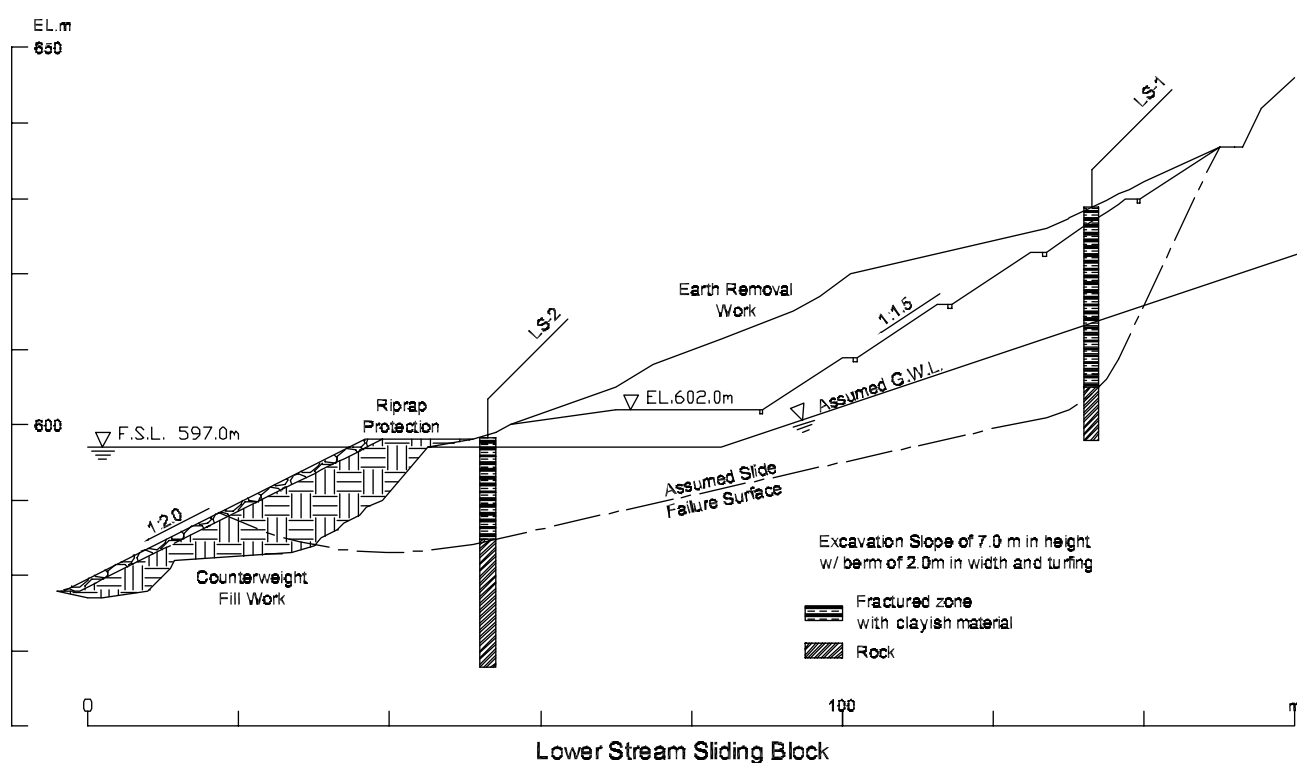
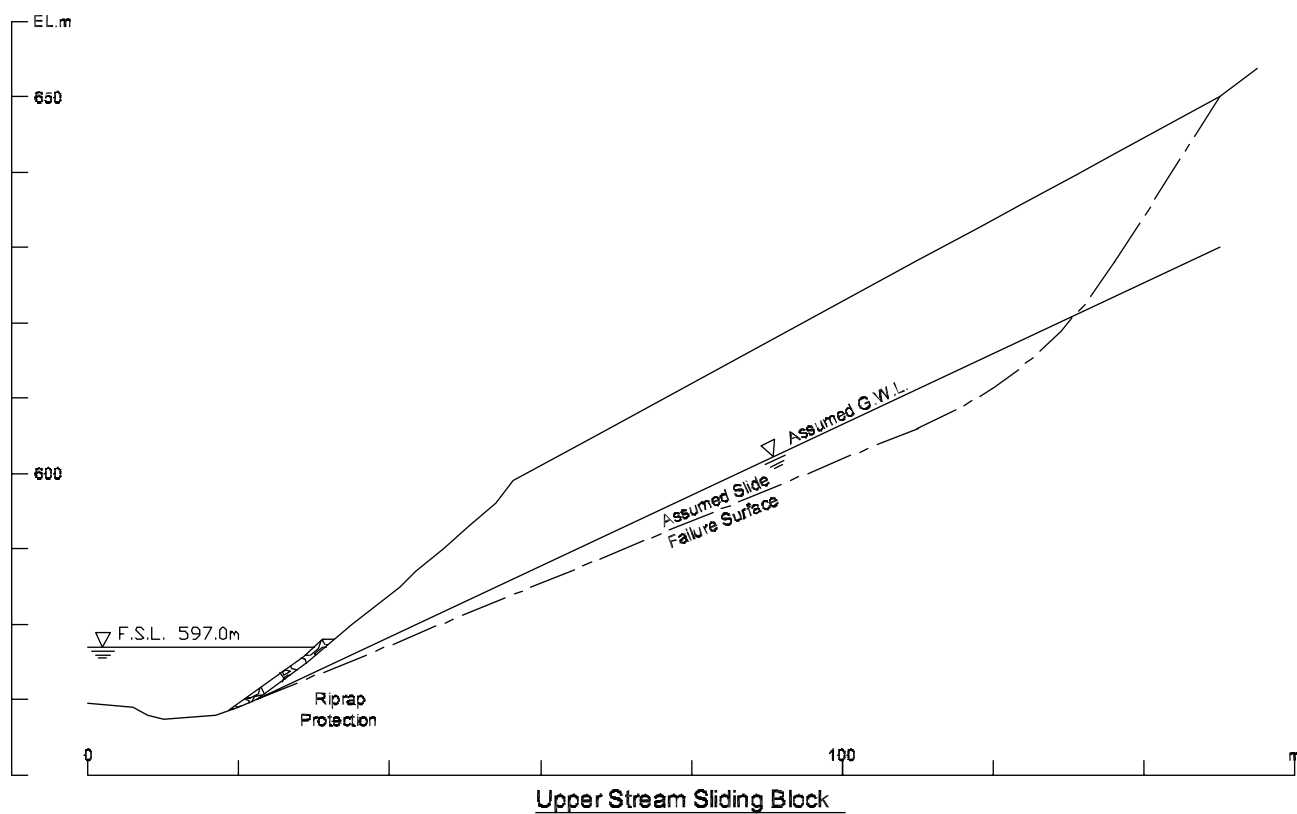


THE UPGRADING FEASIBILITY STUDY ON THE DEVELOPMENT
OF THE KULEKHANI III HYDROPOWER PROJECT
IN THE KINGDOM OF NEPAL

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure 3.4.3

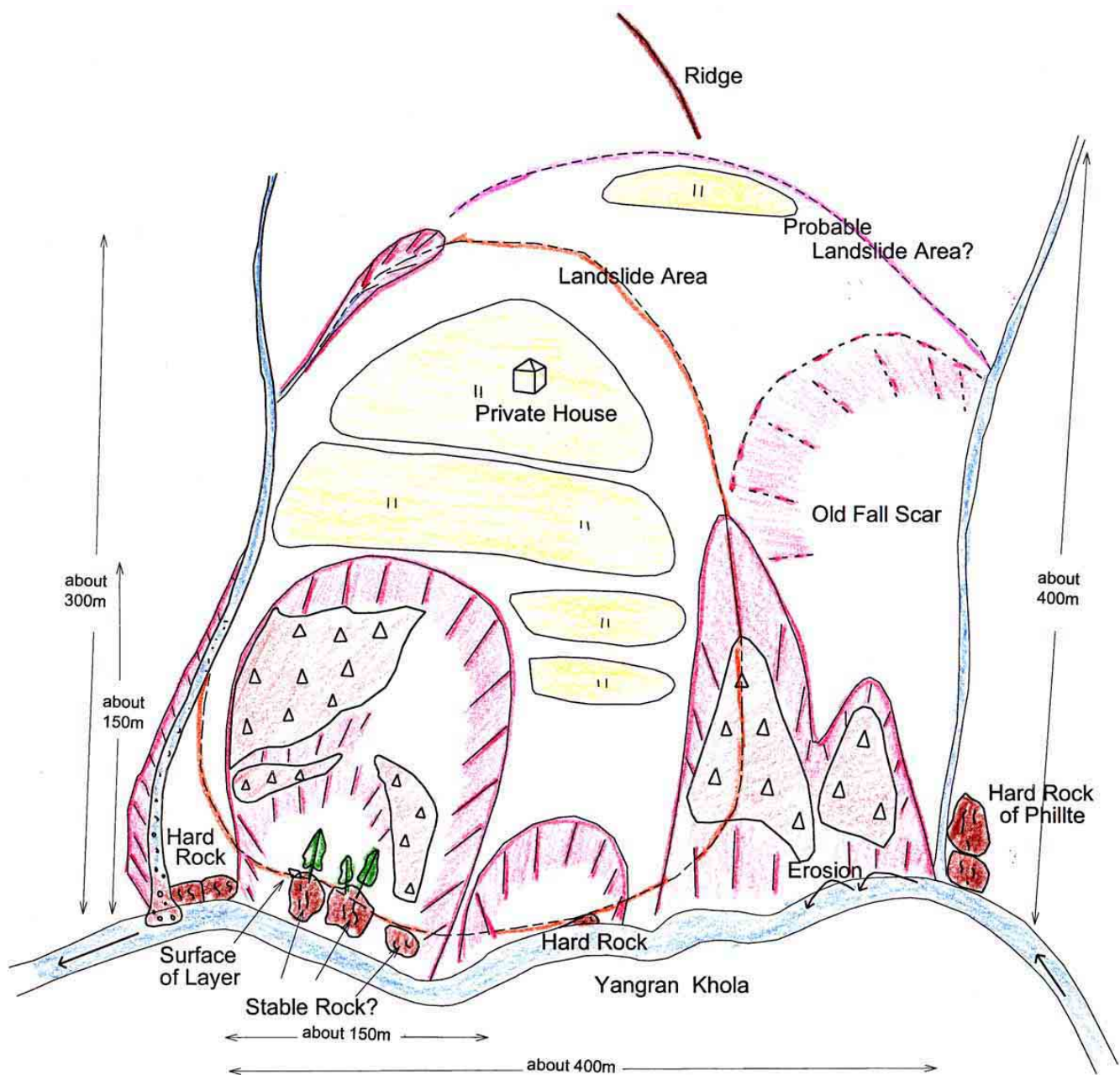
Sketch of Landslide R-1



THE UPGRADING FEASIBILITY STUDY ON THE DEVELOPMENT
OF THE KULEKHANI III HYDROPOWER PROJECT
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Figure 3.4.4
Cross Sections of Landside in Yangran
Regulating Pond and Countermeasure Work



THE UPGRADING FEASIBILITY STUDY ON THE DEVELOPMENT
OF THE KULEKHANI III HYDROPOWER PROJECT
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Figure 3.4.5

Sketch of Landslide R-2

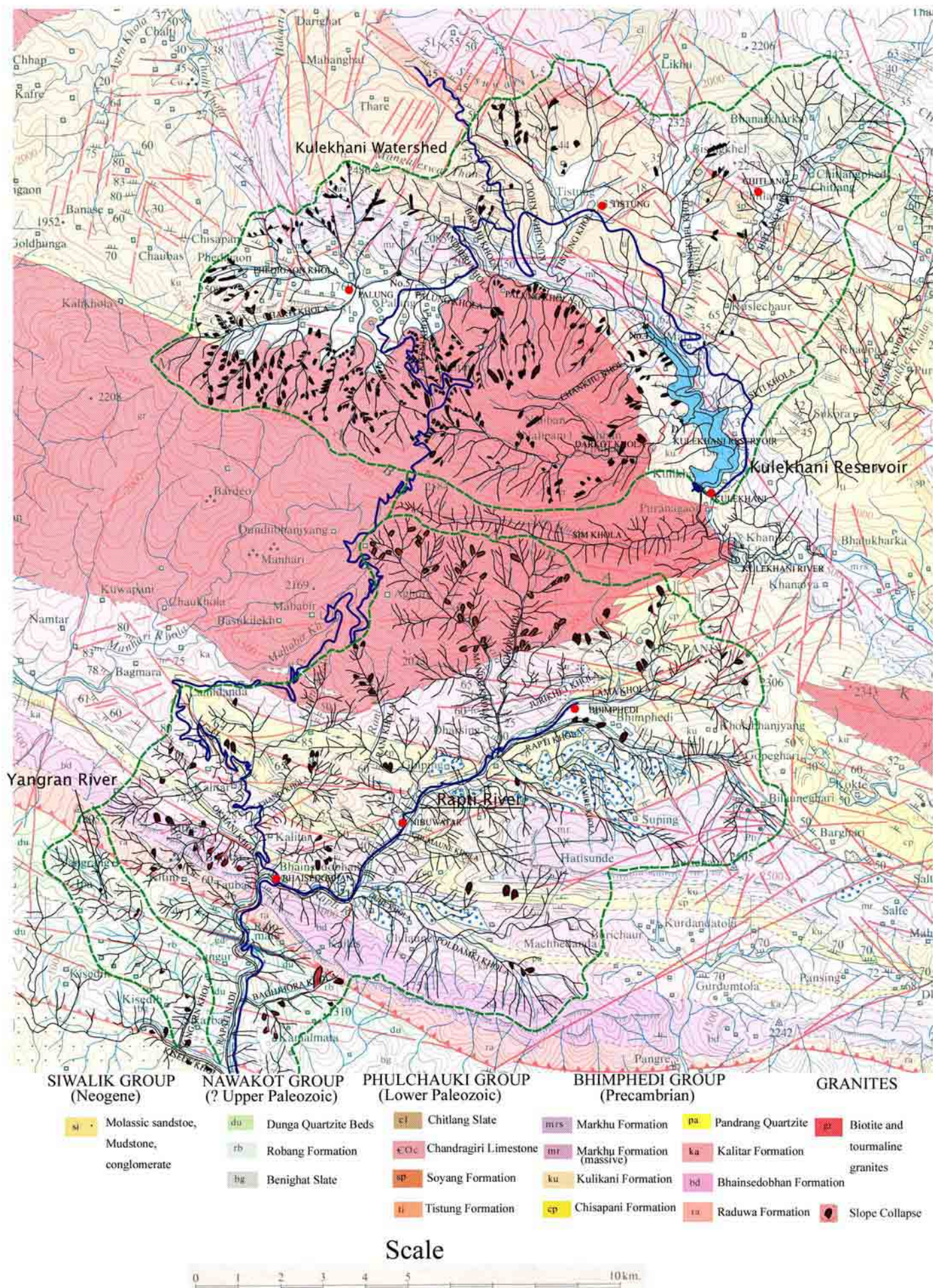


Figure 3.5.1 Geology and Slope Collapse in Project Area

Chapter 4

CHAPTER 4 ENVIRONMENTAL ASSESSMENT

4.1 Introduction

4.1.1 Environmental and Social Background

Knowledge of the Project's environmental and social background is generally good, with the Kulekhani III Hydropower Project (Kulekhani III) having been studied "Environmental Impact Assessment of Kulekhani III Hydroelectric Project in March 2001" by NEA and "the Supplemental Environmental Impact Assessment (Supplemental EIA)" of this Upgrading Feasibility Study and with numerous visits to the area by experts.

The Nepal Electricity Authority (NEA) commissioned an EIA of the Kulekhani III in 2000/2001. The original EIA was submitted to the Ministry of Water Resources (MoPE) in March 2001 and additional information in December 2001. Approval of the EIA in August 2002 clears the way for the Project's implementation and allows for revisions to the EIA and the Environmental Management Plan (EMP), especially to take into account any new components, such as the transmission line.

The impacts on the natural environment are typical of a run-of-river hydro project and have been minimized during the Project's planning and design. Among the impacts on the natural environment will be extensive intrusions into the Yangran Khola (*Khola* is *Nepali* for 'River'). The impacts on the social environment are also known, such as those caused by land acquisition and the influx of the construction workforce.

The environmental and social descriptions, impact assessments, and the management and monitoring plans have been revised to reflect the final Project design layout and the resulting effects of the Kulekhani III that are anticipated. All of these aspects are covered in the supplemental EIA studies recently completed by the JICA Study Team. This supplemental EIA studies summarizes that:

- The impacts on the natural environment (water quality, fauna and flora, fisheries and aquatic ecology) by implementing the Project would be minimal.
- The river maintenance flows of the Yangran River are proposed 0.1m³/sec in the dry season and 0.3m³/sec in the rainy season by taking into account the irrigation water of 0.04m³/sec for Sanutar and Gumaune Villages and applying 90% discharge in both seasons as the minimum requirement.
- The impacts on the social environment are: 1) resettlement and land acquisition in Sanutar and Gumaune Villages along the access road and at temporary facilities, 2) the Yangran regulating pond area, 3) the tailrace outlet area on the Rapti River's right bank, and 4) the daily water release from the tailrace about 4km downstream on the Rapti River to the Hetauda Bridge.
- Resettlement and land acquisition are estimated at 25 households and 15 ha.

