Siddha Beni N. Ma. Vi	Teacher		20 Male
27	Jau Maya Pariyar		Pokharibhanjang-1		Agriculture		40 Female
28	Bishnu Thapa		Pokharibhanjang-1		Student		16 Female
29	Suni Maya Pariyar		Pokharibhanjang-1		Agriculture		31 Female
30	Bishwo Nath Sakila	Brahmin	Pokharibhanjang-1	Nepal Bar Association	Lawyer		44 Male
31	Suk Bdr. Rana	Magar	Pokharibhanjang-1		Teacher		44 Male
32	Hani Maya Malla	Thakuri	Pokharibhanjang				33 Female
33	Sir Maya Thapa	Magar	Pokharibhanjang-1				33 Female
34	Amdhu Thapa	Magar	Pokharibhanjang-1				38 Female
35	Om Lal Thapa	Magar	Pokharibhanjang-1		Agriculture		27 Female
36	Dhan Bdr. B.K	B.K	Pokharibhanjang-1		Mistri		45 Male
37	Nagendra Bdr. Sen Thakuri	Thakuri	Pokharibhanjang Bel Bas-1		Agriculture		60 Male

	Kotdurbar VDC						
1	Indra Bdr. Ale	Magar	Kotdurbar-6		Teaching		39 Male
2	Til Bdr. Thapa	Magar	Kotdurbar-6		Student		28 Male
3	Harkha Bdr. Ale	Magar	Kotdurbar-2		Agriculture		52 Male
4	Yam Bdr. Thapa	Magar	Kotdarbar-7		Student		25 Male

	Rising Ranipokhari VDC						
1	Bhim Kumar Shrestha	Newar	Ranipokhari-3	Shiva Ma. Vi	Teacher		37 Male

	Others						
1	Bishnu Mashke	Magar	Tanahusur-8		Journalist		22 Male
2	Bel Bdr. Pariyar	Darji	Keshubtar-7		Labour		46 Male
3	Jun Narayan Shrestha	Giri			Agriculture		65 Male
4	Soman Ale	Magar	Hawashe		Agriculture		62 Male
5	Krishna Ale	Magar	Dhapakera		Agriculture		32 Male
6	Chen Narayan Chaudhari	Tharu	Pokhara-8		Job		41 Male
7	Dhan Bdr. Thapa	Magar	Gairakholi-2		Agriculture		62 Male
8	Suk Bdr. Ale	Magar	Gairakholi-2		Agriculture		51 Male
9	Damber Singh Thapa	Magar	Ora Bhanjang		Teacher		30 Male
10	Kesar Bdr. Thapa	Magar	Sokmadi-1		Agriculture		53 Male
11	Chal Bdr. Thapa	Magar	Dadkhuri		Agriculture		31 Male
12	Holi Maya Thapa	Magar	Jaluwatar		Agriculture		28 Female
13	Santa Bir Ale	Magar	Bodhadi-1		Agriculture		73 Male
14	Ben Bdr. Thapa	Chhetri			Agriculture		42 Male
16	Bishnu Maya Sunar	Sunar			Agriculture		35 Female
17	Babu Ram Karki	Chhetri	Dulegoda-4	V.D.C	Secretary		53 Male

	NEA, JICA, Study Team, NESS						
1	Narayan Bdr. Khadka	Chhetri	NEA	NEA, PDD	Service	5580374	46 Male
2	Anu Rajbhandari		NEA	NEA, ESSD	Service	4378074	45 Female
3	Jagadishwor M. Singh	Newar	NEA	NEA	Service	4212297	45 Male
4	Bisma Shrestha	Newar	NEA	NEA	Service	4210299	46 Male
5	Raju Sharma	Brahmin	NEA	NEA	Service	4460506	44 Male
6	Bhim Raj Kaderiya	Brahmin	NEA	NEA	Service	4225477	37 Male
7	Shiv Chandra Jha	Brahmin	NEA	NEA	Engineer	4279217	55 Male
8	Dr. Toran Sharma	Brahmin	NESS, Kathmandu	NESS	Consultant	4244989	52 Male
9	Mahadev Joisy	Brahmin	NESS, Kathmandu	NESS	Service	4244989	40 Male
10	Surendra Sharma	Brahmin	NESS, Kathmandu	NESS	Service	4244989	30 Male
11	Amrit Paudel	Brahmin	NESS, Kathmandu	NESS	Service	4244989	27 Male
12	Pradeep Kumar Maharjan	Newar	NESS, Kathmandu	NESS	Service	4244989	30 Male
13	Dr. Katsuhiko Masaki			JICA Environmental Advisory Council member			Male
14	Mr. Makoto Yoshino			Second Secretary, Embassy of Japan			Male
15	Dr. Kanji Usui			JICA Thailand Office			Male
16	Ms. Sayoko Tokuda			JICA Nepal Office			Female
17	Mr. Sorab Rana			JICA Nepal Office			Male
18	Mr. Yoshimasa Ishii			JICA Study Team			Male
19	Mr. Hironobu Nishimiya			JICA Study Team			Male
20	Mr. Tomoo Aoki			JICA Study Team			Male
21	Dr. Hiromi Yasu			JICA Study Team			Male
22	Mr. Tadashi Amano			JICA Study Team			Male
23	Ms. Toshiko Shimada			JICA Study Team			Female
24	Dr. Tej Kumar Shretha			JICA Study Tema (consultant)	Professor		Male
25	Mr. Satish Chandra Devkota			NEA			Male
26	Mr. Rajan Rishi Kadel			NEA			Male

Total Number of participants excluding NEA, JICA, NESS, and Study Team	394(Male 272, Female 122)

Participants Registered in the Third Stakeholders Meeting at Rising Patan, May 5th, 2007

SN	Name	Caste	Address	Office / organization	Profession /Grade	Phone	Age	Sex
	Rising Ranipokari VDC							
1	Ram Chandra Ghaire	Brahmin	Rising Patan-9		Service	9846054266	32	Male
2	Janardan Ghaire	Brahmin	Rising Patan-9		Agriculture		72	Male
3	Keshav Kamal Karki	Chhetri	Rising Patan-9		Agriculture		74	Male
4	Krishna Aryal	Brahmin	Rising Patan-9		Agriculture		33	Male
5	Shiva Raj Ghaire	Brahmin	Rising Patan-9		Student		22	Male
6	Mahadev Ghaire	Brahmin	Rising Patan		Agriculture		28	Male
7	Tulshi Shrestha	Newar	Rising Patan		Agriculture		35	Male
8	Sita Devi Ghaire	Brahmin	Rising		Agriculture		40	Female
9	Lok Bdr. Nepali	Sarki	Rising Patan-9		Agriculture		52	Male
10	Sita B.K.	Kami	Rising Patan		Agriculture		32	Female
11	Batti Maya B.K	Kami	Rising Patan		Agriculture		40	Female
12	Punya Bati Paudel	Brahmin	Rising Patan		Agriculture		69	Female
13	Tirtha Raj Ghaire	Brahmin	Rising Patan		Teacher		42	Male
14	Kashi Ram Ghaire	Brahmin	Ranipokhari		Agriculture		38	Male
15	Kul Bdr. Rana	Magar	Rising Patan		Agriculture		59	Male
16	Narayan Pd. Regmi	Brahmin	Rising		Teacher		48	Male
17	Rishi Ram Ale	Magar	Rising Patan		Business		38	Male
18	Mina Thapa	Magar	Ranipokhari-9		Agriculture		20	Female
19	Lekh Bdr. Thapa	Magar	Rising Ranipokhari-7		Agriculture		65	Male
20	Lal Kumar Thapa	Magar	Rising Ranipokhari-7		Agriculture		58	Male
21	Man Maya Gurung	Gurung	Rising Ranipokhari-7		Agriculture		60	Female
22	Rekhishwori Ghaire	Brahmin	Rising Ranipokhari-7		Agriculture		59	Female
23	Ratna Maya Shrestha	Newar	Rising Patan		Agriculture		60	Female
24	Lila Maya Thapa	Magar	Rising Ranipokhari		Agriculture		43	Female
25	Chandra Maya Thapa	Magar	Rising Ranipokhari		Agriculture		60	Female
26	Gaun Maya Magar	Magar	Rising Ranipokhari		Agriculture		65	Female
27	Dil Bdr. Thapa	Magar	Rising Ranipokhari		Agriculture		52	Male
28	Buddhi Man Shrestha	Newar	Rising Ranipokhari-9		Agriculture		66	Male
29	Jagat Man Shrestha	Newar	Rising Ranipokhari-9		Business		72	Male
30	Murali Mohan Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		28	Male
31	Bhim Bdr. Nepali	Sarki	Rising Ranipokhari-9		Agriculture		50	Male
32	Fadbir Thapa	Magar	Rising Ranipokhari-9		Agriculture		69	Male
33	Jamuna Paudel	Brahmin	Rising Ranipokhari-9		Student		14	Female
34	Yetmaya Pariyar	Darji	Rising Ranipokhari-9		Agriculture		45	Female
35	Krishna Pd. Ghaire	Brahmin	Rising Patan		Agriculture		29	Male
36	Surendra Ghaire	Brahmin	Rising Patan		Agriculture		21	Male
37	Som Pd	Brahmin	ranipokhari		Agriculture		26	Male
38	Dhaiki Maya Devkota	Brahmin	Rising Ranipokhari-9		Agriculture		60	Female
39	Khinu Maya Marsayni	Brahmin	Rising Ranipokhari-9		Agriculture		45	Female
40	Shiva Maya Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		45	Female
41	Bmaya Shrestha	Newar	Rising Ranipokhari-9		Agriculture		48	Female
42	Yam Kumari Rana	Magar	Rising Ranipokhari-9		Agriculture		27	Female
43	Laxmi Ghaire	Brahmin	Rising Patan-9		Agriculture		50	Female
44	Tej Bdr. Thapa	Magar	Rising Patan-7		Agriculture		37	Male
45	Bishnu Maya Ghaire	Brahmin	Rising Patan-9		Agriculture		65	Female
46	Shir Maya Paudel	Brahmin	Rising Patan-9		Agriculture		50	Female
47	Chinu Maya Ghaire	Brahmin	Rising Patan		Agriculture		40	Female
48	Tol Bdr. Nepali	Sarki	Rising Ranipokhari-9		Service		25	Male
49	Bir Bdr. Thapa	Magar	Rising Ranipokhari-7		Agriculture		64	Male
50	Lekh Nath Ghaire	Brahmin	Ranipokhari		Agriculture		17	Male
51	Jamuna Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		51	Female
52	Krishna Mani Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		53	Male
53	Raj Kumar Shrestha	Newar	Ranipokhari		Agriculture		48	Male
54	Laxman Shrestha	Newar	Rising Patan		Agriculture		49	Male
55	Bishnu Hari Ghaire	Brahmin	Rising Patan		Agriculture		56	Male
56	Hari Pd. Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		72	Male
57	Madhav Pariyar	Darji	Rising Ranipokhari Wantang Khola		Agriculture		18	Male
58	Shree Ram Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		39	Male
59	Lati Maya Thapa	Magar	Rising Ranipokhari-7		Agriculture		75	Female
60	Sarita Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		20	Female
61	Sirjana Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		16	Female
62	Rupa Rana	Magar	Rising Ranipokhari-9		Agriculture		40	Female
63	Sita Maya Gurung	Gurung	Rising Ranipokhari-9		Agriculture		20	Female
64	Minu Maya Pariyar	Darji	Rising Ranipokhari-9		Agriculture		22	Female
65	Lati Maya Rana	Magar	Rising Ranipokhari-9		Agriculture		70	Female
66	Yam Maya Gurung	Gurung	Rising Ranipokhari-9		Agriculture		44	Female
67	Chha Maya Gururng	Gurung	Rising Ranipokhari-9		Agriculture		30	Female
68	Gan Chari Gururng	Gurung	Rising Ranipokhari-9		Agriculture		53	Female
69	Bhagirathi Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		40	Female
70	Parbati Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture		60	Female
71	Dam Kumari Shrestha	Newar	Rising Ranipokhari-9		Agriculture		60	Female

72	Bishnu Shrestha	Newar	Rising Patan-9		Agriculture	24	Female
73	Huma Rana	Magar	Rising Patan-9		Agriculture	19	Female
74	Naresh Raj Ghaire	Brahmin	Rising Patan-9		Agriculture	32	Male
75	Krishna Pd. Ghaire	Brahmin	Rising Patan-9		Agriculture	50	Male
76	Tulsi Maya Thapa	Magar	Rising Patan-9		Agriculture	40	Female
77	Durbada Shrestha	Newar	Rising Patan-9		Agriculture	75	Female
78	Tilu Rana	Magar	Rising Patan-9		Agriculture	16	Female
79	Suman Shrestha	Newar	Rising Patan-9		Agriculture	19	Female
80	Sarala Shrestha	Newar	Rising Patan-9		Agriculture	40	Female
81	Mina Kumari Shrestha	Newar	Rising Patan-9		Agriculture	40	Female
82	Ganu Maya Ghaire	Brahmin	Rising Patan-9		Agriculture	80	Female
83	Wanka Thapa	Magar	Rising Patan-9		Student	16	Female
84	Bhim Kumari Thapa	Magar	Rising Patan-9		Agriculture	40	Female
85	Santosh Ghaire	Brahmin	Rising Patan-9		Student	17	Male
86	Kopila Thapa	Magar	Rising Patan-9		Agriculture	33	Female
87	Raju Kumar Sharstha	Newar	Rising Patan-8		Agriculture	38	Male
88	Bal Kumari Shrestha	Newar	Rising Patan-9		Agriculture	55	Female
89	Sumitra Shrestha	Newar	Rising Patan-9		Agriculture	50	Female
90	Kul Bdr. Nepali	Sarki	Rising Ranipokhari-9		Agriculture	54	Male
91	Jhul Bdr. B.K.	Kami	Rising Ranipokhari-9		Labour/Agriculture	44	Male
92	Samser Bdr. Karki	Chhetri	Rising Ranipokhari-9		Agriculture	64	Male
93	Arjun Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture	40	Male
94	Deepak Shrestha	Newar	Rising Ranipokhari-9		Student	28	Male
95	Mangali B.K.	Kami	Rising Ranipokhari-9		Agriculture	60	Female
96	Nar Maya Lankan	Magar	Rising Ranipokhari-9		Agriculture	40	Female
97	Bir Bdr. B.K.	Kami	Rising Ranipokhari-9		Pensioner	47	Male
98	Nar Bdr. Gurung	Gurung	Rising Ranipokhari-9		Agriculture	69	Male
99	Rekh Bdr. Thapa	Magar	Rising Ranipokhari-9		Agriculture	53	Male
100	Jhakke Bir Thapa	Magar	Rising Ranipokhari-9		Agriculture	82	Male
101	Hari Kumar Shrestha	Newar	Rising Ranipokhari-9		Student	17	Male
102	Chun Maya Rana	Magar	Rising Ranipokhari-9		Agriculture	36	Female
103	Shanti Shrestha	Newar	Rising Ranipokhari-9		Agriculture	26	Female
104	Run Prasad Shrestha	Newar	Rising Ranipokhari-9		Agriculture	49	Male
105	Ganesh Kumar Shrestha	Newar	Rising Ranipokhari-9		Agriculture	21	Male
106	Krishna Pd. Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture	30	Male
107	Keshav Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture	66	Male
108	Sojit Thapa	Magar	Rising Ranipokhari-9		Student	18	Male
109	Basu Dev Sharma	Brahmin	Rising Ranipokhari-9		Agriculture	57	Male
110	Prem Bdr. Kaji	Chhetri	Rising Ranipokhari-9		Agriculture	56	Male
111	Sastar B.K.	Kami	Rising Ranipokhari-9		Agriculture	22	Male
112	Santa Kumar Shrestha	Newar	Rishing Patan		Business	30	Male
113	Mukti Nath Ghaire	Brahmin	Rising Patan-9		Agriculture	44	Male
114	Babu Lal Shrestha	Newar	Rising Patan-9		Agriculture	33	Male
115	Khadka Man Gurung	Gurung	Rising Patan-9		Agriculture	52	Male
116	Ram Pd. Paudel	Brahmin	Rising Patan-9		Agriculture	43	Male
117	Krishna Shyam Ghaire	Brahmin	Rising Patan-9		Agriculture	33	Male
118	Chitra Bdr. Rana	Magar	Rising Patan-9		Agriculture	47	Male
119	Rup Narayan Shrestha	Newar	Rising Patan-9		Agriculture	80	Male
120	Dependra Shrestha	Newar	Rising Patan-9		Student	16	Male
121	Bhakta Bdr Shrestha	Newar	Rising Patan-9		Business/Agriculture	54	Male
122	Bhakti Pd. Ghaire	Brahmin	Rising Patan-9		Agriculture	61	Male
123	Surya Lal Sunar	Sunar	Rising Patan		Agriculture		Male
124	Babu Ram Ghaire	Brahmin	Rising Patan-9		Agriculture	53	Male
125	Bishnu Pd. Ghaire	Brahmin	Rising Patan-9		Agriculture	46	Male
126	Bojh Raj Ghaire	Brahmin	Rising Patan-9		Agriculture	62	Male
127	Jun Narayan Shrestha	Newar	Rising Patan-9		Agriculture	66	Male
128	Ratna Bdr. Gurung	Gurung	Rising Patan-9		Agriculture	56	Male
129	Krishna Shyam Ghaire	Brahmin	Rising Patan-9		Agriculture	43	Male
130	Ramji Ghaire	Brahmin	Rising Patan-9		Agriculture	35	Male
131	Arjun Pd. Ghaire	Brahmin	Rising Patan-9		Teacher	42	Male
132	Naba Raj Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture	35	Male
133	Bodh Raj Ghaire	Brahmin	Rising Ranipokhari-9		Agriculture	63	Male
134	Topali Maya Ghaire	Brahmin	Rishing Patan-9		Agriculture	54	Female
135	Khima Devi Ghaire	Brahmin	Rishing Patan-9		Agriculture	40	Male
136	Juna Nepali	Sarki	Rising Ranipokhari-9		Agriculture	40	Female
137	Yam Bdr. B.K.	Kami	Rising Ranipokhari-9		Agriculture	49	Male
138	Tek Bdr. Thapa	Magar	Rising Ranipokhari-7		Agriculture	49	Male
139	Narmata Pariyar	Darji	Rising Ranipokhari-9		Agriculture	50	Female
140	Sanu Shital Shrestha	Newar	Ranipokhari-9		Agriculture	28	Male
141	Badri Nath Ghaire	Brahmin	Ranipokhari-9		Agriculture	39	Male
142	Narayan Pd. Ghaire	Brahmin	Ranipokhari-9		Agriculture	57	Male
143	Hari Pd. Paudel	Brahmin	Ranipokhari-9		Agriculture	47	Male
144	Parshu Ram Ghaire	Brahmin	Ranipokhari-9	Deep Jyoti Primary School	Teacher	36	Male
145	Lal Bdr. Shrestha	Newar	Ranipokhari-9		Business	45	Male
146	Shanta Bdr. Shrestha	Newar	Ranipokhari-9		Agriculture	62	Male

147	Badri Nath Ghaire	Brahmin	Ranipokhari-9		Agriculture	59	Male
148	Dol Raj Mishra	Brahmin	Ranipokhari-9	CTEVT	Electrician	30	Male
149	Debiraj Adhikari	Brahmin	Rising Ranipokhari-9		Agriculture	28	Male
150	Krishna Saru	Magar	Rising Patan-9		Agriculture	60	Female
151	Chun Kumari Shrestha	Newar	Rising Patan-9		Agriculture	40	Female
152	Tuk Maya Gurung	Gurung	Rising Patan-9		Agriculture	40	Female
153	Khir Maya Gurung	Gurung	Rising Patan-9		Agriculture	37	Female
154	Devisara Gurung	Gurung	Rising Patan-9		Agriculture	84	Female
155	Seti Shrestha	Newar	Rising Patan-9		Agriculture	60	Female
156	Parwati thapa	Magar	Rising Patan-9		Agriculture	35	Female
157	Tar Bdr. Thapa	Magar	Rising Patan-8		Agriculture	29	Male
158	Ran Bdr. Thapa	Magar	Rising Patan-7		Agriculture	46	Male
159	Sushila Shrestha	Newar	Rising Patan-9		Agriculture	26	Male
160	Om Raj Shrestha	Newar	Rising Patan-8		Agriculture	54	Male
161	Radhika Shrestha	Newar	Rising Patan-9		Agriculture	45	Female
162	Tena Karki	Chetri	Rising Patan-9		Agriculture	26	Female
163	Saraswati Gaire	Brahmin	Rising Patan-9		Agriculture	48	Female
164	Kala Gaire	Brahmin	Rising Patan-9		Agriculture	40	Female
165	Anil Gaire	Brahmin	Rising Ranipokhari-9		Student	12	Male
166	Kudimaya Gaire	Brahmin	Rising Ranipokhari-9		Agriculture	50	Female
167	Jay Dev Gaire	Brahmin	Rising Ranipokhari-9		Agriculture	40	Male
168	Surya Kala Gaire	Brahmin	Rising Ranipokhari-9		Agriculture	36	Female
169	Madhu Maya Gaire	Brahmin	Rising Ranipokhari-9		Agriculture	30	Female
170	Madhu Maya B.K	B.K	Rising Ranipokhari-9		Agriculture	32	Female
171	Chandra Kala Poudel	Brahmin	Rising Ranipokhari-9		Agriculture	58	Female
172	Madan Gaire	Brahmin	Rising Patan		Agriculture	19	Male
173	Prasan Gaire	Brahmin	Rising Patan		Agriculture	17	Male
174	Thakur Prasad Gaire	Brahmin	Rising Patan		Agriculture	20	Male
175	Tulasa Acharya	Brahmin	Ranipokhari-9		Agriculture	44	Female
176	Darisara Thapa	Magar	Rising Ranipokhari Paltang-7		Agriculture	50	Female
177	Chanimaya Rasaili	Sunar	Rishing Patan-9		Agriculture	60	Female
178	Krishna Kumari Rasaili	Sunar	Rishing Patan-9		Agriculture	28	Female
179	Tulasi Gaire	Brahmin	Rishing Patan-9		Agriculture	50	Female
180	Biba B.K	B.K	Rishing Patan-9		Agriculture	40	Female
181	Nar Bdr. Rana	Magar	Rishing Patan-9		Agriculture	72	Male
182	Dirgha Lal Shrestha	Newar	Rishing Patan-9		Agriculture	76	Male
183	Haribansa Gaire	Brahmin	Rishing Patan-9		Agriculture	45	Male
184	Ganesh Man Shrestha	Newar	Rising Ranipokhari Paltang-8		Agriculture	53	Male
185	Dul Raj Shreshta	Newar	Rishing Patan-9		Agriculture	52	Male
186	Amar Singh Rana	Magar	Rishing Patan-9		Agriculture	40	Male
187	Harkha Bdr. Rana	Magar	Rishing Patan-9		Agriculture	66	Male
188	Dil Bdr. Rana	Magar	Rishing Patan-9		Agriculture	60	Male
189	Jeevan Thapa	Magar	Rishing Patan-9		Agriculture	38	Female
190	Resam Rana	Magar	Rishing Patan		Agriculture	17	Male
191	Dhan Maya Rana	Magar	Rishing Patan		Agriculture	40	Female
192	Milan Karki	Chetri	Rishing Patan		Agriculture	18	Male
193	Balisara Rana	Magar	Rishing Patan		Agriculture	45	Female
194	Nar Bdr. Thapa	Magar	Rishing Patan		Agriculture	19	Male
195	Hom Bdr. Thapa	Magar	Rishing Patan		Agriculture	31	Male
196	Rajkumar	Newar	Rishing Patan		Agriculture	19	Male
197	Rudra Narayan Shrestha	Newar	Rishing Patan-9		Agriculture	74	Male
198	Bishnu Bdr. Thapa	Magar	Rishing Patan-9		Agriculture	32	Male
199	Dal Bdr. Thapa	Magar	Rishi Patan-9		Agriculture	67	Male
200	Man Bdr. Thapa	Magar	Rishi Patan-9		Agriculture	64	Male
201	Ramchandra Gaire]	Brahmin	Ranipokhari-9		Agriculture	50	Male
202	Navraj Shrestha	Newar	Ranipokhari-9		Agriculture	17	Male
203	Om Prakash Gurung	Gurung	Ranipokhari-9		Agriculture	50	Male
204	Hasta Bdr. Thapa	Magar	Ranipokhari-9		Agriculture	60	Male
205	Shri Prasad Rana	Magar	Ranipokhari-9		Agriculture	22	Male
206	Yam Nath Gaire	Brahmin	Ranipokhari-9		Agriculture	62	Male
207	Biru Bajgai	Brahmin	Ranipokhari-9		Teaching	24	Male
208	Deepak Pariyar]	Pariyar	Ranipokhari-9		Tailor	25	Male
209	chandra Nath Pandit	Brahmin	Ranipokhari-9	Ranipokhari V.D.C	Secretary	40	Male
210	Rupsingh Nepali	Nepali	Ranipokhari-9		Agriculture	16	Male
211	Saroj Gurung	Gurung	Ranipokhari-9		Agriculture	13	Male
212	Lok Bdr. Nepali	Nepali	Ranipokhari-9		Agriculture	15	Male
213	Bishwo Prakash Sharma	Brahmin	Ranipokhari-9		Teaching	42	Male
214	Ramesh Gaire	Brahmin	Ranipokhari-9		Agriculture	19	Male
215	Ujjwol Gaire	Brahmin	Ranipokhari-9		Agriculture	17	Male
216	Ramesh Chandra Gaire	Brahmin	Ranipokhari-9		Agriculture	59	Male
217	Kamal Gaire	Brahmin	Ranipokhari-9		Agriculture	39	Male
218	Laxman Nepali	Nepali	Ranipokhari-9		Agriculture	18	Male
219	Pancha Maya Nepali	Nepali	Ranipokhari-9		Agriculture	50	Female
220	Bishnu Prasad Gaire	Brahmin	Ranipokhari-9		Student	22	Male
221	Hari Bhakta Gaire	Brahmin	Ranipokhari-9		Agriculture	32	Male

222	Dilli Raj Shrestha	Newar	Rishing Patan	Agriculture		41	Male
223	Mati Lal Pariyar	Pariyar	Rishing Patan	Agriculture		53	Male
224	Puran Singh Gurung	Gurung	Rishing Patan	Agriculture		53	Male
225	Buddhi Man Thapa	Magar	Ranipokhari-7	Agriculture		30	Male
226	Madhu Sujan Gaire	Brahmin	Rishing Patan	Student		16	Male
227	Pramod Gaire	Brahmin	Rishing Patan	Student		13	Male
228	Mani Shrestha	Newar	Rishing Patan	Agriculture		40	Male
229	Basanta Shrestha]	Newar	Rishing Patan	Abroud		32	Male
230	Hom Bdr. Thapa	Magar	Rishing Patan	Abroud		44	Male
231	Bishnu Kamal Gaire	Brahmin	Ranipokhari-9	Agriculture		46	Male
232	Kedar Nath Gaire	Brahmin	Ranipokhari-9	Agriculture		50	Male
233	Man Kumar Shrestha	Newar	Ranipokhari-9	Agriculture		34	Male
234	Om Raj Gurung	Gurung	Ranipokhari-9	Agriculture		52	Male
235	Sajan Thapa	Magar	Ranipokhari-9	Student		16	Male
236	Bishwo Raj Gaire	Brahmin	Rishing Patan	Teaching		39	Male
237	Jagannath Sharma	Brahmin	Rishing Patan	Teaching		45	Male
238	Hari Bhakta Gaire	Brahmin	Rishing Patan	Agriculture		40	Male
239	Rajendra Prasad Gaire	Brahmin	Rishing Patan	Service		31	Male
240	Rishi Ram Adhikari	Brahmin	Ranipokhari-9	Agriculture	065-690610	30	Male
241	Dal Bdr. Karki	Chetri	Ranipokhari-9	Agriculture	9841657884	26	Male
242	Bal Ram Thapa	Magar	Ranipokhari-9	Agriculture		35	Male
243	Uma Rana	Magar	Ranipokhari-9	Agriculture	9841657864	21	Female
244	Ganga Man Shrestha	Newar	Rishing Patan	Agriculture		34	Male
245	Aarati Gaire	Brahmin	Rishing Patan	Agriculture		25	Female
246	Tul Bdr. Thapa	Magar	Ranipokhari-9	Agriculture		29	Male
247	Puma Chandra Gaire	Brahmin	Ranipokhari-9	Agriculture		34	Male
248	Maina Shrestha	Newar	Rising Ranipokhari-9	Agriculture		50	Female
249	Renu Kumari Shrestha	Newar	Rising Ranipokhari-9	Agriculture		46	Female
250	Gaensh Kumar Shrestha	Newar	Rising Ranipokhari-9	Agriculture		54	Male
251	Rishi ram Gaire	Brahmin	Rising Ranipokhari-9	Agriculture		45	Male
252	Tika Maya Gaire	Brahmin	Rising Ranipokhari-9	Agriculture		67	Female
253	Til Bdr. Thapa	Magar	Rising Ranipokhari-7	Agriculture		49	Male
254	Ghan Shyam Gaire	Brahmin	Rising Ranipokhari-9	Agriculture		40	Male
255	Jit Bdr. Thapa	Magar	Rising Ranipokhari-7	Agriculture		55	Male
256	Dau Bdr. Thapa	Magar	Rising Ranipokhari-9	Agriculture		38	Male
257	Lal Bdr. Khamcha	Magar	Rising Ranipokhari Tutuwa-9	Agriculture		42	Male
258	Som Bdr. B.K	B.K	Rising Ranipokhari Badar Kuna-9	Agriculture		40	Male
259	Sadam Man B.K	B.K	Rising Ranipokhari Badar Kuna-9	Agriculture		58	Male
260	Dauram Ale	Magar	Rising Ranipokhari Aam Dada	Agriculture		55	Male
261	Jit Bdr. Lankan	Magar	Rising Ranipokhari Aam Dada	Agriculture		28	Male

	Chang VDC						
1	Padam Bdr. Gurung	Gurung	Chang-7	Agriculture		55	Male
2	Luk Maya Wagle	Brahmin	Chang Patan-8	Agriculture		56	Female
3	Tara Bdr. Pathak	Chhetri	Chang Patan-8	Agriculture		42	Male
4	Mitra Lal Shrestha	Newar	Chang-4	Agriculture		57	Male
5	Sushma Pathak	Chhetri	Chang-8	Agriculture		33	Female
6	Mina Adhikari	Brahmin	Chang-8	Agriculture		30	Female
7	Kalpana Adhikari	Brahmin	Chang-8	Agriculture		25	Female
8	Yek Bdr. Gurung	Gurung	Chang-7	Agriculture		50	Male
9	Khima Nanda Wagle	Brahmin	Chang Patan-8	Agriculture		33	Male
10	Lok Narayan Shrestha	Newar	Chang-8	Agriculture		48	Male
11	Jhul Bdr. Lamkang	Magar	Chang-2	Agriculture		54	Male
12	Tej Bdr. Gurung	Gurung	Chang-7	Agriculture		54	Male
13	Nanda Lal Shrestha	Newar	Chang-7	Agriculture		55	Male
14	Dan Bdr Gurung	Gurung	Chang-7	Agriculture		59	Male
15	Hira Sing Gurung	Gurung	Chang-7	Agriculture		50	Female
16	Chandra Bdr. Gurung	Gurung	Chang-7	Agriculture		44	Male
17	Samel Tamu	Gurung	Chang	Agriculture		17	Male
18	Man Narayan Shrestha	Newar	Chang-7	Agriculture		47	Male
19	Dil Bdr.	Darji	Chang-2	Agriculture		32	Male
20	Khil Bdr.	Gurung	Chaing-7	Agriculture		50	Male
21	Nanda Bdr. Thapa	Magar	Chang-4	Agriculture		54	Male
22	Man Bdr. Thapa	Magar	Chang-4	Agriculture		50	Male
23	Lekh Narayan Shrestha	Newar	Chang-4	Agriculture		64	Male
24	Samsher Thapa	Magar	Chang-4	Agriculture		40	Male
25	Gaj Bir Ale	Magar	Chang V.D.C-4	Agriculture		64	Male
26	Dan Bdr. Ale	Magar	Chang V.D.C-4	Agriculture		58	Male
27	Gir Bdr. Gurung	Gurung	Chang V.D.C-7	Agriculture		42	Male
28	Sur Bir Gurung	Gurung	Chang V.D.C-7	Agriculture		35	Male
29	Tek Bdr. Gurung	Gurung	Chang-7	Agriculture		58	Male
30	San Chari Gurung	Gurung	Chang V.D.C -7	Agriculture		60	Female
31	Hem Bdr Gurung	Gurung	Chang V.D.C -7	Agriculture		55	Male
32	Ratna Bdr. Pathak	Chetri	Chang Patan-8	Agriculture		38	Male

