

Non-Technical Updated Environmental and Social Impact Assessment Summary Report

Public Consultation Draft

Prepared for:
International Finance
Corporation

UPPER-TRISHULI HYDROPOWER
PROJECT, NEPAL

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ES1. INTRODUCTION

The Nepal Water and Energy Development Company Limited (NWEDC) is proposing to construct the 216 megawatt (MW) Upper Trishuli 1 Hydropower Project (the “Project” or “UT-1”) located on the Trishuli River within the Rasuwa District of the Central Development Region of Nepal, approximately 70 kilometres northeast of Kathmandu (Figure ES1-1). The International Finance Corporation (IFC) is supporting the development of the Project. Other financial institutions considering participating in a lender’s consortium includes the Asian Development Bank, the Asian Infrastructure Investment Bank, the Export–Import Bank of Korea, the German Investment Corporation (DEG), Korean Development Bank, Proparco, CDC Group, and other lenders to be designated, as well as potential loan guarantees from the World Bank and Multilateral Investment Guarantee Agency (collectively the “Lenders”).

NWEDC prepared an Environmental Impact Assessment (EIA) for the Project, which was completed in January 2012 (herein referred to as the National EIA) and approved by the Government of Nepal in February 2013.

With the subsequent involvement of international lenders, and in accordance with their environmental and social policies and standards, the Project has been classified as Category A, assuming a precautionary approach and due to the inherent and contextual risks associated with hydropower development and Nepal socio-political vulnerabilities. As a result, the National EIA was subjected to extensive strengthening and revisions through a number of supplemental studies to bring the Project into conformance with international standards, most notably the World Bank Performance Standards and Environmental, Health and Safety Guidelines, leading to a Supplemental ESIA (herein referred to as the Supplemental ESIA), which was disclosed by IFC in February 2015.

In April 2015, Nepal suffered a large earthquake centred within 100 kilometres of the UT-1 site. The Rasuwa District, where the Project is located, was one of the worst affected areas. NWEDC provided extensive relief to earthquake-affected people and assisted with some reconstruction efforts in the area. This earthquake resulted in both changed environmental and social baseline conditions in the Project area and modifications to the Project design to address geotechnical and other natural hazard risks. After the earthquake, most of the population from the Project area evacuated and many are still living in internally displaced person camps in the region. Over the last year, a few residents have returned (permanently or temporarily) to their local villages. Most of the local residents, however, are reported to be wary of returning to their original settlements due to the risk of landslides. Also, the younger population is reported to have gotten accustomed to living closer to urban centres, which provide better economic opportunities.