- The establishment of the Kulekhani Environmental and Social Management Unit (KESMU) and the execution of the Environmental Management Plan (EMP) consisting of the Resettlement Plan (RP), Social Action Plan (SAP), and Public Consultation (PC) are recommended for mitigation of the social environmental impact.

4.1.2 Nepal Legal and Administrative Framework

Under present HMG Nepal legislation, specifically the Environment Act (1997) and the Environment Protection Regulations (1997), the Ministry of Population and Environment (MoPE) is required to approve the Project's Environmental Impact Assessment (EIA).

NEA will submit any revisions to the EIA to MoPE after consultation with MoWR and with its transmission line EIA consultants, who are carrying out a separate assessment of this Project component.

4.1.3 Japan International Cooperation Agency (JICA) and Japan Bank for International Cooperation (JBIC) Impact Assessment Guidelines

The *Upgrading Feasibility Study* for the Kulekhani III is granted by JICA, and the Project's construction will be financed by international donor. In general, the *Upgrading Feasibility Study* follows the guidelines as they apply to the physical, biological, social and cultural aspects of the EIA, including public consultations. The references used are:

- JICA – *Environmental Impact Assessment Guidelines for Development Studies* (1994)
- JBIC - *Environmental Guidelines*, April, 2002

As the JICA and JBIC guidelines tend to deal more with the natural environment, and comprehensive social policies and guidelines are more explicitly defined by the Asian Development Bank's (ADB's) policies for involuntary resettlement, these have been used for formulating the RP and SAP framework.

4.1.4 World Commission on Dams (WCD) Report and Recommendations

As a background to the latest requirements, the WCD's report "*Dams and Development: A New Framework for Decision-Making*" (2001) has been referred to. This report makes many recommendations and contains policies and guidelines relating to both natural and social impacts and to the involvement of Non Government Organizations (NGOs). On the other hand, since the WCD report focuses on large dams and reservoirs, it is in some respects not fully appropriate to the Kulekhani III, which is a run-of-river project.

4.2 Review and Status of Existing EIA Documents

4.2.1 NEA's EIA

The "*Environmental Impact Assessment of the Kulekhani III Hydroelectric*

Project” prepared by NEA in 2001 was reviewed at the beginning stage of the Upgrading Feasibility Study. The baseline natural environment described in this document is adequate in terms of the physical and biological environment, with its greatest emphasis on the vegetation/forest resources, wildlife and biodiversity, fish and aquatic life and social and general data on socioeconomic and culture, including profiles of communities of the Project area. The report is supplemented here with respect to the implications of implementing the Project in terms of mitigation measures with respect to land acquisition, and possible direct and indirect resettlement effects, and in its EMP, especially in terms of funding.

The previous EIA of NEA in 2001 is supplemented here with respect to land acquisition, including identification of the actual plots affected, and possible direct and indirect resettlement effects. Over half of the plots identified for land acquisition were in Hetauda, Ward 1, to be affected by the tailrace outlet’s impacts downstream, 4 km to the Hetauda Highway Bridge. On investigation, it was found that much of the irrigated agricultural fields had already been destroyed by the 1993 floods; that the lands would not be impacted by the tailrace outlet, for reasons given below, and that only one or two of the properties listed in the original EIA’s annexes could actually be found by using the official cadastral maps obtained from the District Survey Office (DSO) in Hetauda.

Although not predictable at the beginning of the supplement EIA survey fieldwork, it has since transpired that most of the irrigated lands, as well as water mills, have since been destroyed by floods that occurred during July 2002. The original EIA also did not account for resettlement effects. This was despite the fact that the camps associated with the Project, on close examination of existing documents, displaced Sanutar’s school and many of its homes and would have required acquisition its irrigated rice paddy fields, so that resettlement would have been impossible to avoid.

In Nepal’s environmental legislation, under which the original EIA was prepared, it was expected that the question of land required by the Project would be adequately handled under the *Land Acquisition Act, 2034 (1977)*, or LAA, which also makes no provision for resettlement effects caused by development projects. Accordingly, to meet international standards in this regard, the Study Team adopted the ADB’s policy for involuntary resettlement as a guideline for investigating and preparing mitigation for any resettlement effects encountered.

This was appropriate, as the ADB has been providing technical assistance to HMG for updating the LAA to adequately address resettlement effects. Also the ADB’s recent involvement in the Kali Gandaki A and Melamchi Water Supply Projects have provided the Study Team with applied examples setting precedents for the policy adopted in the RP. This has been an important improvement to the original EIA, since it has been impossible to entirely avoid the dislocation of houses. It is also likely that many of those households losing agricultural land will

suffer a significant impact on their livelihoods, for which the RP will provide rehabilitation assistance.

The original EIA proposed a set of social programs that were well conceived, and the Study Team has integrated these into a Social Action Plan (SAP) designed to:

- take advantage of the opportunities for local development the Project will provide,
- mitigate identified indirect resettlement effects not immediately caused by land acquisition, and
- promote good long-term community relations for the Project extending beyond its construction phase into operation.

The Supplementary EIA fieldwork included a socioeconomic survey of the 55 households of the most impacted communities of Sanutar, Ghumaune and Pari Ghumaune, updating the work done in the original EIA. A GIS (Geographic Information System) map was also prepared in the course of the Supplementary EIA fieldwork that includes official cadastral map data as well as the final Project design boundaries. This map has, by reference to individual houses and land plots on the map, identified the Project's direct resettlement effects so that an RP budget could be prepared based on the most reliable information to date. The database acquired will be updated during the detailed design study phase.

4.2.2 Supplemental EIA Field Studies

The Terms of Reference for the supplemental EIA Studies were prepared by the Study Team in November 2001 based on a review of the existing EIA. The main survey work was executed in March 2002 for the dry season and in June 2002 for the wet season, focusing on:

- Confirmation of impacts on the natural environment (water quality, fisheries and aquatic ecology, fauna and flora) and on the social environment (socio-economy and culture) around the Project area,
- Assessment of impacts on the natural and the social environment caused by the Project's implementation,
- Compilation of basic information on land use and on its acquisition by the Project and an integration of with the resulting relevant data into the RP and SAP framework, and
- A review and preparation of an updated EMP.

The supplemental EIA is outlined in Tables 4.2.1 and 4.2.2 for the natural and social EIA field surveys respectively (Refer to *Part A, Chapter A.4 and Part B, Chapter B.1 in Volume III, the Supporting Report (2)*). The Project area covered by the supplementary EIA survey fieldwork is shown in Figure 4.2.1.

4.3 Natural Environment Assessment

4.3.1 Project Impact Zones

The environmental impact of the Kulekhani III will occur mainly during the construction phase. During the Project's operational phase, the impacts will focus on the altered regimes, river maintenance, and the management of the regulating pond, the check dams and the Yangran watershed. Based on this, discussion in this section is according to the:

- Headworks area including de-sanding facilities, open channels to headpond, intake facilities and tunnel portal,
- Work adit and its access road along the Rapti River and spoil bank A located on Rapti River floodplain upstream of the Bodegarha Khola,
- Sanutar area and regulating dam/pond and check dams including access roads and bridge across the Rapti River, tailrace box culvert across the Kesadi Khola, contractor's camp and facilities, spoil banks B and C, regulating dam/pond, two upstream check dams, access adit to the tunnels and power station,
- Tailrace outlet and its associated facilities including access road and spoil bank D, and
- Downstream channel zone including the alteration the Rapti River's regime, the riverside communities, irrigation intakes and the engineers' and contractor's camps.

The general layout of the Kulekhani III will also make extensive use of the Tribhuvan Highway between Nibuwatar and Hetauda. The main features referred to above are shown on Figure 4.3.1.

4.3.2 Inventory of Natural Environment

This section summarizes the fieldwork results for the natural environment, including water quality measurements, vegetation, fisheries, wildlife and aquatic ecology during the dry season (March) and the wet season (June), 2002. Individual maps are provided of the respective sampling sites, which included both the Project area and, for comparison, within the similar catchment of the lower Rani Khola.

(1) Surface Water Quality

The results of the water quality sampling are presented below for both surveys, and all nine (9) sampling locations are shown in Figure 4.3.2. The parameters monitored are summarized table below, and explained in *Section A4.1 in the Supporting Report (2), Part A*.

Parameters Tested	Dry Season – March 2002 (Ave 9 Sites)	Wet Season – June 2002 (Ave. 9 Sites)	WHO Standard for Drinking Water
Temperature (°C)	19.9	25.6	-
pH	8.44	8.21	-
Conductivity (µmhos/ Cm)	169	159	-
Total Suspended Solids –TSS (mg/l)	10.0	642.0	-
Total Phosphorus – TP (mg/l)	0.04	0.63	-
Total Kjeldar Nitrogen (mg/l) – TKN	0.16	0.85	-
Ammonium – NH ₃ (mg/l)	<0.05	0.10	-
Nitrate nitrogen – NO ₃ -N (mg/l)	0.80	0.88	<11.5
Nitrite nitrogen – NO ₂ -N (mg/l)	<0.01	<0.01	<0.9
Dissolved Oxygen – DO (mg/l)	8.28	8.17	-
Biological Oxygen Demand – BOD (mg/l)	1.69	0.58	-

Total Kjeldar Nitrogen: Total amount of ammonia nitrogen and organic nitrogen measured by the Kjeldar method

Conversion rate: nitrate (NO₃-) : nitrate nitrogen (NO₃-N) = 1 : 0.23
Nitrite (NO₂-) : nitrite nitrogen (NO₂-N) = 1:0.30

The conclusions that can be drawn from the measurement obtained by the sampling tests are as follows:

- There is no evidence of regional or local pollution in either the dry season or wet season, or compared with previous water quality measurements.
- As expected, increases occur in the wet season in respect to temperature, TSS, TP and TKN, and a decrease in BOD levels,
- High DO levels characterize all water samples relatively low BOD levels, and this should be protected during construction.

The water quality is good throughout the Project area. There should be no problems associated with water quality for the Kulekhani III, other than increased flows downstream of the tailrace outlet.

(2) Groundwater Resources and Springs

The Project will construct many underground structures including connection tunnel, headrace tunnel, tailrace tunnel, access tunnel, adits and powerhouse cavern. The domestic water used for villagers around the Project area could be decreased since the groundwater may be lowered by excavation of these several tunnels and underground facilities. Therefore, an inventory survey of spring water and surface water is being carried out before the Project's construction in order to establish baseline information.

The spring water inventory survey has located twenty-six (26) springs, twenty-three (23) used, and three (3) occasionally used springs in the mountains & hills along headrace, connection, and tailrace tunnels. These springs are in the villages of Amdada, Kitini, Kiteni, Nayagaun, Sanutar, Shikaribas, and Bokedah. Table 4.3.1 summarizes the results of the survey.

One of the common problems with the tunnels and underground power stations is

the interception of groundwater flows. An inventory survey of the natural spring waters used by the local communities was carried out in the vicinity of the tunnel alignment, and the results are shown in Table 4.3.1.

The results show that:

- A total of twenty-six (26) springs is serving approximately two hundred and thirteen (213) households with drinking water, livestock water, and occasionally irrigation.
- Two-thirds of the springs are provided with PVC pipes and several have improved terminals for collecting water, including one provided by the NGO PLAN International at Sanutar and one supplying the Hetauda Cement Industries LTD's (HCIL's) canteen at Kitni.
- The discharge ranges from 0.04 to 3.00 l/sec in the dry season to 0.05 to 8.23 l/sec in the wet season, with high flow rates occurring at the lower elevations early in the dry season due to the permeability and levels of water in local rocks.

(3) Vegetation and Forest Resources

The terrestrial vegetation survey involved a total of nine (9) locations with a total of thirty (30) individual sampling plots. Detailed data and locations of sites surveyed are shown on Figure 4.3.3. The results are summarized as follows:

- The vegetation cover along the main access road and in the Yangran Khola has more species and diversity of trees and shrubs (i.e., twice as many species), being parts of the community or the National Reserve Forests (NRFs).
- At least eleven (11) tree species are used for timber, fodder or fuel wood and sixteen (16) species as medicinal plants.
- Protected trees are only found along the main access road and in the Yangran Khola, and only about 1/3 of them are trees, the rest being poles or sapling size.

Presently, the Sanutar-Bokedaha and Yangran Khola areas are covered by two Forest User Groups (FUGs) that manage the Bokedaha and Kalika-Kesadi Community Forests (CFs). The area impacted by the check dams is apparently a NRF, but the community is trying to get it declared a CF.

(4) Wildlife - Mammals, Birds and Reptiles

With respect to the distribution of mammals, the Jackal, Rhesus Macaque, Common Langur, Bat, House Rat and Red Fox are the most common and most of the records for rarer species of concern, i.e., the Otter, Leopard and Jackal, are based on local information. A total of thirty-five (35) species of birds were recorded in the Kulekhani III area, with the eleven (11) species in the intake area

and the Rani Khola and nineteen (19) species in the regulating dam area. Most of the species recorded were classed as residents, and no recorded species is listed as protected either by HMG Nepal or International Union for Conservation of Nature and Natural Resources (IUCN) / Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Most of the six (6) species of reptiles recorded for the area are common, and only one (1) species, the Rat Snake, is listed as threatened under CITES II classification.

(5) Fisheries Resources and Use

Extensive work was carried out relating to the fisheries aspect, and this is included in *Section A.4.5 in the Supporting Report (2), Part A*, including several tables relating to fish species present, records of catches and catch per unit effort. The main results for the fish sampling are shown in Table 4.3.2. This shows that most of the eighteen (18) species are residents, and not migratory species, of their local section of the river or creek.

Two families (i.e. Carp and Torrent Minnows) comprised of six (6) species dominate the population. Copper Mahseer (13.5%) and Stone Rollers (29.6%) and Torrent Minnows (*Barilius* spp) (41.7%) account for 85 percent of the species caught overall. There is no IUCN/ CITES classification for rare fish species, but a Nepalese classification indicates that the mid-range and long distance migrant species characteristic of the wet season are the rare (Torrent Catfish) and the vulnerable species Copper Mahseer. The lower Yangran Khola (9 species) and Rani Khola (4 species) contain rare or vulnerable species, the Copper Mahseer and the Torrent Catfish, which are widely distributed elsewhere in the system.

(6) Aquatic Insects and Amphibians

The phytoplankton, zooplankton and aquatic insects were measured during both the dry season and wet seasons and at the fisheries sampling sites shown on Figure 4.3.4. The collected data is summarized in tables in *Section A.4.6 in the Supporting Report (2), Part A* and show:

- Domination of some seventy-six (76) species of phytoplankton by *Bacillariophyceae* (63%), *Chlorophyceae* (16.6%) and *Phyrophyceae* (10.8%), with the number of species decreasing in the wet season by approximately 25 percent,
- Complete domination of the thirty-two (32) species of zooplankton by *Rotifera* (75%) and a also decreases in the number of species in the wet season by 25 percent,
- The Rapti River sites completely dominating the numbers of species and actual counts of both phytoplankton and zooplankton and with the Yangran Khola accounting for less than 8 percent of the total numbers, and
- The thirty-one (31) species of insect larvae dominated by the *Ephemeropter* (Mayflies) and *Odanata* (Dragonflies), with the number of species

increasing significantly in the wet season insects (25-50%), except on the Rapti River upstream of the Khani Khola.

(7) Rare and Endangered Species

The occurrence and distribution of protected and rare species were noted for types of vegetation, mammals, reptiles, birds, fish and aquatic insects. The general classifications of the affected species are summarized in Table 4.3.3. Recognition and caution should be given to recordings of the Yellow-throated Marten, Leopard and Rat Snake, which occur in the Yangran Khola, and the Otters inhabiting river bank sites along the Rapti River, in the vicinity of the headworks and intake.

It is estimated that a total of forty-one (41) mature trees and one hundred and seventeen (117) pole-sized trees, of which most are *Shorea robusta* or *Sal*, will be lost, and explicit actions regarding these and their compensation will have to be negotiated with the District Forest Office (DFO) and the local FUGs. These figures will change, however, once the actual access roads and location of the Yangran Khola facilities are actually surveyed, and trees and saplings are counted, during the pre-construction phase.

(8) Dust, Noise and Vibrations

No background measurements were made in respect of dust, noise and vibrations, but it would be advisable to survey background levels during the pre construction phase.

4.3.3 Impacts during Construction

(1) Surface Water Quality

The results of the water quality survey show the uniform and good water quality in the Project area. The onus is on the Kulekhani III to protect this water during construction. This can best be achieved by the following measures:

- Containment and controlled releases from all tunnel portals and spoil disposal areas through containment of wastes in discharges and in settlement ponds,
- Containment of all runoff from active construction zones through diversion and treatment and sedimentation of flows to the greatest extent practical,
- Periodic monitoring of potential point sources of pollutants (e.g., workshops, batching plants, construction zones and camps), and
- Provision of alternate water supplies for camps, villages affected by project development and regular monitoring of sources and their uses.

