

Kabeli-A Hydroelectric Project

ENVIRONMENTAL IMPACT ASSESSMENT

Executive Summary



July 2013
(update October 2013)

Acronyms and Abbreviations

| | |
|-----------------|--|
| AAPA | Aquatic Animals Protection Act |
| AAS | Atomic Absorption Spectrophotometer |
| AEMP | Aquatic Ecology Management Plan |
| AEPC | Alternative Energy Promotion Center |
| BOD | Biological Oxygen Demand |
| BOOT | Build, Own, Operate and Transfer |
| BPC | Butwal Power Company Limited |
| BS | Bikram Sambat |
| CAO | Comprehensive Assessment of Option |
| CAR | Catchment Area Ratio |
| CAT | Catchment Area Treatment |
| CBO | Community Based Organization |
| CCCP | Canada Climate Change Program |
| CDO | Chief District Officer |
| CF | Community Forest |
| CFUG | Community Forest User Group |
| CGC | Community Guidance Committee |
| CIA | Cumulative Impact Assessment |
| CITES | Convention on International Trade in Endangered Species |
| cm | Centimeter |
| CO ₂ | Carbon dioxide |
| CPUE` | Catch per Unit Effort |
| CSR | Corporate Social Responsibility |
| DBH | Diameter at Breast Height |
| DDC | District Development Committee |
| DFO | District Forest Office |
| DFO | District Forest Office |
| DLRO | District Land Revenue Office |
| DO | Dissolved Oxygen |
| DOED | Department of Electricity Development |
| DNPWC | Department of National Parks and Wildlife Conservation |
| DoLIDAR | Department of Local Infrastructure Development and Agriculture Roads |
| DSCO | District Soil Conservation Office |
| DSPR | Dam Safety Plan Report |
| E | East |
| EEC | Environmental Enhancement committees |
| EF | Environmental Flow |
| EHS | Environmental Health and Safety |
| EIA | Environmental Impact Assessment |
| EMP | Environmental Management Plan |
| EPA | Environment Protection Act |
| EPP | Emergency Preparedness Plan |
| EPR | Environmental Protection Rules |
| FGD | Focus Group Discussions |
| FPICon | Free Prior and Informed Consultation |
| GC | Grievance Committee |
| GDP | Gross Domestic Product |
| GLOF | Glacial Lake Outburst Flood |
| GMF | Government Managed Forest |
| GoN | Government of Nepal |
| GRC | Grievance Redress Committee |
| GRO | Grievance Redress Officer |

| | |
|--------|--|
| GWh | Giga Watt hours |
| Ha | Hectare |
| HCE | Hydro-Consult Engineering Limited |
| HCPL | Hydro-Consult Private Limited |
| HEP | Hydro Electric Project |
| HPP | Hydro Power Project |
| ICIMOD | International Centre for Integrated Mountain Development |
| ICP | Informed Consultation and Participation |
| IEE | Initial Environmental Examination |
| IFC | International Finance Corporation |
| IFI | International Funding Institutions |
| IFIM | In stream Flow Incremental Methodology |
| ILO | International Labour Organization |
| IP | Indigenous Peoples |
| IPPAN | Independent Power Producers' Association of Nepal |
| IUCN | International Union for Conservation of Nature |
| IVCDP | Indigenous and Vulnerable Community Development Plan |
| JOR | Joint Operation Rules |
| JV | Joint Venture |
| KAECDU | Kabeli-A Environment and Community Development Unit |
| KAHEP | Kabeli-A Hydroelectric Project |
| KCA | Kanchenjunga Conservation Area |
| KCAMC | Kanchenjunga Conservation Area Management Council |
| KCAP | Kanchenjunga Conservation Area Project |
| KCC | Kabeli Concern Committee |
| KCTLP | Kabeli Corridor Transmission Line Project |
| KEL | Kabeli Energy Limited |
| kg | Kilogram |
| kV | Kilo volt |
| kW | Kilo Watt |
| kWh | Kilo Watt hours |
| LF | Leasehold Forest |
| LFUG | Leasehold Forest User Group |
| LPG | Liquefied Petroleum Gas |
| m | Meter |
| masl | Meters Above Sea Level |
| MBNP | Makalu-Barun National Park |
| MCT | Main Central Thrust |
| MDG | Millennium Development Goals |
| mg/l | Milligram per liter |
| mm | Millimeter |
| MOE | Ministry of Energy |
| MOFSC | Ministry of Forest and Soil Conservation |
| MOSTE | Ministry of Science, Technology and Environment |
| MSHP | Medium Scale Hydroelectric Project |
| MW | Mega Watt |
| MWI | Monsoon Wetness Index |
| N | North |
| NEA | Nepal Electricity Authority |
| NESS | Nepal Environmental and Scientific Service |
| NGO | Non-Governmental Organization |
| NPWCA | National Parks and Wildlife Conservation Act |
| NRs | Nepalese Rupees |
| NTFP | Non-Timber Forest Product |

| | |
|---------|--|
| O&MP | Operation and Maintenance Plan |
| °C | Degree Centigrade |
| OHS | Occupational Health and Safety |
| OP | Operation Policy |
| PAP | Project Affected Persons |
| PDA | Project Development Agreement |
| PDF | Power Development Fund |
| PHABSIM | Physical Habitat Simulation Model |
| PIC | Project Information Center |
| PM10 | Particulate Matter |
| PMO | Project Management Office |
| POE | Panel of Experts |
| PPA | Power Purchase Agreement |
| PRA | Public Relation Assistant |
| PRO | Public Relations Office |
| PROR | Peaking Run-Of-River |
| PS | Performance Standard |
| RCIA | Rapid Cumulative Impact Assessment |
| RCLAP | Resettlement Compensation and Livelihood Assistance Plan |
| RMR | Rock Mass Rating |
| RoR | Run-of-River |
| RoW | Right of Way |
| S | South |
| s | Second |
| SA | Social Assessment |
| SAP | Social Action Plan |
| SEA | Strategic Environmental Assessment |
| SHOP | Short-term Hydro Operation Planning |
| SHS | Solar Home System |
| STD | Sexually Transmitted Disease |
| SWCA | Soil and Watershed Conservation Act |
| TDS | Total Dissolved Solids |
| TMJ | Tinjure Milke Jaljale |
| TOR | Terms of Reference |
| TSP | Total Suspended Particles |
| TSS | Total Suspended Solids |
| UNCHS | United Nations Centre for Human Settlements |
| UNDP | United Nations Development Program |
| UNEP | United Nations Environment Program |
| USFR | Updated Feasibility Study Report |
| VDC | Village Development Committee |
| W | West |
| WBG | World Bank Group |
| WWF | World Wildlife Fund |

Executive Summary

The proposed Kabeli A Hydroelectric Project (KAHEP) is a 37.6 MW greenfield peaking run-of-the-river hydroelectric power project located on the Kabeli River, a tributary of the Tamor River, in the Taplejung and Panchthar districts in Eastern Nepal (the “project”).

Kabeli Energy Limited (KEL), a subsidiary of Butwal Power Company (BPC), is implementing the project. KEL has signed a Project Development Agreement (PDA) with the Department of Electricity Development (DOED) for the development of KAHEP. KEL has requested a total of US\$75 million in financing from the World Bank Group (WBG), consisting of a US\$35 million senior debt from the International Finance Corporation (IFC) and a US\$40 million subordinated debt from the International Development Association (IDA), on-lent through the Hydropower Investment and Development Company Limited (HIDCL).

The power shortage in the country is crippling its economy. While power sector development is urgently needed, it is constrained by a shortage of funds for public and private projects and a lack of transmission lines. KAHEP, through a blend of private (IFC, CCCP, KEL) and public (IDA) funding will help develop this new generation capacity through a public-private partnership. IDA is also helping power evacuation from this and other projects in the Kabeli corridor through the ongoing IDA-financed Kabeli Transmission Project. The project is expected to contribute to positive socioeconomic development in the local areas.

Project specific environmental assessment studies were undertaken from April 2010 through August 2011. These studies resulted in the first Initial Environmental Examination (IEE)¹ report as per Nepal’s environmental legislation, approved by the Ministry of Energy, Government of Nepal (GoN) on November 13, 2011. The project has been classified by the WBG as a “Category A” project. Therefore, a project specific Environmental Impact Assessment (EIA) was prepared in August 2011 within the framework of the World Bank Safeguard Policies and IFC Policy and Performance Standards on Environmental and Social Sustainability.

A Social Assessment (SA) was conducted during 2010 and 2011. On the basis of the SA, various social interventions were designed in line with GoN and WBG policies and performance standards related to Involuntary Resettlement, Indigenous Peoples, and Gender. These include a Resettlement Compensation and Livelihood Assistance Plan (RCLAP), Indigenous and Vulnerable Community Development Plan (IVCDP), Resettlement Policy Framework, Gender Action Plan, Public Consultation and Consultation,

¹ Initial Environmental Examination (IEE) is used in Nepal legislation for a limited Environmental Assessment. Local legislation requires a full scale EIA for a hydropower project larger than 50 MW, a project lying within officially declared protected areas, or a project requiring clearance of more than 5 ha of forest land. The Ministry of Energy (MOE) has the authority to approve IEEs and the Ministry of Science, Technology and Environment (MOSTE) has the authority to approve hydropower project EIAs.

as well as benefit sharing mechanisms. These are contained in a project Social Action Plan (SAP) for ease of implementation.

Considering the poverty in the project areas and the general expectations of local communities, the SAP designed by KEL goes beyond mitigation of adverse impacts and includes measures to support and promote socioeconomic development in the project areas. These measures include income generating programs, vocational skill training, and provision of and improvement in basic community infrastructure, such as drinking water, health services, schools and roads. A major measure, responding to local community request, is to provide grid-electricity to the project Village Development Committees (VDCs), under the ongoing Kabeli Transmission Line Project managed by Nepal Electricity Authority (NEA). The project will create employment opportunities for the local population during its construction period and vocational training schemes will be designed to prepare people for these employment opportunities.

Additional studies were conducted in 2011 and 2013 to obtain local and international experts' opinion on the adequacy of the downstream ecological flow in the dewatered stretch of Kabeli River and to identify potential risks of fish entrapment at the head works and the impacts related to fluctuating daily flow during peak operation downstream of the tailrace. Also, additional consultations were carried out in the project area to check and confirm the findings and conclusions of the SA, particularly expectations and broad support from local communities, including vulnerable groups potentially affected by the project, namely women, *Dalits* (or "untouchables," those who are religiously, culturally, socially, economically and historically oppressed and excluded) and Indigenous Peoples. The EIA, SA and SAP were updated in February 2012, April 2013 and July 2013 to incorporate information from the various studies, field surveys and consultations completed to date. Furthermore, Chapter V on Analysis of Alternatives was significantly strengthened.

Fundamentals of the project have not changed since the original design. The project's environmental and social impacts and risks as well as conclusions regarding their assessment also remain the same. All the additional studies mentioned above have concluded that the environmental and social interventions as designed are adequate to address the adverse environmental and social impacts and risks identified under the project and that the local stakeholders, including vulnerable groups, maintain the same view regarding the KAHEP, which continues to enjoy Broad Community Support (BCS).