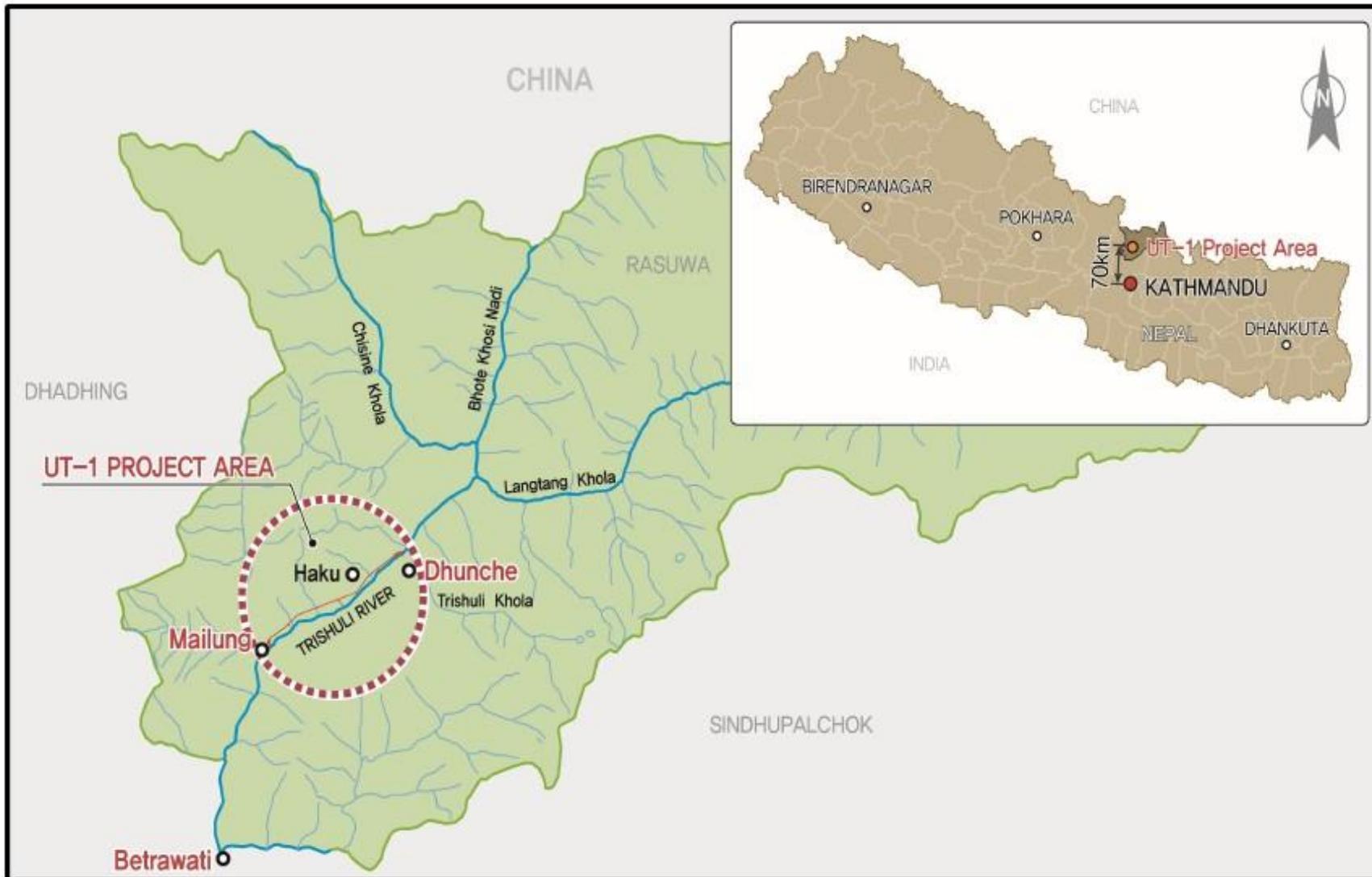


Figure ES1-1: Project Location Map

Despite delays resulting from the earthquake, NWEDC has continued to move the Project forward, completing a number of complementary studies and updating other baseline studies. Given these changed baseline conditions, the lenders selected the international sustainability consulting firm Environmental Resources Management (ERM) to consolidate all prior impact assessments and supplemental and complementary studies into a single Updated Non-Technical ESIA Report (Updated ESIA), along with an updated Environmental and Social Management System (ESMS) and Environmental and Social Management and Monitoring Plans (ESMMP), including a Social Impact Management Framework. The attached document constitutes the Updated ESIA, with the ESMS and ESMMP attached as appendices.

Given the great need in Nepal for domestic power and the fact that other large planned hydropower projects in the country are expected to export a significant amount of their power generation to neighbouring countries, the Project is especially valuable in that it will supply only domestic demand; will increase the country's existing generation capacity by about 50 percent from a fully domestic resource; and will substitute for fossil fuel generation and reduce greenhouse gas emissions of Nepali electric matrix by up to 26,000 tons annually.

ES2. PROJECT DESCRIPTION

The Project consists of a 77-metre-wide diversion dam in a narrow gorge located 275 metres downstream of the confluence of the Langtang Khola with the Bhote Khosi River. The diversion dam creates a small 2.1 hectare (ha) impoundment and diverts up to 76 cubic metres per second (m^3/s) of water through a powerhouse with a 216 MW capacity, returning the water to the Trishuli River approximately 10.7 kilometres downstream of the dam. The Project will connect to the Chilime–Trishuli transmission line via a 689-metre extension from the Project switchyard. The Project will be accessed via existing public roads, but NWEDC will construct an 11.84-kilometre private road upstream along the river to access the UT-1 dam.

The Project design was changed in response to the 2015 earthquake to strengthen its geotechnical and seismic design, take into account updated climate change forecasts, adjust to changes in landscape conditions (e.g. landslides), and to optimize engineering aspects of the dam.

The Project will take approximately 5 years to construct and will employ about 1,090 workers, with about 10 to 15 percent recruited locally and the remainder from elsewhere in Nepal or expatriates. Once in operations, the Project will employ 72 staff and produce about 1,440 gigawatt hours (GWH) per year.

The Project is located in a remote area in the upper portion of the Trishuli River Basin, just downstream of the confluence of the Langtang Khola and the Bhote Khosi River. The Langtang National Park forms the eastern boundary of most of the Project area. There are six existing operating hydropower projects and seven projects under construction within the Upper Trishuli River Basin. In addition, the Upper Trishuli-2 Project is proposed, but not yet under construction, and would be located approximately 0.5 kilometre upstream from the UT-1 dam. Two of the existing and two of the under-construction hydropower projects on the main stem of the Trishuli River downstream of the Project (the nearest, UT-3A Hydropower Project, is approximately 1.5 kilometres away).