33	Tilak Ram Poudel	Brahmin	Chang Patan-2		Agriculture		Male
34	Purna Bdr. Pathak	Brahmin	Chang Patan-8		Agriculture	50	Male
35	Gyanu Maya Poudel	Brahmin	Chang Patan-8		Agriculture	50	Female
36	Radha Bhandari	Brahmin	Chang Patan-8		Agriculture	26	Female
37	Uttar Kumar Gurung	Gurung	Chang-7		Agriculture	57	Male
38	Dharma Raj Khanal	Brahmin	Chang-8		Agriculture	59	Male
39	Tek Bdr Ale	Magar	Chang V.D.C-8		Agriculture	44	Male
40	Ram Bdr. Ale	Magar	Chang V.D.C-8		Agriculture	48	Male
41	Guman Singh Gurung	Gurung	Chang-7		Agriculture	65	Male
42	Indra Kala Poudel	Brahmin	Chang V.D.C-8		Agriculture	71	Female
43	Som Bdr. Gurung	Magar	Chang Ghaderi		Agriculture	24	Male
44	Hem Bdr. Thapa	Magar	Chang-2	Indian Company	Service	22	Male
45	Yub Raj Wagle	Brahmin	Chang-8		Agriculture	43	Male
46	Padam Pani Wagle	Brahmin	Chang		Agriculture	49	Male
47	Som Pathak	Brahmin	Chang		Agriculture	39	Male
48	Ram Bdr. Ale	Magar	Chang		Agriculture	49	Male

	Majhkot VDC						
1	Sharada Acharya	Brahmin	Majhkot		Agriculture	43	Female
2	Ram Bdr. Rana	Magar	Majhkot-9		Agriculture	45	Male
3	Ram Sharan Sharma Gha	Brahmin	Majhkot		Teacher	55	Male
4	Bishnu Pd. Ghaire	Brahmin	Majhkot		Agriculture	40	Male
5	Durga Prasad Gaire	Brahmin	Majhakot -9		Agriculture	35	Male
6	Ram Nath Gaire	Brahmin	Majhakot -9		Service	32	Male
7	Bal Ram Marasani	Brahmin	Majhkot-9		Teacher	45	Male
8	Daya Bikram Devkota	Brahmin	Majhkot-9		Student	17	Male
9	Bodh Raj Ghaire	Brahmin	Majhkot-9		Agriculture	68	Male
10	Krishna Hari Ghaire	Brahmin	Majhkot-9		Teacher	42	Male
11	Ramsaran Gaire	Brahmin	Majhakot -9		Teaching	48	Male
12	Rajendra Pd. Ghaire	Brahmin	Majhkot-9		Agriculture	27	Male
13	Bishnu	Brahmin	Majhkot-9		Agriculture	45	Male
14	Hari Chandra Ghaire	Brahmin	Majkot Chore Patan		Agriculture	38	Male
15	Bal Krishna Ghimire	Brahmin	Majhkot-9		Agriculture	48	Male

	Bhimad VDC						
1	Raju Pariyar	Pariyar	Bhimad		Teaching	28	Male
2	Suk Bdr. Pariyar	Pariyar	Bhimad		Business	44	Male
3	Surya Bhakta Subedi	Brahmin	Bhimad-1		Agriculture	23	Male
4	Kesh Bdr. Sunar	Sunar	Bhimad-2		Business	46	Male
5	Mahendra Reshmi	Magar	Bhimad-1		Agriculture	38	Male
6	Chakra Pani Subedi	Brahmin	Bhimad-1		Agriculture	60	Male
7	Raju Khanal	Brahmin	Bhimad		Business	35	Male
8	Dinesh Bhandari	Brahmin	Bhimad		Student	22	Male
9	Buddhi Ram Lamshal	Brahmin	Bhimad Patan		Business	50	Male
10	Bishnu Bhakta Subedi	Brahmin	Bhimad-1		Agriculture	36	Male
11	Dilli rAm Poudel]	Brahmin	Bhimad-2		Agriculture	45	Male
12	Akhil Suvedi	Brahmin	Bhimad-1		Student	19	Male
13	Surya Pd. Aryal	Brahmin	Bhimad-2		Agriculture	40	Male

	Kotdurbar VDC						
1	Harkha Bdr. Ale	Magar	Kotdrrbar-2		Agriculture	50	Male
2	Hari Bdr. Thapa	Magar	Kot Durbar-7		Agriculture	52	Male
3	Min Bdr. Sharu	Magar	Kot Durbar-7		Agriculture	38	Male

	Jamune VDC						
1	Tirtha Raj Adhikari	Brahmin	Jamune		Agriculture	39	Male
2	Bal Krishna Ghimire	Brahmin	Jamune-7		Agriculture	43	Male
3	Bishnu Kumar Shrestha	Newar	Jamune-7		Agriculture	44	Male

	Others						
1	Bhagirathi Mishra	Brahmin	Bhagabati		Agriculture	48	Female
2	Laxman Pariyar	Darji	Samung Bhagabati		Labour	24	Male
3	Sudan Tiwari	Brahmin	Bhagabati		Student	12	Male
4	Aita Ram Pariyar	Darji	Bhagawatipur-2		Agriculture	31	Male
5	Ram Bdr.	Darji	Bhagawatipur-2		Agriculture	44	Male
6	Chin Bdr. Pariyar	Darji	Bhagawatipur-2		Agriculture	40	Male
7	Chandra Bdr. Pariyar	Darji	Bhagawatipur-2		Agriculture	73	Male
8	Til Bdr. Ale	Magar	Bhagawatipur-2		Agriculture	64	Male
9	Aita Bdr. B.K.	Kami	Bhagawatipur-2		Agriculture	49	Male
10	Narayan Pd. Tiwari	Brahmin	Bhagawatipur-2		Agriculture	42	Male
11	Santosh Tiwari	Brahmin	Samung, Bhagawati-2		Agriculture	18	Male
12	Ratna Bdr. B.K	B.K	Samu Bharpur-2		Agriculture	33	Male
13	K.B. Thapa	Magar	Gajalkot-7		Teacher	21	Male
14	Keshav Shrestha	Newar	Kathmandu		Service	51	Male

15	Bishnu Adhikari	Brahmin	Buduwa Fat-9		Agriculture		31 Male
16	Shiva Pandit	Brahmin			Teaching		49 Male
17	Ram Bhagat Sharma	Brahmin				521404	34 Male

	NEA, JICA, Study Team, NESS						
1	Dr. Toran Sharma	Brahmin	NESS, Kathmandu	NESS	Consultant	4244989	52 Male
2	Mahadev Joisy	Brahmin	NESS, Kathmandu	NESS	Service	4244989	40 Male
3	Surendra Sharma	Brahmin	NESS, Kathmandu	NESS	Service	4244989	30 Male
4	Amrit Paudel	Brahmin	NESS, Kathmandu	NESS	Service	4244989	27 Male
5	Pradeep Kumar Maharjar	Newar	NESS, Kathmandu	NESS	Service	4244989	30 Male
6	Rajan Kandel	Brahmin	NEA	NEA	Service		38 Male
7	Narayan Bdr. Khadka	Chhetri	NEA	NEA, PDD	Service	5580374	46 Male
8	Anu Rajbhandari	Newar	NEA	NEA, ESSD	Service	4378074	45 Female
9	Jagadishwor M. Singh	Newar	NEA	NEA	Service	4212297	45 Male
10	Bisma Shrestha	Newar	NEA	NEA	Service	4210299	46 Male
11	Raju Sharma	Brahmin	NEA	NEA	Service	4460506	44 Male
12	Bhim Raj Kaderiya	Brahmin	NEA	NEA	Service	4225477	37 Male
13	Shiv Chandra Jha	Brahmin	NEA	NEA	Engineer	4279217	55 Male
14	Ram Nath Subedi	Brahmin	Rising Patan-9	NEA	Service		47 Male
15	Dr. Katsuhiko Masaki			JICA Environmental Advisory Council member			Male
16	Dr. Kanji Usui			JICA Thailand Office			Male
17	Ms. Sayoko Tokuda			JICA Nepal Office			Female
18	Mr. Sorab Rana			JICA Nepal Office			Male
19	Mr. Yoshimasa Ishii			JICA Study Team			Male
20	Mr. Hironobu Nishimiya			JICA Study Team			Male
21	Mr. Tomoo Aoki			JICA Study Team			Male
22	Dr. Hiromi Yasu			JICA Study Team			Male
23	Mr. Tadashi Amano			JICA Study Team			Male
24	Ms. Toshiko Shimada			JICA Study Team			Female
25	Dr. Tej Kumar Shretha			JICA Study Tema (consulta	Professor		Male
26	Mr. Satish Chandra Devkota			NEA			Male
27	Mr. Rajan Rishi Kadel			NEA			Male

Total Number of participants excluding NEA, JICA, NESS, and Study Team	360(Male 261, Female 99)

Participants Registered in the Third Stakeholders Meeting at Damauli, May 6th, 2007

SN	Name	Caste	Address	Office / organization	Profession /Grade	Phone	Age	Sex
1	Yek Bdr. Rana	Magar	Vyas-2	CPN (UML) Member	Politician	9846040382	50	Male
2	Surendra Prasad	Shah	Fishery Department, Pokha	Fishery Department, Pokhara	Service	61522004	46	Male
3	Bhagabati Neupane	Braman	Purkot-7	CPN (UML) Member	Social Worker	9846039178	28	Female
4	Kashinath Marrasini	Braman	Tanahun	D.A.O.	Govt. Service	560133	45	Male
5	Ramesh Sigdel	Braman	Tanahun	CPN (Maoist), District Secretary	Politician	98560281212	40	Male
6	Chandra Mani Adhikari	Braman	Tanahun	D.H.O.	Service	9846027358	47	Male
7	Moti Kumar Shrestha	Newar	Vyas-2	N.C. (Democracy)	Politician	9846065310	74	Male
8	Pushpa Khanal	Braman	Jamune-1	Jamune VDC Secretary	Service	9846043024	28	Male
9	Ram Chandra Uppadhya	Braman	Khairenitar	CPN (UML) Member	Politician	9856022196	42	Male
10	Shiva Raj Dhakal	Braman	Tharpek		Agriculture			Male
11	Indira Ojha	Braman	Tanahun	Women Development Office	Service	560142	35	Female
12	Prabin Aryal	Braman	Kathmandu	Ministry of Water Resource	Engineer	4211501	44	Male
13	Kosh Raj Sharma	Braman	Tanahun	Survy Branch, Tanahu	Service			Male
14	Kedar Sigdel	Braman	Kahun-7	CPN (UML) Member	Politician		40	Male
15	Tirtha Raj Wagle	Braman	Chhang	VDC Secretary	Service			Male
16	Mohan Bir Gurung	Gurung	Majhkot-5	VDC Secretary	Service		56	Male
17	Shree Ram Karki	Chhetri	Vyas-4					Male
18	Ram Chandra Pokharel	Braman	Vyas-9	Former precedent, DDC, Tanahun				Male
19	Tirtha Raj Adhikari	Braman	Jamune-7	Nepali Congress	Politician		39	Male
20	Shiva Bdr. Ranabhat	Chhetri	Jamune-3	N.C. (Democracy)	Politician		52	Male
21	Chandra Man Pandit	Braman	Ranipokhari	VDC Secretary	Service	9846026024	40	Male
22	Guru Dutta Ghimire	Braman	Kotdurbar	VDC Secretary				Male
23	Baburam Karki	Chhetri	Kahun Shivapur	VDC Secretary	Service		53	Male
24	Raj Kumar Shrestha	Newar	Vyas-10	Community Forest, Tanahun	Precedent	9846067438	48	Male
25	Narayan Bdr. Khadka	Chhetri	NEA	NEA, PDD	Service	5580374	46	Male
26	Anu Rajbhandari		NEA	NEA, ESSD	Service	4378074	45	Female
27	Jagadishwor M. Singh	Newar	NEA	NEA	Service	4212297	45	Male
28	Bisma Shrestha	Newar	NEA	NEA	Service	4210299	46	Male
29	Raju Sharma	Braman	NEA	NEA	Service	4460506	44	Male
30	Bhim Raj Kaderiya	Braman	NEA	NEA	Service	4225477	37	Male
31	Shiv Chandra Jha	Braman	NEA	NEA	Engineer	4279217	55	Male
32	Dr. Raghu Nath Neupane	Braman	Vyas-10		Doctor	9846043142	54	Male
33	Bishnu Pd. Dhakal	Braman	Tanahun	DDC	Service	9856027533	45	Male
34	Jaya Dev Bista	Braman	Pokhara	Fishery Department, Pokhara	Service	522004	50	
35	Nil Bdr. Thapa	Magar	Kotdurbar-4	Nepali Congress	Social Worker	065 560532	57	Male
36	Radha Wagle	Braman	Kathmandu	MOFSC	Civil Servant	9841445377	30	Female
37	Pradeep Kaphle	Braman	Damauli	FNJ, Tanahun	Joumalisum	9846040432	33	Male
38	Rejan Rishi Kadel	Braman	NEA	NEA	Service	4226730	37	Male
39	Amar Raj	Braman	Damauli	Nepal Samacharpatra	Reportar	560931		Male
40	Bishnu Bdr. Singh	Chhetri	NEA	NEA	Service	4370432	53	Male
41	Ram Bdr. Thapa	Magar		CPN (Maoist),	Politician	9856027590	45	Male
42	V.B. Bhandari	Braman		Bhanjayang Patrika	Joumalisum		59	Male
43	Pratap Lal Shrestha	Newar	Vayas-1	CPN (UML) Member	Politician	9856023891	47	Male
44	Nurma Hamat Miya		Vayas-2	Nepal Muslim Sangathan	Precedent	560224	62	Male
45	Mohamad Yosuf		Vayas-11	Nepal Muslim Sangathan	Member	561513	63	Male
46	Santosh Kumar Shrestha	Newar	Vayas-2	Hotel Committee	Member	60143	64	Male
47	Dhruba Sundar Shrestha	Newar	NEA	NEA	Service	5523778		Male
48	Chatur Bdr. Shrestha	Newar	NEA	NEA	Engineer	4496800	40	Male
49	Ashok Karki		Barbhanjang	Shree Saraswati M.B	Head Master	9856027448	39	Male
50	Ramesh Paudel	Braman	Kahun Shivapur		Social Worker	560356	35	Male
51	Saraswati Adhikari	Braman	Vayas-2	NGO	Member		44	Female
52	Narayan Pd. Wagle	Braman	Tanahun	Malpot Office	Service	560177	49	Male
53	Daya Ram Gautam	Braman	Tanahun	DAO	Service	560105	45	Male
54	Dr. Toran Sharma	Braman	NESS, Kathmandu	NESS	Consultant	4244989	52	Male
55	Mahadev Joisy	Braman	NESS, Kathmandu	NESS	Service	4244989	40	Male
56	Surendra Sharma	Braman	NESS, Kathmandu	NESS	Service	4244989	30	Male
57	Amrit Paudel	Braman	NESS, Kathmandu	NESS	Service	4244989	27	Male
58	Pradeep Kumar Maharjan	Newar	NESS, Kathmandu	NESS	Service	4244989	30	Male
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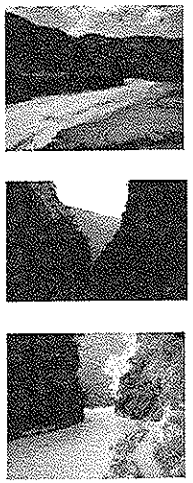
64	Mr. Tomoo Aoki			JICA Study Team				Maleale
65	Dr. Hiromi Yasu			JICA Study Team				Maleale
66	Mr. Tadashi Amano			JICA Study Team				Maleale
67	Ms. Toshiko Shimada			JICA Study Team				Female
68	Dr. Tej Kumar Shretha			JICA Study Tema (consultant)	Professor			Maleale

Presentation Material in Beltar, Rising Patan, Damauli



Major Findings of Upgrading Feasibility Study

JICA Study Team

Damauli, Tanahu District
May 6 2007

Contents of Presentation

1. **Background & Outlines of Study**
2. **Findings**
   - 2.1 **Power Demand & Supply**
   - 2.2 **Characteristics of Project Site**
   - 2.3 **Contents of Study**
3. **Conclusions and Recommendations**
4. **Time-line of the Project**

2

1. Background (1)

- Power Supply
  - Hydropower shares 99 % in energy generated in Nepal
- Electrification: around 25 % in households
- Supply Balance
  - Annual maximum demand: recorded during dry season
    - Minimum monthly discharge: less than 10 % of maximum one
    - Countermeasures: power import, thermal power, & load shedding
- Load shedding
  - FY 2004/05 12 days, July 2005 to May 2006 137 dyas
- Affects of Shortage of Power
  - People's living & economic activities in the country

3

1 Outlines of the Study (1)

- Chronology of Study
  - 2000: Identification and Feasibility Study of storage projects by NEA
  - 2001: F/S by NEA
  - 2004: Upgrading F/S by NEA
  - 2004: Preliminary study by JICA
  - Feb. 2005: Commencement of Upgrading F/S by Study Team
- Study Period: Feb. 2005 to Jun. 2007
- Purpose
  - Formulate the optimum plan
  - Assess its environmental, technical, economical and financial viabilities

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1 Outlines of the Study (2)

Premininary Study Stage
1. Review of existing documents and data
2. Preparation of alternative layout
3. Preparation of investigation plan
4. Power Sector Survey

Detailed Investigation Stage
1. Investigation
   by Subcontracting
   by Study Team
2. Environmental assessment
3. Optimization of Development Plan

Fesbibility Design Stage
1. Design at F/S level
2. Preparation of construction plan
3. Project cost estimation
4. Economic & financial analysis

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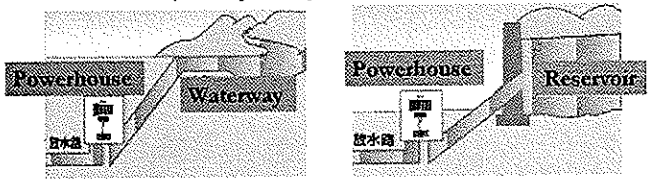
2.1 Power Demand & Supply (1)

- Total Installed Capacity : 611 MW, Hydropower 90%
- Annual Energy: Hydropower 99%
- Peak demand sources: storage type: 92MW (15%)
  Thermal: a. expensive fuel cost
  b. procurement risks and foreign currency
  c. priority on hydropower



Run-off-River Type Storage Type

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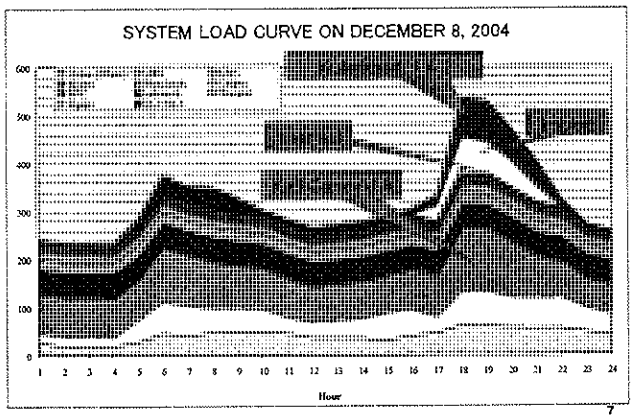
2.1 Power Demand & Supply (2)



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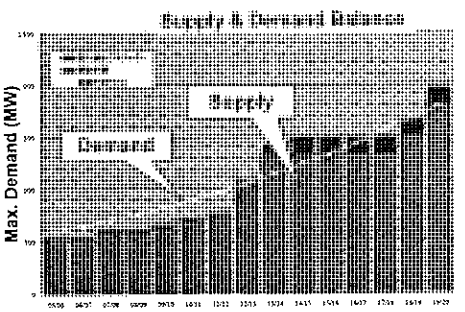
2.1 Power Demand & Supply (3)



- Annual Growth Rate:
  8 % in past 10 years
- Demand forecast:
  8 % per annum

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Major findings of study

2.2 Characteristics of Project (1)

Main Features of the Project

1) Reservoir	
Full Supply Level	415.0 m
Gross Storage Volume	295.1 million m^3
Effective Storage Volume	167.0 million m^3
Reservoir Area	7.26 km^2
Reservoir Length	27.0 km
Drawdown Depth	27.8 m
Design Flood (PMF)	7,377 m^3/s
2) Dam	
Type	Concrete Gravity
Height x Length of Crest	140 m (H) x 170 m (L)

3) Powerhouse	
Type	Underground
Width x Height x Length	22 m (W) x 42 m (H) x 90 m (L)
Turbine Type	Vertical Francis
Number of Turbine	Two (2) nos.
4) Generation	
Effective Head	113.0 m
Maximum Discharge	127.4 m^3/s
Installed Capacity	94MW x 2
Annual Energy Production	475.2 GWh

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2.2 Characteristics of Project (2)

Characteristics of the Site

- Geology: Foundation of high dam
  Underground powerhouse
- Sedimentation:
  Annual sediment: 6,500 ton/year/km^2
- Environment: Storage project
  Category A in JICA Guidelines

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2.3 Study (Geology)

- **Result of geological investigation**

1) Geology around reservoir will be watertight
2) Rock foundation will have enough strength for 140-m high concrete gravity dam.
3) Rock around underground powerhouse will be hard.

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2.3 Study: Sedimentation

- Countermeasures for Sedimentation

1. Sediment flushing facilities in dam
2. Sediment flushing at the beginning of rainy season
3. Coating of turbines due to erosion by small particle of soil

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Major findings of study

2.3 Study (Environment)

- Environmental Impact Assessment (EIA)

1. Review of NEA's EIA
2. Supplemental Environmental Survey
3. Supplemental EIA
4. Proposals on Mitigation Measures
5. Frame work of Resettlement Plan and Social Action Plan
6. Stakeholder Meeting

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2.3 Study (Stakeholder Meeting)

- Findings at 1st and 2nd Stakeholder Meetings

1st Meeting: 402 participants, 2nd Meeting: 574 participants

1) The proposed project is requisite and essential
2) The proposed project needs to provide the maximum benefits to the local society.
3) Due consideration should be given to the compensation and resettlement issues.
4) The alternative mode of transportation for inundated roads and affected suspension bridges should be considered.
5) The mitigation measures to protect Bhimad Bazaar and other necessary areas from erosion should be seriously considered.
6) The affected community forest and grazing lands need to be delineated and compensated.
7) Various development needs such as electricity facility, drinking water and schools should be considered and undertaken.

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2.3 Study (Optimization)

- Optimization of Development Plan

1. Preparation of 5 layouts for comparison
2. Estimate on environmental cost every 10m of Full Supply Level
3. Cost: Construction and O & M Costs of Project
4. Benefit: Construction and O & M Costs of Thermal Power Plant
5. Comparison of Benefit – Cost ratio

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2.3 Optimization Result

- Selected Plan

1. FSL: EL.415 m
2. Dam: Concrete gravity type
3. Installed Capacity: 128MW
4. Powerhouse: Underground type

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Major findings of study

2.3 Study (Design, etc.)

- For the selected plan

1. Design at F/S level
2. Preparation of construction plan
3. Estimate project cost
4. Economic and financial evaluation
5. Proposal on further investigations

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2.3 Study (Construction Cost & Schedule)

Construction Cost

	Item	(Million US$)
1	Preparatory Works	2.24
2	Civil Works	192.93
3	Hydromechanical Eq.	16.63
4	Electromechanical Eq.	47.18
5	Transmission Lines	9.00
	Direct Cost	267.98
6	Environmental Cost	29.10
7	Admin. & Engineering Fee	18.76
8	Contingency	24.61
	Indirect Cost	72.47
9	Total	340.45

- Construction Period:

6 years including preparatory works

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2.3 Study: Economic Evaluation

- Economic Evaluation

1. Method: Comparison of Thermal Power Plant
2. Benefit (B): Construction and O&M Cost of Thermal Power Plant
3. Cost (C): Construction and O&M Cost of Project
4. Results: Confirmed more benefit than thermal power plant

Economically feasible

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2.3 Study: Financial Evaluation

- Financial Evaluation

1. Benefit: Electric tariff of NEA
2. Electric tariff: Assumed reasonable increase
3. NEA can get benefit from Project

Confirmed financially feasible

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Major findings of study

2.3 Study: Others

Other Benefit from Project

1. **Make stable power frequency**
2. **Maintain power voltage in network**
3. **Reduce/replace operation hours of costly thermal power plants**
4. **Reinforce NEA's network by transmission**

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3 Conclusion & Recommendation

- Judged feasibility from technical, environmental, economical, and financial viewpoint
- Recommended to proceed to the next stage as new power sources

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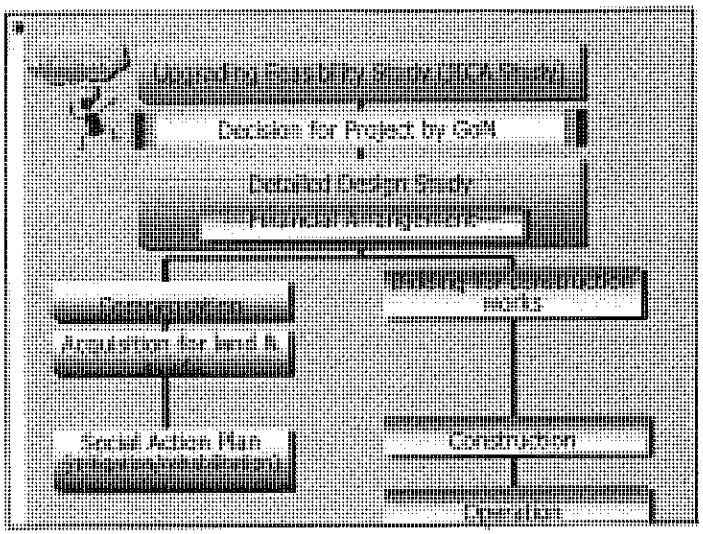


Major findings of study

Natural Environmental Impacts and Mitigation Measures

The Upgrading Feasibility Study

Damauli, Tanahu District
May 6 2007

1

1 Natural Environment - Physical Environment -

Impact on Land Use and Topography

Impact during Construction Phase

Land Use in the Reservoir Area

SN	Land Use Types	Land Use under Nominated FSLs (ha)						
		436	425	416	405	395	385	376
1	Cultivation	223.22	108.89	69.36	51.72	37.45	28.77	16.41
2	Built up	2.19	1.34	0.85	0.38	0	0	0
Total cultivation/built up		*225.41*	*110.23*	*70.21*	*52.1*	*37.45*	*28.77*	*16.41*
3.1	Grazing Land	125.21	102.56	84.59	70.03	47.87	32.25	17.62
3.2	Shrubs	34.53	28.18	17.94	11.07	4.84	2.64	0.82
Total grazing/shrub		*159.74*	*130.74*	*102.53*	*81.1*	*52.71*	*34.89*	*18.44*
3.3	Hill Sal Forest	64.32	43.64	29.46	20.40	11.75	7.29	3.17
3.4	Khair/Sissoo Forest	69.88	60.97	52.62	44.46	36.70	29.12	20.52
3.5	Mixed Open Forest	338.25	304.87	271.81	239.82	206.73	175.79	138.08
Total Forest		*472.45*	*409.48*	*353.89*	*304.68*	*256.18*	*212.2*	*161.77*
4	Barren Land	5.05	1.43	0.28	0.01	0.03	0	0
5	Escarpment	13.17	8.70	5.38	2.14	0.07	0	0
6	River	109.71	98.45	91.11	87.69	81.50	75.31	65.49
7	Sand	164.68	128.54	111.74	101.19	92.57	82.85	69.12
	Grand Total	1150.14	887.57	735.41	628.71	519.51	434.02	331.13

2

1 Natural Environment - Physical Environment -

Impact during Construction Phase

Land Use in the Project Facility Site

SN	Land Use Types	Land Use (ha)
1	Cultivation	35.28
2	Built up Areas	0.245
Total cultivation/built up		*35.525*
3.1	Grazing Land	7.35
3.2	Shrubs	4.67
Total grazing/shrub		*12.02*
3.3	Hill Sal Forest	44.46
3.4	Khair/Sissoo Forest	0
3.5	Mixed Open Forest	24.24
Total Forest		*68.7*
4	Barren Land	0
5	Escarpment	0
6	River	7.01
7	Sand	9.28
	Grand Total	133.08

3

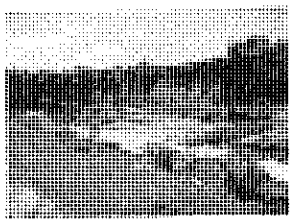
1 Natural Environment - Physical Environment -

Impact during Construction Phase

Reservoir Area

- In the upper reservoir area, the soil slides associated with the terrace materials are prevalent.
- the risk of the slope instability due to the reservoir operation should be considered in the upper reservoir area.

Wantang Khola


Bhimad Bazaar

4

1 Natural Environment - Physical Environment -

Impact during Operation Phase

Flood Water Level

- The annual flushing of the reservoir at FSL 415 m will effectively control any sedimentation.
- In the case that nominated Full Supply Level is 415 m, the sedimentation will not happen around the Bhimad Bazaar.
- The backwater effect after the sedimentation is minor.

5

1 Natural Environment - Physical Environment -

Impact during Operation Phase

Downstream of the Dam

- High sediment deposit at the sediment flush operation and river scouring at the normal operation will be experienced in the Seti River section immediately below the dam.
- The agricultural land on the left bank appears to be high enough that it would not be affected.
- Any economic activities by villagers such as irrigation has not been found in the immediate area of tailrace, since the area is mainly composed of deep gorge.

6

1 Natural Environment - Physical Environment -

The Measures during Construction Phase

- The optimum reservoir Full Supply Level is examined from not only economic viewpoint but also environmental viewpoint
- The layout of the construction facilities to minimize the impacts on the communities of Beni Patan and Shivapur

7

1 Natural Environment - Physical Environment -

The Measures during Operation Phase

Reservoir Area

- Completion of protection embankment works with concrete blocks cover in the vicinity of Bhimad Bazaar
- Land acquisition program and stabilization of erosion prone in the risk zone area from Full Supply Level to 10m high above
- Selective planting of ground cover and trees at the base of areas susceptible to erosion in tributary stream leading into the Seti River
- Land acquisition program and stabilization of erosion prone areas with suitable tree species in the vicinity of the Wantang Khola, the Pedhi Khola and Tittuwa

8

1 Natural Environment - Physical Environment -

The Measures during Operation Phase

Downstream of Dam

- A siren system will be proposed to install in the vicinity of Damauli
- However, in further stage of the project, topographic survey in the downstream river course should carried out to examine the details of hydraulic conditions such as increase speed of downstream water level during the power generation.