As per WBG procedures, the sponsors engaged a panel of experts (POE) to review technical (dam safety and civil works, underground works and sediments) aspects and environmental and social safeguards, including the cumulative effects of the project. After reviewing the EIA, the environmental and social experts of the POE, concluded that the KAHEP was environmentally sound, with minor impacts that can be effectively mitigated, and recommended some specific measures for the Environmental Management Plan (EMP) and monitoring.

Public Consultation and Disclosure

As part of the EIA, SA and SAP planning processes, KEL undertook extensive public consultation from 2010 to 2012 with potentially affected communities and other relevant stakeholders (Table E.1). The EIA (including the EMP, SA and SAP) was subjected to and benefitted from formal and intense community and public consultation meetings, which included briefings with interested district and local governmental institutions and NGOs.

The main objectives of the consultation process were to ensure effective and meaningful consultation with and participation by project affected persons (PAP) in project design decisions, in line with the principle of free, prior and informed consultation (FPICon), as stated in relevant GoN policies and WBG safeguard policies.

The first round of consultations was carried out during the EIA scoping exercise from April 22 to May 1, 2010. Fourteen focus group discussions with community forest user groups (CFUGs), women, *Dalits*, and Indigenous Peoples groups were held in October-November 2010 in different locations in the project area. District level stakeholders such as the District Development Committee (DDC) and District Forest Office (DFO) were also consulted. To ensure FPICon (or ICP)² with PAP, the SA and development of the SAP followed a highly participatory planning process. Local stakeholders, affected population, and various cultural and ethnic groups in the project area, including indigenous and vulnerable groups, were identified and engaged in a culturally sensitive and appropriate fashion throughout the planning process. During these meetings, KEL planning teams worked with the affected communities and other stakeholders and developed measures to minimize and address any negative project impacts as well as initiatives to maximize project benefits to those directly affected, particularly to vulnerable groups, namely women, Dalits and Indigenous Peoples

Comments and suggestions from different stakeholders, including vulnerable groups, were incorporated into the EIA, SA and SAP. Findings and recommendations of the EIA, SA and SAP were disseminated and discussed locally, and affected communities and other stakeholders provided their further feedback, which was also incorporated. Additional public consultation meetings took place at the project site on July 24, 2011, to share findings, explain how communities' concerns had been incorporated and obtain any further feedback from the project affected communities and other stakeholders. As noted above, further consultations were carried out in the project area in 2012 and early 2013, and the EIA, SA and SAP have been updated based on these consultations.

² The acronym FPICon was used to refer to *Free, Prior and Informed Consultation* with project affected communities by IDA and IFC. However, under the 2012 IFC Sustainability Framework this process is now referred to in IFC as *Informed Consultation and Participation – ICP* to differentiate it from *Free, Prior and Informed Consent – FPIC* – only applicable where Indigenous People are involved and when significantly adverse impacts upon them are expected as a result of the project.

The EIA and SA findings were also presented in two district level consultations organized on July 25-26, 2011 at Phungling Bazar, district headquarter of Taplejung and at Phidim, district headquarter of Panchthar. These meetings were attended by government officials, political parties, NGOs, and representatives from public media. A national level consultation at Kathmandu was held on August 1, 2011.

WBG safeguard staff and consultants also carried out five different project site visits and consultations from 2010 to 2013 during preparation and disclosure of the EIA, SA and SAP reports. The latest site visit by the WBG Social Development Consultant was in May 2013 to assess the status of the project, to note the changes in the design, if any, with resultant impacts on PAP, and to keep a record of the key findings. During this visit, the Consultant also met with project staff, affected people and representatives from the affected VDCs.

As can be seen from the above, consultations have been carried out as part of the project planning stages, and local people have been involved from the initial phases of the EIA and SA. KEL has specific plans to continue this engagement process throughout construction and project implementation. For example, in order to ensure regular engagement with local communities, Community Guidance Committees (CGC), comprised of KEL representatives and elected/confirmed representatives of each of the directly affected VDCs, will be formed to ensure close and ongoing engagement during early works and project construction. The CGCs will be supported by the project and will work in close co-operation with the DDCs, VDCs, DFOs, CFUGs and NGOs during the implementation phase. The Kabeli-A Environmental and Community Development Unit (KAECDU) will liaise with all relevant local Government organizations, NGOs and Community Based Organizations (CBOs). KEL maintains a Public Relations Office (PRO) in the project area, opened and fully staffed since early 2012. KEL intends to continue open lines of communication and permanent engagement with affected communities.

KEL disclosed the EIA, SA and SAP through its public website, <http://www.kel.com.np> on February 8, 2011, and has continued uploading the updated versions, including the latest version updated in July 2013. The executive summaries of the EIA and SAP have been translated into Nepali, Limbu, Bantawa Rai, Khaling Rai and Tamang languages and are also disclosed on the KEL website. Project information is also available at the Project Information Center in Amarpur, Panchthar district. These documents were originally disclosed on the World Bank's InfoShop and IFC's website on April 8 and December 8, 2011, respectively. The World Bank and the IFC also disclosed updated versions of these documents and studies as they became available.

KEL has established a robust system for handling communications with project communities and the broad public at the local as well as national levels. An officer has been posted in the PRO and oversees a team of Public Relations Assistants (PRAs) who were recruited from local communities. The team includes a female PRA to address the

communication needs of women in the project area. In addition, a Corporate Social Responsibility (CSR) officer is posted at the site.

Grievance Redress Mechanism. Under a system set up by KEL, local communities have established a committee for interacting with KEL that includes representatives of all affected VDCs, all political parties in the area, women's empowerment groups, Dalits and youth. A grievance redress mechanism also has been established under the project. All grievances, whether oral or written, will be recorded at the Project Information Center (PIC) on the project site. The grievance redress mechanism consists of three tiers: (i) a Grievance Redress Cell on site; (ii) local Grievance Redress Committees (GRCs); and (iii) a Project Grievance Committee. The GRCs include representatives from local communities, district government, the project and contractors (as appropriate). The grievance redress setup, composition and operational mechanisms are described in the SAP.

Table E.1. Summary of Highlights of the Community Consultation and Engagement Activities Performed as Part of the EIA and SA Processes to Date

| Community Engagement Activities | Time Period |
|--|--|
| <i>Intensive, culturally sensitive consultations were carried out in all communities in the project area of influence during the EIA, SA and SAP preparation. Governmental organizations and NGOs were also consulted in public meetings.</i> | |
| Extensive, multi-stakeholder engagement process at national and sector levels as part of the Medium Hydropower Study and Hydropower sector SEA | Over 14 months, late 1990s |
| Consultations with affected communities | April – May 2010 (scoping stage of EIA and SA) |
| 46 sampled household surveys and 14 focus group discussions with Community Forest Users Groups, women, Dalits, Indigenous Peoples held in different locations in the project area of influence | October- November 2010 |
| KEL disseminated and made the initial EIA and SIA copies available on www.kel.com.np . The Executive Summary, SAP and project brochure were translated to 4 local languages and are available at the project's Public Relations Office | July 2011 |
| Public consultation and hearing at the project site to share the findings of the assessment, collect feedback, etc. | July 2011 |
| Two district-level multi-stakeholder consultations to present EIA and SA findings at Phungling Bazaar and at Phidim | July 25-26, 2011 |
| National level consultations at Kathmandu | August 1, 2011 |
| CGCs formed to ensure regular engagement with local communities during project's early works and project construction | January, 2012 |
| Dedicated PRO (or Public Information Center) at the project area is maintained to ensure permanent engagement with affected communities | Fully staffed and operational since January 2012 |

| Community Engagement Activities | Time Period |
|---|------------------|
| KEL developed a CSR/Benefit Sharing Strategy describing multiple community investment and engagement activities to benefit local governments and communities, including the benefits from KEL's support to the Government's Rural Electrification Program | Condition of SAP |
| KEL to develop Stakeholder Engagement Plan with clear activities and timeline, including detailing a robust Grievance Redress Mechanism | Condition of SAP |

Chapter I – Introduction

This chapter provides a general background of the KAHEP, its purpose, and a brief description of the project proponents. Under GoN's environmental requirements,³ the KAHEP is subjected to an IEE because: (i) its size is under 50 MW; (ii) it does not affect more than 5 ha of forestland; and (iii) its area of impact lies outside the limits of any officially declared protected area. However, because the KAHEP is seeking joint financing from both IDA and IFC, KEL performed full Environmental and Social Impact Assessments (EIA and SA) to assure compliance with the World Bank's Environmental and Social Safeguard Policies and IFC Performance Standards on Environmental and Social Sustainability.

This chapter also briefly describes the objectives and the methodology of the EIA study.

Chapter II – Project Description

This chapter describes in detail the project location, access, and components as well as ancillary and associated facilities. It also broadly describes the project material, land and human resources requirements, and the expected implementation schedule.

The KAHEP is located in the Middle Mountains about 800 kilometers east of Kathmandu (see Figure E.1). This project utilizes a more than 15-km long loop of the Kabeli River formed with the Tamor River. At completion, the project is expected to produce an average of 215.4 GWh (including outage) of electricity per year. During the dry months, from November to May, the KAHEP will be operated as a peaking plant, and thus will be expected to generate electricity only during the six hours of peaking energy demand: 2 hours in the morning and 4 hours in the evening.

The main components of the project include: a dam (14.3 m high and 60 m long barrage) with live storage of 335 thousand m³ on the river's natural flood plain; intake and settling basin; a tunnel (4.327 km long, 5.65 m diameter) and above-ground powerhouse with a design discharge of 37.73 m³/sec and tailrace discharging directly into the

³ The Nepali Environmental Protection Act (EPA, 1997) and Environmental Protection Rules (EPR, 1997).

Tamor River. The stretch of reduced water flow from the dam to the Tamor-Kabeli confluence is 5.60 km in length. The access road to the headworks is about 7.40 km and the access road to the powerhouse is about 15 km. A total of 47.71 ha of land will be required for the project, out of which 22.50 ha will be permanently required and 25.21 ha only temporarily required during construction.

Other project facility requirements are the camps for engineers, contractors, and laborers; quarry; construction powers, aggregate crushing, storage yards, batching plants and mechanical yards; spoil disposal sites, etc. All of these facilities will be located close to the headworks and powerhouse sites.

A total of about 600 to 800 workers will be needed for the construction whereas the operation phase is expected to require less than 50 permanent employees. Construction will take place over 4 years and the dam is expected to be operational by 2018.

Transmission Lines. Electricity evacuation capacity will be provided by a separate IDA-funded Kabeli Transmission Project (P112893), which is under implementation. That project involves an approximately 84 km T-Line at 132 kV, under construction by the Government, which will be used to interconnect the KAHEP and multiple other generation projects in Eastern Nepal to the national grid, and will include distribution lines and associated infrastructure to provide access to electricity to communities in its area of influence. The Right of the Way of the transmission line is 18 meters. There are four associated sub-stations for the transmission line located at Damak, Illam, Phidim and Kabeli. The Transmission Line EIA was prepared and disclosed on the NEA website on August 29, 2011.