Contractors will have to meet the *Water Quality Standards for Effluents, 1992* under the *Water Resources Act, 1997* and the *World Health Organization (WHO) Standards for Drinking Water (1993)* for water supplied to camps or from alternate sources for affected communities.

(2) Groundwater Quality

The biggest risk to groundwater quality is through adverse effects on quantities by tunneling activities. The inventory of springs indicates these risks are to six (6) springs; Nayagaon (springs N4, N5 & N6 – 28 HHs), Shikaribas (spring Sh 1- 4 HHs), Sanutar (spring Sh 3- 7 HHs) and Nakoligaon (spring Na 2- 1HH), indicating a total of forty (40) households. Direct monitoring of the use and flows of these springs during construction, in the vicinity of the adits, tunnel and the power station can confirm this. Regular monitoring of the remaining twenty-one (21) springs sampled is recommended in both the dry and wet seasons.

(3) Vegetation and Forest

The probable impacts of the Kulekhani III on the local vegetation and forests will focus on the main access road at Sanutar and in the Yangran Khola valley. These areas are forested. Local losses will be significant to the Yangran valley. However, no extinction or threatening losses to the integrity of the vegetation resources on a regional basis is likely to occur. Minimal impacts are associated with the clearing necessary at the headworks, access road and work adit and the tailrace outlet channel.

Compensation and afforestation measures will need to be negotiated with the DFO and the local FUG. The affected areas are Bokedaha and Kalika-Kesadi CF with a total area of 98.9 ha and including over 300 FUG households. Obvious changes in the land configuration around the regulating dam/pond and the check dams on the Yangran Khola will require a long term Yangran Watershed Management Program (YWMP) covering the entire catchment. This YWMP must incorporate the whole of the existing two CFs of Bokedaha and Kesadi/Kilalia.

(4) Wildlife

The Kulekhani III construction phase will impact on the riverine habitat and wildlife resources in the middle reaches of the Yangran Khola valley. The impacts in habitat are in other areas, such as the headworks, work adit and tailrace channel, since all these habitats are already affected to some degree by degradation and exploitation by local communities. The mammals and their status as rare or endangered species is given in Table 4.3.3, and indicates that:

- The Leopard (if this species does exist) and its prey, the Barking Deer (not an endangered species) and the Yellow-throated Marten are the most vulnerable species due to the losses in forest habitat in the Yangran Khola.
- All other species in the Yangran Khola including the Common Langur, the Rhesus Macaque and the Jackal may lose some habitat but, they are considered adaptable to the altered environment, frequenting a variety of habitats such as agricultural fringes and degraded forest.
- Local populations of the Otter may be adversely affected by the headworks

and intake structures, but they will probably seek new homes in adjacent areas.

(5) Fisheries and Aquatic Ecology

The aquatic life and fisheries resources of the Project area are subject to substantial variations through the flooding associated with normal monsoons. This annual variation affects their breeding, their population and their distribution across the aquatic habitats. It is improbable that the various project infrastructure in the rivers and creeks will affect any of the fish species or their migration, except for the Yangran Khola, where project infrastructure will affect resident species such as Stone Rollers, Torrent Minnows, Loaches and possibly the Copper Mahseer present only in the lower reaches. All these species are common not only in the Rapti River catchment but also throughout Nepal. Snow Trout and other migrant species were not recorded in the Yangran Khola. Thus, the main impact will be on a very small population of Copper Mahseer breeding in the lower Yangran Khola, affecting the margins of their habitat through the barrier effects of the dam.

Temporary adverse effects, limited in scope and extent, would occur on local fish populations through the following:

- Disruption to movement, feeding and breeding through river diversions in the Khani and Kesadi Kholas,
- Visual and smothering effects on feeding potential due to increased sediment loads while work is carried out in the river course, or through accidental spillage from construction areas or spoil disposal sites, and
- Loss of habitat through construction of the headworks and tailrace channel in the Rapti River and the cut and fill in the Kesadi Khola.

The effects on the local populations of the phytoplankton, zooplankton and aquatic insects during construction will also be temporary and limited.

(6) Rare or Endangered Species

The effects of the Kulekhani III on rare and endangered species will be minimal and confined to the Yangran Khola. The loss of protected trees (i.e., *Shorea robusta*, *Michalia champaca* & *Bombax ceiba* – 41 mature trees) is small. It will be compensated for through suitable afforestation programs put in place through the YWMP involving the local FUGs.

The situation with the mammals being IUCN/CITES listed as threatened or rare species can be stated as follows:

- Leopard, if present, is still only reported as present in the Yangran Khola, but it would move to the residual forest areas,
- Common Langur and Rhesus Macque are common to all areas surveyed and

- similar habitats throughout Nepal, frequenting the agriculture fringe areas,
- Yellow-throated Marten and the Jackal, listed by CITES III as requiring international cooperation to control trade in their skins, are common in Nepal and are adaptable to forests and agricultural areas, and
 - Otters, at sites along the Rapti River, are adaptive to change and will move to new suitable habitats along the river, as they will have done after the 2002 monsoon season's heavy floods.

None of the birds surveyed are on HMG Nepal or the IUCN/ CITES protected lists. The Rat Snake is considered likely to move to and survive in those areas of the Yangran Khola and around the intake structure that are less affected. Similarly the fish species, Copper Mahseer is common throughout the Project area. The Yangran Khola is not a key habitat for Copper Mahseer and the species can certainly survive and re-colonized other river sections. The Kulekhani III will have no marked effect on its distribution during construction other than the temporary disturbances due to construction activity in the rivers.

(7) Dust, Noise and Vibrations

The aspects of dust, noise and vibration impacts during the Project construction will be widespread across all the construction zones and to some extent along the linking sectors of the Tribhuvan Highway. Affected communities and the main centers of construction activity will have to be monitored and appropriate public safety actions, such as on-site vehicle speed restrictions and watering of roads for dust suppression, taken, as required. The necessary remedial and mitigation measures have been included in the EMP.

(8) Transport and Operation of Spoil Sites

The most dominant impact of the Kulekhani III construction phase will be the access roads, including bridges, and operation and spoil disposal sites. All material excavated either underground or on the surface will be trucked to the nominated spoil disposal sites. Similarly, as much of the access roads are located in steep or zones of poor stability, extensive protection works and re-vegetation of slopes will be necessary to be carried out by the contractor. Spoil disposal sites have been selected in locations on the upper floodplains and where they will not affect stream flows. The open-cut across the Kesadi Khola will require stability works and careful execution in view of the relatively rapid rise in flood flows in this catchment during the monsoon season.

1) Access Roads and Bridges

At least 4.1 km of permanent access roads and a motorable bridge across the Rapti River to the Project's main work area are envisaged, plus at least another 3.3 km of secondary access roads are required for camps, to spoil disposal sites and to the open-cut and refill area on the Kesadi Khola.

2) Spoil Disposal

Spoil disposal (muck) from the various excavations has been estimated but may change due the actual road construction, river diversions or tunnel excavations. Currently the following four (4) spoil disposal areas are proposed, as shown in Figure 4.2.1, to accommodate 840,000 m³ of spoil.

A detailed waste disposal plan will be required from the contractor as part of his EMP.

(9) Camps and Proposed Locations

In order to minimize the land take in the Sanutar area and to preserve land available for agricultural activities, the following camps have been proposed:

- One construction camp is located at the Headworks (Bhaise) using the land and facilities around the Kulekhani II Power Station.
- One Construction Camp is proposed at Ghumaune, occupying the entire settlement area of Ghumaune, acquired on a temporary rental basis during the construction phase, and with the rehabilitated agricultural land being returned to the owners.
- Labor camps are proposed at Hetauda for housing the Project's work force and at the Sanutar and Yangran areas for the headworks/adit 1 area workforce.
- NEA's diesel power plant site at Hetauda is proposed for the engineer's camp.

(10) River Diversions, Training Works and Structures

River diversions will be necessary for the Kulekhani III. The diversion of the Kesadi Khola for construction of the Tailrace box-culvert and of the lower reaches of the Yangran Khola around the dam structure will be necessary. Measures to counteract erosion, such as gabion walls, are required at all locations to protect them from erosion, landslides or river flood flows.

(11) Environmental Risks

The environmental risks for the Kulekhani III are largely geological or hydrological or relate to storm events, and include the following:

- Tectonic activity or earthquakes associated with the Main Boundary Thrust (MBT), an active slip plane crossing the Project area, and related to the power station cavern and the tailrace tunnel structures,
- Landslides and erosion risks including slips on the access roads and surrounding the regulating pond, with its seasonally and daily fluctuating levels and at existing landslides,
- Hydrological risks to surface or spring waters due to the construction of tunnels,
- Hydrological risks in terms of storm occurrence and localized flooding, which can be of consequence to project construction or its integrity in the

longer term,

- Risks to poorly constructed houses, and to loose accumulation of materials, from vibration due to drilling and blasting activities resulting in damaged houses or land slips, and
- Risks associated with operating under the HCIL's ropeway and on their leases.

4.3.4 Impacts during Operation Phase

(1) Alteration to Regimes

The Kulekhani III implementation will alter the following river regimes:

- Lower Khani River, below the Kulekhani II power station,
- Rapti River, from the Khani Khola confluence to the highway bridge at Hetauda in the dry season, through diversions of flows and daily fluctuations due to power generation,
- Yangran Khola, from the regulating pond to the Kesadi Khola junction, through storage and diversions of flows through the Kulekhani III, and
- Kesadi Khola, only marginally, as the Yangran Khola represents one-fifth (1/5) of the dry season flows in the Kesadi Khola.

Except for those in the Yangran Khola, the overall effects on the ecological integrity of the rivers affected in the dry season will be minimal and are probably not detectable or measurable in the scientific sense. Some effects on fish feeding will occur in the Rapti River and on their movements in the early and late flood season flows in the Rapti River, directly affecting fish breeding. However, monitoring of the aquatic ecology at baseline stations is recommended as a means of interpreting any measurable effects of the Project on local river regimes.

(2) River Maintenance Flows and Environmental Sustainability

The issue of environmental maintenance flows is critical for the Kulekhani III. There are both increased seasonal flows below the tailrace and reduced flows in sections of the Rapti River, in the Khani Khola delta and in the lower Yangran Khola due to diversion for power generation. Environmental sustainability of the rivers and their courses has to be viewed in the context that this is a “dynamic environment” characterized by a forty (40) times factor in seasonal flows (i.e. dry vs. wet season) and characterized by:

- High seasonal and annual variations in flows with resultant changes to the distribution of channels and sand and gravel bars in the river courses,
- Daily fluctuations in river levels in the Rapti River downstream of the Khani Khola, particularly in the dry season, due to the irregular releases from the Kulekhani II (i.e., fluctuations from 1 m³/s to 15 m³/s on a daily basis), and
- Local variation in stream gradients and channel width due to local topography, and ranging from pools to wide riffles to rapids.

1) Legal requirements and estimates for river maintenance flow

The only legal policy or guidelines for riparian rights or maintaining environmental flows in Nepal is set at 5 percent of mean annual flow for the dewatered sections of rivers. (*Aquatic Animals Protection Act, 2001*). The *Medium Hydropower Study Project* (CIWEC, 1997) recommended that dry season compensation flows of at least 0.5 m³/s apply for channels that are cut off by run-of-river projects on major rivers. This latter criterion does not apply to the Kulekhani III.

JBIC Guidelines

There are several references in the *JBIC Environmental Guidelines (2002)* to maintenance flows as itemized below:

- Part 2: Section 1 – Scope of Impacts to be Examined - refers to water usage and ecosystems
- Part 2: Section 2 – EIA Reports for Category A Projects - refers to consultations with relevant stakeholders and local residents
- Check Sheet for ODA Loan-Dam Construction Project : Section III

1) Setting of maintenance flows

Queries regarding basis for determination of maintenance flows, relevant standards for maintenance flows, and consideration for water usage, water quality and impacts on natural environment in the downstream

2) Maintaining productive fisheries

Notification and explanation of the Project to fishermen, and compensation and mitigation measures for fisheries

3) Preparing reservoir operating rules

Reservoir operating rules and catchment management plans

WCD Report

In the section entitled “Sustaining Rivers and Livelihood” the WCD Report (2001) refers to the “environmental management plan to incorporate environmental flows” and other mitigation actions as agreed with stakeholders and defines the monitoring programs required.

2) Khani Khola

Presently, the Kulekhani II releases up to 13.3 m³/s into the lower 300 m of the Khani Khola river course. The Kulekhani III plans to divert a maximum of 2.0 m³/s of the Khani Khola flows, plus all of the Kulekhani II releases, to the Yangran Regulating Pond. Two high check dams exist immediately upstream of the Kulekhani II works, forming a barrier to fish migration. There is virtually no potential for upstream migration of species, such as Copper Mahseer and Snow Trout, for breeding purposes. There are no other uses of water from along this section of the Khani Khola presently.

In view of the above situation, there are no environmental maintenance flow reasons for not permitting the Kulekhani III to divert up to $2.0 \text{ m}^3/\text{s}$ of the Khani Khola flows, meaning that it is possible to divert the water from the Khani Khola to the Kulekhani III and to not release any maintenance flow. Sufficient residual flows will exist in the Khani Khola on a seasonal basis to maintain the state of its present fisheries resources.

3) Yangran Khola

Present Status of Yangran Khola

Presently the Yangran Khola remains relatively undisturbed over most of its river course. However the lower 0.8 km of the river has been disturbed, as it is occupied, is more open, has some dry season cropping on its slopes, and provides the local irrigation supply to the Sanutar/Ghumaune area.

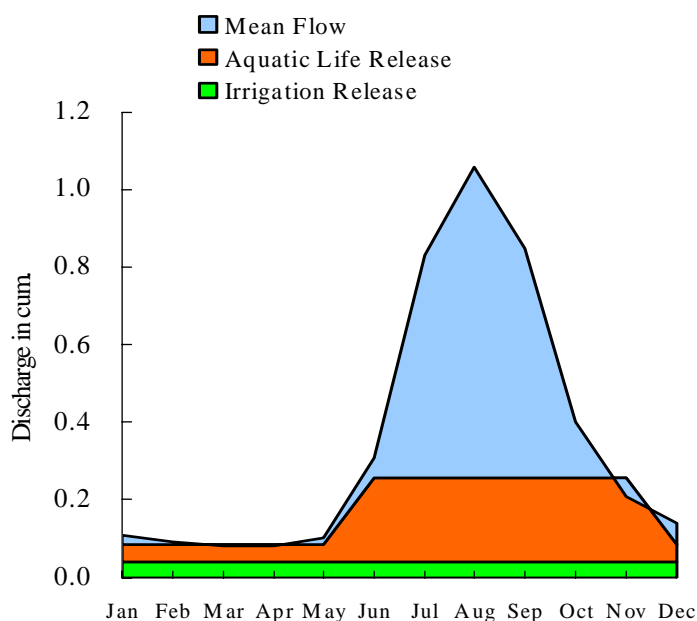
Present diversions for irrigation during the dry season are about 40 l/s ($0.04 \text{ m}^3/\text{s}$) for irrigating 8.5 ha. The exact patterns of irrigation water use in Ghumaune/Sanutar were not determined, as the entire intake for 300 m and the canal in several locations were destroyed in the July 2002 floods.

River Maintenance Flow of Yangran River

Options for a river maintenance flow in the Yangran Khola were analyzed. The nominated alternative is based on the 90 percent reliable flows on a year round basis. These exceed the requirements felt adequate for a small catchment such as the Yangran Khola and amount to 100 percent of the average dry season and 49.6 percent of the average wet season flows. The river maintenance flows in the Yangran Khola in both dry and wet seasons are summarized as follows:

Nominated Alternative Based on 90 % Reliable Flows of Yangran Khola	River Maintenance Flow of Yangran Khola (Aquatic Life + Irrigation Water)
Dry Season – December to May	Release $0.10 \text{ m}^3/\text{s}$ for river maintenance flow: (Release $0.04 \text{ m}^3/\text{s}$ for irrigation & $0.06 \text{ m}^3/\text{s}$ for aquatic life)
Wet Season – June to November	Release $0.30 \text{ m}^3/\text{s}$ for river maintenance flow: (Release $0.04 \text{ m}^3/\text{s}$ for irrigation & $0.26 \text{ m}^3/\text{s}$ for aquatic life)

A diagram representative of this environmental flow for the Yangran Khola is presented as shown below: Fish species are dominated by Copper Mahseer and Torrent Minnows, and Snow Trout are not recorded as migrating to the Yangran Khola. The Yangran Khola has a relatively low number of species (i.e., one-half of total species recorded) and also a low catch per hour of effort compared with the Rapti River and the Kesadi Khola. The nominated environmental flows of $0.10 \text{ m}^3/\text{s}$ and $0.30 \text{ m}^3/\text{s}$ in the dry and wet seasons will allow sufficient residual flows in the Yangran Khola for aquatic life, local domestic use, and for irrigation, when required, plus the retention of surplus flows for hydropower purposes.