9

1 Natural Environment - Physical Environment -

Impact on Water Quality

- Sampling tests are carried out at ①Downstream of Damauli, ②Confluence with the Madi River, ③Dam Site, ④Bhimad Bazaar in June and October.
- ⇒ Present river water is not polluted.
- ⇒ Total Suspended Solids and Settleble Solid are very high.
- ⇒ Concentration of total phosphorus is high. There is possibility of eutrophication in the reservoir

10

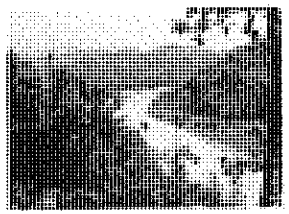
1 Natural Environment - Physical Environment -

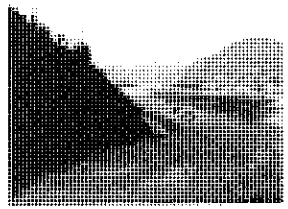
- The measures in the reservoir prevents the algae bloom by decreasing inflow of nutrient such as phosphorus or nitrogen in the active zone of the phytoplankton.
- The measures are composed of the following two method.
  - i) Providing the Fraction Fence to control the inflow of the nutrient into the surface of the reservoir
  - ii) Conducting sand flush operation once a year to prevent the nutrient from accumulating in the bottom of the reservoir

11

1 Natural Environment - Physical Environment -

- Sediment flush operation should be carried out once a year not only to secure reservoir capacity but also to maintain the good water quality in the reservoir
- The environmental flow 2.4 m^3/s proposed by NEA is likely to be reasonable range to mitigate the impact of aquatic ecology in the downstream





12

2 Natural Environment - Biological Environment -

Impact on Vegetation and Forestry

Loss of Forest/Shrub/Grasslands under Reservoir FSL 415m

S N	Forest Land	Area (ha)
1.	Grazing Land	84.59
2.	Shrubs Land	17.94
	Total Grazing and Shrub	102.53
3.	Hardwood Sal Forest Land	29.46
4.	Mixed Open Forest Land	271.81
5.	Khair/Sisso Forest Land	52.62
	Total Forest Land	353.89

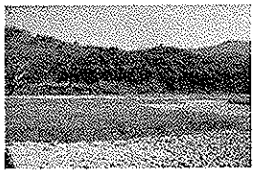
Loss of Forest/Shrub/Grasslands in the Project Facility Sites

S N	Forest Land	Area (ha)
1	Grazing land	7.35
2	Shrub land	4.67
	Total Grazing and Shrub	12.02
3	Hardwood Sal Forest Land	44.46
4	Mixed Open Forest Land	24.24
5	Khair/Sisso Forest Land	0.00
	Total Forest Land	68.7

13

2 Natural Environment - Biological Environment -

- 8 community forests user groups are identified in the Project area
- Compensation for the forest on each administrative category
  - Protection Forest: Plantation 1:25
  - Private Forest: Land and Volume of Trees
  - Community Forest: Plantation 1:25 and Compensation of Production Loss for 5 years



14

2 Natural Environment - Biological Environment -

Impact on Wildlife

Mammal

- A number of protected species according to CITES, IUCN and Government of Nepal classifications are present in the Project areas affected. This includes the Bengal Tiger, Sloth Bear, Himalayan Black Bear, Common Otters and a number of smaller cats.

Reptiles and Amphibians

- A total of 17 reptiles and amphibian species are reported in the Project area. Out of 17 reported species, Golden Monitor Lizard and Rat Snake is respectively categorized in "Lower Risk/Near Threatened" and "Lower Risk/Least Concern" in IUCN Red List. These two species are legally protected in Nepal. In addition, two species are listed in the CITES Annex I and three species in the CITES Annex III.

15

2 Natural Environment - Biological Environment -

Bird

- 62 bird species belonging to 14 orders and 34 families are recoded in the Project area. Large number of birds and many species are found in the lower reservoir area. Out of recorded species, Vulture (Gyps sp.) is categorized into "Globally Threatened" and Spot Billed Ducks (*Anas poecilorhyncha*) and in Appendix I and Eurasian Golden Oriole (*Oriolus oriolus*) in Appendix II of CITES.

Butterfly and Moss

- Total of 44 species of butterflies and 2 species of Mosses are observed in the Project area. No recorded specie is listed in the CITES and IUCN Red List.

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2 Natural Environment - Biological Environment -

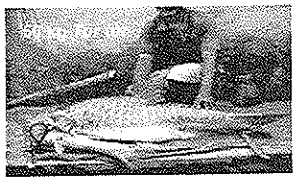
- Related to the protected species, the confirmation of their habitat conditions should continue and the proper measures should be studied through the detail investigation and monitoring in the detailed design stage and construction stage.
- Since similar habitat conditions are widely seen in the vicinity of the study area, it is considered that extinction of specific species will be very low possible incidence.
- To save endangered animals, rescue operation using boats during the filling of the reservoir and relocating them to compatible ecosystem in nearby forests are considered.

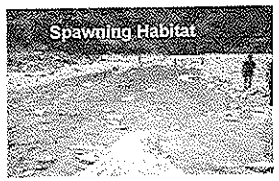
17

2 Natural Environment - Biological Environment -

Impact on Aquatic Ecology and Fishery

- Sampling of fish and aquatic species at ①Dam Site, ②Bhimad Bazaar, ③Downstream of confluence with the Madi River
- Out of the total of 36 species caught, none are officially Red Listed by IUCN
- Impact on migrant fishes is irreversible
- Supply with fry from the fish hatchery in the Kaligandaki A. Extension of the fish hatchery and stocking program in the Upper Seti reservoir will be required.





18

3 Natural Environment - Watershed Management -

Study on Framework of Watershed Management

- Identify ecologically sensitive areas where additional programs are needed and prioritize these based on GIS data and field surveys
  - The sediment source study in the Seti watershed of upstream dam indicates high sediment source areas in the northern part of the Seti watershed, 40 - 50 km away from the reservoir.
  - It is considered that the sediment sources most affected for the reservoir are loose alluvial deposit area (*Tar* in Nepal) with ramifications of gullies extended along the Seti River and its tributaries in the downstream of Pokhara.
  - Consequently, it is proposed to provide small-scale civil engineering and bio-engineering measures of slope protection in the areas upstream from Bhimad to Pokhara.

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4 Natural Environment - Environmental Cost -

Natural Environmental Cost

(million NR)

Physical Environment	
(1)The mitigation measures during the construction phase	43.1
(2)The mitigation measures for the impact on the community in the downstream	3.8
(3)Watershed management	111.5
(4) Monitoring	14.1
Total	172.5
Biological Environment	
(1)The mitigation measures for the impact on forestry and vegetation	291.5
(2)The mitigation measures for the impact on fisheries	163.5
(3)Monitoring	6.2
Total	461.2

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Framework of Resettlement Plan and Social Action Plan

The Upgrading Feasibility Study

Damauli, Tanahu District
May 6 2007

1

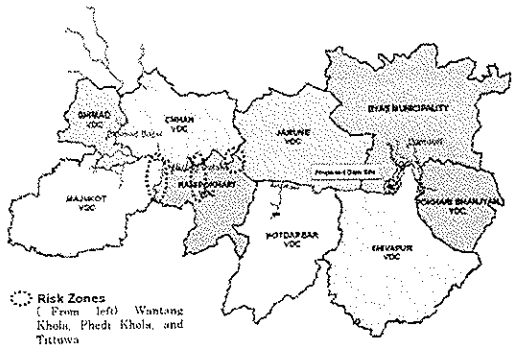
Identification of Affected Areas

Affected 7 VDCs & 1 Municipality

❶	Reservoir Areas (FSL 415+10m)	Bhimad, Chhang, Majkot, Rising Ranipokhari, Kotdurbar, Jamune, Kahun, Shivapur VDCs, Vyas Municipality
	Risk Zones (A 50 m horizontal distance from the edge of the cliff)	i)Wantang Khola (Majkot-Rising Ranipokhari), ii)Phedi Khola (Rising Ranipokhari), and iii) Tittuwa (Rising Ranipokhari)
❷	Project Facility Sites	Kahun Shivapur, Vyas Municipality
❸	Downstream Areas	Kahun Shivapur, Pokhari Bhanjyang, Keshavtar, Dharampani, Baidi, Chhipchiipe, Devghat, Deurali VDCs

2

Affected VDCs and Municipality



3

Major Socio-Economic and Cultural Impacts

Affected Cultivated Land ----------	151.22 ha (FSL415 +10 m)
Affected Built up Area ----------	1.7 ha
Affected Forest Land ----------	424.5 ha
Loss of Agricultural Production --------	660.77 MT
Number of Affected Private Structure-	313
Number of Affected Community Structure-	7 (1 Ghat, 5 Resting place, 1 Temple)
Number of Affected Private Land Owners-	838 hh
Number of Affected Structure Owners-	110 hh (half of them living in the project facility sites)
Number of Residential Structure Owners =Relocatee ----------	86 hh (about one-third of them having non-legal title)

4

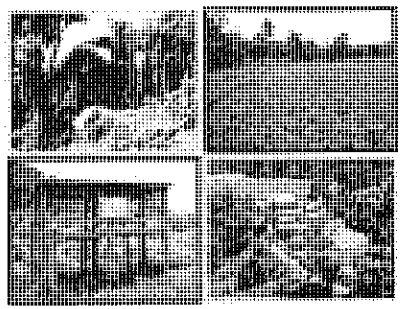
2 Major Socio-Economic and Cultural Impacts

FSL415 m

Affected Infrastructures --	2 stretches of Motorable roads, 6 suspension bridges, 20 foot trails, 1 irrigation cannels, 2 electric distribution line routes
Loss of Water Resources and Forest Resources ------	Giving negative impacts on those who are highly dependent on forest resources such as fodder and fuel wood and water resources in their daily lives
Inflow of a Large Number of Workers ----------	Giving significant stress to the local water supply system and existing public facilities, deteriorating the sanitation conditions and environment

5

Framework of Resettlement Plan



6

1 Resettlement Policy Framework for the Project

- Land acquisition and involuntary resettlement shall be avoided where feasible or minimized to the extent possible.
- Where population displacement is unavoidable, individuals, households and community losing assets, livelihood and other resources shall be informed and consulted.
- Affected Persons(APs) shall be compensated at replacement cost for all losses and damaged assets. The absence of legal titles to lands, property and facilities shall not be a bar to compensation.
- APs shall be fully compensated and resettled before their houses are demolished and their land and facilities are acquired.

7

1 Resettlement Policy Framework for the Project

- A resettlement plan shall be prepared and consulted with APs in advance of the implementation of the project .
- The resettlement plan implementation shall be monitored.
- The resettlement shall be executed as part of the development project.
- After RP implementation, the economic and social conditions of the APs should be improved or at least maintained.

8

2. Entitle Matrix for Compensation/Rehabilitation

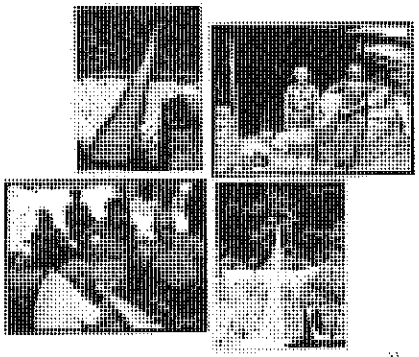
Types of APs	Type of Compensation/Rehabilitation									
	1	2	3	4	5	6	7	8	9	10
	Permanent loss of land at replacement cost	Loss of crops and natural resource	Loss of house and other structures at replacement cost	Loss of community facilities and resources	Loss of government property	Grant for disturbance compensation to displaced households	Grant of transportation allowance to displaced households/community structures	Grant of land plot	Loss of business	House rental allowance
Landowner	✔	✔								
Land tenant	✔	✔								
Structure owner			✔							
Business owner									✔	
Community		✔		✔			✔			
Government Agency		✔			✔					
Relocatees										
House & Lot owner	✔	✔	✔			✔	✔	✔	✔	✔
House owner tenant	✔	✔	✔			✔	✔	✔	✔	✔
Informal settler			✔			✔	✔	✔	✔	✔
House occupant						✔	✔	✔	✔	✔

3. Cost Estimations for Resettlement Plan

Summary	Million NRs
Cost Estimation for the Private Land	999.51
Cost Estimation for the Structures	33.972
Cost Estimates for Agriculture Production Equivalent to One Year Production	0.647
Other Rehabilitation Compensation to Relocatee	44.95
Transportation Allowance to affected Structure Owners Other than the Affected Residential Structure Owners	0.56
Monitoring for 10 years	1.80
Grand Total	1,081.4

10

Proposed Social Action Plan



11

4. Social Action Plan Framework for the Project

- Social Action Plan is designed to mitigate socio-economic impacts on the affected communities and affected persons, and rehabilitate the quality of life of these communities and persons.
- Social Action Plan includes a package of 8 social programs.

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]
8. [illegible]

2 Proposed Social Programs

1 Restoration of Affected Infrastructure Program

- Target Groups: Affected local communities in which infrastructure will be affected.
- Program Components: Affected infrastructure such as motorable roads, suspension bridges, and foot trails will be restored.

2 Affected Communities Priority Support Program

- Target Groups: Affected communities of the project-affected VDCs/municipality of the Reservoir area
- Program Components: Some development funds will be allocated to each affected VDC to undertake programs as per local needs. The local affected VDCs are expected to contribute 25% of the estimated cost in cash or in kind for the selected program.

13

2 Proposed Social Programs

3 Skill Development Training Program

- Target Groups: Local interested and eligible people from affected people and communities. The priority should be given to the poor, destitute and disadvantaged people.
- Program Components: Training will be carried out focusing on enhancement of skills required for the project employment.

4 Agricultural Development Program

- Target Groups: Affected persons and affected communities.
- Program Components: It includes agricultural, horticultural and herbal and vegetable faming development by providing practical training and improved seeds or samplings.

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2 Proposed Social Programs

5 Community Health Awareness and Environment Program

- Target Groups: One program is targeted near the construction sites. The other is targeted in the close vicinity of the reservoir affected VDCs.
- Program Components: It focuses on the improvement of public health, sanitation, water supply, health and education institutions. Various public awareness and education activities such as environmental sanitation, HIV/AIDS, STI and other communicable diseases, and prevention, will be also undertaken.

6 Women Development Program

- Target Groups: Women in the affected VDCs and municipality
- Program Components: It includes income generation skills, education on HIV/AIDS, STI, family planning, and girl trafficking, and micro-credit funds.

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2 Proposed Social Programs

7 Community Participation in Project Management Program

- Target Groups: Affected communities located close to the reservoir in affected VDCs and municipality.
- Program Components: With the technical support of the watershed management experts in the detailed design phase, the program will be launched and managed by the affected communities.

8 Rural Electrification Program

- Target Groups: Unconnected part of the affected VDCs and municipality.
- Program Components: It is designed to meet the electricity connection needs of the local communities.

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Cost Estimation for Social Action Plan

Summary	Million NRs
Replacement of Affected Infrastructures by the Reservoir	85.5
Community's Initiative Support Program	52.13
Skill Enhancement and employment	10.14
Agricultural Development Programs	27.51
Community/Public Health and Education Enhancement Programs at the Project Construction sites	9.66
Community/Public Health and Education Enhancement Programs at the Reservoir affected VDCs	6.27
Women Development Program	13.03
Watershed Management Programs	12.31
Monitoring for 10 years	19.55
Grand Total	236.10

17

Recommendations and Further Investigation at the Detailed Design Stage

- Update and finalize the affected land plots and land owners
- Conduct an inventory structure survey for areas such as Wantang Khola, Phedi Khola and Tittuwa as well as the Project Facility Sites
- Update the framework of Resettlement Plan and the Social Action Plan
- Incorporate the proposed mitigation and enhancement measures in Tender Documents and Contract Agreement

18

Minutes of Third Stakeholder Meeting in Damauli

Upgrading Feasibility Study of Upper Seti Storage Hydroelectric Project

Third Stakeholders Meeting

Time:	1.30 PM
Date :	May 4, 2007; Baishakh, 21, 2064
Venue:	Shree Shukla Lower Secondary School, Kahu Shivapur, Tanahu
Organized by:	Nepal Electricity Authority with the Assistance of Japan International Cooperation Agency
Master of Ceremony:	Mr. Satish Devkota, NEA

The stakeholder meeting was chaired by ***Mr Krishna Prashad Joshi***, *Head Master, Shree Shukla Lower Secondary School, Kahu Shivapur, Tanahu.* Other guests who took chair in the dias were:

1. Mr. Bishnu Bahadur Singh, Head, Project Development Department NEA
2. Mr. Rishikesh Sharma, Head, Managing Director Secretariat, NEA
3. Mr. Amar Bahadur Bishwakarma, Chairman, Shree Shukla Lower Secondary School Management Committee
4. Mr. Shree Jung Thapa, Social Worker, Beltar
5. Mr. Yoshimasamasa Ishii, Team Leader, JICA Study Team
6. Dr. Masaki, Member Environment Advisory council, JICA
7. Mr. Usuii, JICA, Thailand
8. Ms. Tokuda, JICA, Nepal
9. Mr. Saurav Rana, JICA, Nepal
10. Mrs. Lili Maya Thapa, President, Lali Guras Aama Samuha, Kahu Shivapur

Mr. Bishnu Bahadur Singh, Head, Project Development Department, NEA, welcomed the participants of the stakeholder meeting. He reiterated his thanks to the participating people that they have come from far of places despite the scorching heat of the summer.

Highlighting on the power situation in Nepal, he explained the types of electricity projects which are currently operational in Nepal. Nearly 99% of the electricity demand is sourced from the Run off the River Hydroelectric Projects. Power generation from such projects, he explained, varies depending upon the quantity of water in the river. As a result, such projects generate energy to their installed capacity during rainy season and as the water drops in the dry and summer season, only a fraction of the installed capacity could be generated. It is because of this; NEA is forced to cut power to its consumers in the dry and summer season.

The proposed project, he explained, being a reservoir project, could generate energy even during the dry season from the stored water in the reservoir and help NEA to supply energy to its consumer even during the dry season. It is for this reason NEA has undertaken the feasibility study of the project. JICA has helped us in the upgrading feasibility study of the

project and to identify the optimum plan for the project development. A congratulate the JICA team for undertaking the study team in specified time frame.

Hydropower projects could generate various types of environmental impacts. Many of them could be beneficial, while some could be adverse also. The JICA study team has studied the natural and social environmental impacts of the project. They have also come up with measures to mitigate the adverse impacts and enhance the positive impacts.

To day we are gathered here to share the findings of the JICA study team and get your concern and input on the study made by the JICA team. The highlights of the project and related natural and social environmental impacts and conceived mitigation measures and enhancement measures are given in the brochure, which is in your hand. The brochure also includes the answers of the frequently asked questions, which were shorted out from the questions raised during the first and second stakeholder meeting at Damauli and Kathmandu.

I once again welcome you all in this august gathering and humbly request you to put your concerns and suggestions to the study team. Your honest input will make the study and the project sound for smooth implementation and operation. We welcome your suggestions to make the study and project a success.

Dr. Toran Sharma, on behalf of the JICA study team presented the findings of the study. He explained the project background and various studies undertaken by the JICA study team to identify the optimum project plan. He further elaborated the salient features of the identified optimum project plan. Project layout features were explained in the layout maps and in the photographs of the project area particularly of the reservoir, and project facility sites, the dam and powerhouse locations.

The perceived natural and social impacts of the project were explained by Dr. Sharma with the help of the enlarged photographs of the project areas. For each of the identified impacts, he elaborated the nature of the impact, and proposed mitigation measures to avoid, and minimize the impacts. He detailed the policy of resettlement planning and the framework of resettlement planning and explained the proposed entitlement matrix for the affected persons/families/ and communities. The proposed Social Action Plan framework is explained at greater length for the rehabilitation of the affected people and communities.

After the presentation of Dr. Sharma, the forum was open for the questions, concerns, and suggestions from the stakeholders.

Mr. Sakti Lal Thapa – Ex-Chairman, Tanahu District Development Committee

We are happy that, Government of Japan through JICA is undertaking the project study work. We are rich in hydropower, but we are not able to utilize our resource. You have come to our house to organize the stakeholder meeting. We have a feeling that we are the real owner of the project and have a right to decide on the project. The southern part of Tanahu is remote and the people are poor. You have said that the project will provide job opportunity to the local people. We

believe that your words will be translated into practice during project implementation. We have limited skill, and the project has to utilize our skills during project construction and operation. We suggest that small civil works be contracted out to the local people than the outsiders.

Mr. Yam Bahadur Ale Magar, Pokhari Bhanjyang Ward No. 1

Nepal is a country rich in water resource. This area is also rich in many other biodiversity resources. The project should establish the rights of the people as per the provisions of ILO international agreement. The project should be renamed as Kanuh after the name of the Dam location in local Magar dialect. The project should give special consideration to the watershed management in the upstream and downstream area. The spoil disposal site should be developed as playground after the project construction. To maximize the employment of local people in the project, skill training programs should be launched at least six month before the project construction. The project should facilitate electricity transmission in the affected VDCs and the Tanahu district. Considerations on the development of ropeway tourism development, and a historical museum should be undertaken by the project.

Mrs Bishnu Maya Achami – Representative Aama Samuha (Mother Group)

We express our thanks to the JICA study team for explaining us about the project and its impacts. We request JICA to built a office structure for the Aama Samuha. As the project will affect our forest and grass land, alternatives to this effect has to be considered, because, we will be directly impacted by the loss. We women of the area are illiterate, we hope that the project will provide us skill training for the livelihood.

Mr. Ramesh Podel – Kahu Shivapur Ward No 7

The hydropower projects implemented in Nepal have in one or the other way cheated Nepali People. We are rich in hydropower, but we are paying high electricity tariff. I propose the project should give share to the local people and then only they will get the benefit of the project. I propose that the share should be allocated to project affected people, Project affected area people and the project affected district people. I think, the required money could be generated from the local people and we should not depend upon the donors or other private parties for project development.

M. Indra Bahadur Ale Magar – Kotdurbar, Ward No 6

The compensation fixation committee should also include representatives of affected people. We could not agree with the representation of the affected VDC chairman in the Compensation Fixation Committee. The skill training should not be conducted in the district headquarters, such trainings should be conducted at village level so that many people could take benefit of the training. For the development projects, you said that further discussions will be arranged, but when and how? We want to know how much of the electricity revenue

of the project comes to the district? Since we are the project affected district, we want that preference of electrification be given to this district first by the project. All able people of the project affected area should get jobs as to their skills, jobs should not be given to outsiders in the pretext that local people do not have skills. We are happy that the project is coming in this area. We are ready to help the project in the way we could do.

Mr. Upendra Ghimire – Jamune VDC

We expect that the project construction will benefit us. We are lucky that the project is coming here. Since 50% of the directly project affected area is forest, what is the alternative mitigation measures for the loss of our forest resource, we need further explanation as our livelihood is directly linked with the forest resources and its products. You said the resettlement will be done as per the Government Law. What do you mean by law? Our experience is that compensation as per law is very minimum. We know that the land valuation of Land Revenue Office is very low. We should get compensation at the replacement cost.

Dr Toran Sharma, on behalf of the JICA study team, replied to the different quarries of the stakeholders. He further detailed on the model of the skill training prior to the project, and conceived mechanism of incorporating local people in the project related jobs. Each of the items of the Social Action Plan framework including watershed management, agriculture development, women development, rural electrification, Health sanitation and education programs is explained in detail and how there programs will be implemented after discussions with the affected people and communities in the project cycle.

He explained the government of Nepal act provisions for resettlement and land acquisition. The procedures of land acquisition, formation of Compensation Fixation Committee, and the representation of local affected people in the committee proposed by the study team is detailed. He explained that the resettlement policy is to compensate on the land and property at the replacement cost and the valuation of Land Revenue Office will not be basis for compensation payments.

With regard to the loss of forest resources, Dr. Sharma explained that they will be compensated at a ratio of 1:25 plantation following the government policy, however, participation in the afforestation and conservation of planted trees from the local area is of utmost importance to regenerate the lost resources.

Mr. Rishikesh Sharma – Head, Managing Director Secretariat, NEA
Mr. Sharma thanked everybody present in the stakeholder meeting for the patience and active participation. He explained that the project belongs to local people and their active cooperation could only make the project a success. Renewed cooperation from the participants and the local people will be there in future also for the project implementation and operation. Thank you.

Mr. Krishna Prashad Joshi - Chairperson of the Stakeholder Meeting

I am happy that the stakeholder meeting is

conducted in our place. The project is our and if all of us cooperate, I am confident, the project will be implemented. It will not only benefit us but will also benefit the nation as a whole. I wish all success to the project. I want to thank the JICA Study team for their work. I now declare that the stakeholder meeting is adjourned. Thank you.

Upgrading Feasibility Study of Upper Seti Storage Hydroelectric Project

Third Stakeholders Meeting

Time:	10.30 AM
Date :	May 5, 2007; Baishakh, 22, 2064
Venue:	Shree Deep Joyti Primary School, Rising Ranipokhari, Tanahu
Organized by:	Nepal Electricity Authority with the Assistance of Japan International Cooperation Agency
Master of Ceremony:	Mr. Satish Devkota, NEA

The stakeholder meeting was chaired by ***Mr Doola Raj Shrestha***, *Chairperson, Shree Deep Joyti Primary School.* Other guests who took chair in the dais were:

11. Dr. Masaki, Member Environment Advisory council, JICA
12. Mr. Usui, JICA, Thailand
13. Ms. Tokuda, JICA, Nepal
14. Mr. Saurav Rana, JICA, Nepal
15. Mr. Yoshimasa Ishii, Team Leader, JICA Study Team
16. Mr. Shiva Chandra Jha – Head, Environmental and Social Studies Department, NEA
17. Mr. Bishnu Bahadur Singh, Head, Project Development Department NEA
18. Mr. Rishikesh Sharma, Head, Managing Director Secretariat, NEA
19. Mrs. Ishowri Pandey – Head Master, Shree Deep Joyti Primary School
20. Mr. Ram Chandra Gaire – Chairperson, Road Development Committee
21. Mr. Bhakti Prashad Gaire – Ex Ward Chairperson.

Mr. Shiva Chandra Jha - Head, Environmental and Social Studies Department, NEA

First of all I would like to welcome you in this stakeholder meeting. I am thankful to all of you who despite their work have come from long distances to participate in the meeting.

We have conducted public hearing meeting during the first EIA process. This is the third stakeholder meeting during the upgrading feasibility study. The objective of this stakeholder meeting is to discuss on the issues raised by the common people with regard to the project, project related impacts, and mitigation measures. To incorporate the concerns and issues of the local people, we have come to your place for this stakeholder meeting as suggested by you in the second stakeholder meeting. Let us now sit down together and discuss the issues that you think are most important. Let us identify the problems and also identify the solutions to resolve the issues. If we could do this I will consider the meeting was a success and we could take the right decision for project implementation and operation.

Dr. Toran Sharma, on behalf of the JICA study team presented the findings of the study. He explained the project background and various studies undertaken by the JICA study team to identify the optimum project plan. He further elaborated the salient features of the identified optimum project plan. Project layout features were explained in the layout maps and in the photographs of the project area particularly of the reservoir, and project facility sites, the dam and powerhouse locations.

The perceived natural and social impacts of the project were explained by Dr. Sharma with the help of the enlarged photographs of the project areas. For each of the identified impacts, he elaborated the nature of the impact, and proposed mitigation measures to avoid, and minimize the impacts. He detailed the policy of resettlement planning and the framework of resettlement planning and explained the proposed entitlement matrix for the affected persons/families/ and communities. The proposed Social Action Plan framework is explained at greater length for the rehabilitation of the affected people and communities.

After the presentation of Dr. Sharma, the forum was open for the questions, concerns, and suggestions from the stakeholders.

Mr. Budhi Ram Lamsal – Bhimad Ward No. 1, Chairman, Seti River Embankment Action Committee.

River Site is cutting the river banks every year. How high will be the water level at Bhimad area ? What are the measures taken by the project for the control of river cutting?

Mr. Biswa Prakash Sharma – Rising Patan, Rising Ranipokhari

The project should not affect the agricultural land. The affected land and property should be given adequate compensation. The road from Bhimad to Rising Patan should be upgraded. The project should provide job as per the skill of the people. Programs for health and education should be launched. A road should connect Bhimad – Damauli along Seti river. The cremation grounds should be built. A program for watershed management be implemented. All affected bridges should be built on the project cost.

Mr. Parashu Ram Gaire – Risng Patan

The playground used by our children at the bank of Seti River will be under the reservoir. We would want alternative for the playground to our children.

Mr. Kul Bahadur Rana – Wantan Khola, Rising Rani Pokhari Ward No 9

The reservoir effect on land and property is higher in the Rising Rani Pokhari. The entire settlement of Wantan Khola will be submerged. How compensation will be given to the affected people? Where these displaced people will be relocated. Will the compensated money be sufficient for land purchase and house construction? Will the project inundate the settlement of Tutuwa or not ?

Mr. Ram Saran Sharma Gaire, - Bhimad Ward No. 9

There are active landslides along Seti River and also along the tributary streams. How these landslides will be controlled? If there is no land erosion control, we will loose most of our property by the reservoir inundation and by the landslides of the tributary streams. What are the mitigation options for land slide control?

Mr. Bal Krishna Gaire, - Majkot

What will be the compensation to the affected land of the non-titleholders? Will they be compensated?

Mr. Ram Nath Subedi – Rising Ranipokhari, Rising Patan Ward No. 9

I first thank JICA study team for coming to our houses for collection of suggestions. All affected land with legal holdings and without legal holdings should be compensated. We have used this land for our livelihood. The government should give us legal title of the land that we are utilizing for our livelihood.

Iwould request that the project should built a road along the bank of the proposed reservoir area.

Mrs. Sarada Gaire, - Majhkot, Ward No 9

I wish the project a success. There are women in our village who have completed their diploma and degree courses. They should also be give job opportunities in the project according to their skill. Job should not be only for male members of the society. Even women are capable; job opportunities should also be given to the women.

Mr. Bishnu Bahadur Thapa – Rising Ranipokhari, Rising Patan

There are many educated people in our villages. They should nbe give job oppertunites in the construction works. We are far from the construction place, Damauli. If we get job we could take room in Damauli and work. We should not be left out from the project related jobs.

You said the lost land and property will be compensated. That is good, but is that money sufficient to buy land and construct house in other place? This should also be considered while evaluating the loss of land and property.

Mr. Ram Prashad Poudel – Rising Ranipokhari Ward No. 9

The reservoir will affect most of land and property and the infrastructures that connect us with the opposite bank of Seti River. Our children could not go to school once the suspension bridges are affected. What options and alternatives the project study team has visualized to mitigate such effects?

When the land is lost, how the farmer will make their living? Even the community forests are also affected how that will be compensated?

Mr. Bhoj Raj Gaire – Rising Ranipokhari, Rising Patan Ward No 9

The Buduwa Phat will be affected by the reservoir, what is compensation mechanism? The affected people should get compensation directly; there should be no intermediary like VDC and DDC.
Village community has given land of Seti to the Schools, which is being utilized by the school as playground. This land has no legal title, what will happen to these land's compensation?

We will be very happy, if a motorable road along Seti to Damauli is constructed by the project.

Mr. Raju Khanal – Male Bagar, Bhimad.

The Bhimad Bazar is currently under threat by the river cutting. We have constructed embankment structures annually. Now the project is coming, will this work be taken up by the project from this year?

People have stopped fertilizing the land close to Seti Bank with the assumption that this land will be under reservoir. The productivity of the land has declined. Now the project need to decide whether this project is coming or not?

Mr. Dharma Raj Khanal – Chhang Patan Ward No. 8

The River Seti is a wild river. It has been eroding its bank and will continue to do so. The land that will be submerged in the reservoir will be gone for ever. The project should consider conserving the remaining land above reservoir for protection against erosion and landslides.

Mrs. Ishowri Pandey – Head Master, Shree Deep Joyti Primary School

The educated women should be give jobs by the project as per their skills. The uneducated women should be considered by skill training by the project.

Mr. Ram Bahadur Lama – Majkot

The Malebagar will be affected or not ? How will the compensation given?

Mr. Tul Bahadur Thapa – Rising Ranipokhari, Rising Patan

The project should give special consideration to the agricultural field of the Geruwatar, Kundaletar and Bandarkuna. These lands belong to the Magar Communities, who are poor.

Mr. Tej Bahadur Thapa – Paltang, Rising Ranipokhari, Ward No. 7

Will the project affects the Rising Patan – Chautari village Road or not? The project is expected to affect the community forest, what will be the compensation? Seti river has eroded my land. I have the land certificate will I get compensation?

Rajendra Prashad Gaire – Rising, Rising Ranipokhari Ward No 9

The alternative of the Dablang playground should be considered? The affected people should get free electricity? What is the strategy to protect the Buduwa Phat?