Chapter III – Legislative and Regulatory Considerations

This chapter summarizes the applicable environmental legislative and regulatory context in Nepal, and notes the WBG requirements including applicable World Bank Environmental and Social Safeguard Policies and IFC Performance Standards on Environmental and Social Sustainability.

The project complies with Nepal environmental laws and regulations. The EPR 1997 Schedule 1 classified the KAHEP as an IEE category project. In addition to the requirements of national legislation, the KAHEP must also comply with applicable WBG requirements. The project triggered the following World Bank policies: Environmental Assessment; Natural Habitats; Indigenous Peoples; Involuntary Resettlement; Physical Cultural Resources; Safety of Dams; and International Waterways. It also triggered all eight IFC Performance Standards. Full EIA and SA were carried out following terms of reference (TOR) that were agreed with the IDA and IFC and discussed in public meetings.

Compliance with the WBG requirements is summarized in Table E.2.

Table E.2. Compliance with World Bank Safeguard Policies and IFC Performance Standards

| Safeguard Policies | Actions |
|--|---|
| Environmental Assessment (OP/BP 4.01), and PS1: Assessment and Management of Environmental and Social Risks and Impacts. | <ul style="list-style-type: none"> • Category A project. Full EIA and EMP have been prepared for the project. • Full, stand-alone SA and SAP. • A rapid Cumulative Impact Assessment has been prepared as part of the EIA process, and management strategies will be complemented as part of the implementation process by Technical Assistance to the GoN, which is an integral component of the IDA- operation. • A POE with environmental and one social international expertise was recruited. During implementation the POE will work with a TOR agreed with the Bank and will focus on ensuring that the SAP and EMP are implemented as per the agreed schedule. • Intensive, culturally sensitive consultations were designed and carried out in all communities in the project area of influence during the EIA, SA and SAP preparation, particularly to ensure that free, prior and informed consultation (or ICP) with project affected people, including Indigenous Peoples and vulnerable groups, had taken place. Governmental organizations and NGOs were also consulted in public meetings. • The EIA and SAP incorporated local concerns and recommendations. The SA also confirmed Broad Community Support for the project from affected communities, including vulnerable groups. |
| PS2: Labor and Working Conditions. | <ul style="list-style-type: none"> • Preliminary Occupational Health and Safety and Human Resources management plans and procedures have been developed, and an implementation plan has been agreed. |
| PS3: Resource Efficiency and Pollution Prevention. | <ul style="list-style-type: none"> • Adequate Pollution Prevention and Control measures are included in the EMP, and will be further detailed during implementation. |
| Safety of Dams OP 4.37, and | <ul style="list-style-type: none"> • POE includes an international dam safety expert who has advised on |

| Safeguard Policies | Actions |
|---|--|
| PS4: Community Health, Safety, and Security. | <p>all salient aspects of the project design and visited the site on two occasions during project preparation.</p> <ul style="list-style-type: none"> • KEL prepared a Dam Safety Plan including an Operation and Maintenance Manual, Emergency Preparedness Plan and an Instrumentation Plan. • Further measures to assure safety and address public health concerns for potentially impacted communities have been agreed for implementation (e.g., traffic management plan during construction). |
| Involuntary Resettlement (OP/BP 4.12), and PS5: Land Acquisition and Involuntary Resettlement. Indigenous Peoples (OP/BP 4.10 and PS7). | <ul style="list-style-type: none"> • SA has been conducted. No physical resettlement required and limited economic impact envisioned. No significant ethnicity-differentiated economic impacts on Indigenous Peoples and/or other vulnerable groups. • SAP includes RCLAP and IVCDP, which also contains specific measures for Indigenous Peoples in addition to general assistance package. |
| Natural Habitats (OP/BP 4.04), and PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. | <ul style="list-style-type: none"> • The project does not have direct impacts on critical habitats. • Main impacts are on aquatic ecosystems (e.g., restriction of movement and potential entrapment of resident and migratory fish). • Environmental downstream flows were estimated to meet human consumptive and non-consumptive water uses and ecological needs. An Aquatic Ecology Management Plan (AEMP) is being designed, and will include mitigation measures aligned with good international practices and an adaptive management approach to correct any issues raising during construction and operation. • Additional Tamor-Kabeli basin-wide fish and invertebrate studies will be conducted during project implementation, to assist the GoN to better design mitigation measures for the potential basin-wide cumulative effect on the natural aquatic habitats. |
| Physical Cultural Resources (OP/BP 4.11), and PS8: Cultural Heritage. | <ul style="list-style-type: none"> • Based on field surveys, no archeological or historical sites were found in the project area. • Several religious ritual sites (e.g., cremation and resting sites, religious temples) were identified downstream of the dam. Appropriate mitigation measures have been designed (e.g., environmental downstream flows, extraordinary downstream release during high water demand for ceremonial purposes, additional water storage infrastructure to guarantee continuation of religious practices, etc.) • Chance find procedures for archaeological sites and materials located during construction have been prepared and will be included in bidding documents and contracts. |
| International Waterways OP7.50 | <ul style="list-style-type: none"> • World Bank Management served riparian notifications to China, India and Bangladesh on June 27, 2002 and re-issued them in August 2013. • No comments in connection with the proposed project were received from the notified countries by the indicated deadline to date. |

Chapter IV – Baseline Environment

This chapter describes existing environmental and social conditions of the project's area of influence and highlights the ecological and socio-cultural characteristics of the greater project area, including migratory fish species, heavy sediment loads typical of Himalayan rivers, and the presence of vulnerable communities in the direct area of influence.

The Kabeli River Watershed. The Kabeli River is one of the tributaries of the Tamor River and has a total length of about 52.4 km at the intake site. The catchment area of the Kabeli River is 862.3 km² at the barrage site. The Tawa Khola, Phawa Khola and Inwa Khola are the three major tributaries of the Kabeli River upstream intake. The river at intake has an average annual flow of 61.4 m³/s, minimum during the month of February of 8.63 m³/s and maximum during the month of August of 181.71 m³/s.

An important characteristic of the Kabeli, similar to many of the rivers in Nepal, is the presence of about 40 to 50 old landslides within its catchment above the headworks. No recent active landslide features have been reported or noted close to the project development sites. The maximum recorded suspended sediment concentration is an outstanding 13,616 ppm. The monsoon – June to September – is a period of high sediment load in the river.

Terrestrial Ecology. The project area lies outside any official biodiversity conservation site declared by the GoN. The Kanchenjunga Conservation Area (KCA) and Tinjure Milke Jaljale (TMJ) forest are the two important biodiversity areas in the region, neither of which is likely to be affected by the KAHEP. Both KCA (25 km aerial distance from KAHEP) and TMJ (10 km aerial distance from KAHEP) are in remote mountainous region and are accessible only by trekking over steep mountainous terrain from the KAHEP site – at least two days to KCA and one and a half days to TMJ.

There are no IUCN critically endangered species found in the affected area, although *Dioscorea deltooid* (Ban tarul, Deltier yam) and *Orchids* (Sungava, Orchids) found in the region are IUCN threatened and endangered species, respectively. Further, *Shorea robusta* (Sakhuwa, sal tree), *Bombax ceiba* (Simal, Silk cotton tree), and different *lichen* (Jhyau) species are nationally protected for their economic value. All of the listed species are commonly available in the project region.

Farming practices in the project's area are characterized by traditional integrated crop-livestock production, and sub-systems for household subsistence. Farmers cultivate mostly in rain-fed terraced upland and grow a number of cereals like maize, millet, wheat, various pulses, mustard, and vegetables, as well as some perennial crops like fruits, fodder, and timber.

The lands of the project affected villages are predominantly agricultural, with some forest. Settlements are scattered and are located at various distances from the project development sites. Part of the headworks and head pond area lies in the Kabeli Garjite and Thulo Dhuseni Community Forests of Amarpur village. Of the 22.50 ha of land that

will be permanently required, 59 percent (13.28 ha) is river bed, river banks and flooding zone, 34 percent (7.65 ha) agricultural land, and the remaining 7 percent (1.57 ha) community and leasehold forests. Community and leasehold forest lands are affected at nine different places (the biggest single forest plot that is likely to be occupied is 0.70 ha).

Most of the forested areas are degraded, open, or are under the heavy influence of human and domestic animal grazing activities. The forest areas in and around the project sites are not a suitable habitat for medium and large animals. There are no migratory routes of animals with conservation or economic value; although there is a possibility of occasional visits by some solitary animals such as ghoral and barking deer.

Aquatic Ecology. A total of 31 species of fish has been reported for the Kabeli River. Out of the total, only 12 species were actually collected during the 2011 and 2013 field surveys. There are no IUCN critically endangered fish species found in the affected area, although there are five species reported for the Kabeli River which are on the IUCN Red List: three reported long distance migrants, namely *Bagarius yarrelli*, *Tor putitora* and *Tor tor*, and two mid-distance migrants, *Schizothorax richardsoni* and *Neolissochilus hexagonolepis*. Only the *Tor putitora* is listed as an endangered species, the *Schizothorax richardsoni* is listed as vulnerable, and the rest are reported near threatened species.

The Kabre fish (*Glyptothorax sp*), which is a resident fish, is the most valued fish species to the riparian communities of the Kabeli River. The *Schizothorax sp*, also commonly known as snow trout, are the only commercially important mid-range migrants found in the Kabeli River. Other high value and long distance migratory species reported for the Kabeli River are found only in the wet season (June–October) and they mostly migrate for spawning and return to the Tamor River.

Upstream fish migration occurs normally from late spring and through the monsoon, while the downstream migration normally takes place for most species during monsoon and late monsoon. Spawning season for most of the fish species present in Kabeli occurs in the wet season, although some spawn before the monsoon, with juveniles of these species staying in the Kabeli River for few months. There are five spawning areas and two rearing sites found in the reduced water flow section of the river.

All these fish species have also been reported in the Tamor River and its other tributaries, and are reportedly still very common throughout Nepal.

Socio-cultural Setting. About 336,654 people live in the two project districts, Panchthar and Taplejung. Both districts have limited transportation and electricity facilities. The project affected VDCs are Amarpur and Panchami in Panchthar and Thechambu and Nangkholyang in Taplejung. Major project structures including the headworks, surge shaft, waterways and powerhouse are located in Amarpur VDC. The population of these VDCs is 21,098 (48.1 percent male and 51.88 percent female) having a gender

ratio of 1:1.07. Average household size is 5.54. These four VDCs comprise an ethnically heterogeneous mix of people, including various indigenous groups. There are three major groups in the project area of influence that have been defined as vulnerable: women, *Dalits* and Indigenous Peoples (*Adivasi Janajati in Nepali*).