ES3. STAKEHOLDER ENGAGEMENT

Public consultation and the participation of the various relevant stakeholder groups is a critical component of the impact assessment process. NWEDC started engaging early with local stakeholders, using community liaison officers, and has maintained regular communication and interaction with both local and external stakeholders throughout the Project development process, including:

- 2009 to 2012 during the land acquisition process;
- 2012 to 2014 as part of the various environmental and social assessments (including the National Environmental Impact Assessment [EIA] and the Supplemental ESIA processes);
- 2015 as part of the Livelihood Restoration Plan development process;
- 2016 as part of the Gap Assessment process undertaken by ERM;
- 2017 as part of the Land Acquisition and Livelihood Restoration Plan development; and
- 2018 as part of the proposed Free, Prior, and Informed Consent consultation process with affected Indigenous People.

Through these various engagements, NWEDC has attempted to ensure timely dissemination of relevant information to the stakeholders in terms of Project activities, potential impacts, and the proposed mitigation measures.

After the 2015 earthquake, NWEDC proactively engaged with the local community to provide relief and rehabilitation support to the earthquake affected communities. As a part of this engagement, NWEDC, in partnership with IFC, DEG, the local governments and community-based organisations, undertook relief activities, including providing livelihood and sustenance support to people living in internally displaced persons camps. In addition, the company is helping to rebuild two schools and one health centre; remove rubble; and open up local roads for local communities. These efforts have resulted in tremendous goodwill and trust in the Project and NWEDC as a sustainable partner to local communities.

NWEDC has worked to achieve community support and the social license to operate the Project. While the affected communities and other stakeholders may initially have had some concerns regarding the Project, the overall perception is now generally positive. As a result of the April 2015 earthquake, the concerns of the local people have changed as they struggle to restore their homes and livelihoods and adjust to a reorganized government administrative structure, increased land prices, and other changes triggered by the earthquake. The communities clearly view the Project as a source of local development, primarily in the form of access improvements, job opportunities, and benefit sharing.

ES4. KEY PROJECT RISKS AND MANAGEMENT MEASURES

The Project poses several environmental and social risks. This section briefly describes these risks and how NWEDC proposes to manage them.

ES4.1. EFFECTS ON THE TRISHULI RIVER AND AQUATIC BIODIVERSITY

The Project will affect the water quality, sediment transport, aquatic habitat, and fish of the Trishuli River as summarized below.

The Project may impact water quality as a result of land disturbance and clearing; spoil and muck disposal; solid and hazardous material use/waste disposal; wastewater discharges; and elevated water temperatures. The Engineering, Procurement, and Construction (EPC) Contractor will implement several Environmental and Social Management Plans to manage relatively standard construction risks associated with erosion, sedimentation, waste management, and wastewater treatment. The post-earthquake revised Project design involves significant tunnelling, the rock cuttings from which have not been tested to see if they are potentially acid generating. A Rock Cuttings Management Plan will be prepared by the contractor to manage the risk of acid rock drainage. The small Project reservoir (2.1 ha) and short water retention time limit the potential for the Project to impact dissolved oxygen and temperature in the Trishuli River.

Hydropower projects, by their inherent nature, tend to modify the natural sediment regime of a river by trapping sediments behind the dam. The UT-1 Project design includes a desander to trap coarse sediments and periodically flush them back into the Trishuli River. The Project's operational regime also includes periodic flushing flows to move accumulated sediment downstream and prevent the reservoir from filling with sediment.

The existing Trishuli River in the Project area is considered to have an ecological integrity of near natural conditions, and the river is considered Natural Habitat pursuant to the IFC definition. The Project will impact this habitat by creating a 2.1 ha reservoir, constructing a dam across the river, and creating a 10.7-kilometre-long diversion reach that will experience reduced flows. The Project will operate in a true run-of-river mode, which avoids impacts downstream of the power plant discharge that are common with projects with a peaking operational regime. The Project is located at a relatively high elevation in the Trishuli River Basin where high gradient and cold water temperatures limit fish biodiversity. The Common snowtrout (*Schizothorax richardsonii*) is by far the most abundant species found in the Project area, is classified as "Vulnerable" by the International Union for Conservation of Nature (IUCN), and is a migratory species that moves upstream in the spring to spawn, but the winter water temperatures in the Project area are approaching their tolerance threshold.