The aquatic life release is set to be;
 Dry season : average of 90% dependable discharge
 Wet season : average of 90% dependable discharge

River Maintenance Flow in Yrangrang River

(3) Rapti River – Khani Khola Confluence to Tailrace Outlet

The Kulekhani III would affect the section of the Rapti River from the Khani Khola confluence to the tailrace outlet by a reduction in instantaneous flows of approximately $15\text{ m}^3/\text{s}$. These reduced flows in the Rapti River in effect mean a reversal to the flow, approximating that prior to the building of the Kulekhani I and II HPPs in 1982 and 1986 respectively. Maximums in mean monthly flows in this section of the Rapti River at present vary from $14.9\text{ m}^3/\text{s}$ in March and April to $35.7\text{ m}^3/\text{s}$ in August, including some $13.3\text{ m}^3/\text{s}$ of diverted flows, periodically. However, these do not reflect the peak flood flows, which reach an estimated $293\text{ m}^3/\text{s}$ for 1:1 year floods. There are some benefits to these reduced flows in the Khani Khola to the tailrace outlet section including:

- Greater availability of the causeway at HCIL's headquarters, due to cessation in peak flows in the flood season, and
- Improved access during low water at the Trikandeshwor Mahadev temple, associated with the temple's main festival in October/November.

Similarly the water quality will not undergo any appreciable changes except for the possibility of slight increases in temperature associated with the lower volumes and no Kulekhani II releases.

It is probable that the following will occur:

- Beneficial changes to the indicated 13-14 species of fish and to the general status and biodiversity of aquatic fauna and flora (i.e., phytoplankton, zooplankton and insects) indicated for these regions through more regular dry season flows and no daily fluctuations in flow other than those occurring naturally, and
- Possible reductions to fish populations on a seasonal basis due to greater ease of fishing in shallower waters, particularly near the Khani Khola confluence and in the Sanutar and Bagihora Khola regions.

Thus, although they would be noticeable in the dry season, the overall impacts on the Khani Khola to the tailrace outlet section of the Rapti River are actually acceptable and will not cause environmental disruption or degradation.

(4) Rapti River - Downstream of Tailrace Outlet

The operation of the Kulekhani III would result in the release of up to 43.1 m³/s into the Rapti River through the hours of 17:00 to 21:00 daily. This would result in regular daily fluctuations in river flow at the tailrace outlet zone (Supitar) in the dry season from 2.1 m³/s to 45.2 m³/s (mean monthly average for dry season) and in the wet season from 13.0 m³/s to 56.1 m³/s (mean monthly average wet season). These flows would be confined to the dominant channels during the dry season and are much less than the 293 m³/s at the 1:1 year flood levels. The impacts are minor in physical and natural terms, but would have some social impacts as outlined in 4.4 Social Environmental Assessment.

The effects of these daily fluctuations on the fish population and the aquatic ecosystem would be adverse, due to the regular switching between inundation and exposure of the river bank fringe community. This would affect the production of phytoplankton, zooplankton and aquatic insects, which are the food for fish. Also temporary isolation of fish in pools under such a regime would make them more vulnerable to prey and to exploitation. However, detailed monitoring of the aquatic ecosystem at carefully selected sites is required to verify this. This is a recommended monitoring measure for the operational phase of the Project.

(5) Similar Catchment – Rani Khola

The upstream Rani Khola was selected as a similar catchment to the Yangran Khola. It is similar from the water quality and size viewpoints. However, it is not similar from the natural vegetation and the wildlife population viewpoints, having fewer and different species. Thus, its comparison is limited to water quality and aquatic ecology. (i.e. phytoplankton, zooplankton and aquatic insects). The fisheries habitat in the lower reaches of the Rani Khola is seriously degraded as its dry season flows are contained within the riverbed. It is suggested that the Rani Khola be maintained for the water quality and aquatic ecology monitoring for the Kulekhani III.

4.4 Social Environment Assessment

4.4.1 Social Impact Assessment

(1) Social Impact Analysis (SIA)

The Study Team organized a Social Impact Analysis (SIA) that provided community profiles at the Makwanpur District level (including its only municipality, Hetauda), at the level of the Project Impacted Communities (PIC), which included all communities from the headworks area to downstream of the tailrace outlet, to the Most Impacted Communities (MIC) of Sanutar, Ghumaune, and Pari Ghumaune villages, where all of the houses and privately owned agricultural land to be acquired by the Project is found.

The SIA addressed in particular the Project's *indirect* 'resettlement effects,' within the framework of an Impoverishment Risks and Reconstruction (IRR) model, to better prepare an SAP that would counter these risks with a well-informed development strategy suited to local conditions. *Resettlement effects* is taken to mean, very broadly, *all* negative situations directly caused by the Project, including loss of land, property, income generation opportunity, and cultural assets. Therefore, the mitigation measures for adverse impacts as outlined in the SIA are for the most part found in the SAP's several social programs components, whereas the RP will address the *direct* resettlement effects arising from the Project's land acquisition.

Social Impact Assessment (SIA) Survey

The Study Team provided a general profile of the Project impacted Makwanpur District, in particular of Hetauda Municipality, as well as of the Project Impacted Communities more broadly, providing household & population and caste & ethnic composition for these levels and several comparative social and economic indicators for the PIC, defined as Bhaire Village Development Committee (VDC) Ward 6 where the main Project components are situated, Wards 8 & 9 of Basamadi VDC, where the tailrace outlet is located and has its downstream effects, and Ward 1 of Hetauda Municipality, where the tailrace outlet downstream impacts will occur, along a 4 km stretch of the Rapti River to the Hetauda Highway Bridge.

Makwanpur District is one of the seven hill districts located in Nepal's Central Development Region, with a population of 372,604, almost half (48.2 percent) of whom are Tamang ethnic 'tribal' peoples who will be considered among 'vulnerable' groups in the RP policy due to past official discriminatory policies and to their widely acknowledged current level of relative poverty. Chief among the other major groups that also fall within the PIC are Brahmin-Chetri high castes in the Hindu social hierarchy (together 26.6 percent) and Newars, a largely urbanized group that is found primarily in Hetauda but are also absentee landlords in the MIC villages of Sanutar, Ghumaune, and Pari Ghumaune.

Both Brahmin-Chettri and Newars predominate in Hetauda Municipality, at about 56 and 15 percent respectively, with Tamangs only 10 percent of the municipality's population of 64,482. However, in the rural VDCs impacted by the Project, Tamangs are as much as 68 percent of the population in Bhaise and more than 52 percent in Basamadi, whereas Brahmin-Chettri are as little as 6 percent in Bhaise and 31 percent in Basamadi VDC, while Newars are only about 2 percent in both VDCs. Bhaise VDC's population is 6,616 and Basamadi's 10,232.

The MIC (Sanutar, Ghumaune, and Pari Ghumaune) consists of 55 households and a population of only 349, 100 percent surveyed by the Study Team for the socioeconomic profile. This MIC profile is appropriately given in the RP rather than in the SIA, since these MIC are the only ones of all the PIC to lose their housing as well as substantial amounts of their productive agricultural land. The MIC has the highest proportion of Tamangs, at almost 70 percent of the households, Brahmin-Chettri at only 13 percent, and no resident Newars, although Newars are registered as absentee landlords and so are among the potentially affected households identified during the fieldwork's efforts to identify the lands to be acquired. The following table summarizes a few of the socioeconomic indicators at the levels of District, PIC, and MIC, as were collected through the SIA.

Summary of Select Socioeconomic Indicators from SIA

	Makwanpur District	Project Impacted Communities (PIC)	Most Impacted Communities (MIC)
Includes	District & Hetauda Municipality	Bhaise & Basamadi VDCs and Hetauda Municipality	Sanutar, Ghumaune, and Pari Ghumaune Villages, of Bhaise VDC, Ward 6
Households (HH)	71,112 (National 23m)	18,102	55
Avr. HH Size (pers/hh)	5.5 (National 5.4)	4.8	6.3
Population	392,604	86,266	349
Predominant Caste/Ethnic Groups	48.2% Tamang, 3% Brahmin-Chettri, 7% Newar, 5% Magar, 4% Chepang	Tamang 43%, 31% Brahmin-Chettri, 7% Magar, 6% Newar	Tamang 69%, Brahmin-Chettri 14%, Other (Magar, Gurung) 18%
Literate	NA	32% Bhaise, 38% Basamadi, 65% Hetauda (formal education)	+ 75 % (including self-taught)
Skills	NA	NA	35-40 Drivers, Construction, Masons, Employees NEA HCIL
Land Holdings	NA	1.6 Ha (Bhaise VDC), 0.4 Ha (Basamadi VDC), 0.20 Ha (Hetauda) per HH	0.4 Ha average, 42% irrigated rice paddy, 60% joint ownership, 5 Ha tenant farmed
Income/Expenditure	NA	NA	HH annual income estimated NRs. 68,659, annual expenditure NRs. 81,783
Water	NA	Piped water 80% Bhaise VDC, 66% Hetauda, 30% Basamadi	61% piped water (Plan International 8 yrs. program)
Toilets	NA	62% Bhaise, 73 Hetauda, 39% Basamadi	90% have latrines (Plan International 8 yrs. program)

Other social and economic indicators provided for Makwanpur District, the PIC and the MIC are: literacy status, religion, length of residence (MIC), type of families (nuclear/extended), occupation and skills (particularly Project employment-related), Gender Analysis (MIC), livestock holdings and produce, land holding size and ownership pattern, fruit tree ownership, food production, food self-sufficiency and coping strategies, household income and expenditure patterns, energy sources, sources of financial services, access to water and sanitation, and health status. These are given in the SIA for Makwanpur District and the PIC and in the RP for the MIC.

The SIA took into account both *direct* resettlement effects caused by land acquisition and *indirect* resettlement effects caused by a variety of other Project impacts. Together these could affect some estimated 1,100 households or 6,600 persons, assuming that some quantification is possible for the indirect resettlement effects. The following table summarizes these figures.

Estimated Direct and Indirect Resettlement Impacts

<i>Direct Resettlement Effects Due To Land Acquisition, Impacted HHs and Population</i>		
	No. Potentially Affected HHs	Estimated Potentially Affected Population*
HHs Losing 26 Houses	25	150
(Incl. HH Losing Only 1 Ancillary Structure)	(1)	(6)
HHs Losing 15 Ha Agricultural Land	72	454
Total	97	604
<i>Indirect Resettlement Effects Due to Various Project Impacts</i>		
Description	No.	HHs
Water Mills	10 Mills	11
6 Downstream Irrigation Intakes	215 Ha	325
Sanutar-Ghumaune Irrigation	8 Ha	25
Water shortage in Natural Springs	23 Used Springs along Tunnel Route, 7 villages	400
Forest Reserves – Clearing and Encroachment	11 Ha Direct Clearing, 31 Ha indirectly impacted	308
<i>Total Quantifiable Indirect Resettlement Effects:</i>	<i>Approx. 1,000 HHs</i>	<i>Approx. 6,000 Pop.</i>
Foot Transport across Rapti River	Undetermined Seasonal Wooden Bridges	Unknown
Misc. Uses of Rapti	Recreation, Collection of Construction Materials, Etc.	Unknown
Fishing	Undetermined	Unknown

The Section B.1.3 in the Supporting Report (2), Part B on the SIA goes into considerable detail describing the indirect resettlement effects.

July 2002 Floods

It is noted that since the fieldwork assessing the above *indirect* resettlement effects was carried out, disastrous floods occurred in July 2002, fully or partially destroying many of the water mills and irrigation schemes cited in the above table and also discussed below. A site reconnaissance carried out by the Study Team in November 2002 confirmed this damage, and the detailed design phase will need to update this information for appropriate revisions to the SAP to take the new situation into account, especially in assessing whether or not households or communities have managed to rebuild the destroyed irrigation schemes and water mills.

(2) Kulekhani III Impoverishment Risks and Reconstruction (IRR) Model

The ADB has adopted an IRR model as an analytical tool for helping to prevent

the onset of new causes of impoverishment caused by either direct or indirect resettlement effects. A matrix indicating some of the possible impoverishment risks associated with the Kulekhani III including measures to mitigate impoverishment risks, is shown in *Annex B6* in the *Supporting Report (2), Part B*, where the specific risks of direct and indirect resettlement effects are ranked on a scale from very high to very low.

This approach encompasses impoverishment measurements not only in terms of income, but also in terms of employment opportunities, health care, nutrition and food security, common assets, education, shelter, or social capital. Indeed, the eight most common impoverishment risks captured in the model, and also signaled in the *ADB Handbook on Resettlement*,¹ are: (a) landlessness; (b) joblessness; (c) homelessness; (d) marginalization; (e) increased morbidity and mortality; (f) food insecurity; (g) loss of access to common property; and (h) social (community) disarticulation.

During the fieldwork, the following impoverishment risks were assessed from the Project's direct and indirect resettlement effects, assuming no mitigation:

Estimation of Impoverishment Risks Associated with Kulekhani III Project

<i>Impoverishment Risks</i>	
Landlessness	High-Very High
Joblessness	Medium-High
Homelessness	High-Very High
Marginalization	High – Very High
Increased Morbidity & Mortality	Medium-High
Food Insecurity	Medium-High
Loss of Access to Common Property	Medium-High
Social Disarticulation	Medium-High

(Risk Assessment = Very Low, Low, Medium, High, Very High)

These are, to a large extent, subjective findings, but they do provide a useful focus for prioritizing mitigation actions to provide a framework for the SAP and for those parts of the EMP that relate to social impacts, such as the planned mitigation for Project impacts on forests or on fish. The findings show that, while the number of potentially affected households is not as great as, say, a large-scale reservoir hydropower project, the impacts on those households that are affected will need to be no less carefully considered in order to avoid the identified impoverishment risks. The details behind these assessments as given in *Annex B6* of the *Supporting Report (2), Part B*, include suggested *counter measures* to turn the risks around into development opportunities. These 'development opportunities' provide, in turn, the basis for developing the SAP framework. Thus, in the design of the RP and the SAP, an effort will be made to adopt development strategies so that impoverishment risks are transformed into 'counter-risk strategies' through targeted provisions.

¹ ADB, *Handbook on Resettlement. A Guide to Good Practice*, OESD, Manila, 1998, pp. 61

The maximum safeguarding against poverty risks is achieved when involuntary displacement is avoided altogether. This is the first and foremost response to impoverishment risks that has been considered. Recognizing risks upfront and their financial implications is a powerful stimulus to search for alternatives that will eliminate the need for displacement completely or cut down its size.

4.4.2 Resettlement and Land Acquisition

(1) Loss of Houses

The fieldwork discovered twenty-five (25) households that lose their homes and will be required to relocate, as indicated in table shown in Section 4.4.1 under direct resettlement effects. *Annex B3 in the Supporting Report (2), Part B* provides a detailed list of these. At this stage, all households identified within the Project design boundaries, as shown on the *Natural and Social Environment Map* as shown in Figure 4.4.1, are presented only as ‘*potentially affected*’ households, as it is not clear which agricultural or forest land owners will actually be affected once the detailed design phase is completed.

On the other hand, it is almost certain that these 24 homeowners will be classified as Seriously Project Affected Families (SPAFs)² during the detailed design phase studies, based on their having lost their residence. All of the households also own ancillary structures for which they will receive compensation. In addition, the owner of an ancillary structure (a cow shed) at check dam 1 will also receive compensation. Compensation for ancillary structures has been figured into the estimated RP costs, as a part of compensation estimated as required by each affected household. All of the Project induced relocation of households will take place in the MIC of Sanutar, Ghumaune and Pari Ghumaune.

(2) Impacts on Productive Lands

The total potentially affected land area is estimated to be 79.6 ha. The largest proportion of potentially affected land is forestland, most of which is under CF management.

Of the total potentially affected land, some 17.295 ha (22% of total) are, according to the official cadastral maps obtained from the DSO in Hetauda, classed as

² **Project Affected Family (PAF)** is the term commonly used in Projects in Nepal for APs, but with special reference to households, each ‘household’ defined as those family members – especially in extended families – that share a cooking hearth, or kitchen (*Bhaise*). In many extended families, several ‘households’ may live under one roof but have separate kitchens, and adult sons will have inheritance rights to family land that will be recognized by the Project, although the land may not as yet be registered in their name. **Severely Affected Families (SPAFs)** are those PAFs who are displaced from their residences or commercial establishments or who are severely affected through loss of agricultural land as defined in the Kulekhani III HPP’s Resettlement Policy *Entitlement Matrix*: (a) PAFs who lose 25% or more of their land (owned and operated and taking into consideration the local situation) within the Project area or whose production levels are severely affected by the loss of land; (b) PAFs who lose residential/business house SPAFs will be assisted with special rehabilitation measures, including displacement allowances and preferential Project employment, to achieve the Project’s involuntary resettlement policy goals of restoration or improvement of pre-Project living standards.

agriculture land under private ownership. Of this, about 15 ha are required by the Project for permanent and temporary acquisition. This includes all land required from the Sanutar, Ghumaune, Nakoligaon settlements and by the Yangran regulating pond.

Of the total agricultural land needed, 12.36 Ha (82 percent) of private lands are to be acquired permanently for various Project facilities at the Sanutar, Ghumaune, Nakoligaon settlements and along the Yangran Khola. Likewise 2.64 ha (18 percent) of land under private ownership will be needed for the construction camps at Ghumaune but may be acquired on a temporary, rental basis.