In Nepal the *Adivasi Janajati* are recognized Indigenous Peoples having their own territory, language, traditional rites and customs, distinct cultural identity, social structure, and history. The SA identified the presence of *Adivasi Janajati* living in mixed communities within the project's area of influence, where they constitute 53 percent of the total local population, with ethnic Limbu, Rai, and Tamang making up major *Adivasi Janajati* groups. Limbu constitute the highest percentage of population in both districts. Kirat and Hindu are the two major religions of the project districts.

As indicated in the SA, the overall economic structure of the project districts is characterized by a mixture of farm and non-farm activities. Non-farm income is the major source of household income, including foreign employment/remittances, services, pension, trade, wage labor and cottage industries. Agriculture and livestock contributed less than 10 percent of household income while services/jobs/pensions provide about 20 percent and remittances 50 percent. The SA also indicates that the different indigenous groups share a common approach in terms of livelihood patterns, resource use and economic activities and that one common package of economic assistance will be applicable to all, but particular attention needs to be given to indigenous and disadvantaged groups to ensure their participation and maximum benefits from the project.

The Kabeli River is not used for irrigation, drinking, water-mills or any other human consumptive uses in the project's area of impact. It must be noted, however, that local community members practice occasional fishing on different sections of the Kabeli River impacted by the project, but none of them is fully dependent on fishing for their livelihood. The majority of them fish for recreational purposes in their leisure time. Only a few households have adopted fishing as a profession but only during the non-agricultural periods do they sell fish at the local markets. According to the local fishermen and communities, the fish population of the area has rapidly declined in recent years due to an increased opportunistic illegal fishing practices that include poisoning and electric shock.

Archaeological, Cultural and Historical Resources. There are no known archaeological sites located within the project area; however, there are several religious sites that require consideration in design and operation of the project.

Adherents to Hindu ritual practice require water for bathing and funeral rites. The Panchayan Shivalaya (Kabeli) Temple is located about 2.5 km downstream from the barrage at Kabeli Bazar and it is an important religious temple that lies within the 5.6 km section of the river that will be dewatered by the project. Large numbers of worshippers visit the temple, particularly during the festivals such as Shiva Ratri and Ekadashi when

bathing is an important ritual of purification. Hindu pilgrims from the surrounding VDCs come to bathe in the Tamor and Kabeli Rivers on religious holidays like Aushi, Kuse Aushi, and Matatirtha. Hindus in the project area also perform cremations at three sites (Kholakharka cremation site, Kabeli cremation site and Sirupa cremation site) located also in the 5.6 km section of the Kabeli River that will be subjected to modified flows by the project.

The Majhi community of Pinasi village performs rituals like Udyouli and Ubhauri, Dhuli Puja, Sansari Puja, and Tamor Puja in the Tamor River. Near the project construction site there is also a rest house (patti) at Pinase Ghat for funeral processions.

It is reported that Trout (*Schizothorax* spp.) and Stone carp (*Psilorhynchus pseudochenius*) are ritually required for *Adivasi Janajati* (Limbu, Rai and Majhi) to worship and propitiate their clan deities and for other ritual performance.

Chapter V – Alternative Analysis

This chapter describes the alternative analysis performed for KAHEP's siting and project design, the reasoning for its selection over other hydropower projects, over the "no-project" option, and over the overall power generation alternatives in Nepal, including power import (Table E.3).

Additional power generation capacity is urgently needed in Nepal to address the ongoing power crises. Other sources, including solar, biomass, solid waste and wind are not technically feasible at the present time in Nepal for large scale power generation as a substitute for the proposed project. Given this constraint, in the "no project" scenario, technically feasible alternative sources to the KAHEP for grid-connected power generation are diesel and incremental electricity import from India.

Section 5.3 of the EIA specifically deals with the "no project" alternative and discusses implications of meeting equivalent power requirements from all the above, including diesel, other fossil fuel, biomass and solid wastes, solar and wind sources or by importing power from India. Selection of the Kabeli-A project from the list of potential hydropower projects in Nepal is also discussed.

In 1997, the Government of Nepal carried out a screening and ranking study of 138 hydropower projects (ranging from 10 to 300 MW) under the Medium Hydropower Study Project (MHSP) with the support of the World Bank. The ranking was done on the basis of technical, economic, social, and environmental criteria. The KAHEP is one of the top seven ranking hydropower projects.

Table E.3. Summary of Alternative Analysis Process

| No. | Alternatives | Major Conclusions |
|-----|------------------------------------|--|
| 1 | No Project | The gap between current power demand and supply will widen resulting to additional hours of load shedding, with serious socio-economic consequences. Market response to the load shedding would be a continued installation of small captive diesel generation. |
| 2 | Fossil fuel based Power Plant | Cost of generation will be (at about 0.30 US\$/kWh) nearly 5 times the current retail tariff, and not affordable by NEA/consumers. Greenhouse gas emissions are estimated at about 160,800 tons of CO ₂ annually in order to generate an equivalent amount of energy (201 GWh), based on the CO ₂ emission factor of 800 g CO ₂ /kWh. In addition, there would be local and regional level environmental impacts due to the emissions of particulate matter, sulfur and nitrous oxides emissions from the diesel plant. |
| 3 | Additional power import from India | Currently additional power import from India cannot be secured and the cost is high. In the long run, Nepal will need to import coal based power from India in dry seasons, and export surplus hydropower to India in wet seasons. Additional generation of 201 GWh in India will result in about 164,820 tons of additional CO ₂ emission annually, based on the average emission factor of 820 g CO ₂ /kWh of the respective regional grids in India. |
| 4 | Solar | Cost of generation is much higher than the current retail tariff. Subsidies needed to make it financially viable are unlikely to be available. |
| 5 | Wind | Technically, the power system in Nepal is not able to accommodate intermittent wind power generation; Cost of generation is also much higher than the current retail tariff. Subsidies needed to make it financially viable are not available. |
| 6 | Other hydro-power as alternatives | The proposed project is one of seven projects/sites selected for a full feasibility/EIA study through a screening of 138 sites, including a rigorous environmental and social screening. Various alternative locations and dam designs were reviewed and the proposed project was selected as a result of the maximum optimization of multiple criteria. |

Chapter VI – Potential Environmental Impacts and Mitigation Measures

This chapter describes environmental impacts expected from construction and operation of the KAHEP, and briefly outlines the measures proposed to manage such impacts (Table E.4). These measures follow the mitigation hierarchy, and therefore, are designed to avoid, minimize, and mitigate potential impacts, and are aligned with good international practices for the sector.

Temporary Construction Impacts. As with any large civil works, the project construction phase will generate environmental and social impacts, including but not limited to: (i) increase in air emission, dust and noise from construction works, construction traffic and operation of heavy machinery; (ii) generation of waste water and process waters and potential contamination of ground and surface waters, (iii) generation of solid and hazardous wastes, (iv) increased erosion and surface runoff, (v) increased risk from occupational accidents to construction workers, and (vi) a risk of traffic and pedestrian ac-

cidents from the increased construction traffic. In addition, during construction, the project area will likely witness an increase in population due to an influx of workers and service providers (e.g., transport, food, lodging). Peak labor force is expected to be around 600-800 workers who will be housed in construction workers camps within the project sites. Indirect impacts, stemming from the construction and enhanced access, may include increased pressures on natural resources and community forests from hunting and timber extraction, among others. The expected increase in population will also strain local services such as water supply, health care, and sanitation facilities. Lack of proper sanitary measures and increases in water pollution and in solid waste could potentially lead to public health issues. Furthermore, the influx of a large number of people with different social and cultural backgrounds and a sudden inflow of additional cash at the same time, if unmanaged, can result in social conflicts, excessive use of alcohol, and increases in solicitation and prostitution with the subsequent spread of the sexually transmitted diseases, including HIV, etc.

Mitigation. KEL has developed construction Environmental Management Plans (EMPs) that include measures to address these impacts, such as: (i) collecting and re-using top soil; stockpiling and storing construction materials in the designated sites only; protecting excavated surfaces against water erosion (providing vertical and horizontal drainages, and discharging collected water to a safe area); (ii) protecting cut slopes (benching, breast walls, vertical and horizontal drainage and grass plantation); (iii) provisioning drainage in the construction areas and along the access roads; applying noise controlling measures (blasting and noisy activities only during the day time, no horns close to village, etc); (iv) collecting wastewater in settling tanks/ponds (aggregate wash water, tunnel seepage water); (v) collecting and safely disposing of used lubricants/grease/toxic chemicals; (vi) separating collection of wastewater from mechanical yard; (vii) providing toilets in the camps and active construction sites and a system for collection and storage of solid wastes from camps and construction sites; (viii) compensating for houses/structures damaged by vibration/blasting; (ix) measures to avoid soil compaction; measures to mitigate atmospheric pollution due to dust, based mainly on periodic water spraying of unpaved roads and work areas and systematic maintenance of construction vehicles and equipment; (x) measures to minimize water quality impacts, consisting of erosion and sediment runoff control and prohibition of discharges of solid or liquid wastes directly into the water bodies; (xi) establishing a waste management program and clear procedures for handling, classification, transportation and final disposal of all solid wastes generated by the construction process; (xii) re-vegetation program, establishing requirements for reinstatement and bio-restoration of all areas to be directly affected by construction support infrastructure, such as construction camps, borrow pits, and others; (xiii) creating decommissioning procedures, establishing a comprehensive approach to ensure that all applicable construction close-out procedures are adequately implemented as part of the decommissioning process and that no environmental liabilities are left behind; and (xiv) housekeeping and pollution prevention

measures, as pertinent to minimize the risk of spills and other impacts resulting from the use and handling of hazardous products.

In addition, to address the impacts related to workers' influx, KEL has developed a comprehensive strategy that includes: workers code of conduct, rigid camp management restrictions (e.g., no hunting, illegal trade, no alcohol), provision of cooking fuel to workers, and a camp followers management plan.

Other plans and procedures to manage temporary construction impacts and risks include:

- Communication and Social Awareness Program will inform local communities on the project's progress and ensure community safety; this Program will include feedback, grievance and conflict resolution mechanisms;
- Public Health Action Plan to manage health risks to local communities, to the workforce and to the camp followers; and
- Construction Traffic Management Plan.

Furthermore, environmental specifications will be incorporated in all bidding documents and contracts. Environmental supervision of all construction activities will be part of the construction EMP compliance framework.

Long Term Environmental Impacts

The most significant long term environmental impacts are related to the permanent conversion of both terrestrial and aquatic habitats.

Terrestrial Ecology. Direct impacts on terrestrial biodiversity are expected to be minimal. The area to be flooded, the construction and camp sites, quarry site, and other infrastructure will affect mostly modified habitat, composed of pastures, agricultural lands, grasslands, and degraded forests. Only 1.57 ha is forest area (0.33 ha of Community Forest and 0.97 ha of Leasehold Forest) land with a total of 200 trees and 153 pole sizes. However, indirect impacts on terrestrial biodiversity could potentially occur as a result of an increased population (workers and camp followers) and increased access to the area, for instance, the increased demand for fuel for cooking and food could increase illegal timbering, poaching and hunting.