The Project will divert up to 76 m³/s of flow from the 10.7-kilometre segment of the Trishuli River between the dam and the powerhouse (i.e. the diversion reach). This flow diversion will reduce the width and depth of water in the diversion reach; thereby potentially impacting aquatic habitat and fish. In Nepal, hydropower projects are required to release 10 percent of the minimum monthly average flow (i.e. 3.9 m³/s for the UT-1 Project) to preserve the minimum habitat required to support fish and other aquatic life in the diversion reach, and to preserve flow continuity for fish movement/migration through the Project area, which is referred to as an environmental flow, or Eflow. NWEDC has proposed an Eflow that is higher than that required by Nepalese regulations, essentially providing 10 percent of the average monthly flow for each month, rather than the minimum average monthly flow (i.e. ranging from 3.9 m³/s to over 50 m³/s, depending on the month).

NWEDC also proposes to install a fish ladder to allow the upstream passage of migrating Common snowtrout and will design a guidance mechanism to help guide downstream migrating fish away from the powerhouse intake. The fish ladder design was reviewed and found acceptable by fish experts from the IFC and ERM. The provision of sufficient flow to enable upstream migrating adult Common snowtrout to navigate through the diversion reach to the proposed fishway at the dam is critical to the success of the fishway. NWEDC will implement an Adaptive Management Program based on intensive monitoring during the Project's first few years of operation to ensure migrating Common snowtrout are able to reach their spawning grounds upstream of the UT-1 dam.

The Project will implement a Biodiversity Management Plan that achieves No Net Loss of Aquatic Natural Habitat through provision of environmental flows; installation of a fish ladder; monitoring, adaptive management, documentation of effective fish ladder operation for Common snowtrout; and research on Common snowtrout migration timing and preferred spawning grounds. These efforts will improve fish passage design for other future hydropower projects in Nepal and the broader Himalayan region.

ES4.2. EFFECTS ON LANGTANG NATIONAL PARK AND TERRESTRIAL BIODIVERSITY

Project construction and operation will directly impact approximately 108 ha of land, nearly all of which are disturbed and show evident signs of human activity. No globally listed critically endangered, endangered, or endemic terrestrial species have been found in the Project area, so nearly all of the area affected by the Project is considered Modified Habitat, as defined by the IFC. The Project will not impact any IFC-defined Critical Habitat.

The Project will disturb approximately 6.77 ha of land within the Langtang National Park (LNP) boundary—2.61 ha for dam construction and 4.16 ha for the new worker camp construction (2.8 ha owned by the government and 1.36 ha privately owned). Although within the national park boundary, both of these sites are classified as buffer zone land and not part of the park itself. The LNP Management Plan specifically encourages development of hydropower projects within the LNP buffer zone.

NWEDC obtained approval from the Government of Nepal for the 2.61 ha impact at the dam site as part of its original environmental authorization and obtained government approval for the revised worker camp location on 31 December 2017. The 2.61 ha site required for the dam is forested and identified as Natural Habitat. The 4.16 ha site required for the worker camp is disturbed, not forested, isolated from the remainder of the LNP by the Betrawoti-Mailung-Syabrubesi Road, and classified as Modified Habitat.

NWEDC will mitigate for impacts to Natural Habitat, LNP, and forests by:

- Acquiring at least an equivalent area of similar land for donation to the LNP;
- Contributing to enhanced management of LNP;
- Replacing trees removed during construction at a rate of 2:1; and

- Adopting a Worker Code of Conduct that expressly prohibits any hunting; poaching; fishing; collection of, or trade in, any endangered species; and collection of firework from LNP or any Community Forests.

ES4.3. EFFECTS ON PROJECT AFFECTED PEOPLE

The Project is located in a rural area with only a few isolated villages in the vicinity. The Project has the potential to affect landowners and tenants as a result of land acquisition, physical resettlement, and economic displacement; local villages as a result of nuisance impacts, and the introduction of the Project workforce, including foreign workers, into these isolated villages; and Indigenous Peoples. Project effects on each of these Project-affected groups are summarized below.

ES4.3.1. Land Owners and Tenants

Overall, the Project is in general conformance with the requirements of IFC Performance Standard 5, Land Acquisition and Involuntary Resettlement. The Project requires acquisition of 107.79 ha of land through a procurement process that has been broadly consistent with international standards. Most of this land (approximately 78 percent) was owned by the government, but there were 38 affected private land owners representing 154 Project Affected Families (PAF), including 18 tenants farming the Trust (*Guthi*) land, which is owned by the monastery at Swayambhu in Kathmandu, who were treated the same as land owners in the land acquisition process (see Table ES4-1). The Project required the acquisition of 36 residential structures, including houses, sheds, and a water mill. The Project did result in the loss of 14 primary residences, although several of these were damaged by the earthquake and not occupied at the time of acquisition. The Project has also resulted in the loss of some community forest land used by 422 households within five Community Forest User Groups (CFUGs).