Affected Land, by Land Use Categories in Different Project Sites

Project Sites	Agriculture Land (ha)	Forestland (ha)	Grassland and Other (ha)	Total Land (ha)
Khani Khola Headworks	1.64	0	1.96	3.6
Work Adit and Access Road to Adit 1 and Headworks	0.656	1.875	2.869	5.4
Spoil Bank A	0	0	1.6	1.6
Sanutar, Ghumaune, Ghumaune Pari, Yangran Regulating Pond and Check Dams including Spoil Banks B and C	13.5	33.72	16.38	63.6
Tailrace Outlet including Access Road to Tailrace and Spoil Bank D	1.5	0	3.9	5.4
Total	17.296	35.595	26.709	79.6

Note: Acquired land from private owners amounts to 15 ha, totaling 13.5 ha in Sanutar, Ghumaune, Ghumaune Pari and 1.5 ha for the Tailrace Outlet.

(3) Households Losing Agricultural Land

It is presently estimated that some seventy-two (72) households, comprising around four hundred and fifty (450) persons, will lose agricultural land and require compensation. These figures will need to be updated at the beginning of the detailed design study with more reliable data to verify the actual numbers of affected households.

There are three reasons for this inconclusiveness of the data on households losing agricultural land:

- The Project's final design alternative was finalized before the socioeconomic field survey was concluded. However, the location and scheme of the check dam No.1 were determined after socio-economic field survey so that land plots were included within the defined Project design boundaries.
- the second reason is due to inaccuracies found with the official cadastral maps so far obtained from the DSO in Hetauda.
- the third reason has to do with absentee landowners, most of whom appear to be the urban, business oriented ethnic group, Newars, who are probably living in Hetauda or possibly in some cases farther abroad, even in Kathmandu.

The *Natural and Social Environmental Map* in Figure 4.4.1 will be updated using

data from a plane table survey of agricultural fields, combined with new household lists from the DSO, at the beginning of the next, detailed design study phase. Final information will be obtained, though, only after the completion of the final design, when a Detailed Measurement Survey (DMS) will be conducted to obtain the most accurate planning information possible.

4.4.3 Downstream Impacts from Outflow of Tailrace Outlet

The water released from the Kulekhani III tailrace will increase the present instantaneous dry season flows by more than threefold. This will bring a drastic change in the river dynamism, with the daily fluctuations in water flows to extremes of from as little as $2.1 \text{ m}^3/\text{s}$ to a high of around $47.1 \text{ m}^3/\text{s}$.

The water releases from the Kulekhani III tailrace will have, however, both a positive as well as an adverse impact. Water released from the Kulekhani III tailrace will be sediment free and will therefore have a higher erosive power than water currently in the river. The tailrace water is thus expected to initiate a cycle of riverbed erosion, and this will have a positive implication for the currently aggrading riverbed between tailrace to the Hetauda Highway Bridge. It will play a positive role in the protection of the currently used agricultural areas from frequent monsoon flood inundation.³

On the negative side, the riverbed erosion caused by the sediment free tailrace outlet water, as well the high amount of water discharge, may displace the currently operational irrigation intakes of at least five (5) irrigation schemes, one just below the tailrace outlet, at Maintar village, two at the Chauki Tole, and the two at the Hetauda Highway Bridge, with adverse effects on the agricultural production of about two hundred and sixteen (216) ha of land along the 4 km stretch between the tailrace and the Hetauda Highway Bridge.

The original *EIA Report* (2001) had predicted adverse impacts from the water release of the Kulekhani III 's tailrace outlet on agricultural land downstream of the tailrace up to Hetauda Highway Bridge, over a course of only about 4 km. Over fifty percent of the land acquisition and compensation proposed in the original EIA, in fact, was for this agricultural land below the tailrace and above the Hetauda Highway Bridge. Release of the tailrace water of $45 \text{ m}^3/\text{s}$, which will be limited to the hours of 16.00 to 20.00 every day, was envisaged by the original EIA to increase the width and depth of the wet channel below the tailrace outlet for these four hours. On the other hand, the tailrace water release will be mostly in the dry season, and it will not over spill the main channels presently occupied by the Rapti during the dry season. The over spilling of the Rapti's banks in the

³ Other beneficial impacts are easy access for people and stone collecting vehicles across the Rapti River between Bhaise and Nakoligaon; easy access to the Trikhadeshwor Mahadev temple due to lowering of Rapti River during the festival season (at present due to high Rapti water during festival season, worshipers have difficulty visiting the temple located on the opposite bank of the river); and easy access to the HCIL mining area due to reduction in the water flows downstream from Bhaise.

wet season, on the other hand, affecting agricultural lands above the Rapti flood plain, is expected to occur only in flood conditions exceeding 1 in 10 years.

Considering that Nepal's run-of-river projects will operate at their installation capacities during the monsoon, it is highly unlikely that the Kulekhani III will be operated in the monsoon for peak load supply. In this context, there will not be any additional release of water from the Kulekhani III tailrace outlet over and above a monsoon flood.

If the Kulekhani III is at all operated in the monsoon, it will be only during very dry periods. Even if the Kulekhani III were operated during a normal monsoon period, the water released from the tailrace outlet will not over spill the flood plains presently occupied by the Rapti River as shown in Figure 4.4.2. Since water released in other seasons from the tailrace outlet will be confined to the limits of the existing channels, the impacts of water release on the agricultural land above the Rapti flood plain, including those of the East Rapti Irrigation Project about 40 km downstream, does not arise.⁴ Any impacts in future to downstream agricultural land during the monsoon will only be the result of high floods, a natural phenomenon of the region. Such floods have occurred in the past and, as confirmed by the devastating flooding in July of 2002, will have the potential to occur in the future, which is one of the major risks in any case for agricultural land lying near the Rapti River.

On the other hand, there are other possible *indirect* resettlement effects that may occur, including impacts on water mills, irrigation scheme intakes, transport across the Rapti River, and recreational uses of the river banks, and these have been briefly outlined above under item 4.4.1, Social Impact Assessment.

4.4.4 Social Environmental Impacts during Construction

The construction phase impacts will include, besides the usual impacts routinely covered in the EMP, such as dust, noise, vibration, and so forth, a number of 'boom town' effects due to outsiders entering the Project area. Housing complexes may be constructed to house the Project's work force and their families, and new business enterprises and various other services will spontaneously be established nearby the construction camps. The likely impacts are a decline in sanitary conditions, increase in solid waste, and pressure on existing water supply facilities as well as on existing education and health institutions. The carry over effects for health could be the spread of diseases such as cholera and malaria, and HIV AIDS. It is also likely that outsiders will actually out number the local villagers around the construction sites, and this will have possibly adverse impacts on local culture, and social institutions. Thus a number of impoverishment risks, including marginalization, increased morbidity and mortality, food insecurity, loss of access

⁴ The head of the Irrigation Department in Hetauda brought up the issue of the East Rapti Irrigation scheme, and the Study Team visited the scheme in June 2002. A section on this is found in the Supporting Report.

to common property, and social (community) disarticulation may become potential issues for local people.

To reverse these impoverishment risks resulting from the Project's construction and operation, a package of social actions were broadly suggested for implementation in the original EIA. These included an agricultural development program, skill development training, a community development program, a rural electrification program, and priority for local employment.

4.5 Mitigation Measures

4.5.1 Environmental Management Plan (EMP)

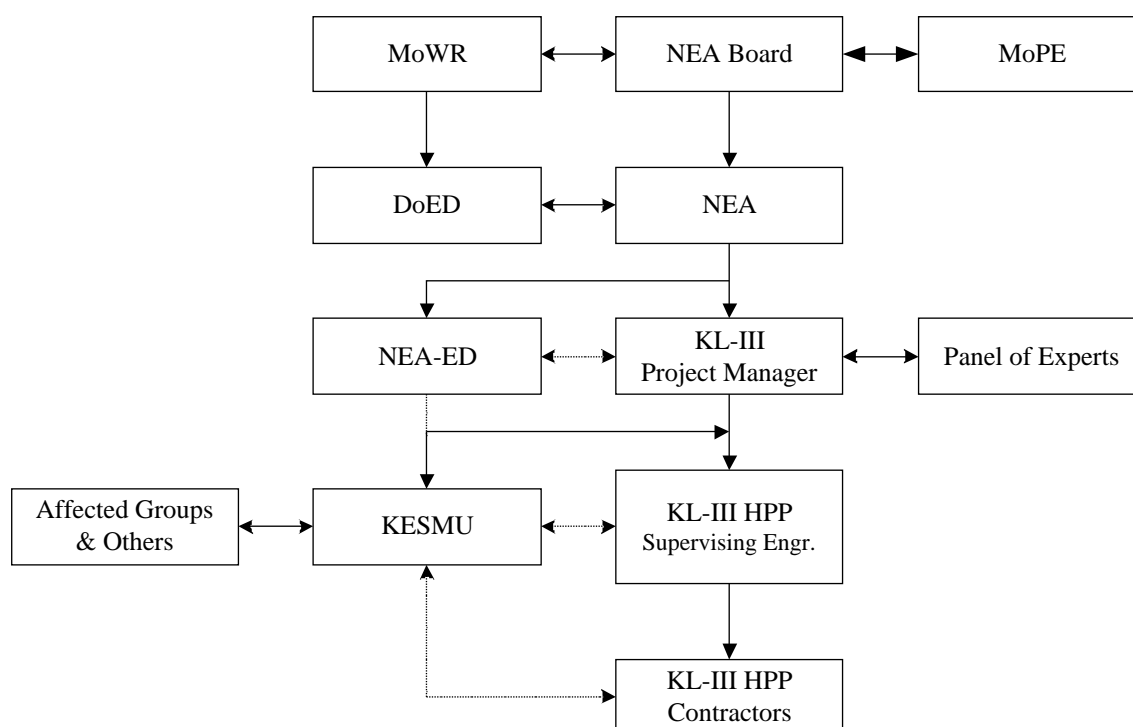
The EMP follows the practice of previous hydropower projects in Nepal, the original EIA (as approved by MoPE) and the recommendations of the recent supplementary EIA fieldwork. The EMP consists of Resettlement Plan (RP), Social Action Plan (SAP) and Public Consultation (PC). The EMP covers the establishment of a Kulekhani Environmental and Social Management Unit (KESMU) and outlines the roles of the various organisations involved for effective implementation of the EMP.

The basic objectives of the EMP include:

- Establishment of the KESMU to ensure that all mitigation measures and monitoring requirements referred to will actually be carried out during the Project development,
- Defining of the environmental management principles for the pre-construction, construction and operational phases,
- Establishment of the roles and responsibilities of all parties involved in implementing the EMP,
- Execution of Social Action Plan (SAP) in the project affected area,
- Delineating the mitigation measures and monitoring actions needed to avoid or mitigate adverse environmental impacts and to maximize positive ones,
- Establishment of a program for EMP supervision, monitoring and reporting, and
- Ensuring that the environment of Kulekhani III area and surrounding region are protected and developed to meet the needs of the local people and other stakeholders and to safeguard the national interests, as well as those of NEA.

(1) Organization for Implementing Environmental Management Plan

The EMP for the Kulekhani III is based on utilizing as much as possible NEA's Environmental Department (ED) staff, backed up by a range of short term consulting expertise. The relative position of the KESMU to the Project, to the NEA's ED, to the supervising engineers, contractors and stakeholders is shown as follows



Overview of KESMU Organization Project Management Plan Structure - Construction Phase

The KESMU will have five (5) major roles, including:

- The implementation and administration of land and property acquisition, compensation and resettlement and the rehabilitation of affected parties,
- The implementation of the SAP in the project-affected areas,
- Monitoring of the environmental and social indicators and measurement of the overall performance, as per the various contract conditions adopted for the EMP,
- Co-ordination and liaison with project management and NEA and the different line agencies, and
- Dissemination of information about the RP and the SAP to the Project's stakeholders.

Accordingly it is recommended that there be four (4) sections within the KESMU as follows:

- Acquisition, Compensation and Resettlement Section (ACRS)
- Social Action Plan Section (SAPS)
- Project Information and Co-ordination Section (PICS)
- Environmental and Social Monitoring Section (ESMS)

(2) EMP Mitigation and Monitoring Plans and Costs

The components of the environmental mitigation and monitoring plans covering the natural environment are summarized below in Table 4.5.1 and those for the

social aspects are summarized in Table 4.5.2.

The detailed components of the mitigation measures for the natural environment are given in Table A.7.7 of the *Supporting Report (2), Part A* detailed design and construction phases.

Three types and levels of environmental monitoring are proposed and include:

- Impact or frontline monitoring during construction,
- Independent monitoring to check on the contractor's and KESMU's performance, and
- Panel of Experts (POE) monitoring.

1) Impact Monitoring during Construction

Mainly the contractor, to the satisfaction of the KESMU, will carry out the regular environmental impact monitoring. The EMP is outlined in Table A.7.8 of the *Supporting Report (2), Part A*.

2) Independent Monitoring

Independent monitoring has rarely occurred in respect to hydroelectric projects in Nepal. It is, however, considered essential and is being implemented at the Middle Marsyangdi HEP, which is now under construction by NEA.

3) Panel of Experts (POE) Monitoring

This is an option on which NEA and donor will have to decide. The Khimti, Kali Gandaki A and Middle Marsyangdi HEPs all had reviews and suggestions for the improvements in the Project implementation by an appointed POE.

4) Environmental Audit

As per the *Environmental Protection Rules* (MoPE, 1997) is required to prepare an environmental audit on the Project two years after completion of construction. It is recommended that at that time NEA consider funding the expenses involved for an environmental audit.

4.5.2 Resettlement Plan (RP)

The Resettlement Plan (RP) studied the following items at the time of preparation of the RP:

- Objectives, policy framework and entitlement (laws regarding land acquisition procedures, involuntary resettlement principles and objects, and eligibility and entitlement)
- Scope of land acquisition and resettlement (resettlement effects and measures for minimizing resettlement effects)
- Socio - economic information
- Consultation, participation and grievance redress
- Relocation of housing and settlement, and income restoration strategy

(resettlement and rehabilitation measures, and compensation for land and property)

- Institutional framework
- Resettlement budget and financing (direct compensation cost and cost of rehabilitation measures)
- Monitoring and evaluation (internal monitoring and external monitoring and evaluation)

A major aspect of the upgrading of the existing EIA was the preparation of a RP for Kulekhani III. The RP, presented in a 'stand alone' format in *Chapter B.2 in the Supporting Report (2), Part B* highlights the extent of the Project's resettlement impacts and proposes mitigation measures so that the Affected Persons (APs) can improve their living standard or at least restore their living standard to its pre-Project status. The RP is based on the most recent data available from field surveys undertaken in June 2002 when the design alternative for the Project was still being finalized. The RP takes into account the most recent attempts to develop comprehensive resettlement policies and action plans including practices by other projects in Nepal, and it incorporates the involuntary resettlement policies of the ADB and World Bank (WB) as far as they are applicable in the local context.

1) Before construction

- Plane table survey : updating of agricultural photos and houses of resettlement effects and GIS maps
- Execution of DMS : updating of RP when detailed design is completed

2) During construction

- Compensation for private land
- Transfer fee for buying replacement land
- Compensation for private owned trees (3,255 trees, 11 varieties)
- Compensation for houses (26 houses)
- Compensation for community structures
- Displacement allowance

3) During operation

- Post evaluation

The *direct* resettlement effects caused by the Project's land acquisition, have been presented above in Section 4.4.1 Social Impact Assessment and are summarized in Table 4.5.2.

The RP describes in detail the impacts of each of the Project's separate components and of its facilities as well as efforts in the design to avoid, or at least minimize, resettlement effects wherever possible. This has been a high priority

during the field study and recommendations:

- to place camps in Hetauda or at Nibuwatar,
- to place spoil sites on river floodplains locations,
- to utilize spoil banks as agricultural land after construction,
- careful siting of the main access road to avoid as many houses as possible are examples of the care that was taken in this regard, and
- incorporating the Sanutar-Ghumaune irrigation canal into the access road design.

Despite its limitations, the *Land Acquisition Act 2034* (1977) (LAA) so far is the main legislation to guide land acquisition in Nepal. The Water and Energy Commission Secretariat (WECS) is currently taking the initiative for amending the LAA, with technical assistance from the ADB to be more in line with international donor policies. A Project-specific resettlement policy for the Kulekhani III will be developed anticipating the ADB-supported proposed amendments to the LAA. The WECS proposed amendments to the LAA to incorporate mitigation measures for resettlement effects that are similar to the resettlement policy developed for the ADB-financed Melamchi Water Supply Project, which has been approved by the Nepal's cabinet and is being implemented. The Middle Marsyangdi HEP has also adapted a similar resettlement policy. Based on these, as well as on precedents set in previous NEA projects such as the Kali Gandaki A, a set of principles and policies together with an entitlement matrix has been prepared to form the basis of an RP for the Kulekhani III.

The terms 'involuntary resettlement' and 'resettlement effects' in the RP are understood to cover all social and economic impacts, permanent or temporary, caused by direct and involuntary acquisition of land and other fixed assets, by change in the use of land, or by restrictions imposed by the Project on access to land and natural resources resulting in the loss of assets, incomes and livelihood, *with or without physical relocation of affected people from housing.*

In line with the above, the basic principles and objectives of the Kulekhani III 's RP will be:

- Land acquisition and involuntary resettlement will be avoided where feasible or minimized to the extent possible through the incorporation of social considerations into the Project design options.
- Where population displacement is unavoidable, individuals, households and communities losing assets, livelihood and other resources will be fully compensated and assisted, so that they can improve or at a minimum restore their former economic and social conditions.
- The Project will seek to enable communities in the Project area to benefit from the Project.