Table E.4. Summary of Potential Project Environmental and Social Impacts and Risks and Mitigation Measures

| Project Impacts/Risks | Mitigation Measures |
|---|---|
| <i>Temporary Construction Impacts</i> | |
| Increase in air emission, dust and noise from construction works, construction traffic and operation of heavy machinery | <ul style="list-style-type: none"> • KEL developed a dedicated construction EMP to include related measures to address all these impacts (e.g., storing construction materials in the designated sites only, protecting cut slopes, applying noise controlling measures, providing toilets in the camps, measures to minimize water quality impacts, re-vegetation program, workers code of conduct, rigid camp management restrictions, etc.) • Communication and Social Awareness Program (include feedback, grievance and conflict resolution mechanisms) • Public Health Action Plan • Construction Traffic Management Plan • Environmental specifications to be incorporated in all bidding documents |
| Generation of waste water and process waters and potential contamination of ground and surface waters | |
| Generation of solid and hazardous wastes | |
| Increased erosion and surface runoff | |
| Increased risk from occupational accidents to construction workers | |
| Potential risk of the increased population due to an influx leading to increased pressures on natural resources, water and worsened public health | |
| <i>Long Term Environmental Impacts</i> | |
| Direct impacts on terrestrial biodiversity are expected to be minimal. Indirect impacts on terrestrial biodiversity could potentially occur as a result of an increased population and increased access to the area | <ul style="list-style-type: none"> • Compensatory afforestation as per the Nepali Forest Guideline (2006) • Lease compensation for forest land area • Reforestation and re-vegetation of cleared areas • Technical and financial assistance to the affected Community Forests and Leasehold Forest users • Preference given to local communities for project employment • Provision of kerosene to the workforce for cooking and prohibition of sale and purchase of local non-timber forest products and fish in the camps • Prohibition of roaming in the local forest area by the outside workforce |
| <p>Permanent modifications of Kabeli River natural flow regime (and geomorphologic and ecologic modifications as a result) by:</p> <ol style="list-style-type: none"> i. creating a barrier to migratory fish and entrapment of resident and migratory species ii. reducing available spawning, foraging, hiding, and resting fish and invertebrate habitat in the dewatered reaches of the river iii. modifying a lotic to a lentic environment by creating a small reservoir upstream from the dam | <ul style="list-style-type: none"> • EIA confirms that (iii) and (iv) are expected to be negligible • As part of the EMP, an AEMP is being developed where all relevant mitigation measures will be incorporated, including a robust quarterly aquatic monitoring system • The project will release at least 10 percent of the minimum monthly flow, or 0.86 m³/s at all times (legal requirement), sufficient to maintain minimum thriving conditions for selected aquatic species • The migratory pathways will be kept open by the construction of a fish ladder, assuring that the minimum release is passed through this proposed fish ladder during dry months • Based on the monitoring results, the measures will be adjusted accordingly |

| Project Impacts/Risks | Mitigation Measures |
|---|---|
| iv. producing daily flow fluctuations at the Tamor downstream from the tailrace during peak generation | |
| <i>Long Term Social Impacts</i> | |
| <p>Permanent acquisition of 22.50 ha of land and temporary lease of 25.21 ha during construction affecting 13 households: 2 will lose >50 percent of their total land, 8 < 25 percent, 3 between 25 and 50%. No physical displacement is required, only limited economic displacement</p> <p>~ 22.4 km of existing community tracks will be upgraded and used as access roads to headworks and powerhouse</p> | <ul style="list-style-type: none"> • To mitigate the economic displacement, the RCLAP was developed, meeting WBG land acquisition, involuntary resettlement and livelihood restoration and requirements • 25 trees will be replanted for every tree lost • Affected CFUGs will be compensated through: (i) compensation for an equivalent of 5 years' production potential; (ii) technical assistance through forestry enhancement programs |
| <p>Adverse impacts on the Panchayan Shivalaya Temple, 3 funerary cremation sites, and a rest house located close to the construction site</p> | <ul style="list-style-type: none"> • Extensive consultation held with the affected communities • Although the proposed ecological flow is deemed sufficient for general river sanitation, the river water will be canalized every November to assure that there is sufficient depth and flow of water for funeral rituals at the river cremation sites during the dry season. • Suitable ponds of chest-height will be established in the dry seasons at the Kabeli Temple site for religious baths • Structures will be built as check dams as needed near cremation sites to create water reservoirs. Regular flushing of the river bed will be carried out • During religious festival days, the project will release additional water flow from the intake structure to maintain adequate water supply |
| <p>Potential adverse impacts on 4 VDCs comprising an ethnically heterogeneous mix of people with several degrees of vulnerability and families / individuals belonging to Indigenous groups.</p> <p>Project will <u>not</u> result in: (i) impacts on lands or natural resources subjected to traditional ownership or under customary use; (ii) relocation of Indigenous Peoples from lands/natural resources subjected to traditional ownership or under customary use; (iii) significant impacts on critical cultural heritage that is essential to the identity and/or cultural, ceremonial, or spiritual aspects of Indigenous Peoples' lives; or (iv) use of cultural heritage.</p> | <ul style="list-style-type: none"> • Related mitigation measures included in the SAP and RCLAP • Community consultations • IVCDP developed specifically to manage impacts on 3 groups of vulnerable people: women, Dalits and Indigenous Peoples. It includes actions related to: (i) agriculture support program; (ii) small loan programs; (iii) skills training; (iv) preferential employment; (v) drinking water; (vi) health and sanitation programs; (vii) capacity building programs; and (viii) programs focused on women and Indigenous Peoples • Small loans and other assistance programs for women • Indigenous Peoples' focused programs to unleash their potential through various training, assistance measures and project employment • KEL committed to support measures for development and welfare opportunities for local and regional affected communities • Two categories of local development funds: (i) for the affected VDCs over 3.5 years during construction; (ii) 50 percent of the royalty received by GoN during 30 years must be allocated to regional development; 12 percent of which is allocated to the project's districts |

Mitigation. To minimize these impacts, the following measures will apply: (i) compensatory afforestation as per the Forest Guideline of Nepal (2006); (ii) lease compensation for the forest land area; (iii) reforestation of clearings of vegetation required for the project structures and facilities; (iv) technical and financial assistance to the affected Community Forests and Leasehold Forest users; (v) preference to the local communities for project employment; (vi) provision of kerosene to the workforce for cooking and prohibition of sale and purchase of local non-timber forest products (NTFPs) and fish in the camps; and (vii) prohibition of roaming in the local forest area by the outside workforce. In addition, the forest enhancement programs and compensation for 5 years of production potential from lost forest area will be provided to the affected forest users.

Aquatic Ecology. The most significant long term environmental impacts of the KAHEP are expected to result from the permanent modifications of the Kabeli River natural flow regime and the resulting geomorphologic and ecologic modifications. Construction and operation of the project has the potential to significantly degrade the Kabeli River aquatic natural habitat by: (i) creating a barrier to migratory fish and entrapment of resident and migratory species with the construction of the dam and headworks; (ii) reducing available spawning, foraging, hiding and resting fish and invertebrate habitat in the dewatered reaches of the river; (iii) modifying a lotic (e.g., river, free flowing) to a lentic (e.g., lake or pond) environment by creating a small reservoir upstream from the dam; and (iv) producing daily flow fluctuations at the Tamor downstream from the tailrace during peak generation.

The EIA process has determined that impacts (iii) and (iv) above are expected to be negligible, as the dam will form a fairly small daily regulation reservoir, with a retention time of only a few hours. During monsoon season the river will flow like a natural river, and the powerhouse will discharge in the tumid or torrential Tamor River. The worst case flow fluctuation downstream of the tailrace has been estimated to be about 42 centimeters difference in the river water level during peak generation, and thus is not expected to have any noticeable impacts on the aquatic habitat of the Tamor River.

The most significant impact related to the KAHEP project will be the disruption of the natural upstream-downstream connectivity by the dam and headworks, especially during the dry months of November to May. This barrier effect will likely impair fish migration from the downstream to the upstream reaches for spawning and feeding, and cause entrapment of juveniles and resident fish upstream from the dam. Closing of the natural in-stream connectivity may mean the reduction in species diversity, change of species dominance/natural assemblies and impairment of migratory species' ability to fulfill their life cycle. In addition, the reduced flows expected in the dewatered section during the dry season are also likely to impair lateral movement of fish and invertebrates in and out of the river banks and significantly reduce wetted usable habitat availability. This will affect both resident and migratory fish, by potentially reducing spawning, foraging, feeding, resting, and cover habitat.

During the wet season, the flow regime will suffice for migration and spawning to occur as under natural flow conditions. In the wet season (June through October) nearly 64 percent of the existing average wet season flow will pass through the dewatered section.

Mitigation. Consistent with the Hydropower Development Policy 2001 of GoN, the KAHEP will release at least 10 percent of the minimum monthly flow, or $0.86 \text{ m}^3/\text{s}$ at all times, aimed at maintaining dry season conditions for selected aquatic species. Downstream of the dam, Kabeli River has three small tributaries which provide an estimate of at least $0.18 \text{ m}^3/\text{s}$ in the dry months, in addition to the above mentioned $0.86 \text{ m}^3/\text{s}$ legally required for the minimum ecological flow release.

Based on the field and desk studies performed in 2011 and 2013, independent international expert advice, and the experience from similar projects in Nepal, the KAHEP determined that the proposed $0.86 \text{ m}^3/\text{s}$ minimum ecological flow, together with the additional input from the tributaries release will: (i) provide depth and velocity in the dewatered stretch to maintain the shallow water ecological requirements for the fish species of Kabeli, thus maintaining shallow water ecological conditions for feeding and rearing of adult and juvenile fish species; and (ii) maintain the migration of fish upstream and downstream along the dewatered section. In addition, the migratory pathways will be kept open by the construction of a fish ladder and assuring that the minimum release is passed through this proposed fish ladder during the dry months.

Literature review and consultation with local fishermen revealed a normal downstream fish migration starting towards the end of September and continuing through December, with peak downstream migration in October. The available flow in October is larger than the KAHEP design discharge, whereas in November and December the available discharge is less. Therefore, the risk of fish entrapment in the turbine is considered higher for the migratory species in November and December than in October. In these months, the only available discharge through the diversion structure is the downstream flow that will be released through the fish ladder structure. The KAHEP will incorporate a surface spill in its barrage design to release the ecological flow through the fish ladder. During the high flow periods or periods when the design flow of the KAHEP is less than the available Kabeli River flow (June through October), the opening of the radial gate of the barrage in addition to the fish ladder structure will provide pathways for migration.

KEL is evaluating different options to avoid fish entrapment in the desanding basin and subsequently in the headrace tunnel and turbine of the KAHEP. One option being considered is to build the fish ladder on the right bank of the dam where KAHEP is also considering construction of a fish friendly spillway. Constructing the fish ladder on the right bank is expected to reduce the risk for up migrating fish to be trapped in the tunnel inlet as soon as they enter the reservoir. Alternatively, these structures may be built on the left bank but in addition to fish friendly spillways and physical barriers, the water ve-

locity at the intake will be kept at less than 1 m³/s to avoid entrapment of upstream migrating fish when they enter the reservoir.