Mr. Bal Krishna Ghimire – Member FECOFUN (Jamune VDC)

The project should conceive a long term environmental management plan to protect and conserve its environmental resources. Recently one more Community forest has been registered at Jamune VDC, which will be affected by the project. The name of the Community forest is Umachok Community Forest, Jamune VDC 5

Dr Toran Sharma, on behalf of the JICA study team, replied to the different quarries of the stakeholders. He further detailed on the model of the skill training prior to the project, and conceived mechanism of incorporating local people in the project related jobs. Each of the items of the Social Action Plan framework including watershed management, agriculture development, women development, rural electrification, Health sanitation and education programs is explained in detail and how there programs will be implemented after discussions with the affected people and communities in the project cycle.

He explained the government of Nepal act provisions for resettlement and land acquisition. The procedures of land acquisition, formation of Compensation Fixation Committee, and the representation of local affected people in the committee proposed by the study team is detailed. He explained that the resettlement policy is to compensate on the land and property at the replacement cost and the valuation of Land Revenue Office will not be basis for compensation payments. He reiterated that the resettlement policy even includes the non-titleholders for compensation to the lost assets

With regard to the loss of forest resources, Dr. Sharma explained that they will be compensated at a ratio of 1:25 plantation following the government policy, however, participation in the afforestation and conservation of planted trees from the local area is of utmost importance to regenerate the lost resources. A special package of compensation for the community forest equal to five year production loss is proposed.

He explained the plans for reservoir shore line erosion protection conceived by the project. He explained the affected areas by the reservoir once again in the enlarged photographs to satisfy the quarry of the people and make them understand which part of the land will actually affected by the reservoir.

Mr. Bishnu Bahadur Singh, Head, Project Development Department NEA
Mr Singh, presented vote of thanks to the participating people. He expressed his happiness for the active participation in the stakeholder meeting by the local people. He emphasized the

need of the Reservoir type project to stabilize the power system of Nepal. To initiate the project, he requested local people to pressurize the government for fast decision. He reiterated that the NEA will do all that is possible to minimize the impacts of the project on the natural and social environment. He requested to send their comments suggestion on the project even in future, and NEA will welcome these suggestions to make the project environmentally sound and feasible. Thank you.

Mr. Doola Raj Dhakal – Chairperson of the Stakeholder Meeting and Chairperson, Shree Deep Joyti Primary School.

We thank the organizers for keeping this stakeholder meeting in our school. We, local could understand the project and put our quarry and concern to the concerned authority. We want the project to come to our area. Our school is poor and has no resources; we hope that the project will help us build the school infrastructure. With this I adjourned the meeting. Thank you.

Upgrading Feasibility Study of Upper Seti Storage Hydroelectric Project

Third Stakeholders Meeting

Time:	10.30 AM
Date :	May 5, 2007; Baishakh, 23, 2064
Venue:	Santosh Hotel, Damauli, Tanahu
Organized by:	Nepal Electricity Authority with the Assistance of Japan International Cooperation Agency
Master of Ceremony:	Mr. Satish Devkota, NEA

The stakeholder meeting was chaired by ***Mr Bishnu Prashad Dhakal***, Local Development Officer, Tanahu. Other guests who took chair in the dais were:

22. Mr. Kashi Nath Marashini – Chief district Officer, Tanahu
23. Mr. Bhoj Raj Regmi – General Manager, Nepal Electricity Authority
24. Dr. Masaki, Member Environment Advisory council, JICA
25. Mr. Pravin Aryal – Under Secretary, Ministry of Water Resource
26. Mr. Ram Chandra Pokhrel – Social worker, Tanahu

Mr. Bhoj Raj Regmi – General Manager, Nepal Electricity Authority, in his opening address, welcomed all the representatives of political parties, government offices, NGOs and Journalists of Damauli in the stakeholder meeting. We have come again to present our findings and discuss with you on the proposed Upper Seti Hydroelectric Project. I am happy that Mr Bishnu Prashad Dhakal, as always have cooperated with us and have taken the seat of chairman on this august gathering. You all know, JICA study team is conducting the upgrading feasibility study of the project. The study is of the international standard. Before the involvement of JICA, NEA has conducted the feasibility study of the project. Present study is based on the NEA study and has added many aspects not covered by NEA study before. As per the JICA guideline, three stakeholders meeting is required during the study period. We have already accomplished two such stakeholders meeting at Damauli and Kathmandu and this is the third stakeholder meeting. This time we have divided the stakeholder meeting into two groups at local level targeting local level affected people and

communities at the project affected sites. We have completed such meetings at Beltar and Rising Patan. These meetings were attended by a large number of local people. This meeting here is targeted for the district level agencies. We have planned for a similar stakeholder meeting at Kathmandu targeting the central level agencies and people on 10th of May.

To attained this meeting representatives of JICA have come from Japan, Thailand, and Kathmandu. I welcome them. The JICA study team member will present the findings of the study.

Let me tell you that this project will be the highest dam project in Nepal after Kulekhaini Project. With the implementation of the project, certainly there will be some adverse impacts, but we have given maximum effort to avoid these impacts wherever possible. Unavoidable impacts will be mitigated though adequate measures which will be presented very shortly by the study team.

We are in dire need of reservoir type project to stabilize our distribution system. As you know all the impacts of the projects are not negative. There are a host of positive impacts of the project. You must have read in newspaper that with the Kulekhani and Kaligandaki projects, local people have benefited by the fish caging programs. The project also has boosted local tourism.

I agree that few people will be displaced by the hydropower projects. Our experience shows that the displaced people could be resettled through pragmatic and effective resettlement management.

I welcome your comments and suggestions to make the project environmentally sound and socially acceptable. Once this is agreeable to you, we will have to arrange project finance to initiate project construction. Within one and half months JICA study team will complete their final report on the upgrading feasibility study. Based on this report we will take next step for the project decision, which I think will be done by the end of this fiscal year.

I request all of you to give your comments and suggestions to improve the project planning from the environmental and social perspective. Once again I thank all of you and hope you will actively participate in this stakeholder meeting.

Mr. Yoshimasa Ishii, Team Leader, JICA Study Team presented the finding of the upgrading feasibility study. His presentation was divided into four topics as under:

1. Background & Outlines of Study
2. Findings
   2.1 Power Demand & Supply
   2.2 Characteristics of Project Site
   2.3 Contents of Study
3 Conclusions and Recommendations
4 Time-line of the Project

On behalf of the JICA Study Team, ***Dr. Toran Sharma*** presented the Natural Environmental Impacts and Mitigation Measures and Framework of Resettlement Plan and Social Action Plan.

After presentation of the JICA Study team, the floor was open for the stakeholders' comments and suggestions on various environmental and social issues of the project.

Mr. Nil Bahadur Thapa – Vice President, Nepali Congress, Tanahu

The project should not be stopped simply because of its impacts. However, project's impacts should be avoided and minimized. There are peoples who live on the natural resources such fish, wild vegetables, and other agro forestry products. How they will be impacted? Project mitigation should also consider them.

Compensation to the affected land will be given, but is that money sufficient to buy same amount of land? This also needs to be considered while deciding the land and property compensation. Land prices are not same throughout the project affected area. How this compensation evaluation will be done?

The project affects the suspension bridges foot trails and roads. These are the lifeline of the people. These infrastructures should be given maximum consideration and people should not be obstructed by the project.

How is this skill training will be given? This needs further elaboration. What has project thought about the people who live by selling grass and firewood in the project area?

Mr. Ramesh Sigdel – Representative Nepal Communist Party Maoist, Tanahu

Bhimad Bazar will be affected by the Project or not? How the embankment will be constructed to protect the risk areas.

What will happen if the dam collapses? How many settlements and population will be affected? How far the downstream effects will be realized?

Who will be compensated for the affected grass land, grazing land, and community forest areas?

What do you mean by grant compensation to the displaced people/community?

The project affected VDCs need unconditional rural electrification program

Mr. Ramchandra Upadyaya – Representative CPNUML, Tanahu

The EIA study need further detail studies. The project affected areas require further expansion covering VDCs upstream of reservoir. Locals are extracting gravels, boulders and sand from upstream areas of Bhimad. Alternatives to these activities should also be considered.

Mr. Chandra Mani Adhikari - District Health Office

Public health issues need further studies. Projects like this in Nepal are found to be associated with STD, HIV/AIDS and various communicable diseases. Extensive programs to mitigate these effects have to be considered.

Mr. Yek Bahadur Rana – Tanahu District Secretary, CPNUML, Tanahu

Sedimentation at the rate of 6500 tons/year/km^2 is potential to fill the reservoir. In the second stakeholder meeting the estimated project cost was less, why now it has gone high?. There are Bote communities in the area, what types of resettlement efforts will be made, if the Bote communities are displaced by the project?

Girl trafficking issues have been highlighted, even male trafficking is also a potential and need consideration by the project.

In the downstream areas, despite siren warning, if there is a loss of life, what are the provisions thought by the project?

Usually, in the development projects, the local people are not given job opportunities in the project in the pretext that they have no technical skills. To avoid such incidents, technical skill training to the local people should be given at least six months before the start of project construction works.

The project affected people should be given time bound loan on lower interest rate to rehabilitate them from the project effects.

Is this project is to be implemented by NEA and JAICA? This needs to be clarified.

What is the maximum and minimum flow of Seti River? What is the unit cost of electricity? How many workers will be involved in the project construction works on a daily basis during construction period?

Mr. Jaya Ram Bista – Hatchery Development Center Pokhara

The aquatic life study in the EIA is just a bird's eye study. Monitoring works on the fishery to understand their behaviors and ecology should be continued even after EIA study for better understanding of the Seti River Aquatic life. Is it possible to go for cage culture in Seti River as in Kulekhani and Kali Gandaki? This will be beneficial to the affected Bote community, if any.

Mr. Ramesh Poudel – Kahu Shivapur

Is water resource is the income earning source of Nepal? If it is, why it is only the property of NEA? We have to pay NRs 7.50 per unit to NEA, why we could not get share on our resources. Public share should be opened for investment in such projects and Nepali people should be given opportunity for investment. Certain percentage of the investment should be given to the local people.

Mr. Kedar Sigdel – District Assistant Secretary, CPNUML, Tanahu

What is the revenue share of the district from the project? After the implementation of the project, Tanahu should be given uninterrupted electricity and the entire district should be electrified.

Mrs Saraswati Adhikari – NGO Network, Tanahu

We are happy that the project is coming. The women are the group who are most impacted by the project, may it be adverse impact or positive impact. But I found very few women in this gathering. Women also have the right to yes or no on the project matter as they occupy 50% of the society. The women should also be given job opportunities in the project and it should not be limited to high up people and male members only.

Mr. Moti Kumar Shestha – Representative Nepali Congress

I have heard that some of the people have launched a campaign to stop the project. We are dead against this approach. The project has to be implemented here in Tanahu.

Mr. Ram Chandra Pokhrel – Ex Chairman, District Development Committee

Is this project going to be implemented or it is feasibility study only? There are number of foot trails connecting southern Tanahu with Damauli through Seti Gorge, which I think will be under the reservoir, if the project is implemented. What are the alternatives to these trails and tracks? I know there will be compensation, but people have to suffer, if they have to measure longer distances.

This part of the Seti gorge is diverse in biological terms. As elaborated by the study, there are few endangered species. The project should identify an alternative habitat for these creatures. The long distant migrant fishes, as pointed out by the study, are there in the Seti river. Have we placed gates for fish migration in the dam? If not what are the alternatives to protect them and their habitats?

I agree to the point raised by one of the colleague that there should be public share in the project.

Only because of the environmental and social impacts, the project should not be stopped. It should be implemented in the place identified by the feasibility study. However, to protect our impacted resources, we all must cooperate and identify an alternative arrangements.

Finally, I request NEA and JICA study team to plan the project in such a way that there are no contractual problems and cost appreciation as in other projects in Nepal during implementation. Let us make it a unique project which could be implemented and operated as per the costs estimates, without any labor and social problems.

Dr. Toran Sharma, on behalf of the JICA study team, addressed the issues and concerns raised by the members of stakeholder meeting. He elaborated the plan for habitat conservation and fish stocking provisions for the maintenance of the fish diversity of the long distant migrant fishes. The project affected infrastructures such as foot trails and suspension bridges will be installed in the close by area in the project cost as a part of social action plan. To facilitate maximum job opportunities to the affected people and local people, project required skill training will be provided before the construction works in the project area. He further elaborated the provisions of resettlement policy and resettlement framework, social action plan framework and watershed management programs to minimize the project impacts on social and physical environment. To minimize the risks of community health during

construction, health and sanitation programs provisions were elaborated by dr. Sharma, targeting the affected areas.

Mr. Shiva Chandra Jha - Head, Environmental and Social Studies Department, NEA

I would like to thank you all for giving your precious time. I also thank you for raising various issues and concerns on the project. This will help us design and plan the project incorporating your concerns and issues.

I also extend my thanks to JICA study team for making sincere effort for the study and for the preparation of standard project feasibility report. I expect that government of Nepal will take decision on the project in near future. Then we will start detailed design and study of the project. We want your cooperation in future. I would once again thank the participant members. Thank you.

Mr. Bishnu Dhakal – Chairperson of the Stakeholder Meeting and Local Development Officer, Tanahu.

This study made by JICA study team is still in primary phase, which after completion will be submitted to the government of Nepal. If the project is found to be environmentally, socially, and financially good, the government of Nepal will take decision for further study and implementation. We have heard that Government of Japan, Asian Development Bank and many other donors are interested in taking up the project. With the implementation of the project, we expect that the current load shedding situation will be over. Hence I request all political parties to show their commitment for the project implementation. The compensation of the losses and resettlement and rehabilitation of the people will be executed as per the legal provisions of the government of Nepal. The compensation fixation committee will decide upon the compensation of land and property after rigorous discussions with the locals, political party representatives and subject matter specialists. To days gathering gives me a feeling that the project will be a success. The District Development committee extends its thanks to every body concerned. With these words, I declare the meeting as adjourned. Thank you.

Reply to Comments and Issue Raised by Stakeholders

at Third Stakeholder Meeting in Beltar, Rising Patan, Damauli

Reply to Comments and Issues Raised by Stakeholders at Third Local Stakeholder Meeting in Beltar, Rising Patan, Damauli on May 4-6, 2007

S. N	Issue raised	Suggestions, Feedback, Comments and Questions raised by the Participants	Comments and Responses from Nepal Electricity Authority (NEA)
1	Decision for implementation of the Project	1) The decision whether or not the Project will be implemented should be made as soon as possible. 2) After the Upgrading Feasibility Study, will JICA implement the Project?	1) After the Upgrading Feasibility Study supported by JICA, the government of Nepal will make a final decision for the Project. 2) JICA is responsible for providing technical assistance to the Upgrading Feasibility Study alone. The government of Nepal will seek further assistance for the Project from donor agencies including the government of Japan.
2	Maximum benefit of the Project given to local people	1) Since the project site is located in Tanahu District, the first priority should be given to local people in Tanahu. 2) Some portion from NEA royalty should be handed over to Tanahu District.	1) Various types of Social Action Programs proposed by the Upgrading Feasibility Study will be implemented to rehabilitate and enhance the affected communities in affected VDCs/municipality of Tanahu District. 2) The hydropower policy requires that the licensee of a hydropower project pays royalty to the Government of Nepal through Ministry of Water Resources, 50 percent of which is deposited in the government's revenue account while the remaining 50 percent is made available to the district and development region mentioned below. This revenue will be distributed as per the rule 211 and schedule 26 of Local Self Governance Rule 2056 and first amendment 061. 38% of the royalty is distributed to the DDCs of affected development region as per the decision made by the officers of committee or the

			committee of DDC Chairman, and remaining 12% of the royalty is directly given to the DDC where the powerhouse is located. This budget can be used for development programs of the concerned district.
3	Compensation and resettlement	1) Adequate and timely compensation should be given to the affected persons.	1) The framework of Resettlement Plan (RP) was formulated under the Upgrading Feasibility Study. Based on this, the detailed RP will be prepared and consulted with affected persons and communities in advance of the implementation of the project.
		2) The representatives from the affected persons need to be member of Compensation Fixation Committee.	2) As per the Land Acquisition Act, a Compensation Fixation Committee (CFC) will be formed. Although this Act does not consider the representatives of affected persons as a member of CFC, NEA will recommend that they should be included in CFC in accordance with the previous practices of Kaligandaki A HEP and Middle Marsyangdi HEP.
		3) Affected persons should be compensated at replacement cost for all losses and damaged assets.	3) The compensation cost will be decided by CFC considering the market price to ensure improvement of the standard of living among the affected people, or at least restoring them to pre-project levels.
		4) Land without legal holding paper should also be compensated.	4) Land without legal holdings will be compensated as per the prevailing practices.
		5) Compensation should be paid to affected persons not through VDC.	5) Compensation will be directly provided to affected persons.
4	Employment opportunities	1) Local people, both men and women should be employed by the Project. If skilled labors are not available in the areas, the skill	1) Wherever possible local people will be employed on the basis of skill and qualification during the construction period. Skill

		training should be provided to them by the Project. 2) How many workers will be involved in the project construction works on a daily basis?	Enhancement and Employment Program will be carried out for local interested and eligible people from affected families and communities. Training will be provided to them focusing on enhancement of skills required for the project employment. 2) The number of workers is expected to be around 2500 to 3000 in the peak period. However, such information will be only available and disseminated during the detailed design study.
5	Electrification	1) Electricity facility should be given to affected people and local people in Tanahu District.	1) Regarding electrification in Tanahu District, the royalty earned from the Project can be utilized by District Development Committee. Only project affected areas can be electrified by the Project during the construction.
6	Road construction	1) Motorable roads should be built from Bhimad, Rising Patan to dam site, and Damauli.	1) With regard to the upgrade of affected stretches of road, further examination will be undertaken from technical and financial aspects in coordination with District Development Committee and the concerned VDCs during the detailed design study phase. In the project facility sites, the access road will be constructed and upgraded. Except for them, the construction of new roads outside the affected areas is out of the scope of the Project.
7	Suspension bridges	1) For inundated suspension bridges, the alternatives need to be arranged.	1) Submerged suspension bridges will be rerouted and replaced under the Social Action Plan.

8	Erosion and landslide	1) Some mitigation measures for the possible hazardous areas including Bhimad Bazaar should be provided by the Project.	1) The special protection measures against erosion will be taken for the cliff of Bhimad Bazaar. For other areas, wherever needed, the mitigation measures such as Community-based Watershed Management and plantation along the risk zones of reservoir areas will be carried out to protect them from erosion or land slides.
9	Community forests	1) The affected community forest and grazing lands need to be properly compensated. 2) Newly registered community forest in Jamune VDC needs to be compensated.	1) The forestry compensation will be provided based on the prevailing forest guideline, i.e., replacement of trees at 1:25. In addition, the fuel wood volumes and grazing lands for the affected community forests will be compensated. 2) During the detailed design study, the affected community forests will be finally delineated for compensation.
10	Fisheries	1) Mitigation measures for fisheries should be undertaken by incorporating the good practices from other hydropower projects such as Kaligandaki A and Kulekhani.	1) Similar hydropower projects' experiences have been reviewed and suitable mitigation measures have been incorporated in the Upgrading Feasibility Study. Fish hatchery development and/or expansion of existing facilities and stocking of fingerlings in the upstream and downstream zones will be undertaken as mitigation measures.
11	Assist for women in affected VDCs	1) Job opportunities, skill training and awareness raising program for avoiding girl trafficking should be given to the local women in affected VDCs.	1) Under the Social Action Plan, women development program including skill training and various awareness activities will be provided to women in affected VDCs/municipality.
12	Health program	1) More focus should be given to health education including prevention of communicable	1) Community/Public Health and Education Enhancement Program will be carried out as part of Social

		diseases.	Action Plan. It focuses on the improvement of public health, sanitation, water supply and health and education institutions/facilities. Various public awareness and health education will be also included.
13	Design of dam	1) Is there a possibility that a dam will collapse? 2) Is there a possibility that the reservoir areas will be filled with sediments?	1) To make the dam safe and stable, flood discharges, sedimentation in the reservoir, earthquake motions for the dam design were studied and estimated, and those were incorporated into the dam design in the Upgrading Feasibility Study. The dam design will be continued more detailed at the detailed design stage. 2) Based on the estimate on sedimentation volume in the reservoir, sediment flushing is proposed through sediment flushing facilities installed in the dam, to avoid the reservoir from being filled with sediments. Thus, there is no possibility that the reservoir areas will be filled with sediments.

Advance Notification of Third Stakeholders Meeting in Damauli

8-1 Public notice published in the local newspaper "Nepal Samachar Patra" 7th May 2007 (Nepali).

माथिल्लो सेतीका लागि छलफल

तनहुँ (नेस)। चर्चामा रहेको पोखरेलले आयोजना जिल्लावासीको माथिल्लो सेती (दमौली) जलाशययुक्त ठूलो स्वर्णिम अवसर भएको र आयोजना जलविद्युत आयोजना सञ्चालनका रोकिन नहुनेमा जोड दिनुभएको थियो। लागि बाटो खुलेको छ।

यस्तै धारणा नेपाली कांग्रेस, नेका आर्यो जनाको स्तरवृद्धि (प्र) नेकपा (एमाले) नेकपा (अपग्रेडिङ) सम्भाव्यता अध्ययन (माओवादी) जनमोर्चा नेपालका गरेको नेपाल विद्युत प्राधिकरण स्थानीय नेता बुद्धिजीवीहरूको थियो। वातावरण तथा सामाजिक अध्ययन आयोजनाका प्राविधिकहरूले विभाग, प्राविधि सेवा, र जाइका नेपालले विगत केही सालदेखि ऊर्जाको अध्ययन टोलीले सरोकारवालासँग सङ्कट खेपिरहेको र यो समस्या आउँदा आइतबार दमौलीमा भएको अन्तरिम वर्षहरूको सुरुखायाममा विद्यमान बैठक (तेस्रो बैठक) मा आयोजना देखिएकाले, माथिल्लो सेतीको महत्त्व तनहुँका लागि उपलब्धिमूलक र बढ्न पुगेको धारणा राख्। फाइदाजनक भएको जनाउँदै चाँडै नै माथिल्लो सेती १ सय २८ सञ्चालन गर्न सुझाव दिए।

मेघावाट क्षमता रहेको प्राधिकरणले सरोकारवालाहरूको सुझावले जनाएको छ। यो आयोजना कुलेखानी आयोजना सञ्चालनको बाटो खुलेकोमा एक आयोजनाभन्दा करिब दुई गुणा नेपाल विद्युत प्राधिकरण इन्जिनियर ठूलो हुनेछ। ऊर्जा सङ्कटको समस्या सेवाका महाप्रबन्धक भोजराज रेग्मी, र समाधान गर्न र गरिबी निवारण गर्न जाइका अध्ययन टोलीका इसी, परामर्श प्रयत्नलाई मूर्त रूप दिन नेपाल दातृ संस्थाका प्रमुख डा. तोरण शर्मा, सरकारका दशौं पञ्चवर्षीय योजना नेपाल विद्युत प्राधिकरण इन्जिनियर (२०५९-२०६४) मा देशको प्रचुर सेवाका निर्देशक शिवचन्द्र झा, जलस्रोत जलस्रोत उपयोग गर्ने उद्देश्यले मन्त्रालयका प्रवीण अधिकारीले खुसी जलविद्युत योजनाहरूको निर्माण गर्न व्यक्त गर्दै, सरोकारवालाबाट निरन्तर प्रस्ताव गरेको छ। माथिल्लो सेतीको सहयोगको अपेक्षा गरे। कार्यक्रममा निर्माणमा २४ अर्ब खर्च हुने जिविस तनहुँका पूर्वसभापति रामचन्द्र प्राधिकरणले जनाएको छ।

8-2 Public notice published in the local newspaper "Nepal Samachar Patra" 7th May 2007 (Nepali).

Meeting held for Upper Seti

Tanahun (NS). The Upper Seti (Damauli) Storage Hydroelectric Project has paved its way for implementation.

Upgrading feasibility study team, comprising of Environment and Social Studies Department, NEA and Japan International Cooperation Agency (JICA) on the third stakeholder meeting in Damauli suggested that the project implementation is beneficial to the Tanahu District

Bhoj Raj Regmi, Managing Director of Engineering Department of NEA, Ishi, Team Leader of JICA study team, Dr. Toran Sharma, consultant to JICA, Shiva Chandra Jha, head of the Environment and Social Studies Department NEA, and Pravin Aryal, representative of Ministry of Water Resources, expressed happiness that the project is potential for implementation and requested continuous support from the stakeholders in future. Mr. Ram Chandra Pokhrel, Ex-DDC chairman of Tanahu lamented that the project is a golden opportunity for the people of Tanahu district and stressed that the project should be continued. Similar opinions were expressed by the representatives of Nepali Congress, Nepali Congress (D), Nepal Communist Party (UML), Nepal Communist Party (Maoist), Jana Morcha Nepal, and other district intellectuals.

Project engineers, highlighting on the ongoing load shedding, expressed that the project has a special significance and importance in the demand and supply management of electricity power, particularly in the dry season in future.

The NEA, stated that the project will be of 128 MW installed capacity. The project is twice the capacity of Kulekhani project. In order to solve the problem of power shortage permanently and to support the poverty reduction efforts in Nepal, the Government of Nepal has proposed the various hydropower projects by using its abundant water resources in its Tenth Plan (2002-2007).The project estimated cost, according to NEA, is NRs. 24 Arab.

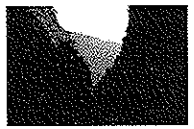
-Nepal Samachar Patra
2064-01-24

List of Invited Institutions/Persons of Third Stakeholder Meeting in Kathmandu

Upper Seti (Damauli) Storage Hydroelectric Project
3rd Stakeholder Meeting, May 10, 2007/ Baishak 27, 2064.
List of Invited Institutions/Persons

S.No.	Name	Address	Number of Participants
1	Ministry of Environment Science and Technology	Singha Durbar	1
2	Ministry of Water Resources	Singha Durbar	1
3	Department of Electricity Development	Singha Durbar	1
4	Ministry of Forest and Soil Conservation	Singha Durbar	1
5	Ministry of Agriculture	Singha Durbar	1
6	Ministry of Land Reform	Babarmahal	1
7	Fisheries Development Directoriate	Balaju	1
8	IUCN	Bakhundol	1
9	Nepal Forum of Environmental Journalist	Thapathali	1
10	Embassy of Japan	Panipokhari	1
11	JICA	Pulchok, Lalitpur	1
12	JBIC	Mr. Krishna Manandhar Local Representative, JBIC, Kathmandu	1
13	ADB	Kamaladi, Kathmandu	1
14	The World Bank	Durbar Marga	1
15	Engineering Association of Nepal	Pulchok	1
16	EIA Association of Nepal	SchEMS	1
17	NGO Federation	Buddha Nagar	1
18	Local NGO Representative	Tanahu	1
19	Water Nepal (Ajay Dixit)	Patan	1
20	Nepal Academy of Science & Technology	Satdobato, Lalitpur	1
21	Radio Sagarmatha	Sanepa, Lalitpur	1
22	The Kathmandu Post	Subidhanagr, Kathmandu	1
23	The Himalayan Times	Ananmnagar, Kathmandu	1
24	The Rising Nepal	Dharampath, Kathmandu	1
25	IMAGE Channel	Lazimpat, Kathmandu	1
26	Kantipur TV	Subidhanagr, Kathmandu	1
27	JICA Study Team		10
28	NESS Consult		5
29	Project Office		3
30	NEA-ESSD		8
31	Planning NEA		22
32	NORAD	Bakhundol, Lalitpur	1
33	KFW	Bakhundol, Lalitpur	1
34	ICIMOD	New Baneshwor	1
35	WWF	Maharjung, Kathmandu	1
36	Winrock International	Baneshwor, Kathmandu	1
37	National Planing Commission	Singa Durbar	1
38	Napal Toursim Board	Exhibation Road	1
39	Department of Gelogy	Lazimpat, Kathmandu	1
40	Federation of Indigenus People	Sanepa, Lalitpur	1
41	Nepal Communist Party (Maost)	Ananmnagar, Lalitpur	1
42	Nepal Communist Party (UML)	Balkhu, Kathmandu	1
43	Nepali Congress	Sanepa, Lalitpur	1
44	Nepali Congress (Democratic)	Bansbari, Kathmandu	1
45	Sadaabhana Party (Anandidevi)	Tripureshwor, Kathmandu	1
46	Nepal Peasant Party	Bhaktapur	1
47	Joint Peoples Movement of Nepal	Dharahara	1
48	Left Movement of Nepal	Dhobidhara	1
49	Ministry of Women and Social Welfare		1
50	Dr. Jagdish Chandra Pokhrel	N.P.C. Singha Durbar	1
51	H. Parlamentary Member Tuk Raj Sigdel		1
52	H. Parlamentary Member Govinda Raj Joshi		1
53	Ex. Parlamentary Member Amar Raj Kaini		1
54	Hon. Rama Kanta Gauro		1
55	Hon. Suresh Ale Magar		1
56	Hon. Sabitri Dura (Gurung)		1
Total Number of Participants			99

Presentation Material in Kathmandu



Major Findings of Upgrading Feasibility Study

JICA Study Team

Malla Hotel, Kathmandu
May 10 2007

Contents of Presentation

1. **Background & Outlines of Study**
2. **Findings**
   - 2.1 **Power Demand & Supply**
   - 2.2 **Characteristics of Project Site**
   - 2.3 **Contents of Study**
3. **Conclusions and Recommendations**
4. **Time-line of the Project**

2

1. Background (1)

- Power Supply
  - Hydropower shares 99 % in energy generated in Nepal
- Electrification: around 25 % in households
- Supply Balance
  - Annual maximum demand: recorded during dry season
    - Minimum monthly discharge: less than 10 % of maximum one
    - Countermeasures: power import, thermal power, & load shedding
- Load shedding
  - FY 2004/05 12 days, July 2005 to May 2006 137 dyas
- Affects of Shortage of Power
  - People's living & economic activities in the country

3

1 Outlines of the Study (1)

- Chronology of Study
  - 2000: Identification and Feasibility Study of storage projects by NEA
  - 2001: F/S by NEA
  - 2004: Upgrading F/S by NEA
  - 2004: Preliminary study by JICA
  - Feb. 2005: Commencement of Upgrading F/S by Study Team
- Study Period: Feb. 2005 to Jun. 2007
- Purpose
  - Formulate the optimum plan
  - Assess its environmental, technical, economical and financial viabilities

4

1 Outlines of the Study (2)

Preminary Study Stage
1. Review of existing documents and data
2. Preparation of alternative layout
3. Preparation of investigation plan
4. Power Sector Survey

Detailed Investigation Stage
1. Investigation
   by Subcontracting
   by Study Team
2. Environmental assessment
3. Optimization of Development Plan

Fesbibility Design Stage
1. Design at F/S level
2. Preparation of construction plan
3. Project cost estimation
4. Economic & financial analysis

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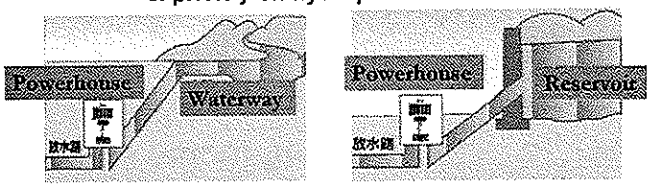
2.1 Power Demand & Supply (1)

- Total Installed Capacity : 611 MW, Hydropower 90%
- Annual Energy: Hydropower 99%
- Peak demand sources: storage type: 92MW (15%)

Thermal: a. expensive fuel cost
b. procurement risks and foreign currency
c. priority on hydropower



Run-off-River Type Storage Type

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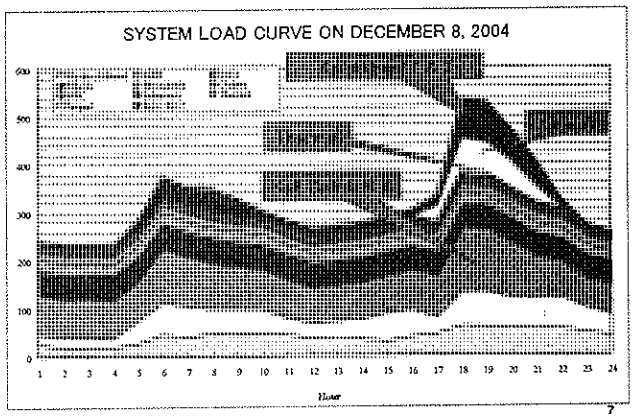
2.1 Power Demand & Supply (2)



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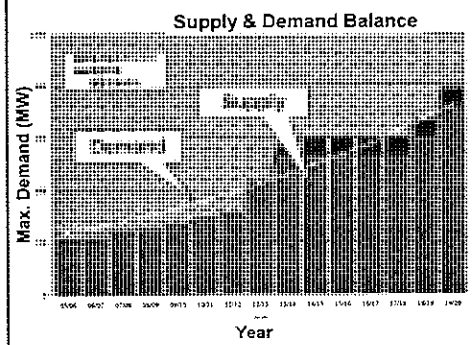
2.1 Power Demand & Supply (3)



- Annual Growth Rate:
  8 % in past 10 years
- Demand forecast:
  8 % per annum

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2.2 Characteristics of Project (1)

Main Features of the Project

1) Reservoir	
Full Supply Level	415.0 m
Gross Storage Volume	295.1 million m^3
Effective Storage Volume	167.0 million m^3
Reservoir Area	7.26 km^2
Reservoir Length	27.0 km
Drawdown Depth	27.8 m
Design Flood (PMF)	7,377 m^3/s
2) Dam	
Type	Concrete Gravity
Height x Length of Crest	140 m (H) x 170 m (L)

3) Powerhouse	
Type	Underground
Width x Height x Length	22 m (W) x 42 m (H) x 90 m (L)
Turbine Type	Vertical Francis
Number of Turbine	Two (2) nos.
4) Generation	
Effective Head	113.0 m
Maximum Discharge	127.4 m^3/s
Installed Capacity	64MW x 2
Annual Energy Production	475.2 GWh

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2.2 Characteristics of Project (2)

Characteristics of the Site

- Geology: Foundation of high dam
  Underground powerhouse
- Sedimentation:
  Annual sediment: 6,500 ton/year/km^2
- Environment: Storage project
  Category A in JICA Guidelines

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2.3 Study (Geology)

- **Result of geological investigation**

1) Geology around reservoir will be watertight
2) Rock foundation will have enough strength for 140-m high concrete gravity dam.
3) Rock around underground powerhouse will be hard.