The RP follows the standard outline found the ADB's *Handbook on Resettlement*, and contains a detailed entitlement matrix as shown in Table 4.5.3

4.5.3 Social Action Plan (SAP) Framework

Implementation of the Kulekhani III requires careful planning for managing a number of social impacts of diverse nature, aside from the acquisition of land and relocation of houses. These include the disruption of social infrastructure such as irrigation canals, water supply systems, and health and education facilities. This also includes the direct and indirect de-capitalization of APs, who may risk losing capital in all its forms: natural capital and man-made capital, as well as human and social capital.

The RP addresses the de-capitalization issue in its various forms for the APs losing their land or house. However, the Project's *indirect* impacts on those whose land and property will not be directly affected by the Project, but who are living by the side of Project activities are often poorly addressed. Past project experiences have revealed this to be an issue of dissatisfaction of most of the Project area peoples in Nepal.

Among the general population, projects such as the Kulekhani III are seen as a potential wheel of development in the Project area. In fact most of the projects, national or donor funded, have a basic underlying objective of poverty reduction and improvement of the quality of life of the Nepalese people. While this may be realized in the national context, if viewed in terms of revenue generated from the Project, in most of the cases that people of the Project area have little or no access to the Project benefits. In a number of instances, the loss of local area resources has not been compensated in any way, and the local people have suffered from the outcome of these Project induced losses in various unrecognized ways.

If the Kulekhani III is implemented, there will be a number such de-capitalization risk issues potentially leading to impoverishment of households in the Project area. For example, reduction and fluctuation of water discharges in the Rapti River may impart the existing irrigation canal intakes ineffective for diversion of water to irrigation areas at the correct time and in appropriate quantities, with adverse effects on agricultural production. Similarly diversion of the Yangran Khola's water will risk the agricultural production of Sanutar and Ghumaune villages, unless provisions are made for irrigation releases. Loss of the Yangran catchment vegetation, forming a part of Bokedaha and Kalika CFs will be not only a community loss but also a loss of natural resources, and this will particularly affect the livelihood of the poorer peoples of the area, who traditionally depend on forest resources to make up for lack of agricultural land. These Project induced encroachments to the local people's communal property will be an *indirect* impact of the Project.

There will be a number of other impacts besides these examples given above. The

construction phase impacts will include a number of ‘boom town’ effects due to outsiders entering the Project area, and these have been described above in Section 4.4.5 *Social Environmental Impacts during Construction*. The proposed SAP (Section 4.4.5) lays out the framework for the detailed design of the SAP in the next study phase. It is important to reiterate, however, that the SAP, as presented in the current SAP Framework, is still a very generalized ‘program of activities.’ Tentative cost allocations is made to ensure that the costs are included in the Project. However, the Project in its detail design phase will carry out an exercise to fill in the details of the individual programs through the use of extensive public consultations and the use of experts from NGOs and other agencies, including from government and private sources. Table 4.5.4 presents a summary of SAP programs.

- 1) Restoration of Project impacted infrastructure outside the construction sites
Restoration of 5 water mills and 8 irrigation intakes, and installation of two suspension bridges
- 2) Awareness program for accident risks downstream of the tailrace outlet, and along the Tribhuvan Rajpath during construction
- 3) Agricultural development program
Minimization and enhancement of impact on the irrigated rice fields at the directly Project impacted villages of Sanutar, Ghumaune and Ghumaune Pari villages
- 4) Community / public health and education enhancement in areas close to the construction camps
- 5) Skill development and project employment of local population
- 6) Rural electrification program
Rural electrification for Ward 6 and 8 of Bhaise VDC and Ward 9 of Basamadi VDC connection to National Electricity Grid
- 7) Yangran watershed management program
- 8) Neighborhood support programs
Financial assistance to project affected communities of Bhaise Wards 1,6 and 8, Basamadi Ward 9 and Hetauda Municipality Ward 1
- 9) Woman’s development program
Improvement of family and prevention health, household sanitation, income generative skills, STD, HIV AIDS education, family planning, and girl trafficking and micro - credit funds
- 10) Information dissemination and feed back
Establishment of public information centers inside and outside the project, dissemination of information through the local FM radio station and by use of Internet, and stakeholders meetings

4.6 Public Consultation (PC) Program

A Public Consultation (PC) strategy has been developed based on experience gained during the fieldwork carrying out two PC Meetings, described in detail in *Section B.4.5 in the Supporting Report (2), Part B*.

The communities affected by the Project range across a wide area from the Kulekhani III Intake to some 4 km below the tailrace. There are concerns due to the security situation currently in Nepal as to how PC may be carried out. The Supplementary EIA fieldwork included explanations of the Project's principal features and the possible natural and social environmental impacts to APs and stakeholders. Taking into account the experiences gained in holding two PC meetings during the fieldwork period, a draft PC program has been proposed, consisting of:

- Clarification of affected communities and APS,
- Identification of the stakeholders,
- Clarification of the contents of public information related to the Project,
- Obtaining the participation of and cooperation with NGOs for public information, and
- Proposing the methods of public information dissemination as well as the appropriate Project's PC meetings required and carrying them out.

Main items of the PC are summarized below:

	Items of Consultation	Details
(1)	Affected Communities and Aps	<ul style="list-style-type: none"> • Bhaise VDC Ward 6: Sanutar, Ghumaune, Kisedi • Hetauda Ward • Basamadi VDC Wards 8&9: Bokhade, Maintar • Bhaise-Dhoban – Nibuwatar
(2)	Stakeholders	<ul style="list-style-type: none"> • Women • INGO/NGOs • District Development Offices • Hetauda Municipality • Community Based Groups • Hetauda Cement Limited – Site and Hetauda Offices
(3)	Contents	<ul style="list-style-type: none"> • Project layout and principal features • Implementation schedule of project (Plan, Design and Construction) • Economic/financial analysis, basic design, detailed design • Possible impacts • Social action plan • RP - Land acquisition, compensation and entitlement • Stakeholder feedback
(4)	Public information for NGOs	<ul style="list-style-type: none"> • Plan International, Urban – Rural Linkage Program/ Swiss HIV/AIDs/ Hetauda Cement Limited • TLO/VAGs/Hetauda Cement
(5)	Methods of public information	<ul style="list-style-type: none"> • Media: photographs, posters, brochures, TV/Radio, WebPages, CD, scale model
(6)	Place of public information	<ul style="list-style-type: none"> • VDC – PICs and NEA's PIC • District Information Center • Hetauda 'Internet Club'
(7)	Project explanation	<ul style="list-style-type: none"> • Explanation of the Project at the Upgrading F/S stage • Explanation of the Project at detailed design phase

During the detailed design study, it will be important to carefully plan for and budget the next phase of the PC. It is recommended to have three stakeholders PC meetings held in Hetauda and in Bhaise Dobhan. One will be at the beginning and reiterate the findings of the Upgrading Feasibility Studies. The second meeting will come approximately six months into the next phase of the detailed design phase to present preliminary findings and obtain public feedback. The third and final meetings will present the final study findings. The Hetauda and Bhaise Dobhan stakeholders PC meetings will need to be set up through the respective Chief District Officer's (CDO's) office, and sufficient time needs to be allotted to accommodate this formal process and to assure all attendees have adequate advance notice. It is recommended that sufficient budget be allotted to produce brochures and posters, as well as to have flip chart equipment, for these meetings to properly record issues and recommendations. Adequate budget for refreshments is recommended for about two hundred (200) attendees per meeting, as well as for conference hall rental. Finally, it will be an important courtesy to the village attendees to rent at least one van or small bus to assist the villagers in coming to and returning from Hetauda or Bhaise Dobhan.

4.7 Recent Hydrological Events in the Rapti Watershed

The combination of four recent events, the 1993 storm event and floods, HCIL operation (1985 to present), Baghjhora Khola landslide (2001) and the 2002 monsoon floods in the Rapti River watershed are outlined in *Chapter A.8 in the Supporting Report (2), Part A*. These events have led to a degraded and unstable catchment, particularly in terms of landslides, erosion risks and aggradation of the Rapti River, including consistent switching of channels. All of these factors will need to be addressed further during the final design and especially during the construction of the Kulekhani III.

4.8 Summary of Total Environmental Management Costs

Details of the main components of the natural and social environment EMP are shown in Table 4.5.1 and 4.5.2, respectively. An overall summary of the total estimated costs of the EMP including the KESMU, its operating cost and for both the natural and social environment for the detailed design and construction phases are given below. The estimated costs are subject to revision and review as more information on the final inputs is established. The total estimated costs are NRs.143,684,000, which is approximately equivalent to US\$1,835,000.

	Items	Cost in NRs1,000
1.	Natural Environmental Mitigation and Monitoring Plan (NEMP)	
1.1	Mitigation and monitoring measures during pre-construction	3,161
1.2	Mitigation and monitoring measures during construction	13,444
	Subtotal	16,605
2.	Social Environmental Mitigation and Monitoring Plan (SEMP)	
2.1	Resettlement Plan, Social Action Plan and Public Consultation during pre-construction	3,375
2.2	Mitigation measures during construction	
(1)	Resettlement Plan (RP) including compensation for private land (15ha), houses (26houses) and compensation of trees	41,737
(2)	Social Action Plan (SAP)	42,700
(3)	Public Consultation (PC)	1,286
	Subtotal	89,098
3.	Kulekhani Environmental and Social Management Unit (KESMU)	37,981
	Total	143,684

4.9 Further Studies Required

The recommendations for further study include:

- a review and updating during the detailed design including environmental risk,
- carrying out the *PC strategy* already defined above in the PC program and in *Chapter B.4 in the Supporting Report (2), Part B* and
- full implementation of the EMP, the RP and SAP through construction. It is realized that some of the individual recommendations and their costing will change, but it is advocated that the Kulekhani III now has a sound basis for proceeding and that the Project can be implemented effectively.

For the social environment, the following studies are required during the detailed design phase:

Resettlement Plan

- Plane Table Survey (PTS) of agricultural plots, updating of household records and updating of *natural and social environment map*. This survey will also use records obtained from the Tax Office (*Mal Addha*) and the DSO, to prepare for a DMS
- The DMS to be carried out for updating and finalizing the RP when the detailed design phase is completed

Social Action Plan (SAP) Framework

- *Strengthening the Urban-Rural Linkage in Rural Development of the Kulekhani III Area*, to explore both existing and potential economic activities related to rural-urban linkage development, particularly as an incentive to agricultural development in the Project affected area and its surroundings. This includes a survey of foot traffic for proposed Choki Tole suspension bridge (and for feasibility of relocation of Sanutar's suspension bridge, for assessing the economic impact of the Project's motorable bridge over Rapti River and possible development of a commercial nucleus (produce collection center, bus stand) on the spoil bank B at Sanutar,
- Surveys of irrigation and water mill water diversions downstream of the tailrace, including surveys of types and volumes of agricultural produce in downstream irrigation and the economies of the water mills, as well as updating information from July 2002 floods, and
- Preparation of a detailed program for the SAP including NGO involvement.

TABLES

Chapter 4

Table 4.2.1 Supplemental Natural Environmental Impact Assessment Survey

	Items	Purpose	Location	Duration
1.	Water Quality	Sampling of water quality: 9 points Parameter to be measured : 11 Flow velocity (m/s), Discharge (m ³ /s), Ambient temperature (°C), PH, Conductivity, Suspended solids (SS), Dissolved oxygen (DO), Biological oxygen demand (BOD), Total phosphorous (P), Total nitrate (N), and Ammonia (NH ₃)	① Khani Khola: upstream (UP) of KL II tailrace ② Khani K: downstream (DS) of KL II tailrace ③ Rapti K: 1 km DS of Khani Khola at Tauba ④ Rapti: 0.5 km DS of large slide on Bagihara K ⑤ Yangran K: 0.8km US of confluence with Kesadi ⑥ Kesadi K: Below confluence of Yangran ⑦ Rapti K: Below KL III outlet ⑧ Rapti K: Hetauda/Thanabaran Bridge ⑨ Rani K: UP of Churibagaicha Bridge (Similar)	Each 15days in April (dry season) and August (wet season) 2002
2.	Comparison with Adjacent Catchment	Survey of similar ecosystem in neighboring rivers in the vicinity of KL III to prepare mitigation measures against impacted ecosystem in the case that it is possible that the current ecosystem will be largely changed by KL III in the Khani River and the Yangran Rivers	① Khani River ② Yangran River ③ Rani River (Similar ecosystem)	Each 15days in March (dry season) and June (wet season)
3.	Fisheries and Aquatic Ecology (Insects, Aquatic life and Fish)	Survey of impacts on insects, aquatic life and fish in the Khani and Yangran rivers by taking the water at the Khani headworks and the Regulating dam at the Yangran River	① 300m section between KL III tailrace outlet and the confluence of the Khani and the Rapti ② 1,500m section between the Yangran regulating dam and the confluence of the Yangran and Kesadi rivers ③ Rani River (Similar ecosystem)	Each 15days in March (dry season) and June (wet season)
4.	Fauna and Flora Surveys	Survey of fauna and flora inhabiting in the vicinity of KL III for grasping and assessing the degree of impact on fauna and flora	Fauna: Yangran river basin and Raniriver basin Flora: Yangran river basin All access road and camp area Khani headworks Regulating pond Tailrace outlet Adits and spoil banks	Each 15days in March and June
5.	Downstream Consequence (Release of peak discharge)	Survey of impacts on land use and downstream inhabitants by releasing of 40.1m ³ /sec from the KL III tailrace outlet in the riverbed of the Rapti River	4km downstream from the KL III tailrace outlet in the Rapti River	Each 15 days in March and June
6.	River Maintenance Flow	Survey of the discharge in dry season and the irrigation water used in the Khani River and the Yangran River to prepare the data for determination of the river maintenance flow in the Khani and Yangran rivers	① 300m upstream from the confluence of the Khani and Rapti rivers ② 1.8km upstream from the confluence of the Kesadi and Yangran rivers	15days in March
7.	Environmental Risk	Survey of possibility of landslide and erosion in the vicinity of KL III since KL III is located at the Mahabarat Range and just upstream of MBT, and there is a possibility of further landslides and erosions	Vicinity of KL III	15day in June
8.	Spoil Disposal	Survey of impact by spoil disposal produced by excavation works of KL III	① Main structure sites ② Spoil areas	15days in June
9.	Dust, Noise and Vibrations	Survey of impacts by dust noise and vibration during construction of KL III	① Sanutar and Shikaribas villages along access road and base camp ② Bhaisedobahan in the Khani headworks	7days in March and 15days in June
10.	Environment Management Plan	Review of all mitigation and monitoring proposed in the EIA	-	15days in August

Table 4.2.2 Supplemental Social Environmental Impact Assessment Survey (1/2)

	Item	Purpose	Location and Reference Data	Duration
1.	Resettlement Plan	(RP)		
1.1	Scope of Land Acquisition and Resettlement	Survey of boundary areas showing permanent and temporarily acquired land, identifying Project 'footprints' (camps, quarries, spoil, facilities, etc), land use (including economic, cultural and religious areas of significance) etc. affected by KL III in scale of 1: 5,000. Identify alternate Project sites for minimizing land acquisition impacts.	① Sanutar and Shikaribas villages along access road and in base camp ② KL III Tailrace outlet, including affected & acquired areas downstream (small temporary bridges, water mills, washing areas, etc). ③ Intake at Bhaise-Dhoban (Hetauda Cement Lease, KL II Boundaries)	30 days in March, 2002
1.2	Socio-economic Information	Updating of existing database of socio-economic information in the vicinity of KL III	Around KL III project area	15 days in March, 2002
1.3	Policy Framework and Entitlement	Survey of policy, framework and entitlement in Nepal for compensation of household, land, crops and trees, displacement allowances and rehabilitation measures, government property and community facilities Entitlement will be followed by Community Consensus Valuation (CCV) process for land compensation rates in KGA.	Kali Gandaki "A"(KGA), Middle Marsyangdi, Arun III, Modi Khola, Kimiti, Bhote Kosia HPPs and Melamchi Water Supply Project (MWSP)	15days in April 2002
1.4	Consultation and Grievance Redress Participation	Survey of consultation, grievance redress participation. Establishment of Village Advisory Committee (VACs) and KL III Environmental and Social Management Unit (KESMU) will be proposed by referring to KGA	VACs of KGA	15days in April 2002
1.5	Relocation of Housing and Settlements	Survey of existing policy for relocation of housing and settlement	KGA experience and policy of Melamchi Water Supply Project and Middle Narsyandi	15days in April 2002
1.6	Income Restoration Strategy	Survey of income restoration strategy for compensation of PAFs/SPAFs by skill training, project employment, and support for funds and income-generating scheme	PAFs/SPAFs in project areas, especially Sanutar villages along access road and base camp and households affected by KL III tailrace outlet	15days in April 2002
1.7	Institutional Framework	Survey of institutional framework	NEA and Project Levels	15days in March 2002
1.8	Resettlement Budget and Financing	Updating and itemization of budget and financing of resettlement in NEA's EIA	-	15days in June 2002
1.9	Draft Implementation Plan	Preparation of Implementation Plan	-	15days in June 2002
1.10	Draft Monitoring & Implementation Plan	Preparation of Draft Monitoring & Implementation Plan	-	15days in June 2002
1.11	Spring water and surface water survey	Spring water and surface for utilization of domestic water for villagers on ridges and hills along tunnels and cavern	Amdada, kitini, Kiteni, Nayagaun, Sanutar, Shikaribas, Bokedah akong connection tunnel, headrace tunnel, tailrace and cavern	15days in June and October 2002