As part of the implementation management plan and process, KAHEP is developing an AEMP, where all the proposed mitigation measures will be incorporated. This plan is expected to help strengthen the existing hydro-biological baseline by proposing a robust aquatic monitoring protocol to better understand the significance of the potential degradation caused by the reduced flows, and propose – via an adaptive management approach – potential mitigation, compensation and offset measures, if and as needed. The AEMP will include provisions for: (i) the minimum ecological downstream release, and (ii) the construction of physical structures at the dam and headworks to assure upstream fish migration (e.g., fish ladder) and avoid downstream migration and resident fish entrapment (e.g., fish friendly spillway, location and intake designs).

In addition, the AEMP will also include provisions for other relevant mitigation measures such as: (iii) catch and release program paired with cold-water native fish hatcheries with open water stocking of mid-range and long distance migrant species annually in the upper catchment of the Kabeli; (iv) habitat management program (e.g., minimize removal of boulders from the river bed, construction of pools at specified locations or other physical modification in the river channel); (v) promotion of protection/conservation of pristine tributaries elsewhere in the Kabeli watershed; (vi) plantation and bioengineering works to the extent possible in the areas upstream of the reservoir, in the stretch of reduced water flow and catchment of tributaries joining in the stretch of the reduced water flow; (vii) prohibition of fishing in the stretch of the reduced water flow in the seven dry months and patrolling to enforce prohibition; (viii) aquatic habitat/fish conservation awareness program; and (ix) assistance to local communities for improvement of onsite sanitation management and in the use of agrochemicals.

The AEMP will include a robust quarterly monitoring program of water quality and quantity (e.g., temperature, dissolved oxygen, flow, depth and velocity), along with fish and invertebrate diversity, population health and species composition, to allow adaptive management and minor adjustments as required. It is expected that if, as a monitoring consequence, it is determined that there is a need to adjust the minimum flow release, these are likely to be only minor adjustments, such as increasing flow for a few days or a week to meet specific ecological (e.g., specific fish migration during dry months) and/or social needs (e.g. specific ceremonial needs).

Long Term Social Impacts

The most significant long term potential social impacts relate to land acquisition, socio-cultural impacts caused by modification of the Kabeli River natural flow regime, and any impact on Indigenous Peoples and other vulnerable groups. The project direct impacts include permanent land acquisition required for the reservoir, headworks, powerhouse and other infrastructure. No physical relocation is expected under the proposed project.

There will be some social impacts associated with reduced river flows, particularly during the dry season, in the 5.6 km stretch of the Kabeli River downstream of the diversion dam before the confluence with the Tamor River. These include impacts on fishing, cultural and religious practices (bathing and cremation) for which the river is used.

The project will require the permanent acquisition of 22.50 ha of land and temporary lease of 25.21 ha during construction (e.g., camp and storage sites). Out of the permanently required land, 7.6 ha (34 percent) is private agricultural land, affecting 13 households of 122 people. As shown in the SA, agriculture contributes less than 16 percent to their total annual household income and the impact of the land loss on their household income is expected to be small. Community and leasehold forests comprise 1.57 ha of lands being permanently acquired. They are small areas scattered in nine different places, which are used for the collection of timber and NTFPs.

Approximately 22.4 km of existing community tracks will be upgraded to be used as access roads to headworks (15 km) and powerhouse (7.4 km). This option/alignment was chosen after extensive consultations with and upon eager requests of local communities who expect to improve and upgrade their village access roads under the project. No relocation or land acquisition is required for these access roads.

The project activities will affect the Panchayan Shivalaya (Kabeli) Temple and three funerary cremation sites along the 5.60 km section of the reduced water flow. Under the reduced flow condition during dry months, the Kabeli River may not be able to maintain the basic sanitation conditions needed for ash dispersion and spiritual purification during cremation and religious ceremonies. This issue may be aggravated when large numbers of people gather during religious holidays and festivals.

Following the principle of free, prior and informed consultation (or ICP) as outlined in the government policy framework and WBG policies and performance standards, KEL designed its consultations in a tiered fashion. Apart from general community level consultations where all members could attend, the SA team organized separate focused group consultations with Indigenous Peoples, Dalits, women and community organizations, such as Community Forestry Organizations. The consultations were held in different impact zones to understand specific concerns and requests from the respective community groups. These consultations managed to reach all different cultural and ethnic groups, enabled a free and transparent environment for meaningful consultations and brought forward rich feedback from various groups of local communities, particularly the indigenous and other disadvantaged groups. The SA documents the consultation process, its feedback as well as the broad support of the project by local communities, including the indigenous groups.

As stated above the KAHEP may have potential adverse impacts on four VDCs comprising an ethnically heterogeneous mix of people with several degrees of vulnerability as well as families and individuals belonging to the different indigenous groups.

The SA shows that, in spite of the ethnic differences, local population shares a common pattern in terms of their livelihoods and economic activities. It is expected that the economic impacts due to land loss would be the same for all ethnic and cultural groups and therefore one common compensation and livelihood assistance package would be applicable to all community groups. 13 households will lose land as a result of the project. Of these 13 households, only one is a *Limbu* household – who are considered the original settlers of the project area. In addition, the project land-take from that household represents only 1.8 percent of its total land holding. As such, the KAHEP will not result in: (i) impacts on lands or natural resources subjected to traditional ownership or under customary use; (ii) relocation of Indigenous Peoples from lands and natural resources subjected to traditional ownership or under customary use; (iii) significant impacts on critical cultural heritage that is essential to the identity and/or cultural, ceremonial, or spiritual aspects of Indigenous Peoples' lives; and (iv) use of cultural heritage, including knowledge, innovations or practices of Indigenous Peoples for commercial purposes. The SA also analyzed the vulnerable status of the identified vulnerable groups, namely the indigenous groups, dalits and women, and recommended that particular attention should be given to them in the program design and implementation to ensure their meaningful participation and maximum benefits from the project.

Mitigation and Social Development Interventions. Development interventions have been designed in line with relevant GoN and WBG policies and performance standards on consultation, land acquisition and involuntary resettlement, and Indigenous Peoples. These interventions and action plans were developed on the basis of the findings and recommendations of the SA. They respond to different policy requirements and are packaged into one project SAP for ease of implementation. The SAP includes: (i) an overall social safeguard policy framework; (ii) the RCLAP; (iii) the IVCDP; (iv) public health measures; (v) benefit sharing measures; (vi) a public consultation and communications strategy; and (vii) implementation arrangements including grievance redress and monitoring mechanisms.

- ***Resettlement Compensation and Livelihood Assistance Plan (RCLAP).*** The RCLAP was designed to mitigate the direct project impacts and to support local development through a comprehensive package of interventions. This package includes: (i) cash compensation payment at replacement cost for land acquired and leased; (ii) an agricultural extension program; (iii) vocational training; (iv) preferential employment of local people by contractors; (v) health awareness programs for construction workers and the local population; (vi) establishment of clinics for construction workers and the local population; (vii) assistance to local communities in building new and repairing existing drinking water and sanitation schemes; and (viii) measures to mitigate the impacts of reduced river flows downstream of the diversion dam, including higher releases of water as required for cremations and ritual bathing on religious holidays.

- **Indigenous and Vulnerable Community Development Plan (IVCDP).** Three groups have been identified and covered under this program. They are Indigenous Peoples, Dalits and women-headed households. The IVCDP was developed in keeping with the relevant policies of the GoN, including ILO Convention 169 and UNDRIP as well as with the requirements of the World Bank's Indigenous Peoples operational policy and IFC's Performance Standards. While these groups are entitled to benefit from the generic measures in the SAP, the IVCDP includes specifically designed measures such as: (i) specific interventions that target *Adivasi Janajati* households, such as employment, and livelihood empowerment activities; (ii) awareness training in health, sanitation, gender and other life-skills improvement activities; (iii) supplementary infrastructure facilities in the Majhi settlements; and (iv) and women-focused programs. This last contain a series of measures for women's empowerment, including micro-credit, village banking and savings, small income generating business, social mobilization and capacity-building for women's empowerment.
- **Benefit Sharing Schemes.** In consultation with local communities in the project area and guided by the principle of promoting social cohesion and inclusion, KEL has agreed to benefit sharing mechanisms to be supported under the proposed project. During the construction period, the project will fund local infrastructure works, including new and improved health facilities; drinking water schemes; health services such as clinics; occupation skill training; upgrading of education facilities, and agricultural extension services in the project areas. The IDA-funded Kabeli Transmission Project includes funds for extending access to electricity in the Kabeli corridor, including the project affected village communities. In addition, the hydropower royalty that KEL will pay once the project is operational will also serve as a source of funding to support rural electrification, in keeping with the established procedures for the use of these funds.

Regular monitoring of SAP implementation will be conducted by KEL as well as by an independent external monitor who will be designated to carry out semi-annual reviews of the SAP implementation. The specific monitoring activities and monitoring framework are detailed in the SAP. A third-party monitoring mechanism is also included in the Governance and Accountability Action Plan that has been agreed for the project. An ex-post third party audit of the implementation of the RCLAP and IVCDP will also be undertaken by KEL.

Chapter VII – Rapid Cumulative Impact Assessment and Management

There are in total 24 hydroelectric power projects (HPP) at different stages of development and licensing in the Tamor-Kabeli watershed. The KAHEP is not only the first hy-

dropower project to be developed in the Kabeli River, but also the first one in the entire watershed. (Figure E.2)

This chapter describes KEL's efforts to identify cumulative impacts that the KAHEP may generate or initiate when placed in the context of existing, planned, and reasonably predictable developments in the future.

As part of the EIA process, KEL performed a Rapid Cumulative Impact Assessment (RCIA). In 2011, a preliminary RCIA only covering the Kabeli River watershed was performed, but as a result of this initial effort, the final RCIA geographical boundaries were expanded to cover the whole Tamor-Kabeli watershed.

Preparation of this RCIA involved consultation with local experts, government officials, and international CIA practitioners; advice from an independent international freshwater fish ecology expert who has worked in Nepal for several years; collection of additional fish and water quality data; and an extensive literature review.

KAHEP is committed to manage the significant potential cumulative impacts identified by the RCIA by:

- Including in its EMPs the mitigation measures to appropriately manage its contribution to any potentially significant cumulative impacts; and
- Work with the WBG, GoN and other stakeholders to design a governance mechanism that would allow for the appropriate development, implementation, enforcement, supervision and monitoring of a basin-wide approach to the environmental and social management of the cumulative impacts.

To implement the second part, the proposed project includes a separate US\$2 million Technical Assistance component for the Ministry of Energy (MoE). This Technical Assistance is to increase GoN's capacity to manage the potential cumulative impacts and risks, and carry out any additional basin-wide studies that are necessary to design additional measures to manage potential cumulative impacts at the Tamor-Kabeli watershed level. The main components of this Technical Assistance are summarized in Table E.5.