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2.3 Study: Sedimentation

- Countermeasures for Sedimentation

1. Sediment flushing facilities in dam
2. Sediment flushing at the beginning of rainy season
3. Coating of turbines due to erosion by small particle of soil

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2.3 Study (Environment)

- Environmental Impact Assessment (EIA)

1. Review of NEA's EIA
2. Supplemental Environmental Survey
3. Supplemental EIA
4. Proposals on Mitigation Measures
5. Frame work of Resettlement Plan and Social Action Plan
6. Stakeholder Meeting

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2.3 Study (Stakeholder Meeting)

- Findings at 1st and 2nd Stakeholder Meetings

1st Meeting: 402 participants, 2nd Meeting: 574 participants

1) The proposed project is requisite and essential
2) The proposed project needs to provide the maximum benefits to the local society.
3) Due consideration should be given to the compensation and resettlement issues.
4) The alternative mode of transportation for inundated roads and affected suspension bridges should be considered.
5) The mitigation measures to protect Bhimad Bazaar and other necessary areas from erosion should be seriously considered.
6) The affected community forest and grazing lands need to be delineated and compensated.
7) Various development needs such as electricity facility, drinking water and schools should be considered and undertaken.

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2.3 Study (Optimization)

- Optimization of Development Plan

1. Preparation of 5 layouts for comparison
2. Estimate on environmental cost every 10m of Full Supply Level
3. Cost: Construction and O & M Costs of Project
4. Benefit: Construction and O & M Costs of Thermal Power Plant
5. Comparison of Benefit – Cost ratio

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2.3 Optimization Result

- Selected Plan

1. FSL: EL.415 m
2. Dam: Concrete gravity type
3. Installed Capacity: 128MW
4. Powerhouse: Underground type

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2.3 Study (Design, etc.)

- For the selected plan

1. Design at F/S level
2. Preparation of construction plan
3. Estimate project cost
4. Economic and financial evaluation
5. Proposal on further investigations

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2.3 Study (Construction Cost & Schedule)

Construction Cost

	Item	(Million US$)
1	Preparatory Works	2.24
2	Civil Works	192.93
3	Hydromechanical Eq.	16.63
4	Electromechanical Eq.	47.18
5	Transmission Lines	9.00
	Direct Cost	267.98
6	Environmental Cost	29.10
7	Admin. & Engineering Fee	18.76
8	Contingency	24.61
	Indirect Cost	72.47
9	Total	340.45

- Construction Period:

6 years including preparatory works

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2.3 Study: Economic Evaluation

- Economic Evaluation

1. Method : Comparison of Thermal Power Plant
2. Benefit (B) : Construction and O&M Cost of Thermal Power Plant
3. Cost (C): Construction and O&M Cost of Project
4. Results : Confirmed more benefit than thermal power plant

Economically feasible

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2.3 Study: Financial Evaluation

- Financial Evaluation

1. Benefit: Electric tariff of NEA
2. Electric tariff: Assumed reasonable increase
3. NEA can get benefit from Project

Confirmed financially feasible

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2.3 Study: Others

Other Benefit from Project

1. Make stable power frequency
2. Maintain power voltage in network
3. Reduce/replace operation hours of costly thermal power plants
4. Reinforce NEA's network by transmission

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3 Conclusion & Recommendation

- Judged feasibility from technical, environmental, economical, and financial viewpoint
- Recommended to proceed to the next stage as new power sources

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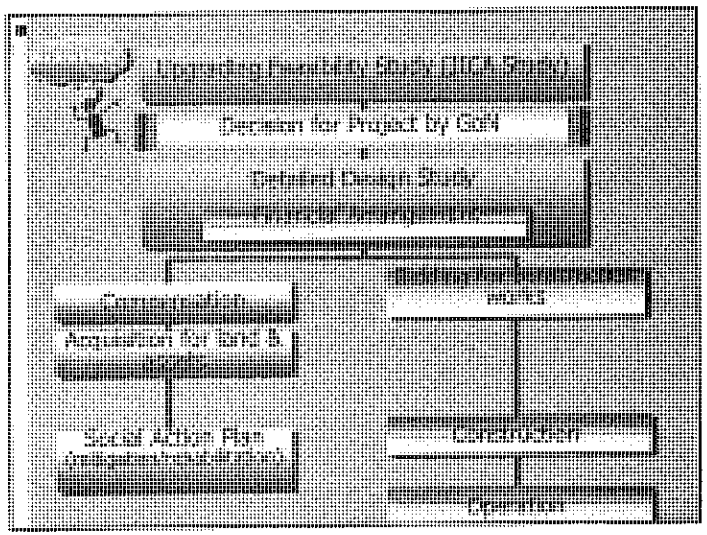
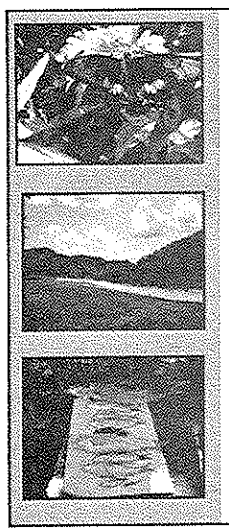


jor findings of study



Natural Environmental Impacts and Mitigation Measures

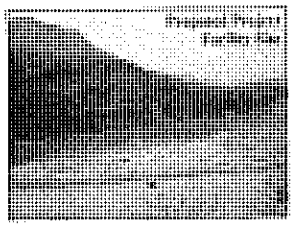
The Upgrading Feasibility Study on Upper Seti Storage Hydroelectric Project in Nepal

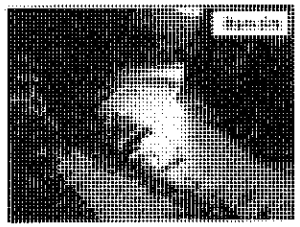
Malla Hotel, Kathmandu,
May 10 2007

1

Contents of presentation

1. Impact and Mitigation for the physical environment
1.1 Impact and mitigation during the construction phase
1.2 Impact and mitigation during the operation phase
2. Impact and Mitigation for the biological environment
3. Cost for Mitigation and Monitoring





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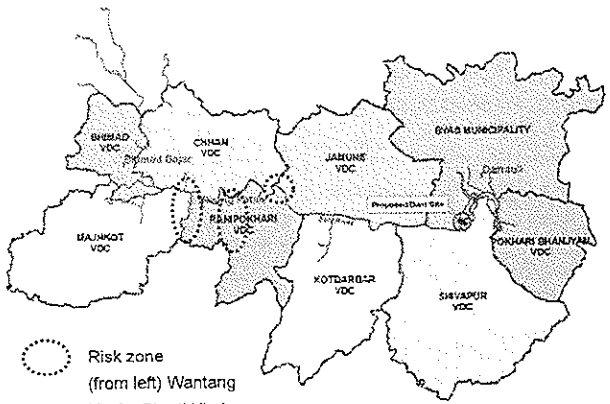
Proposed dam site and affected DVC



Risk zone
(from left) Wantang Khola, Phedi Khola, and Tittuwa

3

1. Impact and Mitigation for the physical environment

1.1 Impact and mitigation during the construction phase

Changes of land use:

SN	Land use	Affected area (ha)			
		Reservoir area (FSL: 415 m)	Project facility site	Risk Zone	Total
1	Cultivation	108.89	35.82	6.51	144.71
2	built up	1.34	0.25	0.11	1.59
Total cultivation / built up area		110.23	36.07	6.62	152.92
3.1	Grazing land	102.56	7.35	2.24	109.91
3.2	Shrubs	28.18	4.67	2.31	32.85
Total grazing land / shrub		130.74	12.02	4.55	147.31
3.3	Hill sal Forest	29.46	44.46	1.85	73.92
3.4	Khair / Sissoo Forest	52.62	0.00	0.06	52.62
3.5	Mixed Open Forest	271.81	24.24	0.00	296.05
Total Forest		353.89	68.70	1.91	424.50
4	Barren land	1.43	0.00	0.00	1.43
5	Escarpment	8.70	0.00	0.00	8.70
6	River	98.45	7.01	0.00	105.46
7	Sand	128.54	9.28	0.33	137.82
	Grand Total	831.98	133.08	13.42	978.47

4

1.1 Impact and mitigation during the construction phase (continued)

Construction phase		
Items	Impact by the Project	Proposed Mitigation
1. Landuse & topography	1) Inundation of land and changes of existing land use 2) Excavations, drilling and blasting etc, are potential to generate new sets of land instabilities at tailrace area and dam site.	- To set the lower FSL (Proposed FSL: 415m + risk zone 10 m) based on the optimum balance between incurred losses and Project benefits. - To select the layout of facilities minimizing the impact of land use changes in the communities e.g. Beni Pokari & Shivapur.
2. Air Quality	Excavations, filing, construction vehicle movements, etc. will generate the dust which detriorate the air quality in the reservoir.	- To water on the road, dusty barren areas and spoil disposal areas. - To restrict on-site vehicle speed - To wash vehicles before leaving the site
3. Noise	Cut-and cover activities, excavation,transportation of the vehicles and other construction activities will generate more noise. Vibration also will be generated by drilling, brast activities, etc.	- To use and correct fitting of silencers, mufflers and acoustic shields - To take care in the replacement and orientation of noisy plants from sensitive receivers
4. Water quality	1) Poor facilities for sanitation in the construction area and camp site may cause the open defecation of solid waste in the river bed, which degrades the water quality. 2) Accidental spills or discharge of materials (oil, cement, etc.) can also degrades the water quality.	- To set up good water supply & sanitation facilities in the work camp - To set up the effective solid waste collection facilities in the camp - Discharge of batching plant, aggregate washing plants, etc. should be done just after appropriate treatment to the river.
5. Construction Spoils	Erosion may occur at the spoil bank constructed at the right bank of the river	- To construct dry stone gabion structure at the toe of the spoil bank - To construct a water collection system for the bank

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1.2 Impact and mitigation during the operation phase

Operation phase		
Items	Impact by the Project	Proposed Mitigation
1. Land use & Topography		
(1) Reservoir area / Reservoir Shoreline Failure	1) Risk of slope instability in the upper reservoir area 2) Risk of terrace breaks by toe cutting of the stream	-To complete protection embankment works with concrete blocks near the Bhimad Bazaar. - To condust land acquisition program to stabilize the erosion prone area in the 10m above from FSL and in the vicinity of Wantang Khola, Pedhi Khola and Tutuwa. - To plant trees and grasses in the erosion prone area along the tributaries of Seti river. - To formulate and implement Watershed Management Plan to reduce the erosion rate in the upstream of Seti river watershed
(2) Full Supply Level (FSL) / Environmental Flow	Sedimentation and backwater may occur if FSL is not appropriate to control them.	- Proposed FSL 415 m will effectively control any sedimentation. - In case of FSL 415 m, the sedimentation will not occur around Bhimad Bazaar. - Backwater effect after sedimentation is minor.
(3) Impact in the Downsteam of the Dam	High sediment deposit at the sediment flush operation and river scouring at the normal operation is supposed to occur immediately below the dam.	- To monitor the sedimentation patterns in 10km downstreams of the dam - The environmental flow 2.4 m3/s proposed by NEA is likely to be reasonable range to mitigate the impact of aquatic ecology in the downstream.

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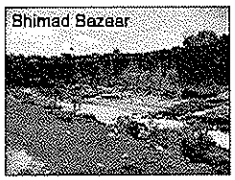
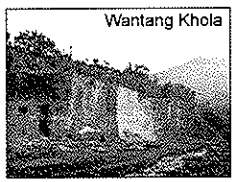
1.2 Impact and mitigation during the operation phase (continued)

Operation phase		
Items	Impact by the Project	Proposed Mitigation
2. Water Quality		
(1) Eutrophication of the Reservoir	1) The current phosphorous level in the reservoir is much higher than 0.03 mg/l. 2) Eutrophicaton possibly occurs by the inflow of phosphoruos expected to increase during the operation phase.	- To install the fraction fence (low cost and easy maintenences) - To install the aerator - To install vegetated floating inland - To input minerals - To conduct sediment flush operation once a year to prevent the nutrient from accumulating in the bottom of the reservoir
(2) Sediment Flush Operation	The operation may degrade the water quality in the downstream environment.	It needs to be examined sufficiently based on the past experience. Sediment flush operation should be carried out once a year to maintain the good water quality in the reservoir





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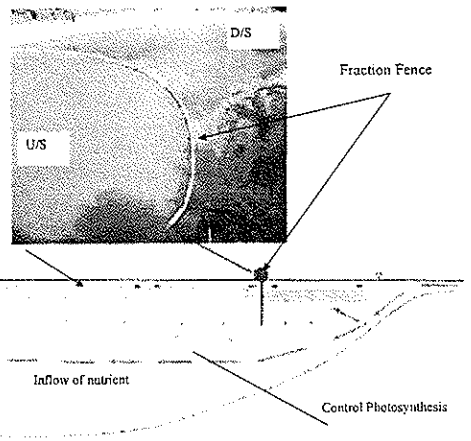
1.2 Impact and mitigation during the operation phase (continued)

Fraction fence:



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2. Impact and Mitigation for the biological environment

Items	Impact by the Project	Proposed Mitigation
1. Forest & Vegetation	1) Baseline: Among 209 plants found in the area, 3 species under GON, 6 species under CITES and 6 species under IUCN conservation categories. 2) In total, 422.58 ha of forests (excluding 1.91 ha of Risk zone) are affected. Among them, 296.05 ha (70%) is "hardwood mixed forest".	- To plant trees in the national and community forest following the Forest Department Regulation with rate of lost / plant trees to be 1:25 - To compensate for the fuel wood, timber and fodder in the affected community and private forest
2. Wildlife	1) Baseline: 16 species of mammals, 7 species of reptiles & amphibians, 3 species of birds found in the site are indicated as protected species under CITES Appendixes and IUCN Red Data List. 2) Impacts on habitat and lives of the mammals & reptiles in the project facility site & riverine area due to the construction works, establishment of workers camp and poaching (illegal hunting)	- To minimize the cutting of trees by selecting appropriate site layout and providing alternative energy e.g. kerosene for the workers camp - To restrict hunting and trapping of wildlives - To save endangered animals by a rescue operation using boats
3. Fish & Aquatic life	1) Baseline: None of the species are listed in CITES and IUCN red list among 36 species found in the site. 2) Impact of dam construction to the habitat of fish and aquatic lives 3) Barrier impacts by the dam to the migrating fish species (economically important), 4) Impact on the fish species structure in the down stream by sediment flushing and decline of water level	- Fish trapping & trucking, fish rock or ladder - Extension of fish hatchery in Kaligandaki A Project to supply fry to the river

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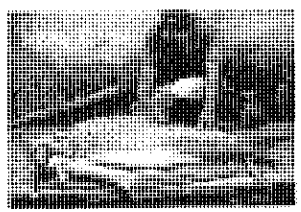
2. Impact and Mitigation for the biological environment (continued)

Some comments on the impact and mitigation for the biological environment

- Since similar habitat conditions are widely seen in the vicinity of the study area, it is considered that possibility of specific species extinction is little in the wider area including the project site.
- Further survey on the protected species and their habitat conditions should be conducted. If it is needed, the proper measures should be taken during the detailed design stage and/or construction stage.



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3. Cost for Mitigation and Monitoring

Construction phase

Environmental Impact	Mitigation Measures	Cost (NRs. Million)
1. Land instabilities & erosion	Bio-engineering of the cut batter slopes of the access roads (lump sum)	2.0
2. Air Quality	Suppression of dust by sprinkling	4.9
	Dust masks to workers	0.7
3. Water quality	Sanitation (toilet provisions)	4.5
	Solid waste management system	2.8
	Sedimentation tank	10.0
4. Construction Spoil Drainage	Dry gabion wall approximately 1,300m (1.5 m high and 1 m wide)	5.0
	Run off catch drainage of mountain slope	3.2
5. Accidental costs	Vibration effects	10.0
	Total	43.1

Operation phase

Environmental Impact	Mitigation Measures	Cost (NRs. Million)
1. Downstream impacts to community activities	Siren network along the Seti downstream tailrace (lump sum)	3.5
	Awareness training on the safety measures to downstream areas (lump sum)	0.3
	Total	3.8

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3. Cost for Mitigation and Monitoring (continued)

Watereshed management

Measure	Cost (NRs. Million)
1. Studies and planning	1.5
2. Bio-enginnering Measures for Soil Erosoin Control	25.0
3. Afforestation Programs in the watershed	15.0
4. River training works	25.0
5. Landslides Stabilisation Measures	10.0
6. Check dums in the tributary streams (draining to reservoir)	35.0
Total	111.5

Cost for monitoring changes of physical environment

Particulars	Cost (NRs. Million)
Construction phase	
1. Measurement of the indicators (air, water, noise, spoil, erosion, etc.)	5.32
2. Effect of the measurements for downstreams	3.80
Operation phase	
1. Measurement of the water quality fro twenty (20) years	3.00
2. Measurement of river bed sedimentation & erosion for twenty (20) years	2.00
Total	14.12

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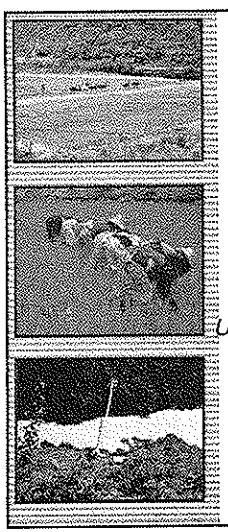
3. Cost for Mitigation and Monitoring (continued)

Mitigation measures and cost for fisheries

Priticulars	Mitigation Measures	Cost (NRs. Million)
1. Financial & technical assistance to Kali Gandaki A hatchery	Assistance in adding the production, developing the facility and conducting the research for upstream & downstream stocking in Seti river	73.5
2. Release of fish	Annual release of puchased exotic carps to the reservoir	1.2
	Trial cage & aquaculture program	0.7
3. NEA Extension program	Extension program foe fisheries and mitigation to local fisherman	1.0
	Total	76.5

Monitoring costs - Construction & Operation phase

Monitoring items	Cost (NRS. Million)
Aquatic ecology survey in the 7 baseline stations twice a year for 5 years during construction phase, @ 0.1 million NRs/monitoring season, sub total for 5 years	1.0
Aquatic ecology survey in the 7 baseline stations after two years of project operation for 10 years, @ 0.15 million NRs/monitoring, sub total monitoring cost for 10 years	3.0
Total	4.013



Framework of Resettlement Plan and Social Action Plan

The Upgrading Feasibility Study on Upper Seti Storage Hydroelectric Project

Malla Hotel, Kathmandu
May 10 2007

1

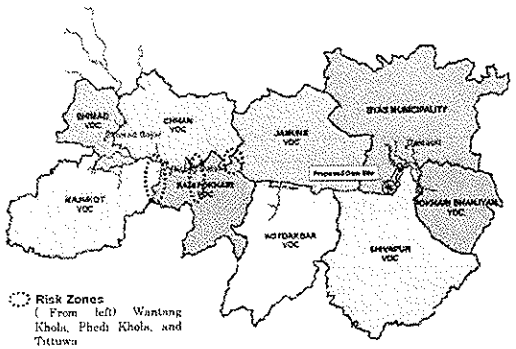
1 Identification of Affected Areas

Affected 7 VDCs & 1 Municipality

❶	Reservoir Areas (FSL 415+10m)	Bhimad, Chhang, Majkot, Rising Ranipokhari, Kotdurbar, Jamune, Kahun, Shivapur VDCs, Vyas Municipality
	Risk Zones (A 50 m horizontal distance from the edge of the cliff)	i)Wantang Khola (Majkot-Rising Ranipokhari), ii)Phedi Khola (Rising Ranipokhari), and iii) Tittuwa (Rising Ranipokhari)
❷	Project Facility Sites	Kahun Shivapur, Vyas Municipality
❸	Downstream Areas	Kahun Shivapur, Pokhari Bhanjyang, Keshavtar, Dharampani, Baidi, Chhipchiipe, Devghat, Deurali VDCs

2

1 Affected VDCs and Municipality



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2 Major Socio-Economic and Cultural Impacts

FSL415 +10 m

- Affected Cultivated Land ---------- 151.22 ha
- Affected Built up Area ---------- 1.7 ha
- Affected Forest Land ---------- 424.5 ha
- Loss of Agricultural Production -------- 660.77 MT
- Number of Affected Private Structure- 313
- Number of Affected Community Structure- 7 (1 Ghat, 5 Resting place, 1 Temple)
- Number of Affected Private Land Owners- 838 hh
- Number of Affected Structure Owners- 110 hh (half of them living in the project facility sites)
- Number of Residential Structure Owners =Relocatee ---------- 86 hh (about one-third of them having non-legal title)

4

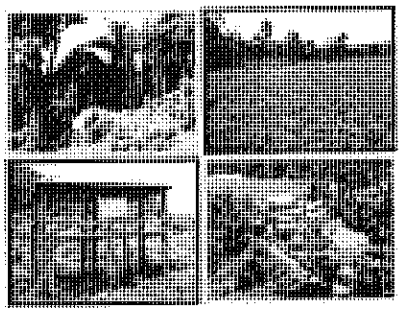
2. Major Socio-Economic and Cultural Impacts

FSL415 m

Affected Infrastructures --	2 stretches of Motorable roads, 6 suspension bridges, 20 foot trails, 1 irrigation cannels, 2 electric distribution line routes
Loss of Water Resources and Forest Resources -------	Giving negative impacts on those who are highly dependent on forest resources such as fodder and fuel wood and water resources in their daily lives
Inflow of a Large Number of Workers ----------	Giving significant stress to the local water supply system and existing public facilities, deteriorating the sanitation conditions and environment

5

Framework of Resettlement Plan



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3. Resettlement Policy Framework for the Project

- Land acquisition and involuntary resettlement shall be avoided where feasible or minimized to the extent possible.
- Where population displacement is unavoidable, individuals, households and community losing assets, livelihood and other resources shall be informed and consulted.
- Affected Persons(APs) shall be compensated at replacement cost for all losses and damaged assets. The absence of legal titles to lands, property and facilities shall not be a bar to compensation.
- APs shall be fully compensated and resettled before their houses are demolished and their land and facilities are acquired.

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3. Resettlement Policy Framework for the Project

- A resettlement plan shall be prepared and consulted with APs in advance of the implementation of the project .
- The resettlement plan implementation shall be monitored.
- The resettlement shall be executed as part of the development project.
- After RP implementation, the economic and social conditions of the APs should be improved or at least maintained.

8

2. Entitle Matrix for Compensation/Rehabilitation

Types of APs	Type of Compensation/Rehabilitation									
	1	2	3	4	5	6	7	8	9	10
	Permanent loss of land at replacement cost	Loss of crops and natural resource	Loss of house and other structures at replacement cost	Loss of community facilities and resources	Loss of government property	Grant for disturbance compensation to displaced households	Grant of transportation allowance to displaced households/community structures	Grant of land plot	Loss of business	House rental allowance
Landowner	✔	✔								
Land tenant	✔	✔								
Structure owner			✔							
Business owner									✔	
Community		✔		✔			✔			
Government Agency		✔			✔					
Relocatees										
House & Lot owner	✔	✔	✔			✔	✔	✔	✔	✔
House owner tenant	✔	✔	✔			✔	✔	✔	✔	✔
Informal settler			✔			✔	✔	✔	✔	✔
House occupant						✔	✔	✔	✔	✔

3. Cost Estimation for Resettlement Plan

Summary	Million NRs
Cost Estimation for the Private Land	999.51
Cost Estimation for the Structures	33.972
Cost Estimates for Agriculture Production Equivalent to One Year Production	0.647
Other Rehabilitation Compensation to Relocatee	44.95
Transportation Allowance to affected Structure Owners Other than the Affected Residential Structure Owners	0.56
Monitoring for 10 years	1.80
Grand Total	1,081.4

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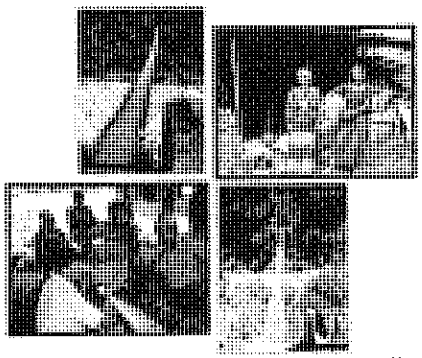
Proposed Social Action Plan



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4. Social Action Plan Framework for this Project

- Social Action Plan is designed to mitigate socio-economic impacts on the affected communities and affected persons, and rehabilitate the quality of life of these communities and persons.
- Social Action Plan includes a package of 8 social programs.

1. [redacted]
2. [redacted]
3. [redacted]
4. [redacted]
5. [redacted]
6. [redacted]
7. [redacted]
8. [redacted]

2. Proposed Social Programs

1. Restoration of Damaged Infrastructure

◆Target Groups: Affected local communities in which infrastructure will be affected.

◆Program Components: Affected infrastructure such as motorable roads, suspension bridges, and foot trails will be restored.

2. Affected Communities Initiative Support Program

◆Target Groups: Affected communities of the project-affected VDCs/municipality of the Reservoir area

◆Program Components: Some development funds will be allocated to each affected VDC to undertake programs as per local needs. The local affected VDCs are expected to contribute 25% of the estimated cost in cash or in kind for the selected program.

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2. Proposed Social Programs

3. Skill Enhancement Training Program

◆Target Groups: Local interested and eligible people from affected people and communities. The priority should be given to the poor, destitute and disadvantaged people.

◆Program Components: Training will be carried out focusing on enhancement of skills required for the project employment.

4. Agricultural Development Program

◆Target Groups: Affected persons and affected communities.

◆Program Components: It includes agricultural, horticultural and herbal and vegetable faming development by providing practical training and improved seeds or samplings.

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2. Proposed Social Programs

5. Community Health, Sanitation and Education Program

◆Target Groups: One program is targeted near the construction sites. The other is targeted in the close vicinity of the reservoir affected VDCs.

◆Program Components: It focuses on the improvement of public health, sanitation, water supply, health and education institutions. Various public awareness and education activities such as environmental sanitation, HIV/AIDS, STI and other communicable diseases, and prevention, will be also undertaken.

6. Women Empowerment Program

◆Target Groups: Women in the affected VDCs and municipality

◆Program Components: It includes income generation skills, education on HIV/AIDS, STI, family planning, and girl trafficking, and micro-credit funds.

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2. Proposed Social Programs

7. Community Forestry Development Program

◆Target Groups: Affected communities located close to the reservoir in affected VDCs and municipality.

◆Program Components: With the technical support of the watershed management experts in the detailed design phase, the program will be launched and managed by the affected communities.

8. Rural Electrification Program

◆Target Groups: Unconnected part of the affected VDCs and municipality.

◆Program Components: It is designed to meet the electricity connection needs of the local communities.