Table 4.2.2 Supplemental Social Environmental Impact Assessment Survey (2/2)

2. Social Action Plan (SAP)				
2.1	Skill Development & Project Employment	Survey of skill training and local employment for PAFs and SPAFs; (Community & Stakeholder Consultation for all SAP components)	Project area	Each 15days in March and June
2.2	Agricultural Development	Survey for minimization impacts on the existing 25ha (40 family) irrigated rice fields at Sanutar Village by review of KGA agricultural development program	Sanutar Village (25ha (40 family) irrigated rice fields)	Each 15days in March and June
2.3	Community Development	Survey of community development program by referring to KGA experience	NEA's EIA and KGA experience	Each 15days in March and June
2.4	Community/Public Health & Education Enhancement	Survey of local education and health facilities affected by influx of about 1,000 workers, including program of adequate schooling, sanitation facilities and health clinic (with HIV-AIDs prevention public education, etc)	Project area	Each 15days in March and June
2.5	Rural Electrification	Assessment of current situation and ongoing program for rural electrification in the vicinity of KL III	① Bhainse VDC (Village Decvelopment Committee) ② Basamadi VDC	Each 15days in March and June
2.6	Environment Awareness (EAC)	Survey of habitat destruction and negative effects of slash-and-burn agriculture for education of local community	① Sanutar and Shikaribas villages ② Bokedaha Forest (KL III tailrace outlet)	Each 15days in March and June
2.7	Direct Construction Social Impacts Mitigation	Survey of direct impacts during construction such as spoil, dust, noise and vibration	Sanutar and Shikaribas villages	Each 15days in March and June
2.8	Siren Waming System	Survey of impact by releasing peak discharge of 40m ³ /sec from KL III tailrace outlet in the Rapti River of 4km downstream from the outlet	Rapti River of 4km downstream from the outlet	Each 15days in March and June
2.9	Trikandi Mandir – Water Release	Possible water release for annual fair at temple complex just below Bhaise-Dhoban.	Bhaise Dhoban, below KLII Powerhouse	Each 7days in March and August

Table 4.3.1 Summary Results from Spring Survey in Wet and Dry Seasons

Location and User Village	Number of Springs	Number of House-holds	Flow in lps		With PVC Pipe to Communities	Purposes
			June-Wet	Oct-Dry		
Nakoligaoan	2	4	0.16 – 0.41	0.41 – 1.12	1 spring with pipe	Drinking & Irrigation
Bokedaha	4	11	0.19 – 1.12	0.36 – 3.00	2 springs with pipe	Drinking, Irrigation & Stockwater
Sanutar & Ghumane	3	51	0.14 – 1.41	0.05 – 1.33	3 springs with pipe	Drinking
Shikaribas	3	23	0.05 – 1.86	0.07 – 0.50	2 springs with pipe	Drinking
Nayagaon	8	63	0.33 – 8.23	0.04 – 2.16	7 springs with pipes	Drinking & Stockwater
Kitni	3	61 + Industry	0.39 – 2.26	0.44 – 1.64	3 springs with pipe	Drinking, Stocwater & Canteen
NEA Tunnel Adit	3	-	-	0.34 – 0.94	No pipes	Drinking
TOTALS	27	213	0.05 – 8.23	0.04 – 3.00	18	-

NOTE: lps = litres per second; which is a standard measurement for groundwater flows

Table 4.3.2 Main Results for Fish Sampling Surveys

Sta No	Scientific Name	English Name	Local Name	No. of Fish Caught in Dry Season	No. of Fish Caught in Wet Season	Total	(%)
1	<i>Barilius bendelisis</i>	Torrent minnows	Faketa	18	152	170	18.20
2	<i>Barilius barila</i>	Torrent minnows	Jhuli	138	58	196	20.98
3	<i>Barilius barna</i>	Torrent minnows	Pate Faketa	12	12	24	2.56
4	<i>Botia lohachata</i>	Loach	Baghi	0	1	1	0.10
5	<i>Channa gachua</i>	Murrels	Bhoti	5	4	9	0.96
6	<i>Cyprinon semiplatus</i>	Minor carps	Rewa	0	3	3	0.32
7	<i>Garra gotyla</i>	Stone Roller	Nakatuwa	102	54	156	16.70
8	<i>Garra annandalei</i>	"	Buduna	21	100	121	12.95
9	<i>Glyptothorax trilineatus</i>	Catfish	Kabre	0	15	15	1.60
10	<i>Labeo dero</i>	Minor carps	Gardi	0	30	30	3.21
11	<i>Mastacembelus armatus</i>	Spiny eel	Bam	4	2	6	0.64
12	<i>Neolisceilus hexagonolepis</i>	Copper Mahseer	Katle	80	46	126	13.49
13	<i>Nemacheilus botia</i>	Stone loach	Gadela	0	6	6	0.64
14	<i>Nemacheilus rupicola</i>	Stone loach	Gadela	4	9	13	1.39
15	<i>Puntius conchoni</i>	Barbs	Sidra	16	11	27	2.89
16	<i>Schizothorax plagiostomus</i>	Snow Trout	Asala	10	0	10	1.07
17	<i>Schizothoracichthys progastus</i>	Point Nosed Snow Trout	Chuche Asala	0	16	16	1.71
18	<i>Tor putitora</i>	Mahseer	Sahar	0	5	5	0.3
	総数			410	524	934	100

Source: JICA Study Team

Table 4.3.3 List of Protected Species in the Project Area

Species by Scientific Name	Common Name	Protected Nepal	IUCN Category	Location in Project	Comments
1. Vegetation					
- <i>Shorea robusta</i>	Sal	Protected		Bridge Site, Regulation Pond, Main Access Road	-Banned from local felling, transport & export
- <i>Michalia champaca</i>		Protected		Regulation Pond, Access Road	- Sal accounts for majority of trees & saplings BUT can be reafforested
- <i>Bombax ceiba</i>	Silky Cotton	Protected		Regulation Pond	
- <i>Acacia catechu</i>	Cutch	Protected		Power Station	
2. Mammals					
- <i>Canis aerus</i>	Jackal		Cites III	Regulation Pond, Tailrace, Rani Khola	-Based on call & local information
- <i>Luta perspita</i>	Otter		IUCN/K	Intake, Tailrace	- Species of concern
- <i>Macca mulatta</i>	Rhesus macaque		Cites II	Intake, Regulation Pond, Tailrace, Rani Khola	- Both species observed & common in Nepal
- <i>Presbytis entellus</i>	Common langur		Cites I	Intake, Regulation Pond, Tailrace, Rani Khola	- Protected for religious purposes
- <i>Martes flagivula</i>	Yellow throated marten		Cites III	-Regulation Pond	- Species of concern
- <i>Panthera pardus</i>	Leopard		Cites I	Regulation Pond	- May not occur based on local knowledge only
3. Birds					
<i>- 35 Species-Recorded in Area BUT None of These Listed as Rare and Endangered</i>					
4. Reptiles					
- <i>Pyas muscos</i>	Rat snake		Cites II	Regulation Pond, Tailrace	-Based on local information
5. Fish					
- <i>Glyptorax trilineatus</i>	River catfish	Rare		Rapti, Kesadi, Khani , Rani Khola	-Not in Yangran Khola – wet season only
- <i>Neolissochelus hexagonolepis</i>	Copper mahseer	Vulnerable		Rapti, Kesadi, Khani , Yangran, Rani Khola	-Widespread & dry and wet season
- <i>Schizothorax plagiostomus</i>	Snow trout	Vulnerable		Rapti River (3 sites)	-Dry season only in Rapti River
- <i>Schizothoracichthys progastus</i>	Point nosed snow trout	Vulnerable		Rapti, Khani Khola	-Wet season migrant to area
- <i>Tor putitora</i>	Golden mahseer	Vulnerable		Rapti & Kesadi Khola	-Wet season migrant to area
6. Aquatic Insects					
<i>31Species- Recorded AND None of These Listed as Rare or Endangered</i>					

NOTE: (1) All trees are protected from felling and transport by Department of Forests
(2) CITES I = threatened with extinction
CITES II = Species not threatened with extinction but could become so
CITES III = Species requiring international cooperation to control trade
(3) Fish species preliminarily classified for Nepal and subject to clarification.

Table 4.5.1 Natural Environmental Mitigation & Monitoring Plan Cost

1. PROJECT DESIGN & PRE-CONSTRUCTION PHASE					
Description	Type	Sampling Stations	Frequency	Unit Costs	Costs in NRp
1.1 Mitigation Measures					
Status Survey of Houses on Tunnel	Baseline	100	1x	3500	350,000
Forest Inventory & Volumes along Access Roads, Regulation Pond, Portals, Check Dams & Tailrace	Baseline	Road & Reg Pond Misc Area	5 km + 15 ha = 30ha	10,000	300,000
Forest Compensation to DOF/ Owners	Baseline	As Above	30 ha	60,000	1,800,000
Habitat Survey- Otters, Leopard, Marten & Primates	Baseline	6	2x	10,000	120,000
1.2 Monitoring Measures					
Ambient Air Quality	Baseline	2	2x	25,000	100,000
Vibration & Noise Levels	Baseline	3	1x	25,000	75,000
Water Quality	Baseline	8	4 x1	13,000	416,000
Total					3,161,000
2.CONSTRUCTION PHASE – 4 YEARS					
2.1 Mitigation Measures					
Compensation Fund – Houses & Water	Impact	Provisional Lump Sum			5,000,000
Warning Sirens Awareness Program	Impact	6			3,000,000
Environmental Awareness re Firewood & Protected Wildlife	Impact	-	4	75,000	300,000
Revegetation & Stabilization of Affected Areas	Impact	Road & Reg Pond	4 Yrs 30 ha	50,000	450,000
Yangran Watershed Mgmt Preparation	Impact	Consultant	6 Mos	LS	70,000
Sub Total					8,820,000
2.2 Monitoring Measures					
Ambient Air Quality	Impact	2	3x 4 Yrs	25,000	600,000
Vibration Monitoring	Impact	3	2x 4 Yrs	25,000	600,000
Spring Water along Tunnels & P'house	Impact	10	2x 4 Yrs	15,000	1,200,000
Water Quality Project Facilities	Co' liance	5	3x 4Yrs	12,000	720,000
Water Quality of Baseline Stations	Impact	8	2x 4 Yrs	13,000	832,000
Aquatic Ecology of Affected Rivers	Impact	7	2x 4Yrs	12,000	672,000
Sub Total					4,624,000
Total					13,444,000
3. TOTAL COST OF MITIGATION & MONITORING PROGRAM					16,605,000

Table 4.5.2 Social Environmental Mitigation & Monitoring Plan Cost (1/3)

Description	Frequency/Unit	Unit Costs	Costs NRs
1. PROJECT DESIGN & PRE-CONSTRUCTION PHASE			
1.1 Resettlement Plan (RP)			
Plane Table Survey – Agri. Plots & updating HH records & GIS map, from Tax Office (<i>Mal Addha</i>) to prepare for DMS	1.5 mos.	Lump Sum	50,000
Detailed Measurement Survey (DMS) – when Detailed Design is completed & Updating RP	3 mos.	Lump Sum	500,000
Sub Total			550,000
1.2 Social Action Plan (SAP)			
GIS Tracking survey of foot traffic for proposed 2 susp. Bridges and for econ. Impact of Project's motorable bridge – Rapti River	1 month Dry & 1 month Wet Season	Lump Sum	75,000
Survey irrigation and water mill water diversion downstream Tailrace	1 month Dry & 1 month Wet Season	Lump Sum	50,000
Survey type and vol. Of agri. Produce – downstream irrigation.	1 month Dry & 1 month Wet Season – Harvest periods	Lump Sum	50,000
Preparation of Social Program Details		5-10% of SAP Allocated Costs	1,550,000
Sub Total			1,725,000
1.3 Public Consultation			
Brochure Preparation & printing in Nepali for distribution	Approximately 20 pages, 2,000 copies	15NRs/copy	30,000
Interactive Web page hosting designing & registration	One year		100,000
Manakama FM Radio Broadcasting, Incl. Material preparation.	12 Mo/15 min	7,000/Mo	84,000
Village Consultations	3 sessions in 5 VDCs	37,000/once/Place	555,000
Hetauda Consultation	3 sessions, 1 place	47,000/Once/Place	141,000
Kathmandu Consultation	3 sessions, 1 place	63,250/Once/Place	189,750
Sub Total			1,099,750
Total			3,374,750
2.CONSTRUCTION PHASE – 4 YEARS			
2.1 Resettlement Plan (RP)			
Compensation for private land	6 Ha. <i>Khet</i> (Irrig) Land 9 Ha <i>Bari</i> (Non-Irrig) Land	<i>Khet</i> (Irrig) land 2,000,000NRs/Ha <i>Bari</i> (Non-Irrig) 1,500,000 NRs/Ha (Negotiated cost for any temporary acq.)	25,500,000
Transfer fee for buying replacement land		Provisional Lump Sum	1,897,200
Compensation for Privately Owned Trees	3,255 trees – 11 varieties	Rates calculated for each variety of tree	5,491,060
Compensation for Houses	26 Houses	226,950 NRs average/House	5,900,700
Compensation for Sheds	29 Sheds	10,483 Nrs average/Shed	304,000
Compensation for Community Structures		Provisional Lump Sum	100,000
Displacement Allowance	24 HHs	1,500 Nrs/Person @ 6 Person/HH	648,000
Rental Stipend	24 HHs	NRs 3,000/mo*6mo	432,000
Cultivation Disruption Allowance	12 HHs	12HH*annual paddy 0.323 kg/ha*NRs 20/kg	144,000
Transportation Allowance	24 HHs	NRs5,000/HH	120,000
House Plot Grant	24 HHs	NRs 50,000/HH	1,200,000
Sub Total			41,736,960

Table 4.5.2 Social Environmental Mitigation & Monitoring Plan Cost (2/3)

2.2 Social Action Plan (SAP)			
Improvement of intakes for 5 water mill canals	5 Canal Intakes	25,000/canal	125,000
Design & construction 3 Irrigation Canals	3 Irrigation Canals	2,000,000/canal	6,000,000
Improvement intakes for 3 irrigation canals downstream tailace	3 Canal Intakes	33,000/canal	100,000
Constr. of 2 Susp. bridges @ Maintar & Chaukitole - Rapti River	1 Suspension Bridges on Rapti	NRs 15,000,000 each	15,000,000
Awareness Program – Accidental Risks Downstream Tailrace, Tribhuvan Highway	Riverbank sanitation, traffic signs; traffic and tailrace public education	Provisional Lump Sum	2,875,000
Agricultural Development – Veg. Produce Pickup Center & Bus Stop	3 Components - Downstream Tailrace, Project Area at Sanutar, Yangran Hinterlands	Provisional Lump Sum	5,000,000
Community/Public Heath & Education Enhancement	Water Supply, Schools, Clinic, STD/Aids, Malaria Education	Provisional Lump Sum	2,000,000
Skill Enhancement	Skill Survey & Training	Provisional Lump Sum	1,250,000
Rural Electrification	20 Km TL length – 4 Wards	Provisional Lump Sum	5,000,000
Neighborhood Support	Matching Community Development Funds – 5 Wards	Provisional Lump Sum	3,750,000
Women's Development	Skill Training, Micro-Credit Funds, Public Health Education	Provisional Lump Sum	1,600,000
Sub Total			42,700,000
2.3 Public Consultation			
Information Dissemination & Feedback	Public Information Center, Radio, Internet	Provisional Lump Sum	1,286,000
Total Costs			85,722,960
3. TOTAL COST OF SOCIAL IMPACTS & MITIGATION PROGRAM - NRs			89,097,710

Table 4.5.2 Social Environmental Mitigation & Monitoring Plan Cost (3/3)