Table E.5: Components of the IDA Technical Assistance to the DOED

| Component | Budget (USD) |
|---|--------------|
| 1. TA for supervision of KAHEP to ensure compliance with PDA. | 300,000 |
| 2. Capacity Building of GoN agencies and financial institutions in hydropower development | 200,000 |
| 3. Capacity Building on Social Aspects <ul style="list-style-type: none"> • Development of implementing guidelines for resettlement, community benefit-sharing mechanisms, monitoring and evaluation, etc. | 500,000 |

| | |
|---|------------------|
| <ul style="list-style-type: none"> Strengthen capacity of regulators, project developers and consultants by offering short and medium term training | |
| 4. International Workshop on “Integrated River Basin Management For Sustainable Hydropower Development” | Trust Fund (TBD) |
| 5. Additional Basin-wide Studies to Manage Cumulative Impacts in Kabeli-Tamor Watershed | 600,000 |
| 6. Capacity Building on Environmental Aspects <ul style="list-style-type: none"> Review of existing guidelines for hydropower sector Develop supplementary guidelines on specific topics such as Minimum Ecological Flows; Watershed Management; Sediment Management etc. Strengthen capacity of regulators, project developers and consultants by offering short and medium term training | 400,000 |

The RCIA addresses the set of potential concerns posed in three different proposed development scenarios, and focuses on cumulative impacts on those elements considered to be key Valued Environmental and Social Components (VECs).

KEL undertook a rigorous and extensive consultation process to define, together with the relevant stakeholders, which VECs are most likely to be significantly affected or to be the most sensitive receptors to the potential cumulative impacts of the project. VECs were divided into three major categories, namely, physical, biological, and socio-economic/cultural.

Among the residents of the Tamor-Kabeli basin, the most valued VECs were fishing resources. Another important concern associated with the Kabeli River is its cultural and spiritual value to local communities. Culturally and spiritually the Kabeli River has its own significance to the local communities and is regarded as the most holy river by the people of the region. In that context, the water quantity and quality of Kabeli River are extremely important to local people, as it is a source of spiritual cleansing in religious rituals, including burial ceremonies.

As a result of the consultation process, and based on advice of international and local experts, KEL focused the RCIA on five selected VECs (Table E.6).

The VECs, considered by stakeholders to be the most likely significantly affected by the cumulative impacts from the multiple hydropower developments in the Tamor-Kabeli basin are:

- Physical environment:
 - Surface and water quality and quantity; and
 - Erosion/Landslide and sedimentation.
- Biological environment:

- Resident and migratory fish populations.
- Socio-economic and cultural environment:
 - Spiritual and religious practices; and
 - Landscape integrity.

Table E.6. Selected Valued Environmental and Social Components

| Feature | VEC | Valued Feature to Focus Management Strategies |
|---|--|---|
| Physical Environment | Surface Water Quality and Quantity | <ul style="list-style-type: none"> Ecosystem and environmental services integrity: long-term temperature (T°C), Dissolved Oxygen (DO), Total Suspended Solids (TSS), microbiology, natural patterns should remain within acceptable limits; Enough quantity/quality of water to satisfy present and future consumptive human uses (e.g., domestic, irrigation, others). |
| | Landslide/Erosion and Sedimentation | <ul style="list-style-type: none"> Erosion control: watershed sediment load retention/ regulation capacity should not be degraded; and ideally, it should be improved. |
| Biological Environment | Resident and Migratory Fish Population | <ul style="list-style-type: none"> Basin-wide aquatic connectivity: fish upstream and downstream migration should not be impaired; Suitable habitat availability: foraging, spawning and cover habitat for indicator fish species should be maintained. |
| Socio-economic and Cultural Environment | Spiritual and Religious | <ul style="list-style-type: none"> Riparian flow regime: adequate quantity, quality, depth and velocity of river flow should be maintained to avoid disruption of existing cultural, spiritual and/or religious practices by local people. |
| | Landscape | <ul style="list-style-type: none"> Landscape/ habitat fragmentation due to multiple and overlapping access roads and transmission lines should be avoided. |

The potential cumulative impacts on these five VECs are:

- Reduction of water quality and quantity.** Under a multiple hydropower plant cascade scenario it can be reasonably predicted that the natural river flow regimes will be modified, as the river system will be converted from free-flowing rivers to a highly regulated ones. Water quality is likely to be affected. Reduced flows in the dewatered sections will likely be warmer, dissolved oxygen reduced, and any pollutants, microbiological contamination, as well as suspended solids may be present at higher concentrations. This will be aggravated if water is extracted for human consumptive uses from any of the dewatered segments, or if they are subjected to domestic wastewater discharges.

Even though these cascading hydropower projects are not net consumers of water, the timing as well as the allocation of the water flow will be modified. During dry-month periods, the dewatered sections will likely achieve a steady state at the new reduced flows, typically of about 10 percent of the natural flow for that time of the year. On the other hand, during peak generation, the river sections downstream from the tailraces will be subjected to daily water pulses, that could sometimes be signifi-

cantly higher than the natural base flow of the receiving river. These daily water flow pulsating shocks will not allow for the downstream stretches to reach an ecological steady state and thereby are expected to introduce a stressing river environment during low flow season. The daily flow fluctuations might also be accompanied by a subsequent daily modification in the water quality. Furthermore, these downstream pulses of water could also compromise any traditional downstream water uses (e.g., irrigation, recreation), as even though technically the amount of water release will be the same, it will be coming all at once, thus not allowing for the timely use for the intended purpose.

- ***Landslide/erosion and sedimentation.*** Landslides and sediment transport in the Himalayas is a natural phenomenon, often aggravated by anthropogenic influences. Multiple hydropower developments, paired with the increased human activities from enhanced access (e.g., deforestation, slash and burn, haphazard dumping of spoil from road construction directly into the rivers, indiscriminate garbage disposal) will likely reduce forest cover and increase the rate of land-use change and overall erosion. A reduction of the forest cover's catchment will have a significant impact on the soil retention capacity, increasing surface sediment runoff and the vulnerability to landslides.

Flow modification resulting from multiple and cascading hydropower developments will likely have implications on the river morphology and hydraulics/ sediment loads and dispersion dynamics. Sand, gravel and boulder deposition dynamics will likely change. Debris flows are also likely to be modified.

If unmitigated, the potential cumulative impacts of poor watershed management, deforestation, and increased erosion could be significant, not only for the ecological and geomorphological integrity of the basin, but also for the technical and financial sustainability of the cascading hydropower projects.

- ***Aquatic habitat degradation and fragmentation.*** As a result of cascading hydropower plants in the same river system, fragmentation of aquatic habitat is expected from the barrier effect of dams and weirs, and of the reduced flows in the dewatered reaches. This fragmentation will interfere with upstream and downstream fish migration as well as lateral in-stream movements in-and-out of the riverbanks.

Furthermore, natural flow disruption and the reduced flow in the dewatered segments will likely reduce the quantity and quality of suitable foraging, spawning, cover and habitat for both migratory and resident species.

The most important effect due to this habitat fragmentation is the closing of the ecological aquatic corridors. Closing of the ecological corridor means reduction in species diversity, change of species dominance/natural assemblies and impairment of migratory species' ability to fulfill their lifecycle. The river system's natural upstream-downstream connectivity will be significantly disrupted, especially during the dry

season. The barrier effect will likely impair fish migration from the downstream reaches to the upstream reaches for spawning and feeding. Once breeding habitats and nursing areas are lost, a gradual decline in the fish population leading to the extinction of certain fish species in the watershed may be inevitable. One of the main reasons for this is that robust fish populations in the downstream reaches of the large river systems depend largely on the recruitment of fish fry and fingerlings from the upstream nursing areas.

- **Adverse impacts on spiritual and religious sites/practices.** Reduced flows in the dewatered sections as well as the overall cumulative flow regime modifications resulting from the development of cascading hydropower plants in the Tamor and Kabeli basins also have the potential to adversely affect water availability and quality needed for religious ceremonies. Cremation sites require clean water in enough quantity (chest-high depths) for people to perform their traditional ceremonies and rituals. Pure and clean flowing water is a prerequisite for performing these rituals. The minimum constant depth of water in the river is also required for these traditional cultural and religious activities.
- **Landscape conversion.** Multiple cascading hydropower plants, together with the construction of ancillary facilities such as roads and transmission lines, and all the induced development could significantly modify the existing landscape. This could be a very significant negative impact to Nepal's development of tourism based activities in the project area. The visual impacts and landscape fragmentation as a result of unplanned and multiple roads and electric transmission and distribution lines, though still uncertain, could potentially be very significant. Nepal is a country that markets its natural pristine beauty as one of its main touristic features, and this image could be significantly jeopardized if the landscape is encroached upon by multiple transmission lines, towers, cables and roads.

Mitigation of Potential Cumulative Impacts. Since the KAHEP is the first hydropower project to be constructed and operated in the Tamor-Kabeli basin, it has the opportunity to establish a good practice in the design and implementation of appropriate mitigation measures and to incorporate continuous management of the potential cumulative effects in the EMP.

KAHEP will include in its operational EMP the following measures to curb the cumulative impacts at the basin level:

- Design and construction of a fish ladder to assure that upstream-downstream fish migration is not impaired;
- Design and construction of structures / check dams along cremation sites to create chest-depth pools. In addition, downstream flow release will be increased during religious festivals to meet riparian communities' ritual requirements and maintain adequate sanitation;

- Design and construction of fish diversion structures to minimize fish entrapment in the headrace tunnel;
- Release of a downstream environmental flow regime that will: (i) maintain the ecological river corridor open; (ii) secure survival of substantial amounts of fry and fingerlings of target species in the dewatered segments; and (iii) ensure local populations can continue performing their traditional burial rituals and other religious ceremonies undisturbed;
- Development and implementation of a robust monitoring program during the construction and operation phases to allow for improved understanding of the potential effects of the proposed minimum downstream release on riparian connectivity and migration challenges of the key fish species; and
- Adaptive management to allow for adjustments of the downstream environmental flow regime releases as a response to the monitoring program results.

In addition, in the area of terrestrial influence KAHEP will apply:

- Soil conservation through biological and engineering solutions in the catchment areas to reduce the upland erosion and sediment load in Kabeli River; and close monitoring of the grain size distribution and sediment concentrations in the river in real time;
- Awareness programs at catchment level for ecosystem conservation through improvements in the water retaining properties of soil;
- Afforestation and bio-engineering works for degraded areas to enhance basin vegetative cover; and
- Promotion of rural electrification as per the hydropower policy (2001) in the project influenced VDCs to reduce reliance on fuel wood for energy.

It is expected that once KAHEP makes the investments required to develop and implement these mitigation measures, all other projects in the basin will follow the trend. However, if the future projects upstream and downstream from the KAHEP do not implement similar and coordinated measures, KAHEP's efforts alone will not be sufficient to maintain the ecological and socio-economic integrity of the Tamor-Kabeli watershed.