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Cost Estimation for Social Action Plan

Summary	Million NRs
Replacement of Affected Infrastructures by the Reservoir	85.5
Community's Initiative Support Program	52.13
Skill Enhancement and employment	10.14
Agricultural Development Programs	27.51
Community/Public Health and Education Enhancement Programs at the Project Construction sites	9.66
Community/Public Health and Education Enhancement Programs at the Reservoir affected VDCs	6.27
Women Development Program	13.03
Watershed Management Programs	12.31
Monitoring for 10 years	19.55
Grand Total	236.10

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Recommendations and Further Investigation at the Detailed Design Stage

- Update and finalize the affected land plots and land owners
- Conduct an inventory structure survey for areas such as Wantang Khola, Phedi Khola and Tittuwa as well as the Project Facility Sites
- Update the framework of Resettlement Plan and the Social Action Plan
- Incorporate the proposed mitigation and enhancement measures in Tender Documents and Contract Agreement

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Participants Registered in the Third Stakeholder Meeting

in Kathmandu

Participants Registered in the Third Stakeholders Meeting at Kathmandu, May 10, 2007

SN	Name	Caste	Address	Office / organization	Profession /Grade	Phone	Age	Sex
1	Surendra Pandey		K.K.P			4258338	45	Male
2	Dr. Mukesh Kumar Pandey		NEFEJ	NEFEJ	Service	5526893	50	Male
3	Radesh Man Pradhanang		SRCL/NEA	NEA	Service	4243227	54	Male
4	Jagdishwor M. Singh	Newar	NEA	NEA	Service	4212297	45	Male
5	Bhim Raj Kadariya	Bhramin	Public Ralation	NEA	Service	4225477	37	Male
6	Ritu Duwal	Newar	ESSD	NEA	Service	4226780	36	Female
7	K.R Bhatta	Bhramin	Chameliya HEP	NEA	Service	4482788	52	Male
8	Prem Rajbhandari		NEA, ESSD	NEA	Service	4378074	45	Female
9	Mathura Dangol	Newar	MOWR	Singh Durbar	Service	4211504	52	Male
10	Raja Rishi Kadel	Bhramin	NEA/ESSD	Employee	Service	491502	37	Male
11	Bhakta Bdr. Belayas	Chhetri	Doti	Nepali Congress (Dem	M.P	9.851E+09	59	Male
12	Birendra Kumar Pathak		NEA, Durbar Marg	NEA	Service	4227039	49	Male
13	Dr. Tej Kumar Shrestha	Newar	Zoology Res. T.U	T.U	Professor	4070748	57	Male
14	B.P Dhakal	Bhramin	Tanahu	DDC	GDOE	9.856E+09	45	Male
15	Raj Kumar K.C		TRN	TRN		9.841E+09		Male
16	D.P Bashyal	Bhramin	NEA, HEAD Office	NEA	Service	985101843	53	Male
17	Raju Manandhar	Newar	Anam Nagar	The Himalayan	Reporter	4771489	30	Male
18	Sanak Man	Newar	Kath	NWDD		4352787	41	Male
19	Resham Raj Dhital	Bhramin	Kath	Fisheries (Directorate)	Officer	4350662	55	Male
20	Shyam Shrestha		NEA	Director NEA	GM	4248101	55	Male
21	Sayako Tokuda		Pulchok	JICA	ARR	5552711	32	Female
22	Neera Pradhan		Thamel	MOFSC	HMG Service	4230832		Female
23	Ghana Shyam Sharma			CPN (JA Morcha)	G.S	4112241		Male
24	D.P Upadhaya		NEA	NEA	GM	4225852		Male
25	Shyam Bhandari		NEAEU	NEA	Vice Precident	9.851E+09	48	Male
26	Vishnu Bdr. Sigh		NEA	NEA	Dir/PPD	4370432		Male
27	Iswor Onta		Nepal Eng. Council	NEA	Chair	985100427	65	Male
28	Shiva Chandra Jha		Swyambhu	NEA	Engineer	4279217		Male
29	Shailendra Lal		Baneshwor	NEA	Employee	470151	51	Male
30	Thakur Raj Pandey		Bhaktapur	NEA	Service	4495642	56	Male
31	Janaki Sangraula		NEA-ESSD	NEA	Ast. Director	4431628	57	Female
32	C.B Bajracharya		NEA-ESSD	NEA	Director	422534	56	Male
33	R.B Shrestha		DMG	DMG	Geologist	4416679	52	Female
34	Arjun K. Kafle			NEA				Male
35	Suman Basnet			Winrock	Director	4467087		Male
36	Binod Shrestha		Baneshwor	Winrock	Sr. Pr. Officer	4467087		Male
37	Krishna C. Manandhar		Thamel	JBIC	Coordinator	4226467		Male
38	Upendra Dev Bhatta			NEA	Director	4229651		Male
39	Sabitri Gurung Dura		Tanahu	C.P.N (Maoist)	M.P	9.841E+09		Male
40	Hari Krishna Shah		NEA	NEA	Employee	9.841E+09		Male
41	Suresh Ale Magar		CPN	CPN (Maoist)	Politics	9.842E+10		Male
42	Saurab Rana		Sanghayakosh Building	JICA		9.851E+09		Male
43	Satis Chandra Devkota		NEA-ESSD	NEA	Economist	9.841E+09		Male
44	Dr. Toran Sharma	Braman	NESS, Kathmandu	NESS	Consultant	4244989	52	Male
45	Surendra Sharma	Braman	NESS, Kathmandu	NESS	Service	4244989	30	Male
46	Amrit Paudel	Braman	NESS, Kathmandu	NESS	Service	4244989	27	Male
47	Pradeep Kumar Maharjan	Newar	NESS, Kathmandu	NESS	Service	4244989	30	Male
48	Mr. Yoshimasa Ishii			JICA Study Team				Maleale
49	Mr. Hironobu Nishimiya			JICA Study Team				Maleale
50	Mr. Tomoo Aoki			JICA Study Team				Maleale
51	Dr. Hiromi Yasu			JICA Study Team				Maleale
52	Mr. Tadashi Amano			JICA Study Team				Maleale
53	Ms. Toshiko Shimada			JICA Study Team				Female

Minutes of Third Stakeholder Meeting in Kathmandu

Upgrading Feasibility Study of Upper Seti Storage Hydroelectric Project

Third Stakeholders Meeting

Time:	10.30 AM
Date :	May 5, 2007; Baishakh, 27, 2064
Venue:	Malla Hotel, Thamel, Kathmandu
Organized by:	Nepal Electricity Authority with the Assistance of Japan International Cooperation Agency
Master of Ceremony:	Mr. Satish Devkota, NEA

The stakeholder meeting was chaired by ***Mr Arjun Bahadur Karki***, Managing Director, Nepal Electricity Authority. Other guests who took chair in the dais were:

1. Mr. Bhakta Bahadur Balayar – Representative Nepali Congress (D)
2. Mr. Bhoj Raj Regmi – General Manager, Nepal Electricity Authority
3. Mr. Shiva Chandra Jha – Head, Environmental and Social Studies Department, NEA
4. Mr. Yoshimasa Ishii, Team Leader, JICA Study Team
5. Mrs. Sabitri Gurung Dura - Representative NCP Maoist
6. Mr. Suresh Ale Magar - Representative NCP Maoist
7. Mr. Ghana Shyam Sharma – Representative, Jana Morcha

Mr. Bhoj Raj Regmi – General Manager, Nepal Electricity Authority, delivered opening address to the participants of the stakeholder meeting. Welcoming the participants, he briefly described the project features and objective of the stakeholder meeting.

The project is undertaken by the collaboration of the NEA and JICA Study Team. The JICA Study team initiated the project feasibility Study from 2062 (2005). The draft report has been submitted to NEA and the final report of the project is expected in June 2007. During the project study, JICA study Team has also conducted detailed environmental and social studies. To disseminate the findings of the study and to collect feed back from the concerned stakeholders, two stakeholders meeting have already accomplished by the team. This is the third stakeholder meeting.

Nepal is passing though a phase of severe electricity shortage. In this context the project is of utmost significance. The past screening studies, and the present investigations, have shown that the project is the best among the available options for implementation. NEA has already requested JBIC and ADB for the financial arrangements for the project. This project is twice the capacity of currently operational Kulekhani storage project. With your cooperation and creative and constructive suggestions to the study team, the project could be developed as environmentally sound and socially acceptable project.

Mr. Yoshimasa Ishii, Team Leader, JICA Study Team presented the finding of the upgrading feasibility study. His presentation was divided into four topics as under:

1. Background & Outlines of Study
2. Findings
   2.1 Power Demand & Supply
   2.2 Characteristics of Project Site
   2.3 Contents of Study

3 Conclusions and Recommendations
4 Time-line of the Project

Dr. Yasu, Member, JICA Study Team, presented the findings of natural environmental studies. His studies focused on.

1. Baseline physical and biological environment of the project
2. Project impacts and proposed mitigation measures on physical and biological environments
3. Monitoring plan and project physical and biological environment mitigation costs.

Miss Shimada, Member, JICA Study Team, presented the findings of Social and socio-economic environments of the project. Her presentation focused on:

1. Identification of the Project impact areas
2. Major Socio-economic and Cultural impacts
3. Framework of Resettlement Plan
4. Framework of Social Action Plan
5. Recommendations and further investigations in the detail design phase

After the deliberations from the JICA Study Team the floor was open for comments and suggestions on the project findings on natural and social environments.

Mrs. Neera Pradhan – Representative Ministry of Forests and Soil Conservation

The project seems to affect a large portion of riverine forest. A few of the species reported are also listed in the conservation lists of Government of Nepal, IUCN and CITES. The project should give emphasis on the conservation of forest area as much as possible. Appropriate mitigation measures should be designed and implemented, if the impacts on the forest areas are unavoidable.

Mr. Ghanashyam Sharma Poudel – General Secretary, Jana Morcha, Nepal

Though the project is estimated to cost 34 corores of US$, our experience is that it may even exceed 50 Corores of US$. The cost estimations should be more pragmatic and reflect actual conditions.

How much of the project cost is to be borne by NEA? Does Government of Nepal also invest on the project? Have you allocated shares to the Nepali people? What is the number or quantity of allocated shares to the people?

JBIC and ADB are requested for loan. What is the amount of loan and what are the conditions attached to the loan?

How much of the productive land of Bhimad area will be affected? As far as possible such productive land should be conserved. The Bote community of the area will be affected. Provisions for such community should be considered. The river banks are highly unstable and would require protection. My suggestion is to minimize the loss of productive land and forest as far as possible. We should consider to built the project on our own effort than depend on loan and attached conditions.

Mr Bishnu Prashad Dhakal, Local Development Officer, Tanahu

The project has been a source of inspiration to the local community. The District Development Committee meeting has endorsed the project and has shown commitment for the project implementation. The local people expect minimum impacts to the local community and resources from the project. They expect adequate mitigation measures to minimize the project impacts. In this regard, they have expected a pragmatic resettlement Plan and social action plan to rehabilitate the project's impact to the affected community.

Job opportunity in the project is the other concern of the local people. Maximum job opportunity should be made available to the local people and a mechanism of employment of the affected district and affected people need to be well considered before the project construction activity. In this connection, skill training programs should be launched at least six month before the project construction works to train the local interested people in the project construction works.

Mr. Suresh Ale Magar – Representative, NCP Maoist

Our party is in favor of any good work that makes the people quality of life better. That is why we emphasize the project to be people centric. Development project of this scale, we know is going to have some negative impacts. But the project should try to minimize the negative impacts as far as possible and maximize the beneficial impacts.

This is a 140m high dam. We must also look into its implication in the downstream areas on the event of any accidents. The compensation and resettlement plan need to be robust and should not marginalize affected people.

We have to change the prevailing mindset and start new approach in the project implementation. In all conditions, the local people should get maximum benefit.

Mr. Ishwor Onta – Representative Nepal Engineering Council

The project has a risk of sedimentation. Watershed management should be one of the components of the project and should give emphasis in the control and prevention of erosion. The estimated sedimentation rate is quite high, further investigation is desirable.

The project has considered only two turbines for power generation. Our experience in the repair and maintenance of the turbine is not very good. Many times, the repair and maintenance work hinder the electricity generation in the most critical period. I would request that the number of turbines be increased. I purpose 43MW capacity three turbines instead of 64 MW capacity two turbines.

This project should be developed as a company. Shares should be opened for the people. There is no dearth of money in the market. Remittance of the workers outside Nepal is a good source of money for investment. Only deficit amount should be taken from the funding agencies local or foreign (JBIC/ADB).

We have started implementing hydropower projects since long. However, we are still lagging behind in the technical and contractual aspects. It is therefore, we must develop a mechanism to include our consultants and contractors in the project both during investigation and construction. Our contractors and consultants could be involved in joint

venture with the foreign companies. Government has to develop such regulations and obligatory provisions.

Further investigations will bring new impact issues. This is a continuous process and should be continued. Some of the mitigation measures are very good. The example of fraction fence to control eutrophication is a good example. To implement the resettlement plan and social action plan local committee need to be constituted and resettlement and compensation should be accomplished before the beginning of the project construction.

Mr. Suman Basnet – WINROCK International

In the context of Climate Change, the storage project is better than the thermal projects. However, the impacts of high dam projects are also high and require high investments for the mitigation of the project effect. The project should consider the provisions of Cleaner Development Mechanism and its benefits to implement the mitigation measure required for the project impacts.

Mr. V.B. Singh - NEA

Is there any provision for emission trading management system /CDM mechanism in this project? Can we introduce benefit from CDM for financial analysis?

Mr. --- Representative, Employee Union, NEA

This project will take minimum of six years for the construction. In this period many other projects will come up, such as 309 MW Tamakosi, which NEA is implementing. What is the rate of return of this project? If we have to take loan, the interest rates are very high. Hence, I purpose to focus on the Run off The river projects than in the storage projects.

Mr. Sanat Man Shrestha – Representative, Nepal Worker's and Peasants Party

The NEA is always interested in the mega projects. Why we have not given adequate attention to the small scale projects? They are environmentally and otherwise are more beneficial. At policy level, we need to consider these things.

When we start a new project of this type, we are happier. But when the project construction starts, a new sets of problem surface and the project cost becomes high. It is therefore, it is opportune moment to take stock of the likely problems during project construction and take needed mitigation options such that the project cost does not shoot up and the local problems are adequately addressed.

Much is said on the financial aspect of the project. How much is the loan from JBIC and ADB?. What is the rate of return of the project. We must allocate share for the Nepali citizens and project area people.

To enhance and strengthen our technical skills and capabilities, we must give preference to the local consulting firms and contractors in the study and project construction. As far as possible we must use our local technology to maximize the benefit.

Mr. Resham Raj Dhital - Fisheries Directorate

For the control of phytoplankton, the fishes could be effectively used. Fish culture provision in the reservoir should also be considered for fish production and economic enhancement of the local people and their culture.

Mr. Bhakta Bahadur Balayar – Representative, Nepali Congress (Democratic) Former Minister of Environment

All development works should benefit the local people. As this is a storage project, we have to incorporate the lesson learned from the Kulekhani project in the design and conceptualization of the mitigation measures of this project. Sedimentation of the reservoir is a major problem. Comprehensive watershed management plan is a pre-requisite of the project to control and minimize the sedimentation impacts.

The local have the right over their resources. Project is expected to encroach upon the peoples right. Hence adequate attention should be given to conserve the natural resources, and culture of the people. The displaced people should be the target group to up keep their living standards after the project implementation.

The local people should be given adequate opportunities for jobs related to the project. Skill enhancement programs should uplift their skills for maximization of job opportunities. The people should be told in advance what benefits and other development programs that they will be getting from the project.

All the information with regard to the project should be delivered to the people before hand. So that they could understand and participate in the decision making process.

Mr. Shiva Chandra Jha - Head, Environmental and Social Studies Department, NEA

On behalf of NEA, I extend my thanks to all the participant members of this stakeholder meeting. Your suggestions are very valuable to us and will certainly help the study team in finalizing the Upgrading feasibility study.

This being a storage project, we are focused to the impacts of the project on the local communities and households. The study has emphasized on the Resettlement framework and Social action plan framework to minimize the impacts and rehabilitate the effects of the project.

For the implementation of the project we will have to depend upon the donor agencies. This study is conducted as per the JICA guideline to make the feasibility study technically sound and financially bankable from the international agencies. Your continued cooperation will move the project forward. Once the government gives approval, the project will go ahead with further detailed studies.

Mr Arjun Bahadur Karki, Managing Director, Nepal Electricity Authority.

The concerns of the stakeholders raised in this meeting certainly strengthen the project. We are going through a phase of critical power shortage. Only 40% of the Nepalese people have

been using electricity. Even these people are affected by the recent load shedding. If the situation remains like this, these 40% people will also become like remaining 60% who have not got electricity supply.
We have Run Off the River system for hydropower generation. The seasonal variation in water discharge affects our power generation. In the dry season out of 611MW installed capacity we could only get 170MW. The Kulekhani storage project is supplementing the power demand in this period. It is for this reason; we have no other alternative than to go for storage project like this for the management of power deficit in the coming years. Implementation of only ROR project is not going to manage our power system. Further we have to provide power to the remaining 60% of Nepalese population. Certainly storage projects are costly than ROR projects, but in long term storage projects are more dependable than the ROR for power demand and supply management.

It is high time for us to implement such projects by 2014 despite all problems. We require foreign assistance in the project development. It is said that the money market is inundated with excess liquidity. The remittance money could be utilized for the required project investment. However, our experience in the case of Tama Koshi Project, does not reveal such a situation. Even the national banks, Karmachari Sanchayakosh refuses to lend money for investment despite our commitment to directly transfer revenue of some of the projects into their accounts. We are not against local investment, but there should be government mechanism established for such investment environment.

Only way for the development in Nepal is the development of hydropower. We can sell the excess electricity to growing Indian market. Considering this we have an agreement with India to built high capacity Transmission Line projects for power transfer. The project is underway for development.

The concern that hydropower project have made us poorer, but are we getting richer by allowing our rivers to rundown without harnessing electricity. We are constrained by many limitations for the development of hydropower projects. This is one of the reasons why our projects are becoming costlier. Government policy is different for different sector. This policy conflict does not allow us to complete jobs in time. Unified policy at national level and at all sectors is very essential for the development of the hydropower. This demands a long term political commitment and review of the existing policy, and legal provisions.

Lengthy EIA process, Forest policy conflict, etc are instrumental in the project delays. We are not against EIA; we understand that project impacts have to be internalized in the project cost; no body should be marginalized by the project, but could we not carry out all EIA required things hand in hand during project implementation. Let us form a committee involving all sector ministries and department to look into these matters for speedy project development. Our Board has requested such an arrangement to the cabinet.

We are in the process of opening power bond. Such power bond could be converted into share if the investor would like to do so. We welcome every one in the public life for the development of the hydropower in Nepal.

Advance Notification of Third Stakeholders Meeting

in Kathmandu

13-1 Public notice published in the national newspaper "The Himalayan Times" 11th May 2007.

NEA seeks hydropower policy

Himalayan News Service

Kathmandu, May 10

Managing director of the Nepal Electricity Authority (NEA) Arjun Kumar Karki said today that the country would not develop unless the government came up with a clear policy for the execution of power projects.

"Lack of consensus among the political parties is hampering the exploitation of water resources," Karki said at a programme on the Upper Seti Storage Hydroelectricity Project.

He urged the parties to build a consensus on the execution of hydropower projects. Terming the "differences among leaders over the utilisation of water resources" 'very disappointing', Karki said hydropower could not be harnessed unless parties came up with a unified stance on harnessing of natural resources.

"Some party leaders say no country has become rich by exporting electricity. I wonder if any country has become rich by letting water flow off the river."

He called on the government to make a policy with help from ministries concerned and enable the NEA to execute hydroelectricity projects.

13-2 Public notice published in the national newspaper "The Himalayan Times" 11th May 2007.

Go ahead with Upper Seti project, experts tell NEA

Himalayan News Service

Kathmandu, May 10.

A team of experts from the Japan International Cooperation Agency (JICA), which is conducting feasibility study of 128 MW Upper Seti Hydroelectricity Project, has advised the Nepal Electricity Authority to do the needful to develop the project as new source of power.

"We recommend the NEA to proceed to the next stage of study to develop the Upper Seti project as a new power source," said Masayoshi Ishii, while addressing a stakeholders' meeting today. He is the leader of the Japanese study team.

He said the team examined the feasibility of the project in terms of technology, impact on the environment, economic cost and financial aspect from February 2005 to January 2007 and found it suitable to be developed.

The project has been identified as a possible remedy for the current power shortage. The NEA had undertaken a feasibility study in 2001, an upgrading feasibility in 2004 and the JICA had initiated a preliminary study in 2004.

The findings of the recent Upgrading Feasibility Study by the JICA team showed that the project would make stable power frequency, maintain power voltage in the network, reduce or replace operation hours of costly thermal power plants and reinforcement of NEA's network by transmission.

The study has estimated that the project would cost to the tune of $340 million and would take six years, including preparatory work.

Previous stakeholders meeting for the same project had pointed out that provision of electricity, drinking water and schools should be given priority.

Meantime, a member of the JICA team, Masami Yasu, said the project is going to make impact on land use, air quality and water quality.

The report states that habitat of some wild species will be disturbed by the project.

"Since similar habitat conditions are widely seen in the vicinity of the study area, it is considered that possibility of specific species extinction is little in the wilder area including the project site," the report states. Toshiko Shimada, who had studied the framework of resettlement plan and social action plan, said land acquisition and involuntary resettlement should be avoided where feasible and minimised to the extent possible.

"Affected persons shall be compensated at replacement cost for all losses and damaged assets. The absence of legal titles to lands, property and facilities shall not be a bar to compensation," she said. The study estimates that the resettlement plan alone would cost over Rs 1000 million to the project.

13-3 Public notice published in the national newspaper "The Rising Nepal" 11th May 2007

Upper Seti to cover power deficit

By Raj Kumar KC

KATHMANDU, May 10: If everything goes uninterrupted, the state-owned Nepal Electricity Authority with the financial/ technical assistance of Government of Japan will begin the country's biggest reservoir type project-the Upper Seti Storage Hydroelectric Project (USSHP) in the next couple of months.

Major political parties in the country have also expressed their full commitments to support it as long as the project does 'good' for the local people.

USSHP, the second reservoir project (after Kulekhani First Hydropower Project) is expected to supply 128 MW of peaking power throughout the year.

The NEA with the technical support of Japan International Cooperation Agency (JICA) began feasibility study of the USSHP in February, 2005. The study will be completed by June this year, *according to the NEA officials.*

The 128MW Storage Hydroelectric Project is expected to play a vital role in reducing power-deficit and more importantly providing economic opportunities to the local people without causing much damage to the local environment.

Even though the storage hydro-electric project is costlier than the run-of river (RoR) hydro-power projects, it is need of the nation to cut down the power-shortages.

If we fail to initiate this project, the people (who are bearing hours of load-shedding now) will have to bear the brunt of more load-shedding in future, said Chairman of the NEA Arjun Kumar Karki.

Karki also noted that the USSHP is more feasible in comparison to other projects. The study report has proved that degree of risks can be minimised to a larger extent, he added. However, he lamented over the dearth of fund for hydropower development.

It is said that the money market is inundated with excess liquidity, but bankers or even top financial institutions including the Karmachary Sanchaya Kosh (Employees' Provident Fund) which has billions of rupees in its coffer are reluctant to invest in the power sector, he lamented.

On top of that bankers are also not interested to investment in the hydropower sector, said Karki adding "the country's economic development is possible only through the generation of hydropower."

Karki while speaking at the third Stakeholders' meeting expressed confidence over the economic and technical viabilities of the project.

The NEA and JICA have already hold three consultative meetings with the local people/ stakeholders in its project site in Tanahu. Apart from that two meetings in the capital have already been held in the past.

However, in today's stakeholders' meeting people from different walks of life underlined the need for sustainability of the project.

Some even questioned why the NEA chose storage hydro-electric Project instead of cheaper and more sustainable RoR hydropower projects. The NEA management and concerned authorities at the Ministry

See UPPER, Page 6

UPPER: Seti to cover power deficit

of Water Resources have been much criticized for choosing expensive project.

However, NEA officials have flatly denied the charges saying that the project would be more viable though the initial costs of the project are bigger.

Yoshimasa Ishii, team leader of JICA Study team while presenting the study report described the technical viability of the project.

Other JICA experts presented their social- cost and benefit analysis. They noted that the project to the greatest possible extent has tried to mitigation losses.

However, political leaders emphasised on the aspects of the welfare of the people. Suresh Ale Magar, a senior leader of Communist Party of Nepal-Maoist assured his party's full support to the project. "But the project should serve the interests of majority of people."

The Local Development Officer of Tanahu district informed that the local people had pinned much hope on the project that it would do something to support their livelihoods.

According to him, around 19 houses will be displaced from the project.

Bhakta Bahadur Balayar a former minister also spoke about the environmental aspects of the project area. He said that the project will affect the major cultivable land and create the problem of inundation. The people who are likely to be affected by the project should be adequately compensated, he said.

As of July 2006, total installed capacity of the country is 614 MW out of which 90 per cent is contributed by hydropower.

Energy demand in Nepal has been on the rise by eight per cent per annum since last one decade, according to NEA. But the supply has not been increased even after the addition of 144 MW Kaligandaki 'A' hydropower project in the system.

According to the NEA the RoR type of hydropower plants dominates Nepal's hydro power capacity.

However, RoR type of plants can marginally regulate river discharge for power generation. Thus to cope with problem of power shortage in the dry season, NEA has initiated the process of developing storage type of hydropower plants that can seasonally regulate river discharge for generation.

The main objective of the study, according to NEA and JICA officials is to formulate the optimum development plan of the project and to assess the technical and economical and financial and environmental viabilities of the USSHP.

Major features of USSHP

Specifications	Value
Type	Underground
Width x Length x Height	22m x 42m x 90 m (L)
Turbine Types	Vertical Francis
Maximum Discharge	127.4 m^3/s

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS (ESC) REPORT

PART E

IEE FOR 220 KV TRANSMISSION LINE

PART E IEE FOR 220 KV TRANSMISSION LINE

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CHAPTER 1 INTRODUCTION

1.1 Objectives

The proposed 220 kV Transmission Line from Upper Seti (Damauli) Storage Hydroelectric Project (the Project) Switch Yard to Bharatpur Substation would deliver power from the Project to the National Grid System at Bharatpur. Presently, the 220 kV transmission line development proposal is under study at the feasibility level to assess different viable options.

This IEE level study of the 220 kV transmission line has the objective to assess the implications of the different alignments of power line development on the existing bio-physical and social environment and to select the best alternative alignment for detailed study and design.

1.2 Project Line Route and Affected Areas

The selected 220 kV transmission line project, will connect the USSHEP to Bharatpur Sub-station, cut across five VDCs of Tanahu District, namely Kahun Shivapur, Pokhari Bhanjyang, Keshavtar, Dharampani, and Devghat VDCs, and one VDC and one municipality of Chitwan District , namely Kabilas VDC and Bharatpur Municipality. The resources (physical, biological and social) of the above VDCs and municipality of Tanahu and Chitwan Districts lie under the 60 m ROW of the project and are directly affected, whereas the resources lying outside the TL ROW are indirectly affected by the project.

Nominal System Voltage	: 220 kV
Circuit	: Double circuit
Length of Line	: 38.42 km
Nominal span	: 300 m
Number of Towers	: Approximately 130
Right of Way	: 60 m
For tower foundation	: 5.2 ha (Agricultural land: 1.76 ha, Forest land: 3.44 ha)
Land use restricted under ROW	: 193.02 ha

CHAPTER 2 ALTERNATIVE STUDY

2.1 Alignment Alternatives

The alignment of a new transmission line should be selected taking into consideration the following criteria:

- Right-of-ways which have minimal environmental impact
- Improvement of reliability of the power system
- Increase in competition in the generation market to lower the cost of electricity

Based on the above principles, three possible alternative alignments were selected to evacuate power from Upper Seti (Damauli) Storage Hydroelectric Project's switchyard to Bharatpur substation (NEA, May 2006). **Figure 2.1-1** presents the three proposed alignments.

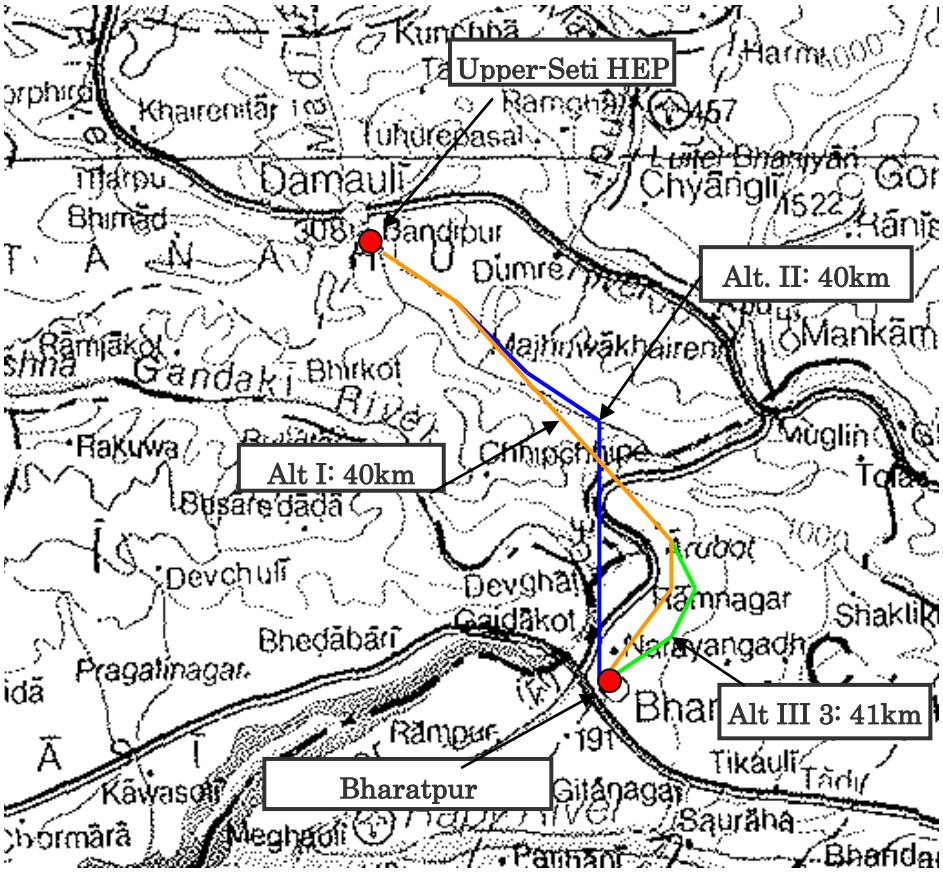

Figure 2.1-1 Alternative Route of Transmission Line

2.2 Comparison of Alternatives

Tables 2.2-1, **2.2-2** and **2.2-3** presents the land use characteristics of the three alignments and approximate areas required for acquisition and land use restriction under the ROW of the alignments. Land use under the ROW of the three alignments shows that:

- Alternative I and II passes mostly through the agricultural/grazing areas compared to the Alternative III
- Alternative I has the least ROW area under forest cover compared to Alternative II and III
- The number of built structures under Alternatives I, II and III are almost the same with Alternative III having 17 built structures compared to 19 and 24 in Alternative I and II respectively
- Alternative III is the longest followed by Alternative I and II but the lengths of Alternative I and II are comparable.

From the environmental viewpoint to avoid or minimize impacts, Alternative I is selected for detailed survey and design for the following reasons:

- The loss of forest due to clearance of trees under the ROW is minimized in comparison with the other two options including the opening up of new areas of the Narayani Protected Forest
- Total ROW area under Alternative I can be minimized by alignment of the ROW to the existing TL for about 11 km distance, which further reduces the forest losses
- Agricultural areas along the ROW could continue and the impact to local socio-economy is envisaged to be minimal.

Table 2.2-1 Land Use along Transmission Line Alternative Alignment I

District	VDC	Land Use								Total Length (m)	Total Area (ha)	Structures	Streams	Settlement / village
		Forest		Agriculture		River		Others						
		Length (m)	ROW (sq.m)	Length (m)	ROW (sq.m)	Length (m)	ROW (sq.m)	Length (m)	ROW (sq.m)					
Tanahu	Kahun Shivapur	675	40500	675	40500	125	7500	0	0	1475	8.85	0	Seti	Banchare
	Pokhari Bhanjyang	50	3000	4500	270000	15	900	0	0	4565	27.39	7	Khirkhadi Khola	Simalswara, Chhapdanda, Arkhale Pani
	Keshavtar	2000	120000	3725	223500	15	900	0	0	5740	34.44	3	Dhad Khola (2)	Guwandanda, Marauto
	Dharampani	4850	291000	1775	106500	125	7500	0	0	6750	40.5	1	Bagar Khola, Seti	Huslan, Bagarkhola, Setigaon
	Devghat	0	0	2270	136200	125	7500	2575	154500	4970	29.82	4	Bar Khola, seti	Bargaon, Chaughare, Duighare
	Kabilas	9200	552000	3675	220500	0	0	1375	82500	14250	85.5	4	Das Khola	Duighare, Upper syalni, Tandran, Devitar
Chitwan	Bharatpur	0	0	2125	127500	0	0	0	0	2125	12.75	0		
Total		16775	1006500	18745	1124700	405	24300	3950	197500	39875	239.25	19	8	16

Source: Based on the measurements in 1:25000 Topographic Maps of the Area, Transmission Line ROW = 60m

Table 2.2-2 Land Use along Transmission Line Alternative Alignment II

District	VDC	Land Use								Total Length (m)	Total Area (ha)	Structures	Streams	Settlement/ village
		Forest		Agriculture		River		Others						
		Length (m)	ROW (sq.m)	Length (m)	ROW (sq.m)	Length (m)	ROW (sq.m)	Length (m)	ROW (sq.m)					
Tanahu	Kahun Shivapur	675	40500	675	40500	125	7500	0	0	1475	8.85	0	Seti	Banchare
	Pokhari Bhanjyang	50	3000	4500	270000	15	900	0	0	4565	27.39	7	Khirkhadi Khola	Simalswara, Chhapdanda, Arkhale Pani
	Keshavtar	2000	120000	3725	223500	15	900	0	0	5740	34.44	3	Dhad Khola (2)	Guwandanda, Marauto
	Dharampani	4850	291000	1775	106500	125	7500	0	0	6750	40.5	1	Bagar Khola, Seti	Huslan, Bagarkhola, Setigaon
	Devghat	0	0	2270	136200	125	7500	2575	154500	4970	29.82	4	Bar Khola, Seti	Bargaon, Chaughare, Duighare
Chitwan	Kabilas	8375	502500	4000	240000	875	52500	1375	82500	14625	87.75	6	Das Khola, Narayani	Duighare, Upper syalni, Tandran, Devitar, Jugedi Bazzar
	Bharatpur	0	0	1625	97500	0	0		0	1625	9.75	3		Ganeshsthan, Barmelichouk, Baseni
Total		15950	957000	18570	1114200	1280	76800	3950	237000	39750	238.5	24	9	20

Source: Based on the measurements in 1:25000 Topographic Maps of the Area, Transmission Line ROW = 50m

Table 2.2-3 Land Use along Transmission Line Alternative Alignment III

District	VDC	Land Use								Total Length (km)	Total Area (ha)	Structures	Streams	Settlement /village
		Forest		Agriculture		River		Others						
		Length (m)	ROW (sq.m)	Length (m)	ROW (sq.m)	Length (m)	ROW (sq.m)	Length (m)	ROW (sq.m)					
Tanahu	Kahun Shivapur	1250	75000	0	0	125	7500	0	0	1.375	8.25	0	Seti	Banchare
	Pokhari Bhanjyang	4750	285000	0	0	15	900	0	0	4.765	28.59	0	Khirkhadi Khola	Simalswara Chhapdanda,Arkhale Pani
	Keshavtar	4325	259500	1175	70500	20	1200	0	0	5.52	33.12	0	Dhad Khola (2)	Guwandanda, Marauto
	Dharampani	10800	648000	575	34500	90	5400	0	0	11.465	68.79	5	Bagar Khola, Seti	Huslan, Bagarkhola, Setigaon
	Devghat	5075	304500	2450	147000	340	20400	3500	210000	11.365	68.19	9	Bar Khola, Narayani	Bargaon, Chaughare, Duighare
	Kabilas	4875	292500	250	15000	10	600	0	0	5.135	30.81	0	Das Khola	Duighare, Upper syalni, Tandran, Devitar
Chitwan	Bharatpur	0	0	1500	90000	0	0	0	0	1.5	9	3		Ganeshsthan, Barmelichouk, Baseni
		31075	1864500	5950	357000	600	36000	3500	210000	41.125	246.75	17	8	19

Source: Based on the measurements in 1:25000 Topographic Maps of the Area, Transmission Line ROW = 60m

CHAPTER 3 BASELINE DATA

3.1 Physical Environment Impacts

Detailed field surveys of the transmission line corridor show that the total length of the corridor to be approximately 40 km. Of the total length approximately 1.7 km passes over the rivers, streams, creeks and roads. The length covered by forest, grazing land and cultivated land is approximately 21.6 km, 2.1 km and 12.9 km, respectively. Taking 60m as the ROW for 220 kV transmission line (i.e. 30 m either side from the TL central line), the total ROW area required for the proposed project is 230.5 ha. Since the ROW areas over rivers, streams, creeks and roads is not required for acquisition, the total ROW area is further reduced to 220.3 ha.