Description	Period Years	Number of Staff	Allowance Month (NRs)	Costs NRs
1. KESMU Manpower Costs				
NEA Staff				
(1) KESMU Co-ordinate (class 10 officer)	5	1	25,000	1,500,000
(2) ACRS - Section Chief (class 8 officer)	4	1	15,000	720,000
(3) SAPS - Section Chief (class 8 officer)	4	1	15,000	720,000
(4) PICS - Section Chief (class 8 officer)	4.8	1	15,000	840,000
(5) Senior Accountant (deputed)(ACRS)	3	1	10,000	360,000
(6) Junior Accountant (deputed)(ACRS)	3	1	8,000	288,000
(7) Surveyors (deputed)(ACRS)	2	2	8,000	384,000
(8) Social Officer (deputed)(SAPS)	4	1	10,000	480,000
(9) Public Information Officer (deputed)(ACRS)	4.8	4	8,000	1,792,000
(10) Office Runner (ACRS)	3	1	5,000	180,000
(11) Office Runner (SAPS)	4	1	5,000	240,000
(12) Office Runner (PICS)	4.8	4	5,000	1,152,000
(13) Short Term Consultants (SAPS)	2		70,000	1,680,000
Sub-Total				10,336,000
Consultants				
(1) ESMS-Section Chief (Environmental Engineer-Consultant)	4.25	1	75,000	3,825,000
(2) Environmental Engineer (ESMS)	4	1	45,000	2,160,000
(3) Sociologist (ESMS)	4	1	45,000	2,160,000
(4) Office Runner (ESMS)	4	1	5,000	240,000
(5) Part time Consultants (Socio-economist /Terrestrial ecologist/Aquatic ecologist)	2		45,000	1,080,000
Sub-Total				9,465,000
Total				19,801,000
Particulars	Units		Unit Costs	Totals
2. KESMU, Support Facilities and Costs				
(1) Computers and printers	10sets		150,000	1,500,000
(2) 4 wheel drive vehicles	3		3,000,000	9,000,000
(3) Fuel and maintenance costs for vehicles	3years		80,000/month	2,880,000
(4) Furniture			Lump Sum	500,000
(5) Other equipment (Camera, Tape recorders, Power point, pH meter, turbidity meter, flow meter, photocopier etc)			Lump Sum	1,000,000
(6) Office consumables	5years		40,000/month	2,400,000
(7) Telephone and electricity	5years		15,000/month	900,000
Total				18,180,000
Total item1 and item2				37,981,000

Table 4.5.3 Entitlement Matrix (1/4)

Type of Loss	Entitlement Unit	Description of Entitlement & Implementation Procedures	Remarks
A. COMPENSATION			
1. Land under private ownership (agriculture, homestead, and private land)			
<i>A. Loss of Private Land</i>	Titleholder	<p>1. For PAFs: compensation at full replacement cost.</p> <p>2. Registered tenants will be entitled to 50% of the compensation payable to the titleholder for affected land and crops</p> <p>PAFs will have the option to relinquish the remainder of that parcel or landholding if they feel that remaining portion of land plot after acquisition is too small to be viable for cultivation or other use. The minimum land area for viability shall be 8 ana or as defined by the project in consultation with local VDC.¹</p>	<p>The following categories of affected households will be considered as SPAFs:</p> <p>Households who lose 25% or more of their land (owned and operated) within the Project area.</p> <p>Households who lose residential/business house</p> <p>If any SPAF receives cash compensation for farmland & purchases farmland within 1 year from the date of receiving compensation, the land registration fees for the purchased land & all government taxes & duties related to the acquisition & registration of affected assets will be borne by the project.</p> <p>Compensation in all cases will be either by cash or cheque, depending on the PAFs' preferences.</p> <p>The composition of CDC as per this Policy will consist of:</p> <ul style="list-style-type: none"> Chief District Officer (CDO) Chief/Land Revenue Officer (LRO) Representative from DDC Representative from Kulehani HEP III Representative from respective VDC/Municipality, preferably from the LCG Representative from PAFs, preferably from VAC
<i>B. Loss of Tenancy Land</i>	Non-registered tenant not-legalizable as a registered tenant	<p>1. Non-registered tenants do not qualify for compensation for land losses, however they will be entitled to compensation for crops according to their lease arrangement. Such compensation will be based on 5 years annual net production for fruit & fodder trees & 3 years annual net production for timber/fuel wood trees & other perennial crops.</p> <p>2. If the landowner is not identified, the full compensation amount as per (1) above will be paid to the tenant cultivator (operator).</p>	<p>Households who lose more than 50 percent of their operated land will be considered a SPAF</p> <p>Tenants will be assisted with the identification of other agricultural production opportunities in the area.</p>
<i>C. Temporary Loss of Private Land</i>	Titleholder	<p>1. Compensation for crop losses for the duration of temporary occupation plus one more year necessary for the soil to be adequately prepared to its original productivity. PAFs will sign a temporary occupation contract specifying:</p> <ul style="list-style-type: none"> Period of occupancy, Formula for the calculation of annual rent, e.g., market value of crops normally produced on the required land, and annual inflation adjustments; Form of payment, e.g., money or grain; Frequency of payment/delivery, e.g., quarterly Compensation for other disturbances & damages caused to property. Land protection measures during the lease; and Land will be returned to the owner at the end of temporary acquisition, restored to its original condition. 	

¹ Ana = 16th of a Ropani (19.655 ropani = 1 Ha)

Table 4.5.3 Entitlement Matrix (2/4)

Type of Loss	Entitlement Unit	Description of Entitlement & Implementation Procedures	Remarks
2. Crops and Trees			
<i>A. Loss of Trees & Perennial Crops</i>	Titleholder Tenant Lessee/cultivators having agreement with the owner	1. Advance notice to harvest crops will be given. 2. Net value of crops where harvesting is not possible will be provided. 3. Compensation at market value on the basis of loss of future production, based on 5 years annual net production for fruit & fodder trees & 3 years annual net production for timber/ fuel wood trees & other perennial crops.	Crop market values will be determined by the CDCs & compensation prices will be finalized with active participation of PAF representatives, including VACs and LCGs. If the land is registered under tenancy, both the owner & the tenant will be entitled for 50 percent of compensation amount each. When a tenant/lessee & landowner have a non registered sharecropping arrangement, the compensation payable will be apportioned according to the arrangement.
<i>B. Loss of Non-perennial Crops</i>	Titleholder	1. Advance notice to harvest crops will be given. 2. Where harvesting is not possible, the net value of crops will be provided.	Crop market values will be determined by the CDCs & the compensation process will be finalized with active participation of PAF representatives, VACs and LCGs. Where there is a registered tenant, the tenant & titleholder will each be entitled to 50% of the compensation payable. Where there is a non-registered tenant with a sharecropping arrangement with the titleholder, the compensation payable will be apportioned according to the arrangement.
3. Houses and Other Structures			
<i>A. Loss of other privately-owned structures</i>	Titleholder (Owner)	Compensation for full or partial loss at full replacement cost, according to structure type, without deduction for depreciation. Cash compensation for damages to structures resulting from temporary occupation of land at replacement cost.	Other structures include such items as: sheds, walls, fences, and water mills. Loss of structures other than houses does not entail payment of a Displacement Allowance. Compensation determination and compensation payment as per 1A above.
4. Damages Caused During Construction			
<i>A. Public and Private Buildings And Structures, Infrastructure, Land, Crops, Trees</i>	All categories of Entitled Persons	Extreme care will be taken by Contractors to avoid damaging public and private property unnecessarily. Where damages do occur to public or private property as a result of construction works, the PAF/SPAFs, groups, communities, or government agency shall be compensated for damages to crops and trees; damaged land, structures, and infrastructure shall be restored to their former conditions.	CDC will make compensation determination for the losses in consultation with VACs and LCGs, as per CCV procedures.
5. Community Facilities And Resources			
<i>A. Loss of Buildings and Structures</i>	Local community	Restoration of affected community buildings and structures to at least previous condition, or replacement in areas identified in consultation with affected communities and relevant authorities. Restoration before commencement of the Project where necessary, to be determined in consultation with the community.	Community buildings and structures include: schools, temples, graves, ghats, waiting sheds, irrigation channels, water points, trails/foot paths and bridges.
<i>B. Loss of Land</i>	Local Community or User Groups	1. Restoration of access to community resources.	The Departments of Agriculture and Forestry will be consulted and requested to assist communities so that impacts on grazing areas are adequately mitigated, and as necessary, measures will be paid for by the Project, as included in the SAP.
<i>C. Loss of Community Forests due to Construction</i>	Forest User Groups	Mitigation measures will be initiated to control erosion caused by tree cutting, and to stabilize and rehabilitate the slopes with suitable bioengineering works and vegetation. Compensation for trees Advance notice to harvest resources from affected community forest areas.	Community Forests in various Project sites affected by construction will be rehabilitated.

Table 4.5.3 Entitlement Matrix (3/4)

Type of Loss	Entitlement Unit	Description of Entitlement & Implementation Procedures	Remarks
<i>D. Loss of Drinking Water Points due to Construction</i>	Community that owns the Water Points	Replacement and restoration of the Water Points at suitable locations. Replacement will be made before construction damages the systems.	The down time between construction of the new system and transfer from the old will be minimized to minimize impact on households caused by disruption in water availability. As far as possible, alternate sources of water will be made available during the construction period. Loss of water due to tunneling will be determined according to baseline established during 2002-2004 field surveys and will be compensated if found to occur.
6. Group Losses			
<i>A. Loss of Income Indirectly due to the Project (Employment For Porters and Other Laborers)</i>	Persons in the Vicinity of the Project Area	1. Rehabilitation assistance as defined below.	Vulnerable social categories and losses actually affected by the Project will be identified in consultation with VACs and LCGs and may include: porters and other providers of non-vehicular transport.
B. REHABILITATION MEASURES			
7. Housing Displacement Allowances			
<i>A. Displacement of Households</i>	Titleholder (Resident) Tenant Landless Squatter on Public Land (prior to cut off date)	Every SPAF household will be entitled to a Housing Displacement Allowance. Each displaced household will be entitled for a reasonable amount of Rental Stipend for six months.	Each member of a displaced household will receive a fixed amount of <i>Housing Displacement Allowance</i> for three months. Housing displacement allowance will be based on minimum wage as established at the national or local level, whichever amount is higher. Allowances will be paid prior to displacement.
<i>B. Severe Disruption to Cultivation</i>	Titleholder Lessee/Cultivator having Agreement with the Owner	SPAFs as defined in clause 1 A. column 4 in this <i>Entitlement Matrix</i> will be entitled to a <i>Cultivation Disruption Allowance</i> for severe disruption to household cultivation levels. 2.The <i>Cultivation Disruption Allowance</i> will be equal to one season's production on the area of cultivation land lost, based on the published District and VDC productions figures, land types and market prices for crops for the year in which the land is acquired, to be paid at the time of compensation payment.	SPAFs as defined in clause 1-A. Column 4 in this <i>Entitlement Matrix</i> will be entitled to a <i>Cultivation Disruption Allowance</i>
<i>C. Transportation Allowance</i>	Titleholder Tenant Persons living on rented accommodation Landless Squatters/ Encroachers on Public Land As per clause 4 of this Policy	1. Each displaced SPAF household will be entitled to Transportation Assistance to move their belongings.	

Table 4.5.3 Entitlement Matrix (4/4)

Type of Loss	Entitlement Unit	Description of Entitlement & Implementation Procedures	Remarks
8 Other Rehabilitation Assistance			
<i>A. Severe Loss of Assets Directly due to the Project, and Severe Impact indirectly caused by the Project.</i>	SPAFs Seriously Affected Population over 18 years of age	<ol style="list-style-type: none"> 1. Counseling regarding Project impacts, compensation alternatives and risks, and resettlement options (where required). 2. Counseling on saving schemes and cash management 3. Preferential access to project construction employment opportunities, to the extent possible. 4. Assistance with training in life skills that would help in obtaining employment and/or earning livelihood. 5. The Project will facilitate the assessment and (where feasible) establishment of small-scale income generating schemes for seriously affected households in the areas. 6. Assistance to gain access to National Poverty Alleviation and Credit Programs to SPAFs will be provided. 7. Households shall be entitled to Agricultural Extension Services to increase production on their remaining agricultural and forestry land. 	<p>The Rehabilitation Measures will be targeted to SPAFs and to other vulnerable groups in the vicinity of the Project area who may be adversely affected by the Project, even though they do not lose assets. Vulnerable groups include: porters and other non-vehicular transport providers who may lose jobs because of project interventions, Chepang (<i>praja</i>) households, and landless households.</p> <p>Specifications for training and hiring workers will be included in Contractors' contracts.</p> <p>The Project's Resettlement Unit (located in KESMU) will investigate the potential for coordination with existing programs. The respective Agriculture Institutions will be requested to assist in implementing the program. Any costs will be borne by the project, as part of the SAP.</p>
9. Government Property			
<i>A. Loss of Infrastructure and Facilities</i>	Relevant Agency	1. Facilities will be repaired or replaced.	To be undertaken in consultation with the relevant Department or Ministry.
<i>B. Loss of Forest Areas</i>	Department of Forest	1. Mitigation by means of afforestation.	To be undertaken in consultation with Department of Forestry and User Groups.
10. General Counseling			
<i>A. All Project Impacts</i>	Persons within the Project Areas	General Counseling on: Project Impacts, Construction Schedules Land Acquisition Schedules, Valuation, Compensation and Grievance Resolution Mechanisms, Construction Procedures Local Development Initiatives.	

Table 4.5.4 Summary Table of SAP Program (1/2)

	Social Program	Summary Description
1	Restoration of Project Impacted Infrastructure Outside the Construction Sites	Restoration 5 water mills, 8 irrigation intakes (depending on re-evaluation July 2002 floods impacts); Suspension bridge, Maintar; feasibility study (foot traffic survey) suspension bridge, Choki Tole
2	Awareness Program for Accident Risks Downstream of the Tailrace and along the Tribhuvan Rajpath	Community Awareness Programs for Accident Risks Due to Increased Traffic through the Communities along <i>Tribhuvan Rajpath</i> and within the Project Construction Sites; Placing of Traffic Signs Along the Highway; Placement of Display Boards and Warning Signs (Tailrace Downstream Areas); Community Awareness Programs for Accident Risks of Daily Tailrace Water Releases (Hetauda Ward 1, Maintar and Laljhundi and Downstream Communities along the <i>Tribhuvan Rajpath</i>); and Sanitation Program For The River Bank Communities Downstream of the Tailrace
3	Agricultural Development Program	Impact minimization and enhancement of the irrigated rice fields at the directly Project impacted villages of Sanutar, Ghumaune, and Ghumaune Pari villages. In addition, the Program will launch activities to enhance the agricultural production and diversification of agricultural crops, including vegetables and fruit, of the Yangran catchment area, including the villages of Kisedi, Nakhudanda, Kamitole, Machhebas, Shikharibas, Nayagaon, Kitni, Yangran, and Amdanda; animal husbandry enhancement activities; establishing Micro-Enterprise Groups for organizing Collection Depots for local agricultural produces and for improving marketing arrangements at the Hetauda Township in hinterland of new motorable bridge across Rapti (constructed by Project).
4	Community/Public Health & Education Enhancement in Areas Close to the Construction Camps	Countering boomtown impacts, targeted support Program for public health, sanitation, water supply, health and education institutions at Sanutar, Ghumaune, Ghumaune Pari, and Bhaise. Support for improved schooling accommodations, including more classroom space and provision of new teachers; Sanitation facilities (water supply taps, toilets and waste management) based on informed estimation of the likely influx of outsiders; health clinic facility manned by a medical doctor during the construction phase; preventative health program preventing fecal-borne diseases such as cholera and other gastro-intestinal; environmental sanitation and water education; Awareness and education about sanitation, proper water management, and other appropriate measures to control and prevent Malaria vectors.
5	Skill Development & Project Employment of Local Population	Provision of access to the better paying jobs through skill enhancement suited to the Project construction works; Provision of certification at the level of training taken and according to the quality of trainee performance. Pre-project skills and testing of skills, certification and accreditation of skills. Incorporation of contractual clauses into civil contracts whereby the contractors and their sub-contractors are responsible to set up a transparent employment mechanism to provide skilled job opportunities to the local people in preferential order from SPAF, PAF, Project VDC, Adjoining VDCs, Project District, to hiring Nepalese, including employment of only Nepali Citizens for unskilled and semi-skilled jobs, and for skilled jobs requirement of proof of non-availability of qualified person in Nepal as condition for employment of foreigners by the contractor or sub contractor.

Table 4.5.4 Summary Table of SAP Program (2/2)

	Social Program	Summary Description
6	Rural Electrification Program	Rural electrification for Wards 6 and 8 of Bhaise VDC and Ward 9 of Basamadi VDC connection to National Electricity Grid in line with making APs direct project beneficiaries and as a development gesture on the part of the Kulekhani III Project, 20 km TL.
7	Yangran Watershed Management Program	To be carried out under EMP
8	Neighborhood Support Programs	Financial assistance to project affected communities of Bhaise Wards 1, 6 and 8; Basamadi Ward 9 and Hetauda Municipality Ward 1. Allocation of development funds to each Wards for select development programs, Ward or community contributing about twenty five percent of the estimated cost (in cash or in kind) for number of medium and small sized community development projects, such as the repair and expansion of schools, student hostels, and teacher's quarter; improvement or construction of water supply systems, irrigation systems, trails, temples, and health posts.
9	Women's Development Program	Improvement of family and preventative health, household sanitation, income generation skills, STD, HIV AIDS education, family planning, and girl trafficking; micro-credit funds in the Project affected areas, Bhaise Wards 1, 6, 8; Basamadi Ward 9 and Hetauda Municipality, Ward 1.
10	Information Dissemination and Feedback	Establishment of Public Information Centers inside and outside the Project, dissemination of information through the local FM radio station and by use of Internet services for establishing a Project Webpage; Stakeholders Meetings within the Project area on regular basis.