With the support of the WBG, KEL will use best efforts to leverage and engage the GoN and other developers in the application of good practices. Therefore:

- All hydropower developments should provide downstream flow regimes that will adequately meet ecological and social requirements, especially during the dry season. Establishing the required flow release is often a challenge and needs multi-stakeholder long term coordinated monitoring efforts;

- To assure ecological corridors are kept open, all projects should include fish ladders and entrapment prevention measures in their design;
- Native fish hatcheries should be supported by all developers in the basin, and open water fish-restocking should take place on an annual basis and in a coordinated fashion;
- It is envisaged that all developers with stakes in the Tamor-Kabeli basin shall work jointly for the overall development of the Tamor-Kabeli basin. For this purpose a joint Catchment Area Treatment (CAT) plan should be developed. The CAT will highlight erosion control techniques, and will involve understanding of the erosion characteristics of the terrain and suggest preventive, stabilization and remedial measures to reduce the erosion rate. These shall give attention to the proper construction of rural roads and rural electrification to avoid and minimize the potential adverse environmental impacts;
- Infrastructure should be shared to avoid unnecessary land acquisition and additional habitat and landscape fragmentation as a result of overlapping access roads and transmission lines; and
- Joint operation and maintenance activities should be developed (e.g., agreeing on common operation and maintenance manuals and guidelines). Coordinated downstream environmental flow and extraordinary flow release, flushing, and other operational, maintenance and emergency prevention and response activities are crucial for increased efficiency and reduction of maintenance costs.

As stated above in Table E.5, the IDA has allocated a total of US\$2 million to help the DoED to carry out the following capacity building activities during implementation.

- **International Workshop on “Integrated River Basin Management for Sustainable Hydropower Development in Nepal”** The WBG in collaboration with the DoE and other development partners active in Nepal, assist the GoN in organizing an international workshop on “Integrated River Basin Management for Sustainable Hydroelectric Development in Nepal”. This proposed workshop will focus on sharing international experiences and case studies on sustainable hydropower development and bring together key stakeholders to discuss technical assistance needs to promote sustainable hydropower development in Nepal. Some of the specific topics that will be discussed include: cumulative impact assessment methodologies and their application to hydroelectric development at the watershed level; maintenance of minimum ecological flows and regimes; ecological compensation and offsets; design of Environmental Management Plans for construction and operation; community engagement and consultation with project affected people; resettlement and land acquisition aspects; consent from affected indigenous peoples; and good practices on benefit sharing. Target Groups: Policy makers, Regulators, Civil society, Project de-

velopers, Private sector, Government Agencies connected to Hydropower development in Nepal, Academia, and Consultants.

- **Additional Basin-wide Studies to Manage Cumulative Impacts in Kabeli-Tamor Watershed.** This task will provide resources for the DoE to engage national and international consultants to consolidate good baseline data, develop thematic maps of the Tamor – Kabeli watershed, collect all relevant data needed to assist the GoN to manage Cumulative Impacts in Kabeli-Tamor Watershed.
- **Capacity Building.** This task will focus on two aspects of environmental capacity building for regulators, consultants, private developers, construction engineers, academia etc: (a) preparation and issuance of guidelines on specific topics such as: Cumulative Impacts; Minimum Ecological Flows, Watershed Management, Sediment Management, etc. and (b) offer specialized short and medium term training programs on Sustainable Hydropower Development in Nepal.

In addition to the above, DoED will receive support to implement the following two initiatives to manage social aspects: (a) development of implementing guidelines for resettlement, community benefit-sharing mechanisms, monitoring and evaluation etc. and (b) strengthen capacity of regulators, project developers and consultants by offering short and medium term training.

The project will provide resources to DoE to hire national and international experts to prepare the above stated specific guidelines. DoE will also hire reputed national institutions such as: Institute of Engineering (IoE), Kathmandu University, New Era, Winrock International, Nepal, and Himalayan Resources etc. to offer regular training programs for various stakeholders (policy makers, regulators, civil society, project developers, private sector, relevant Government departments, Academia, and Consultants) connected to hydropower development in Nepal.

Chapter VIII – Environmental Management Plan, Monitoring Plan and Audit

This chapter describes KEL's proposed measures to manage environmental and social impacts associated with the construction and operation of KAHEP. The mitigation measures are encompassed in a comprehensive EMP that identifies the principles, approaches, procedures and methods to be used to control and minimize environmental and social impacts of all construction and operational activities associated with the project development. It is intended to ensure that commitments made by KEL to minimize project related environmental and social impacts are upheld throughout all project phases. The EMP is also a companion document to the SAP.

Basic principles under which the EMP will be implemented are:

- Fulfill all environmental and social conditions associated with the project approvals;
- Develop, promote and foster a shared sense of responsibility for environmental and social performance of the project;

- Promote environmental awareness and understanding among employees and contractors through training, identification of roles and responsibilities regarding environmental and social management and linking project performance to the overall environmental performance;
- Encourage an understanding of social and cultural sensitivities in local communities and the importance of minimizing project impacts on local lifestyles and cultures;
- Monitor environmental and social performance throughout the project and implement an adaptive management approach to continuous improvement;
- Work with local communities and project affected stakeholders to ensure that they benefit as a result of the project development; and
- Maintain an ongoing commitment to informing, engaging and involving local stakeholders throughout all phases of the project.

KEL's environmental management activities reflect a synthesized plan incorporating the elements of environmental mitigation and enhancement measures. They can be described as activities to manage construction and operation impacts and adaptive management strategies to address the selected environmental impacts the magnitude of which may still be uncertain.

Management of construction and operation impacts addresses all the issues that are associated with the impacts from the project's activities, and include: (i) permits and approvals; (ii) environmental training; (iii) construction camps and traffic management plan; (iv) pollution abatement plan; (v) terrestrial ecology management plan; (vi) AEMP; (v) erosion abatement and muck/spoil management plan; (vi) public health and occupational safety management plan; (vi) emergency management plan; (vii) rehabilitation plan; (viii) chance find procedures; (ix) labor law compliance; (x) security personnel; and (xi) grievance redress mechanisms.

Contractor responsibilities during construction in all of these plans will be detailed in the Environmental Specifications for Contractors, which will be included in bidding documents and enforced by an external supervising consulting firm.

To effectively integrate various stakeholders in KAHEP environmental management, an institutional framework for the different phases of project development and implementation will be established. The objective of the institutional framework is to establish linkages of various stakeholders such that project activities are taken forward through a linear command and control, while inputs from various stakeholders are taken into account and internalized in the project implementation at various levels of the institutions.

As noted above, a POE has been established to provide independent review and guidance on the treatment of technical, environmental and social issues associated with the KAHEP. Among other duties, the POE will provide reports on the status and compliance with EMP and SAP requirements.

Adaptive Management. It is recognized that the proposed plans may need future adjustments. An adaptive management approach will therefore be adopted for environmental and social management components. Based on monitoring and evaluation of actual performance, proper adjustments will be made to the management plans. This iterative process needs to be repeated until all environmental and social systems are stabilized upon project completion. Adaptive management approaches will particularly apply to the management of fish populations, the management of water releases and environmental flows, and the management of cumulative impacts. The EIA report revealed key areas in which additional information is needed to identify or improve mitigation measures. The main baseline studies are: baseline information on the aquatic life and community water uses of the Kabeli and Tamor Rivers and baseline information on the status of houses and infrastructure along the tunnel alignment.

In addition to the monitoring efforts and the baseline studies, the adaptive management framework will be supported by two key studies that will be carried out during project construction:

- ***Migratory and resident fish study.*** The water diversion projects such as KAHEP may affect fish diversity and population through barrier and dewatering effects. In order to minimize the impacts the project has integrated a ladder provision in the dam body. The uncertainty of the effective use of the fish ladder for upstream and downstream migration of the fish is one of the concerns. Therefore, a fish hatchery, annexed with an open water fish stocking, is proposed for the KAHEP to minimize the uncertainty risks of the fish ladder with an objective to maintain the fish diversity and population in the upstream section of the Kabeli River. Target fish species for hatching in the fish hatchery are the Red List species, the migratory species, and those species that have an economic value to locals. The study TOR will include: (i) a review of the fish hatching experience of the target fish species in Nepal; (ii) identification of suitable fish hatching site close to the KAHEP; (iii) design of the fish hatching facility with the required accessories; (iv) operations management and (v) costs of construction and operation of the fish hatching facility.
- ***Catchment Area Treatment Plan.*** Upland erosion and downstream sedimentation are issues of concern in Himalaya Rivers including the Kabeli basin. To minimize the effects of erosion and sedimentation, there is a need for basin wide identification of vulnerable areas and activities that result in erosion and subsequent sedimentation. To date, there are no such studies of the Kabeli basin. The KAHEP will conduct a basin wide study for identification of the key erosion prone areas and activities that are likely to exacerbate erosion and sedimentation in future. Based on such a study, a catchment area treatment plan will be drawn for the Kabeli basin. This study will form a basis for responsibility sharing between various development agencies including KAHEP developer for the minimization of erosion and sedimentation in the basin.

Environmental Monitoring. Environmental monitoring plans include environmental monitoring during pre-construction, construction and operational phases for the baseline, compliance and impact monitoring of the project activities. A set of measurable indicators have been selected for the monitoring and the plan includes methods of monitoring, monitoring frequency, monitoring location, and personnel responsible for monitoring along with the costs. Quarterly internal monitoring will be carried out by KEL regularly and four reports will be issued per year. During construction, independent external monitoring will be carried out semi-annually to review the implementation of environmental and social safeguard measures.

Chapter IX – Environmental Mitigation, Monitoring, Auditing and Management Costs

This chapter provides the expected costs associated with the implementation of the EMP, environmental mitigation and environmental monitoring costs. The total environmental costs of the project are NRs 238,279,187.00 (about US\$2,307,833.00);⁴ out of which 30,223,575.00 NRs are dedicated to environmental management during construction; NRs 13,502,500.00 to environmental monitoring during pre-construction, construction and operations; NRs 41,744,177 to overall environmental mitigation, NRs 750,000.00 to environmental audit and NRs 152,058,935.00 to environmental and social civil costs including camps, resettlement, rehabilitation and other. Additional NRs 29,579,173.05 are dedicated separately to SAP implementation.

Other Safeguard Issues

Safety of Dams (OP.4.37). An international POE advised the project on all salient aspects of its design and visited the site twice during project preparation. KEL prepared a Dam Safety Plan, including an Operation and Maintenance Manual, Emergency Preparedness Plan and an Instrumentation Plan satisfactory to the WBG.

International Waterways (OP 7.50). The initial feasibility study and the environmental impact assessment for KAHEP were completed in 1998. Riparian notification was made to China, India and Bangladesh on June 27, 2002. The riparian notification letter requested comments from the riparian countries by September 30, 2002. No comments in connection with the proposed project were received from China, India or Bangladesh by the indicated deadline or at any time since then. An updated riparian notification was submitted to the three riparian countries on August 15, 2013, with a deadline for submitting comments on September 27, 2013. No comments were received.

⁴ Exchange rate 1 US\$ = NRs 103.25.