Also as the proposed ROW from 29210 Chainage onwards to the Bharatpur Sub-station is shared with the existing 132 kV transmission line, only 197.4 ha is actually required for the new ROW acquisition or restricted land use. Of the 197.4 ha of the ROW land requirement, about 73.7 ha falls under agricultural land use category, 12.8 ha under grazing land use category and remaining 110.9 ha under forest land use category.

3.2 Biological Environment Impacts

(1) Forest and Vegetation

In the Bio-geographic map (NARMSAP, 2002), the proposed 220 kV transmission line corridor lies in the Central Nepalese Bio-geographic region comprising *Schima-Castanopsis* Forest zone, Hill Sal Forest Zone and Lower Tropical Sal Forest Zone.

There is no distinct separation of the above forest zones in the TL corridor area. The *Schima – castonopsis* zone occurs usually between 1000 to 2000 m. Below 1000 m *Schima wallichii* is mixed with *Shorea robusta* and other elements of deciduous Hill Sal Forest. The TL corridor in the Dharampani, and parts of Keshavatr VDC of Tanahu District passes along this zone. The Hill Sal (Shorea robusta) occurs usually between 300 m to 1000 m. *Shorea robusta* is the dominant tree species of this zone and the land is undulating to flat. Orchids are especially abundant in ravine areas. Besides, a number of endangered plant species such as *Cycas pectinanta*, *Gnetum montanum*, *Cyathea spinulosa* are found associated with *shorea robusta* in this zone. *Acacia Catechu* and *Bombax cieba*, the protected tree species in Nepal under the Forest Regulation, 1995 are also found along the ravine corridors and alluvial tars along the Sei River.

(2) Wildlife

The TL corridor extends from the Mid Hills region in the north to the Dun valley (a component of Siwaliks and Terai) in the south. It is the transition zone of the Lowlands and the Mid Hills, is diverse in its faunal composition. Ecologically, though the corridor area is dominated by the Lower Tropical Sal, Hill Sal and *Schima –castonopsis* Forests, it also consists of other ecological types of tropical and

sub-tropical zones of central Nepal. Only a few species of wildlife and birds are listed in the IUCN, CITES and HMG protection. None of these species is threatened to any degree by the T/L Project.

3.3 Socio-economic and Cultural Environment Impacts

(1) Affected VDCs

This section is based on available secondary information of the affected VDCs of the Tanahu and Chitwan Districts. **Table 3.3-1** presents the demography of the districts traversed by the 220 kV transmission line corridor. Population density is about 210 persons/ km^2, average household size is around 5 and the female population is marginally higher than the male population.

Table 3.3-1 Demographic Characteristics of the Affected Districts

District	Chitawan	Tanahu
Total Population	472,048.00	315,237.00
Male	235,084.00	146,788.00
Female	236,964.00	168,449.00
Number of Households	92,863.00	62,898.00
Average Household Size	5.08	5.01
Area in km^2.	2,218.00	1,546.00
Population Density Person/km^2.	213.0	204.00

Source: CBS, 2001

The demographic features of the Village Development Committees (VDC) traversed by the transmission line corridor are presented in **Table 3.3-2**. Hill VDCs show slightly higher Household size than occurs in the Municipality of Bharatpur.

Table 3.3-2 Population Distribution in the Affected VDCs and Municipality

Village Development Committee / Municipality	**Total Population**	**Total Household**	**HH size**	**Male**	**%**	**Female**	**%**	**M:F**
Kahun Shivapur (T)	8066	1087	7.4	4031	50.0	4035	50.0	1 : 1
Pokhari Bhanjang (T)	4082	832	4.9	1902	46.6	2180	53.4	0.87 : 1
Kesavtar (T)	5423	1054	5.1	2513	46.3	2910	53.7	0.86 : 1
Dharmapani (T)	3914	709	5.5	1780	45.5	2134	54.5	0.83 : 1
Devghat (T)	7620	1666	4.6	3691	48.4	3929	51.6	0.94 : 1
Kabilas (C)	5513	985	5.6	2765	50.2	2748	49.8	1.008 : 1
Bharatpur NP (C)	89323	19922	4.5	45858	51.3	43465	48.7	1.05 : 1
Total Affected Population	**123941**	**26255**	4.7	**62540**	50.5	**61401**	49.5	**1.02 : 1**

Source: CBS, 2001 Note (T) = Tanahu; (C) =Chitawan

In general the major ethnic composition of the TL corridor VDCs is mainly Magar and Gurung in the hills and rural areas with groups of Brahmins and Chettris outnumbering the other groups within the Municipality of Bharatpur. Kami, Damai and Sarki (KDS), the disadvantageous ethnic groups, are

distributed all along the TL corridor of the various VDCs in smaller numbers. Their numbers are comparatively higher in the hills of Tanahu District compared with Chitwan District.

(2) Characteristics of Affected Persons and Properties

Detailed information on the project affected people is not available. Detailed surveys are required for the above purposes along the TL ROW corridor. However, information on the potentially affected land and built structures can be roughly estimated from the available database of the detailed survey (Masina Continental Associates et. al, July 2006).

A total of 32 structures are located under the TL ROW, of which 18 are residential structures and 14 are cowsheds or field structures used seasonally during crop harvesting as noted in **Table 3.3-3**. Estimated agricultural land under the ROW of transmission line is 77.5 ha. Of this total of agricultural land, only 1.76 ha is required permanently for the construction of tower foundations, while 75.73 ha agricultural land will be restricted to some degree for land uses such as tree plantations and structures.

Agricultural land plots identified for permanent land acquisition and land use restrictions are presented in the Supplemental EIA. An indicated total of 447 land parcels located on 20 Cadastral Maps have been identified. Landowners of these land parcels are to be identified and their socio-economic and social conditions are to be ascertained through a structured questionnaire survey during the EIA for the TL to be undertaken by NEA Environmental and Social Studies Department (ESSD). Besides this is the factor that, in a number of places along ROW, there are land units under agriculture use that are not legally registered and identification of these plots and their users is also required during detailed filed surveys.

Table 3.3-3 Houses & Other Structures and Features along 220 kV Transmission Line Right-Of-Way

Drawing Number	Approx. Distance m	Village	No of Houses	No of Sheds	Total Structures	Feature	Along RoW C/L	Within T/L RoW	Outside T/L RoW	RoW Width -m	Comments
2	230	Dharapeni	1	-	1	-	-	-	1R	60	
2	785	Banchare	1	2	3	-	-	1L	2L	60	
2	935	Banchare	1	1	2	-	-	-	2L	60	
2	1365	-	-	-	-	Seti River	-	-	-	-	40m wide
3	1425	-	-	-	-	Road to Belbas	-	-	-	60	
3	1545	-	-	3	3	-	2	1R	-	60	
3	1710	Majhkot	1	1	2	-	-	2R	-	60	
4	3800	-	-	-	-	Gagate Khola	-	-	-	60	20m wide
4	4127	-	-	-	-	Kirandi Khola	-	-	-	60	40m wide
5	4555	-	-	-	-	Chisopani Khola	-	-	-	60	5m wide
5	5126	Kukurdhunge Gudi	1	1	2	-	1	1L	-	60	
5	5445		1	2	3	-	1	2L	-	60	
6	6027	-	-	-	-	Khirekhadi Khola	-	-	-	60	
7	7051	-	-	1	1	Road to Kesabata	1	-	-	60	
7	7693	Guwandanda	1	1	2	-	-	2R	-	60	
7	8195	-	-	-	-	Road to Kesbata	-	-	-	60	
8	8605-8901	-	-	-	-	Sukaura Khola	-	-	-	60	300m along valley
9	9854	No Name	1	-	1	-	-	1L	-	60	

Drawing Number	Approx. Distance m	Village	No of Houses	No of Sheds	Total Structures	Feature	Along RoW C/L	Within T/L RoW	Outside T/L RoW	RoW Width -m	Comments
9	10380					Danda Kho;a	-	-	-	60	
9	10685	No Name	1	-	1	-	-	1R	-	60	
9	10835	No Name	1	-	1	-	-	1R	-	60	Track to Sukaura
10	11781	-	-	-	-	Dhada Khola	-	-	-	60	30m wide
11	14915	-	-	-	-	Bakse Khola	-	-	-	60	15m wide
14	17935	Kesartar	1	-	1	Bagar Khola	-	1L	-	60	110m wide
15	18285	Kesartar	1	-	1	-	-	1L	-	60	
15	18578	-	-	-	-	Seti River	-	-	-	-	120m wide
15	19010 -19245	Serenghat	2	-	2	Boad Khola	-	2R	-	60	235m wide
16	20045	-	-	-	-	Daduwa Khola	-	-	-	60	30m wide
18	23460-23620	-	-	-	-	Narayani River	-	-	-	-	160m wide
18	23697	-	-	-	-	XXHighway	-	-	-	60	Mugling-Bharatpur
19	23940	No Name	1	-	1	-	-	1R	-	60	
19	24360	-	-	-	-	Parallel 132kV T/L	-	-	-	60	
19	24600	-	-	-	-	Bench Mark 788	-	-	-	45	132kv T/L adjacent to East
21	27450	-	-	-	-	Das Khola	-	-	-	45	25m wide
21	27880	No Name	1	1	2	Tandrang Kholsi	2	-	-	45	80m wide junction
22	28915	-	-	-	-	Khahare Khola	-	-	-	45	52m wide
22	29210	No Name	2	1	3	-	1	2R	-	45	Crossing 132kV T/L
23	29617	-	-	-	-	Bharlang Khola	-	-	-	30	For 160m follows Bharlang valley
23	29990	-	-	-	-	Jugedi	-	-	-	30	220m wide valley

Drawing Number	Approx. Distance m	Village	No of Houses	No of Sheds	Total Structures	Feature	Along RoW C/L	Within T/L RoW	Outside T/L RoW	RoW Width -m	Comments
						Khola					
23	30415	-	-	-	-	Crossing of 132 kV T/L	-	-	-	30	
24	30948	-	-	-	-	Bhateri Kholsi	-	-	-	30	30m wide + landslide
24	31789	-	-	-	-	Sal-National Forest	-	-	-	45	Bench Mark 827 & reserve boundary
26	34786	-	-	-	-	Ramnagar Khola	-	-	-	45	40m wide
27	36200	-	-	-	-	Jal Binayak Khola	-	-	-	45	20m wide
28	37858	Chihan	-	-	-	Temple Complex	1	-	-	45	80m long
29	38151	-	-	-	-	132kV T/L exits	-	-	-	60	-
29	38415	Ganeshsthan	-	-	-	Bench Mark 900	-	-	-	60	End of T/L _ Substation adjacent
TOTAL	38.42km	8 Villages	18	14	32		8 + 1	14	5 +5		

NOTES:
1) Approximately 1702 m of river, creek and road crossing
2) Approximately 21614 m of Forest crossing;
3) Approximately 2138 m of grazing and scattered tree area crossing
4) Approximately 12916 m of cultivated land area crossing
5) ROW area required for restriction on land use in the grazing and agricultural land = 86.484 ha
6) ROW area required for forest clearance = 110.94 ha
7) ROW area under rivers, streams, creeks and road not required for acquisition = 10.212 ha

CHAPTER 4 INITIAL ENVIRONMENTAL EXAMINATION

4.1 Environmental Impacts and Mitigation

Transmission lines are linear projects, covering long distance but limited in the area disturbed at any specific point. Unlike other linear projects such as roads, their area of influence is limited to the corridor only. Furthermore, their construction and operation activities are not as extensive as road projects requiring huge amount of excavation, quarries and drainage alterations bringing significant changes to local land systems. However, changes in the land use are the major and key environmental issues of transmission line projects with implications to the biological, social and socio-economic environments of the corridor area affected.

The impacts have been divided into insignificant and significant impacts in the Supplemental EIA of which only the significant are given in **Table 4.1-1**.

Table 4.1-1 Environmental Impact and Mitigation Measure Matrix for Significant Adverse Environmental Impacts of the 220 kV Transmission Line Project

SN	Environmental Issue	Environmental Impact	Stage of Project	Mitigation Measures
1.Physical Environment				
1.1	Soil erosion	Land degradation and landslides	Construction phase	• Ground clearance should not be carried out by uprooting of trees and ground vegetation • Tower foundation excavation should be minimized to required levels and spoil should be properly placed and compacted in designated areas
1.2	Land Use*	Change in land use	Construction & operation phases	• Reduction in ROW width
2. Biological Environment				
2.1	Terrestrial forests and vegetation*	Loss of forests and vegetation	Construction and operation phases	• Reduction in ROW width • Restriction on illegal felling of trees in areas other than required for ROW and T L itself
2.2	Wildlife and wildlife habitat*	Loss of wildlife habitat and wildlife	Construction phase	• Reduction in ROW width • Restriction on hunting of wildlife by the construction workforce
2.3	Avian Fauna*	Loss of avian fauna	Operation phase	
3. Socio-economic and Cultural Environment				
3.1	Telephone/electric lines and built structures*	Disruption of services and losses of built structures	Construction phase	• Adequate clearance height of the conductors above the telephone and electrical lines • Information to local people for the service disruption during construction • Adequate compensation to the owners of built structures without deduction of depreciation costs • Resettlement and rehabilitation package to the affected structure owner

SN	Environmental Issue	Environmental Impact	Stage of Project	Mitigation Measures
3.2	Public Health and safety*	Risks to public health and safety	Operation phase	• Bill boards and hoarding boards with information about the hazards • Public awareness programs on measures for public health and safety in the TL corridor
3.3	Agricultural production	Loss of Agriculture production due to disruption	Construction phase	• Adequate compensation of the loss of agricultural produce • Scheduling of the construction activity such that the agricultural fields are without crops during construction period.
3.4	Loss of Land and Property*	Livelihood and future opportunity	Construction & Operation phase	• Reduction in ROW width • Adequate compensation to the affected land and property owners with permanent occupation of areas affected • Adequate compensation for the affected land under ROW for restriction considering the future opportunity of the agricultural land • Resettlement and rehabilitation package to the affected population
3.5	Tourism and Aesthetics	Loss of tourism and aesthetic value	Construction and operation phases	• Restriction on haphazard storage, camp managements, and disposal of spoils • Design the tower structures that complements to the natural background
3.6	Occupational Health	Risks to the health of construction and operation workforce	Construction and operation phases	• Provision of appropriate protective equipment and gear to the construction and operational workforce • Trainings on the possible occupation hazards to the construction and operation workers

*Note: * Irreversible impacts*

4.2 Institutional Requirements and Environmental Monitoring Program

The Nepal Electricity Authority (NEA), compared to other institutions in Nepal, has established an Environment and Social Studies Department (ESSD) to deal with environmental studies and monitoring. However, it has shortages of trained manpower to effectively carry out environmental monitoring to the project requirements. There is a need to strengthen the ESSD in respect of its monitoring capabilities. Environmental and social monitoring, particularly in the construction phase of TL projects is very important.

4.3 Findings and Conclusion

This IEE level assessment has identified key issues of environmental concerns for the proposed 220 kV transmission line project. The project is not envisaged to have any significant damage to the physical environment except for limited erosion and land stability issues. But the concerns that are

associated with clearance of trees in Protected Forests are a major issue to be addressed in the full EIA. Other issues such as tower foundation excavation and spoil management also require attention.

There is some potentials of irreversible damage to the local biological environments, particularly in forested areas, whereas the impacts on wildlife habitat are limited along the TL ROW in a stretch of about 21.6 km of forest land. About 1.76 ha of agricultural land will be permanently acquired for tower foundations and some restrictions within the corridor on land use would occur. A total of 18 residential house structures will have to be acquired as well as 14 ancillary structures.

In summary, the significance of the impacts due to loss of forest land, and agricultural land and property are yet to be assessed. Also thee is a need to design site-specific mitigations to minimize and rehabilitate losses to natural and social infrastructure. A project specific mitigation program and monitoring program should be prepared and include an Environmental Management Plan and Resettlement and Rehabilitation Management Plan.

The IEE level study for the proposed 220 kV TL, has established sufficient justifications for the selection of the best TL alternative from among the various TL options and to proceed to the next phase of detailed design study. The study has also identified the key significant adverse environmental issues for the nominated TL alternative for the detailed EIA. It is concluded that the selected TL option be considered acceptable according to the provisions of Environmental Protection Rule (1997) of Government of Nepal and in compliance with the JICA Guidelines (2004).

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS (ESC) REPORT

PART F

ENVIRONMENTAL MANAGEMENT FRAMEWORK

PART F ENVIRONMENTAL MANAGEMENT FRAMEWORK

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CHAPTER 1 ENVIRONMENTAL MANAGEMENT FRAMEWORK

1.1 Background

The Environmental Management Plan (EMP) represents the key mitigation/enhancement measures and monitoring for major impacts, which are translated into concrete action programs/projects and defines the institutional framework and mechanisms for ensuring their appropriate implementation to actually be carried out in subsequent stages of project development. It likewise provides the estimated investment requirements and commitments/guarantees to carry out the proposed plan. The EMP is based on the experiences of previously constructed hydropower projects of similar nature, and findings of the EIA study, Social Action Plan (SAP), Resettlement Plan (RP), review of other EMPs prepared for the environmental management and Government of Nepal Act, Regulations and Guidelines relevant to the hydropower projects.

1.2 Overall EMP Summary

The overall EMP summary including mitigation/enhancement measures, schedule of implementation, estimated investment requirements, institutional responsibilities and guarantees/agreements is shown in **Table 1.2-1**. The cost computations are rough estimates and need to be verified/ validated during the detailed design stage.

Table 1.2-1 Summary of Environmental Impacts and their Corresponding Mitigation/Enhancement Measures and EMP

Impact Items/ Project Activities	Potential Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
1. Pre-Construction/ Construction Period						
A. Physical Environment						
(1) Land Use and Topography						
▪ Inundation of the land for reservoir	Loss of current land use opportunity for villagers, and loss of habitat for wildlife and vegetation	S, P (negative)	▪ Unavoidable impact, but selection of lower reservoir Full Supply Level could minimize existing land use changes drastically.	▪ n/a	▪ NEA	▪ n/a
▪ Construction activities of various types in the dam site and project facility sites involving excavations, drilling, blasting and material removals	Land instabilities	NS, T (negative)	▪ Locating the access road route under the Vyas-Shivapur footbridge rather than through the village, with associated benefits of traffic separation; ▪ Shifting the spoil bank to the river side to reduce the affected area; ▪ Locating the permanent NEA camp at the southern end of the flat area and close to the power station; ▪ Shifting the main access road to uphill from the present road so that project-related traffic is separated from schools and shops along the existing road in Beni Patan.	▪ Bio-engineering of the cut batter slopes of the access roads (lump sum): 2.0 million NRs	▪ Contractor, NEA	▪ Part of contractor's contract
▪ Spoil bank to be constructed along with the right bank of the Seti River	Soil erosion	NS, P (negative)	▪ Construction of a dry stone gabion structure at the toe of the spoil bank; ▪ Construction of a water collection system for the spoil bank to avoid free flow of the run off from the mountain slope over the spoil material; ▪ Proper grading of the spoil surface with adequate drainage provisions after the closure of spoil disposal at the site; ▪ Afforestation and bioengineering of the spoil area after proper grading and drainage management.	▪ Dry gabion wall approximately 1,300 m (1.5m high and 1m wide): 5.0 million NRs ▪ Run off catch drainage of mountain slope (approx. 900m): 3.2 million NRs	▪ Contractor, NEA	▪ Part of contractor's contract
(2) Air Quality						
▪ Dust generated from excavation, filling, stockpiling and construction vehicle movements associated with the construction of the various surface and sub-surface structures and transportation of the spoil materials to the spoil bank.	Increase in particulates and gaseous emissions	MS, T (negative)	▪ On-site vehicle speed restrictions and vehicle washing before leaving the site; ▪ Frequent watering of the road in the dry season ensuring that the road surface does not generate dust. ▪ Frequent watering of the dusty barren areas or spoil disposal areas.	▪ Water sprinkling: 4.9 million NRs (2 tankers /day/245 days a year/5 year) ▪ Dust masks to workers: 0.7 million NRs (twice a year (lump sum)/5 year)	▪ Contractor, NEA	▪ Part of contractor's contract

Impact Items/ Project Activities	Potential Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
(3) Noise/Vibration Level						
▪ Noise generated from cut-and-cover activities, excavation, back filling and construction of above ground structures and transportation of the construction vehicle. ▪ Vibration generated from and drill & blast activities in the dam, tunnel and powerhouse.	Increase in noise and vibration levels It is not expected to effect communities living away from source. However, impacts to wildlife are expected.	MS, T (negative)	▪ Care in the placement and orientation of noisy plants away from sensitive receivers; ▪ Use and correct fitting of silencers, mufflers and acoustic shields; ▪ Regular maintenance of plant and equipment; ▪ Awareness programs and information sharing with the communities on the noise related issues	▪ Part of construction cost	▪ Contractor, NEA	▪ Part of contractor's contract
(4) Water Quality						
▪ Poor sanitation facilities to construction workforce at the construction camps and construction areas may promote the use of the adjacent river bed areas for open defecation dislodging of solid waste and other sanitation uses.	Changes in river water quality Such uses of the river area, especially in the dry season, may substantially degrade the water quality in the Seti River due to discharges of organic load.	MS, T (negative)	▪ Establishment of good water supply and sanitation facilities in the construction work camps, at actual construction sites; ▪ Establishment of effective solid waste collection facilities in the construction work camps; ▪ Public awareness program to the construction workforce and the construction on good health and sanitation practices	▪ Sanitation (toilet provisions) at all work and campsites 4.5 million NRs (lump sum, about 100 toilets) ▪ Camp solid waste collection management system and disposal facilities: 2.8 million NRs	▪ Contractor, NEA	▪ Part of contractor's contract
▪ Excavation works are expected to increase the turbidity and total suspended solids in the flowing water. Besides, accidental oil spills of the operating equipment will be released to the flowing water. And also, discharge of concrete plants, aggregate washing plants etc. provide huge amount of fine sediment to the receiving water bodies.	Changes in river water quality	MS, T (negative)	▪ Discharge of batching plant, aggregate washing plant, and tunnel seepage waters only after appropriate treatment (sedimentation facility) to the natural water bodies; ▪ Public awareness program to the construction workforce and the construction on good health and sanitation practices; ▪ Disposal of construction related spoils only into defined and well protected spoil disposal sites approved by concerned authorities.	▪ Sedimentation tank for batching discharges, tunnel discharges and aggregate crushing discharges and spoil disposal area: 10 million NRs	▪ Contractor, NEA	▪ Part of contractor's contract

Impact Items/ Project Activities	Potential Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
B. Biological Environment						
(1) Terrestrial						
▪ Forest and vegetation clearing, excavation and grading and other construction activities	Loss, disturbance and damage to existing vegetation; Habitat degradation of dependent species	MS, P (negative)	<u>Forest and vegetation</u> ▪ For every tree cut, the compensatory plantation at 1:25 trees must be made ▪ Secure necessary permit for tree cutting ▪ Implement tree balling where practicable ▪ Immediate revegetation ▪ To provide alternatives of kerosene rather than fuel wood <u>Wildlife</u> ▪ Selecting the appropriate layout to minimize the cutting trees (especially from the dam site to the lower reservoir area) ▪ To restrict hunting and trapping ▪ To save endangered animals by a rescue operation using boats during the filling of the reservoir and relocating them to compatible ecosystem in nearby forests.	▪ Part of construction cost	▪ Contractor, NEA	▪ Part of contractor's contract
C. Socio-economic Environment						
▪ Inundation by reservoir development	Inundation of existing infrastructure facilities of the communities such as motorable roads, suspension bridges, foot trails, irrigation canals, and electricity distribution.	MS, T (negative)	▪ Implementation of restoration of project impacted infrastructure program under social program of the project ▪ Implementation of rural electrification program under social program of the project	▪ Restoration of project impacted infrastructure program: 85.5 million NRs ▪ Rural electrification program: 19.6 million NRs	▪ Contractor, RSISU-PMO -NEA, local government	▪ Social program of the project
	Inundation of existing community built structure (cremation, resting places etc.).	MS, T (negative)	▪ Provision of compensation for affected community structures under the framework of Resettlement Plan ▪ Implementation of affected community's initiative support program under social program of the project	▪ Compensation for community structures : 0.39 million NRs ▪ Affected community's initiative support program: 52.1 million NRs	▪ Contractor, RSISU-PMO -NEA, local government	▪ Social program of the project

Impact Items/ Project Activities	Potential Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
	Inundation of land, loss of yield, involuntary resettlement, and impact on the livelihood of Affected Persons (APs)	MS, P (negative)	▪ Land acquisition, and provision of compensation including the affected private land, the affected structures, loss of agricultural production equivalent to one year production, and other rehabilitation compensation fees for relocatee ▪ Implementation of separate package programs for restoration of livelihood and enhancement of quality of life. They include agricultural development program, skill enhancement and employment program, affected community's initiative support program, women development program, and community-based watershed management program.	▪ Compensation and relocation costs: 1,080 million NRs ▪ Agricultural development program: 27.51 million NRs ▪ Skill enhancement and employment program: 10.14 million NRs ▪ Women development program: 13.03 million NRs ▪ Watershed management program: 12.31 million NRs	▪ Contractor, RSISU-PMO -NEA, local government	▪ Resettlement action plan ▪ Social program of the project
	Risk of shoreline erosion and land failure, where the people often utilize the edge of land for cultivation and other purposes	MS, P (negative)	▪ Acquire land as risk zones by delineating a 10 m vertical height from the FSL with measures such as planting work ▪ Implementation of community-based watershed management program and community's initiative support program	▪ Included in the land acquisition cost and in the mitigation cost for forest and vegetation ▪ Included in community-based watershed management program, and community's initiative support program	▪ RSISU-PMO -NEA	▪ Social program of the project
▪ Influx of large number of workers	Shortages of drinking water	NS, T (negative)	▪ Provide water supply for construction workers by contractors ▪ Implementation of community/public health and education enhancement program under social program of the project including the support for water supply taps	▪ Part of construction cost ▪ Community/public health and education enhancement program: 15.9 million NRs	▪ Contractor, NEA ▪ Contactor, RSISU-PMO -NEA, local government	▪ Part of contractor's contract ▪ Social program of the project
	Deterioration of the existing sanitation conditions and break of the epidemics such as typhoid, cholera, and diarrhea and other communicable diseases like STD and HIV	MS, T (negative)	▪ Implementation of community/public health and education enhancement program under social program of the project	▪ Included in community/public health and education enhancement program cost	▪ Contractor, RSISU-PMO -NEA, local government	▪ Social program of the project

Impact Items/ Project Activities	Potential Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
▪ Land clearing within project facility site; site grading, excavation, hauling/stockpiling of excavated and construction materials including land acquisition for project site	Total or partial loss of land/farm area, properties and crops, involuntary resettlement, impacts on the livelihood of APs including loss of income due to land acquisition	S, P (negative)	▪ Negotiate with PAFs/PAPs for an acceptable compromise on valuation and compensation ▪ Finalize the RAP incorporating therein the agreements reached during public consultations ▪ Land acquisition and provision of compensation as stated previously ▪ Implementation of several social programs for restoration of livelihood and enhancement of quality of life as stated previously	▪ Included in compensation and relocation costs ▪ Included in social action program costs	▪ RSISU-PMO -NEA	▪ Resettlement action plan ▪ Social program of the project
▪ Construction activities for the project	Work related injuries and accidents	MS, T (negative)	▪ Project contractors will be responsible for the occupational health of workers.	▪ n/a	▪ Contractor	▪ Part of contractor's contract
	Girl trafficking, and sexual and labor exploitation, child labor	S, T (negative)	▪ Implementation of women development program under social program of the project, including education on HIV/AIDS, STD, family planning, and girl trafficking.	▪ Women development program: 13.0 million NRs	▪ Contractor, RSISU-PMO -NEA, local government	▪ Social program of the project
	Increase in employment opportunities	MS, T (positive)	▪ Require contractors to source workforce from qualified locals ▪ Contractors to orient workers on desirable working relationship especially if there are non-resident workers ▪ Implementation of skill enhancement and employment program under social program of the project	▪ n/a ▪ Skill enhancement and employment program: 10.1 million NRs	▪ Contractor, RSISU-PMO -NEA ▪ Contractor, NEA, local government	▪ Part of contractor's contract ▪ Social program of the project
	Increase in livelihood and business opportunities	MS, T (positive)	▪ Priority to be given to local subcontractors ▪ Priority to be given to local suppliers of construction materials and equipment ▪ Supply of food and catering to be preferentially awarded to local suppliers ▪ Implementation of skill enhancement and employment program, agricultural development program, and women development program including income generation and micro credit funds	▪ n/a ▪ Included in social action program costs	▪ Contractor, RSISU-PMO -NEA	▪ Part of contractor's contract ▪ Social program of the project

Impact Items/ Project Activities	Potential Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
	Potential health, sanitation and safety problems including accidental risks for local community people	NS, T (negative)	▪ Contractor to provide construction camp as temporary housing facilities for workers equipped with adequate water and sanitation facilities ▪ Contractors to implement proper solid waste management in the work site, workers will be oriented to observe proper hygiene and sanitation practices and provided with appropriate protection gears while working ▪ Construction areas to be enclosed as necessary and provided with appropriate signage to avoid accidents	▪ Part of construction cost	▪ Contractor, RSISU-PMO -NEA	▪ Part of contractor's contract
2. Operations and Maintenance Period						
A. Physical Environment						
(1) Land Use and Topography						
▪ Failure at the terrace breaks associated with the toe cutting by the stream, caving and overhanging	Soil slides associated with the terrace materials in the upper reservoir area	S, P (negative)	▪ Completion of protection embankment works with concrete blocks cover in the vicinity of Bhimad Bazaar ▪ Land acquisition program and stabilization of erosion prone in the risk zone area from Full Supply Level to 10m high above ▪ Selective planting of ground cover and trees at the base of areas susceptible to erosion in tributary stream leading into the Seti River ▪ Land acquisition program and stabilization of erosion prone areas with suitable tree species in the vicinity of the Wantang Khola, the Pedhi Khola and Tittuwa	▪ Part of construction cost	▪ Contractor, NEA	▪ Part of contractor's contract
▪ Full supply level at 415m and flushing operation	Backwater effects of the reservoir	NS, T (negative)	▪ The annual flushing of the reservoir at FSL 415 m will effectively control any sedimentation. ▪ In the case that nominated Full Supply Level is 415 m, the sedimentation will not happen around the Bhimad Bazaar. ▪ The backwater effect after the sedimentation is minor.	▪ n/a	▪ NEA	▪ n/a
▪ Diverted water flowing out from tailrace outlet and immediate increase of downstream water level by dam operation	Impact to agricultural land in the downstream of the dam	NS, P (negative)	▪ The agricultural land on the left bank appears to be high enough that it would not be affected. ▪ The agricultural land on the right bank will be acquired for the construction. ▪ The permanent river protection work will not be required in this section. ▪ Monitoring of sedimentation patterns should be undertaken in this zone for at least 10 km below the outlet.	▪ Land acquisition cost for agricultural land on the right bank	▪ NEA	▪ n/a

Impact Items/ Project Activities	Potential Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
(2) Water Quality						
▪ Environmental flow	Changes in river water quality and flow volume	S, P (negative)	▪ The mitigating effects of joining the Madi River downstream which has a flow regime equivalent to 75% of the Seti River flows. ▪ Impacts on the river's aquatic ecology and fish resources are unavoidable in the section of the Seti River immediately downstream of the dam and must be mitigated to the fullest extent possible.	▪ n/a	▪ NEA	▪ n/a
▪ Eutrophication of the reservoir	Changes in river water quality	S, P (negative)	▪ Installation of Fraction Fence system in the reservoir ▪ Development of sewerage system in the upstream urban area to prevent waste water with nutrient salt flowing into the river	▪ n/a ▪ To be estimated, but not be covered by the project	▪ NEA ▪ Local government	▪ Part of contractor's contract ▪ n/a
▪ Sediment flush operation	Changes in river water quality	S, P (negative)	▪ Optimum operation to minimize environmental impact based on experiences of operation in Japan	▪ n/a	▪ NEA	▪ n/a
B. Biological Environment						
(1) Freshwater						
▪ Change of flow regime due to dam	Local aquatic habitat alteration and permanent/temporary displacement of species	MS, P (negative)	▪ Fish hatchery backed with open water stocking of suitable fish species, as is being done at NEA's Kali Gandaki A HEP.	▪ Financial and Technical Assistance to Kali Gandaki A hatchery for added production & facility development and research for Upstream & Downstream Stocking in Seti River system: 73.6 million NRs ▪ NEA Extension program for fisheries and mitigation to local fishermen: 1.0 million NRs	▪ NEA	▪ n/a

Impact Items/ Project Activities	Potential Environmental Impacts	Degree /type of Impact	Mitigation/Enhancement Measure	Cost	Responsible Institution	Guarantees/ Agreements
C. Socio-economic Environment						
Downstream safety						
▪ Immediate increase of water level in power generation and just after the sediment flushing operation	Danger in downstream communities and river users	S, P (negative)	▪ Installation of siren system ▪ Public awareness on safety for downstream communities	▪ Siren network along the Seti in the downstream of dam (lump sum): 3.5 million NRs ▪ Awareness training on the safety measures to downstream areas (lump sum): 0.3 million NRs	▪ Contractor, NEA	▪ Part of contractor's contract for installation
White water rafting in the downstream of the dam						
▪ Decrease of flow volume in non-power generation period, and immediate increase of water level in power generation and just after the sediment flushing operation	Danger of the rafting activity in the river and camp site at the riverside for the rafting participants	S or MS, P (negative)	▪ Scheduled rafting activity to avoid immediate increase of water level ▪ Public awareness on safety for both rafting operators and participants ▪ Select safe location of the camp site for the rafting participants	▪ n/a	▪ NEA	▪ n/a

Note: S - Significant impact, MS - Moderately significant impact, NS - Not significant impact
T - Temporary impact, P - Permanent impact
(negative) - negative impact, (positive) - positive impact

RSISU - Resettlement Plan and Social Action Plan Implementation Sub-unit under Environmental and Social Monitoring Unit of PMO, NEA

1.3 Stakeholders under the EMP

The EMP for the Project is prepared to show linkages with different parties envisaged to be involved during the different phases of project development and operation in compliance with the existing Act and Rules. Overall project environmental management is the responsibility of the Project, Project Management Office (PMO) of NEA. There are a number of key stakeholders to be involved in project environmental and social management. These key stakeholder and their main roles and responsibilities are presented below.

Table 1.3-1 Environmental Management Roles and Responsibilities

Organizations	Roles and Responsibilities	Timings
MOEST	▪ Ensure that the environmental measures and cost are included in the project documents and tender clauses ▪ Monitoring of the overall project ▪ Auditing of project performance	▪ Prior to Final Project approval ▪ At least once a year during construction ▪ After two years of project completion - operation phase
MOWR/ DOED	▪ Ensure that the environmental measures and cost are included in the project documents and tender clauses ▪ Monitoring of the overall project	▪ Prior to Final Project approval ▪ At least twice a year during construction and once during operation
NEA Board/NEA/ NEA-ESSD/USSHEP - PMO	▪ Ensure that the EIA and EMP measures are incorporated in the final project design and costs. ▪ Acquire necessary permits and approval for project construction and operation. ▪ Ensure that the project construction activities are in accordance with legislative requirements. ▪ Implementation of repair and maintenance of project components including environmental safeguards as recommended by EMP, MOWR, DOED and MOEST ▪ Monitoring and record keeping regarding environmental measures and impacts as per EMP ▪ Ensure public participation and involvement in all phases of project implementation	▪ Prior to contract award ▪ Before construction ▪ During construction continuously ▪ During operation continuously ▪ During operation continuously ▪ Project period continuously
Panel of Experts (POE)	▪ Review and recommend the final design of the project and ensure that the EMP measures are included in the design and Tender ▪ Review monitoring and auditing reports of the supervising consultants and Project- Environmental Monitoring Sub-unit (ESMU) and recommend corrective measures to meet the objectives of EMP	▪ Prior to contract tendering in Detail Design Phase ▪ During construction phase every six month
Detail Design Consultants	▪ Incorporate environmental mitigation measures as per POE recommendation in the design, project cost and tender documents ▪ Include EIA recommendations in the design, project cost and tender documents	During Detail Design Phase
EIA Consultant	▪ Verify and improve upon the earlier EIA reports and EMP and recommend environmental measures to Detail Design Consultants ▪ Verify and prepare detailed programs for Affected Persons/Affected Families and communities and recommend final RP costs to Detail Design engineers ▪ Verify and complete RP and recommend final RP measures and costs to Detail Design Consultants	During Detail Design Phase

Organizations	Roles and Responsibilities	Timings
Supervising Engineers	▪ Approval to civil construction as per design ▪ Monitoring of civil construction as per detail design ▪ Ensure that the EMP provisions are implemented and recorded ▪ Ensure that the Project corrective actions are duly implemented.	Continuously in Construction phase
USSHEP -ESMU	***RSISU:*** ▪ Implementation, and supervision of land acquisition, compensation and resettlement as per RP and record keeping of these ▪ Implementation, and supervision of SAP as per SAPF ▪ Liaison with other Nepalese authorities for EMP/RP/SAPF items ▪ Information Dissemination through Public Information Center and other media and collection of feed back through regular consultation with the various stakeholders ▪ Distribution of the Project's bimonthly monitoring reports of EMSU to different central and local level stakeholders ▪ Project grievance and complaint handling ***EMSU:*** ▪ Monitoring of natural environmental, RP and SAP mitigation measures as per EMP/RP/SAPF by EMSU and recommend concerned engineers and sections for corrective actions and bi-monthly report preparation ▪ Environmental impact and compliance monitoring of construction works as per EMP by EMSU and recommend corrective actions to supervising engineers and bi-monthly report preparation.	Pre-construction and construction phase, continuously
Construction Contractor	▪ Implement civil construction as approved by supervising engineers ▪ Implement mitigation measures as specified in EMP and recommended by Supervising engineers ▪ Front line Monitoring and record keeping of environmental mitigation measures as per EMP through a special monitoring unit ▪ Maintain good public relationship with the project area people	Construction phase continuously
NGOs, CBOs, VDCs,/ Municipality and DDCs and other stakeholders	▪ Monitor that the environmental and social mitigation measures are implemented in all stages of the project as per EMP, RAP, SPAF ▪ Ensure that the public participation and involvement in the project implementation is maximized by the project owner, consultants and contractors.	Project period

EMP structure for different phases of project development and implementation are illustrated in **Figure 1.3-1**.

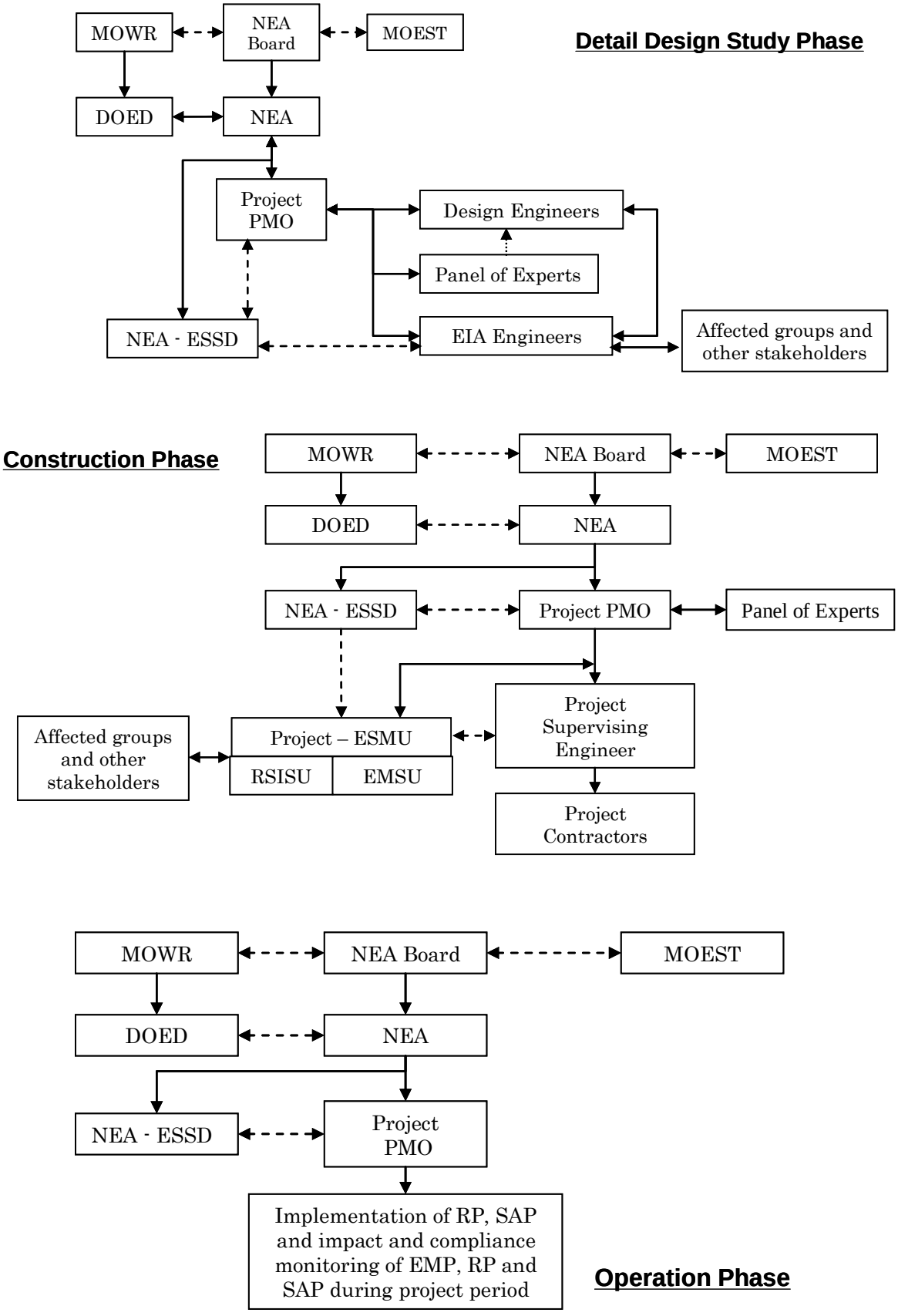

Figure 1.3-1 Environmental Management Plan Structure

1.4 Project's Environmental Management Office

As per the Nepalese Environmental Protection Rules, environmental management of the project is the responsibility of the proponent. For the Project, NEA and NEA-Project Management Office (PMO) have the responsibility of Project's Environmental Management. NEA has a separate "Environment and Social Studies Department" to look into the environmental matters of projects, planned, under implementation and operational. The Department has limited manpower to fully undertake the environmental Management of the Project.

To ensure that the Supplemental EIA recommended mitigation and monitoring actions are duly implemented, monitored, assessed, evaluated and disseminated to the stakeholders for feed back and improvement, the project - PMO should establish a separate Environmental and Social Monitoring Unit (ESMU) within the Project-PMO as the other on-going hydroelectric projects did. The proposed ESMU will comprise of two sub-units, namely RP and SAP Implementation Sub-unit (RSISU) and Environmental Monitoring Sub-unit (EMSU). The former sub-unit, to which the staff members of NEA with past similar experiences are to be assigned, will be responsible to implement RP and SAP. The latter sub-unit will be managed by the consultants with experience in environmental monitoring of the hydropower projects in the past. The project ESMU shall be established at least eight months before the project's civil construction award. The ESMU shall function directly under the Project Manager but the EMSU will have a responsibility to co-ordinate with the project's Supervising Consultant, Whereas RSSISU will coordinate with NEA – ESSD and stakeholders of the project such as Local VDCs, DDCs, NGOs, CBOs, affected parties, DOED, MOWR, and MOEST (**Figure 1.4-1**).

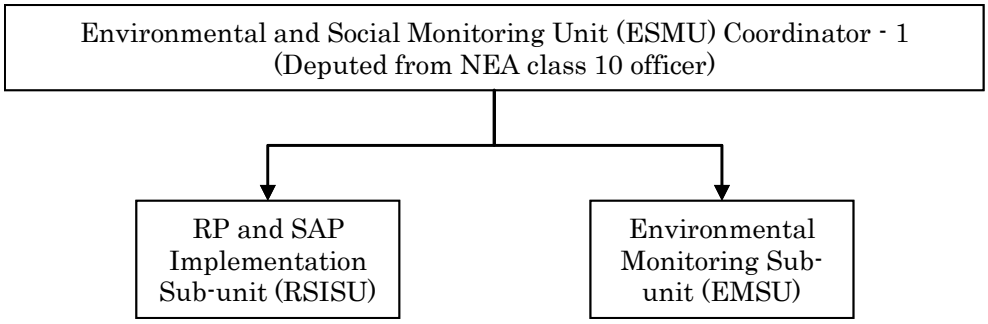

Figure 1.4-1 Organization Framework of ESMU

1.5 Administrative and Management Cost for ESMU

Office for the ESMU shall be established in the engineer's camp as a part of the civil construction workforce. Administrative and management cost is estimated based on the assumption that most of the persons shall be deputed from NEA, ESMU particularly for RSISU and shall not require additional project cost. The cost required is for the EMSU consultants. Administrative and management costs are illustrated in **Table 1.5-1, 1.5-2, 1.5-3** and summarized in **Table 1.5-4**.

Table 1.5-1 Manpower Remuneration

SN	Position	Numbers	Period (yr)	Project Allowance/month (NRs.)	Total NRs. Million
1.	ESMU - Section chief (Environmental Management – Team Leader consultant)	1	5.66	90000	6.11
2.	Environmental Engineer (ESMU)	2	5.66	60000	4.08
3.	Sociologist (ESMU)	2	5.66	60000	4.08
4.	Part time consultant (socio-economist/ Terrestrial ecologist/ Aquatic ecologist)		3.33	60000	2.40
5.	Office runner (ESMU)	2	5.66	10000	0.68
Total					**17.34**

Table 1.5-2 Support Facilities

SN	Particulars	Unit	Cost	Total NRs. (Million)
1.	Computers and printers	10 sets	150000.00/unit	1.50
2.	4 wheel drive vehicles	5 nos	3000000.00/no	15.00
3.	Furniture		Lump sum	0.00
4.	Other equipment (camera, tape recorders, power point projector, pH meter, turbidity meter, flow meter, photocopier etc.)		Lump sum	0.00
5.	Office consumables	5.66 years	40000/month	2.72
6.	Telephone and electricity	5.66 years	15000/month	1.02
7.	Vehicle operation including Driver, Fuel and O &M (4 vehicles)	5.66 years	45000/month/vehicle	12.23
Total				**32.47**

Table 1.5-3 Information Dissemination and Feedback

SN	Particulars	Years	NRs./yr	Cost NRs. (Million)
1.	Information through internet and web page	5.66	75000	0.42
2.	Information dissemination through FM	5.66	100000	0.57
3.	Regular stakeholder meetings in the project area	5.66	125000	0.71
Total				**1.70**

Table 1.5-4 Summary of Administrative and Management Costs for ESMU

SN	Particulars	NRs. Million
1.	Consultant Remuneration	17.34
2.	Support facilities	32.47
3.	Information Dissemination and Feedback	1.70
Grand Total		**51.51**

1.6 Environmental Monitoring Program

Environmental monitoring shall be undertaken;

- To ensure that the recommended mitigation and enhancement measures as embodied in the EMP;
- To undertake regular monitoring of specific parameters in compliance with existing environmental quality standards; and
- To determine the effectiveness of the EMP and make recommendations for any corrective or additional mitigating measures.

A monitoring plan shall be developed based on the mitigation/enhancement measures identified for significant environmental impacts and those that are moderately significant, but can have critical effects if not mitigated. The environmental monitoring plan proposed including the key parameters to be monitored is presented in **Table 1.6-1**. This covers both the pre-construction/construction and operation stages. The baseline information generated during the EIA will generally serve as the benchmark data.

Table 1.6-1 Environmental Monitoring Plan

Project Phase	Method and Scope	Parameter	Location	Frequency	Responsibility	Cost (NR)
1. Pre-Construction/ Construction Period						
A. Physical Environment						
▪ Land acquisition ▪ Vegetation clearing/tree cutting ▪ Excavation works ▪ Foundation works	▪ Measurement of ambient air quality	▪ Dust (TSP/PM10)	▪ Jhaputar and Damauli (close to the District Public Health Office)	Three times a year in dry season (Nov., Feb., and May). Baseline data shall be taken before construction in dry season (April/May)	Contractor	NRs 5.3 million (lump sum including air, water, noise, spoil management, land erosion, etc.)
	▪ Compliance of mitigation measures for air pollution	a) Gravelling of road and its maintenance b) Control on vehicle speed c) Watering of roads d) Careful handling the contaminant or dumping of dusty materials e) Covering of exposed areas and site restoration f) Provision of dust mask to drivers and workers	a) Along the construction road b) Along the construction road c) Along the construction road d) Temporary waste stock facility and disposal site e) Excavated area f) Construction sites	a) Once a three months b) Once a day c) Once a day d) Once a week e) Once a week f) Once a week	Contractor	Part of contractor's contract
	▪ Water sampling and analysis	▪ Flow velocity, discharge, water temperature, pH, conductivity, total suspended solids (TSS), total phosphorous (T-P), Total Kjeldahl Nitrogen (TKN), ammonia (NH_3), nitrate , nitrite, dissolved oxygen (DO), and BOD_5	1) upstream of the reservoir, 2) reservoir area (close to dam site), 3) confluence with the Madi River, 4) immediate downstream of the tailrace outlet	4 times a year in 4 seasons (November, March, June, and September)	Contractor/EMSU-PMO-NEA	Included in the lump sum cost mentioned in air quality (dust) measurement.

Project Phase	Method and Scope	Parameter	Location	Frequency	Responsibility	Cost (NR)
	▪ Compliance of mitigation measures for water pollution	a) Adequacy and operation of water supply and sanitation facilities at engineers camps, construction camps and construction sites b) Collection of solid waste and safe disposal practices at engineers camps, construction camps and construction sites c) Awareness program on health and sanitation d) Prohibition on open defecation and solid waste disposal e) Storage facilities for fuel, lubricants, spent oils, and toxic chemicals f) Treatment facilities for waste water of batching plant, aggregate washing and tunnel seepages and its effective operation g) Water quality test for discharge of treated wastewater from batching plant aggregate washing plant, and tunnel discharges h) Disposal of construction spoils only in designated areas	a) Engineers camps, construction camps and construction sites b) Engineers camps, construction camps and construction sites c) All over the construction site d) All over the construction site e) Storage facilities f) Treatment facilities g) Batching plant aggregate washing plant, and tunnel discharges h) All over the construction site	a) Before project and every 3 month b) Once a week c) Every six month d) Once a week e) Before project and every 3 month f) Before project and every 3 month g) Once a three months h) Once a day	Contractor	Part of contractor's contract
	▪ Measurement of noise level	▪ Noise level	▪ Jhaputar and Damauli (close to District Public Health Office), and Beltar (near the school)	▪ Twice a year Baseline data shall be taken before the construction.	Contractor/ EMSU-PMO-NEA	Included in the lump sum cost mentioned in air quality (dust) measurement.
	▪ Compliance of mitigation measures for noise	a) Placement of noise arresting equipment b) Correct fitting of silencers, mufflers and acoustic shields c) Maintenance of plant and equipment d) Blasting restriction provisions as negotiated e) Blasting design and follow ups	a) Construction site near the residential area b) Construction vehicles and machineries c) All over the construction sites d) Blasting site e)	a) Once before construction b) Once a three months c) Once a three months d) Once a day e) Once a three months f) Once a week	Contractor	Part of contractor's contract

Project Phase	Method and Scope	Parameter	Location	Frequency	Responsibility	Cost (NR)
	▪ Compliance of mitigation measures for land instability and erosion	a) Vegetation clearance only to required limits b) Excavation works only to required limit by the design c) Side casting of excavated earth d) Management of spoil in the designated area e) Maintenance of toe protection structure, and drainage structure at spoil disposal; and sedimentation tank at batching yard, spoil disposal area and tunnel discharge areas f) Civil and bio-engineering protection works and their maintenance (including side drains) at access roads	a) Along the project boundary such as FSL 415m area for the reservoir, dam site, and project facility sites. b) All over the construction site c) All over the construction site d) All over the construction site e) Batching yard, spoil disposal area and tunnel discharge areas f) Along the access roads	a) Once a month b) Once a week c) Once a day d) Once a day e) Once a month f) Once a month	Contractor	Part of contractor's contract
B. Biological Environment						
▪ Land acquisition ▪ Vegetation clearing/tree cutting ▪ Excavation works ▪ Foundation works	▪ Compliance of mitigation measures for illegal tree cutting and poaching through frequent patrol activity	▪ Identification of illegal tree cutting and poaching	▪ All over the construction site and adjacent area	Frequent and at random patrol	Contractor	Part of contractor's contract
	▪ Habitat loss around the project sites	▪ Number of habitat loss identified before construction	▪ All over the construction site and adjacent area	Every four months	Contractor/ EMSU-PMO-NEA	NRs 1 million
	▪ Species occurrence around project sites	▪ Number of wildlife species	▪ All over the construction site and adjacent area	Every four months	Contractor/ EMSU-PMO-NEA	
	▪ Construction disturbances around project sites	▪ Damage to habitat and/or death of wildlife due to construction activity	▪ All over the construction site and adjacent area	Once a week	Contractor/ EMSU-PMO-NEA	
	▪ Mitigation measures compliance for wildlife conservation	▪ Implementation of the proposed measures based on designated schedule	▪ All over the construction site and adjacent area	Every four months	Contractor/ EMSU-PMO-NEA	
	▪ Aquatic life and ecology survey (fish, phytoplankton, zooplankton and aquatic insects)	▪ Identification of aquatic species	▪ 7 baseline stations	Every six months (dry season and wet season) for 5 years	Contractor/ EMSU-PMO-NEA	NRs 1 million
	▪ Observation of compliance of contractual mitigation clauses	▪ Adequate implementation of the mitigation measures	▪ At the designated location of the measures	Every three months	Contractor	Part of contractor's contract

Project Phase	Method and Scope	Parameter	Location	Frequency	Responsibility	Cost (NR)
2. Operation and Maintenance Period						
A. Physical Environment						
▪ Operation and maintenance of dam	▪ Water sampling and analysis (except reservoir area)	▪ Flow velocity, discharge, water temperature, pH, conductivity, total suspended solids (TSS), total phosphorous (T-P), Total Kjeldahl Nitrogen (TKN), ammonia (NH_3), nitrate , nitrite, dissolved oxygen (DO), and BOD_5	1) Upstream of the reservoir, 2) Confluence with the Madi River, 3) Immediate downstream of the tailrace outlet	5 times a year in 4 seasons (November, March, beginning of June before the sediment flushing operation, end of July after the sediment flushing operation, and September)	EMSU-PMO-NEA	NRs 3 million for 20 years
	▪ Water sampling and analysis (reservoir area: close to the dam site)	a) Water temperature, turbidity, DO b) pH, BOD/COD, SS, coliform counts, chlorophyll a, Pheophytin, inorganic nitrogen (I-N), inorganic phosphorus (I-P) c) Ingredient of bottom sediment d) Phytoplankton e) Heavy metals, hazardous substances, carcinogenic substance	a) 0.1 m from the water surface, 0.5 m from the water surface, 1 m interval from the water surface to the bottom b) Surface layer (0.5 m from the water surface) Middle layer (half of the water depth) Bottom layer (1 m above from the bottom) c) First surface layer of the sediment d) Surface layer of water e) Surface layer of water	a) Once a month b) Once a month c) Twice a year (End of May just before the sediment flushing operation, and November after stabilizing the bottom condition) d) Once a month e) Twice a year in dry season and rainy season)	EMSU-PMO-NEA	Included in the above.
	▪ Monitoring of riverbed sedimentation and erosion	▪ Riverbed sedimentation and erosion	▪ Several designated locations in the downstream riverbed	Once a year in dry season	EMSU-PMO-NEA	NRs 2 million for 20 years
B. Biological Environment						
▪ Operation and maintenance of dam	▪ Transect survey for wildlife	▪ Wildlife species and population, habitat condition	▪ All over the construction site and adjacent area	Every 3 years for 20 years	EMSU-PMO-NEA	NRs 1.2 million
	▪ Aquatic ecology survey for impact analysis	▪ Species composition	▪ 7 baseline stations	Every six months after 2 years of the project operation, Once a year for 10 years	EMSU-PMO-NEA	NRs 3 million
	▪ Compliance of mitigation measures for aquatic lives	a) Compliance to release of environmental flows at Seti b) Compliance to restriction of fishing activities below tailrace c) Compliance to fish stocking, fish release in the reservoir and downstream area	a) Dam site b) Downstream area of the tailrace c) reservoir and downstream area	a) Daily b) Daily c) Once a year for project life	EMSU-PMO-NEA	Part of project operation cost

Note: EMSU- Environmental Monitoring Sub-unit under Environmental and Social Monitoring Unit of PMO, NEA

1.7 Records and Corrective Actions

To demonstrate compliance with the environmental management, the construction contractors will maintain daily records of his mitigation implementation and monitoring works during the construction phase. The EMSU shall carryout monitoring works with the Supervising Engineers and prepares Bi-monthly Monitoring Reports during construction phase. He shall also maintain the records of any corrective actions recommended to the contractor and its performance. The Bi-monthly Reports produced by the EMSU in co-ordination with other sections of RSISU shall be distributed to the stakeholder for their comments and suggestions after the approval by the Project Manager. The ESMU shall compile the Final Environmental Monitoring Report of the construction phase within 3 months of the construction completion and submit to the Project. The project shall pass the report to stakeholders to get feed back and provide database of environmental management works of the project for future use.

1.8 Environmental Audit

As per EPR, Ministry of Environment, Science and Technology shall prepare an environmental audit report of the project after two years of project Operation. The audit shall be based on the monitoring reports of the ESMU, Supervising Engineers, and POE with limited field visits and data collection. Project performance audit reports include a final assessment of the degree to which the project satisfied the proposed environmental requirements, the effectiveness of mitigation measures and institutional development and whether any unanticipated effects occurred as a result of project activities. Though auditing is the legal responsibility and works of MOEST, it lacks adequate resources to cover these works. It is therefore, the proponent is recommended to allocate a sum of NRs. 0.35 million for auditing.

1.9 Summary of Environmental Cost

Table 1.9-1 and **1.9-2** presents the environmental cost summary for pre-construction, construction and operation phases of the project respectively. **Table 1.9-3** presents the total environmental cost of the project.

Table 1.9-1 Environmental Costs in Pre-construction and Construction Phase

Physical Environment	
Cost for Clearing the Vegetation in the Reservoir	43.10
Monitoring for Air, Water, Noise, Vibrations & Spoil Management at Works Areas	5.32
Watershed Management Programs for 10 Years*	111.50
Mitigation Measures for Eutrophication	63.6
Grand Total (million NRs)	**223.52**
Biological Environment	
Cost for Clearing the Vegetation in Reservoir	3.72
Support to Kaligandaki A Hatchery for 5 Years	73.5
Capture & Release of Wildlife including 2 Reptile Species	0.5
Fish Monitoring during the Construction Phase	1
Grand Total (million NRs)	**78.72**
Compensation and Rehabilitation	
Cost Estimation for the Private Land	999.51
Cost Estimation for the Structures	33.972
Cost Estimates for Agriculture Production Equivalent to One Year Production	0.663
Other Rehabilitation Compensation to Relocate	90.88
Transportation Allowance to affected Structure Owners Other than the Affected Residential Structure Owners	0.47
Grand Total (million NRs)	**1125.5**
Social Action Plan	
Replacement of Affected Infrastructures by the Reservoir	85.5
Community's Initiative Support Program	52.13
Skill Enhancement and employment	10.14
Agricultural Development Programs	27.51
Community/Public Health and Education Enhancement Programs at the Project Construction sites	9.66
Community/Public Health and Education Enhancement Programs at the Reservoir affected VDCs	6.27
Women Development Program	13.03
Watershed Management Programs	12.31
Rural Electrification Programs	19.55
Total (million NRs)	**236.10**

Table 1.9-2 Environmental Costs in Operation Phase

Physical Environment	
Measures for Downstream Effects	3.8
Monitoring of Water Quality in Reservoir & Surrounds for 20 Years X 2 Times / Year	3.0
Monitoring of Reservoir & River Bed Sedimentation and Erosion for 20 Years X Once / Year	2.0
Grand Total (million NRs)	**8.8**
Biological Environment	
Compensation to Dept of Forestry for Trees, Community Forests & to Private Tree Owners	287.8
Annual Release of Purchased Carp fry & extras – 20 years	80
Fisheries Extension Program for Reservoir Area	10
Wildlife Monitor in the Reservoir Area	0.5
Monitoring of Wildlife for 10 Years	1.2
Fish Monitoring for 10 Years	3.0
Grand Total (million NRs)	**382.5**
Socio-economic Environment	
Monitoring of affected people and communities for 10 years	1.80
Grand Total (million NRs)	**1.80**

Table 1.9-3 Administrative and Management Cost

Administrative and Management Cost	
Consultant Remuneration	17.34
Support facilities	32.47
Information Dissemination and Feedback	1.70
Grand Total (million NRs)	**51.51**

Table 1.9-4 Summary of Environmental Cost

Summary of Environmental Cost		
1	Physical Environmental Cost	224
2	Biological Environmental Cost	461
3	Cost for Compensation and Rehabilitation	1,126
4	Social Action Plan	236
5.	Socio-Economic Environment	2
6	Administrative and Management Cost	52
Grand Total (million NRs)		**2,101**