Table ES4-1: Summary of Land Acquisition

Government Land	Langtang National Park Land ¹	Private Land	Trust Land (<i>Guthi</i>)	Mailung HEP Land	Total (ha)	Number of Affected Private Land Owners
78.646	5.41	5.05	15.53	3.15	107.79	39

ha = hectares

1. Land areas as follows: 2.61 ha to be used permanently for headworks, 2.8 ha of already disturbed/deforested land for the temporary placement of worker camps (to be returned once construction is finalized).

NWEDC has prepared a Land Acquisition and Livelihood Restoration Plan that documents the land acquisition process and ensures that the livelihoods of those incurring economic displacement are restored. ERM notes that concerns have been raised by the owners of a few residential and non-residential structures that were left out of the compensation process. NWEDC will resolve these few remaining compensation questions so that the land acquisition process can be documented as being consistent with international standards.

ES4.3.2. Local Villages

Project construction and operation will occur in the vicinity of eight rural villages, with those located closer to the river (and primary construction activities) being most affected, including Phoolbari, Haku Besi, Thanku, and Mailung. Residents of these villages will be exposed to typical nuisance construction impacts such as noise, vibration, lighting, and fugitive dust. These impacts are associated with construction, and therefore will be temporary (albeit the estimated construction period is 5 years) and NWEDC has agreed to several management plans to minimize these impacts such as restrictions on night time construction and spraying water to manage dust.

The Project is expected to employ approximately 1,090 workers, with 85 to 90 percent of them likely to be from outside the Project area and some will likely be expatriates. This influx of labour into the area for an estimated 5-year period increases the risk of social conflict between the local community and the construction workers, illicit behaviour and crime, introduction of communicable diseases, traffic congestion, among other potential impacts. The World Bank has indicated that these labour influx risks are the greatest when the capacity of the host community is low (e.g. no formal law enforcement presence) and when the ratio of the number of workers to community members is high, both of which will be the case for the UT-1 Project (World Bank 2016). In this high risk setting, the World Bank guidance requires an additional specific labour influx management plan. NWEDC is preparing, and will implement, a Labour Influx Management Plan, with specific measures to manage these risks, such as adoption of a Worker Code of Conduct with associated penalties for any violations. The availability of a grievance mechanism is also critical so that local residents have an easy way to notify NWEDC and the EPC Contractor of any concerns. Close monitoring of complaints and ongoing engagement with the local villages is critical to pre-empt these risks.

ES4.3.3. Indigenous Peoples

Nearly 90 percent of PAFs directly impacted by the Project belong to the Tamang ethnic group (Nepal's fifth largest), which is identified as an indigenous nationality, or *Adivasi Janajati*, in Nepal. The Tamang have their own language, traditional customary practices, distinct cultural identity, social structure, and oral or written history, as recognized by the National Foundation for Development of Indigenous Nationalities Act (NFDIN 2002).

The presence of this group triggers specific requirements under lender social safeguard policies. World Bank Group Performance Standard 7 (Indigenous Peoples) requires a client to seek the Free, Prior, Informed Consent (FPIC) of affected Indigenous Peoples (IP) communities under specific circumstances, including 'where a project impacts on land and natural resources subject to traditional ownership or under customary use.' Based on UT-1 project impacts on Government owned forest land communally administered by Community Forest User Groups (CFUGs), which are primarily composed of Tamang, it has been determined that FPIC is applicable to this project. NWEDC is initiating an FPIC process in the first half of 2018, focusing on those IPs currently or formerly resident in the eight main villages in or near the Project footprint and their traditional representatives (if any) located elsewhere.

ES4.4. COMMUNITY HEALTH AND SAFETY

Even though the area downstream of the Project is not densely inhabited and mostly composed of agricultural lands or community managed forests, the Project has performed a standard dam break study and has committed to constructing the dam in accordance to best industry practices. After the 2015 earthquake, the Project design was modified to take into account better defined seismic hazards (e.g. the Lender's Engineer specified a Maximum Credible Earthquake of 0.83 g [acceleration of gravity] for a 3,000 year recurrence period based on a Deterministic Seismic Hazard Analysis), changes in landscape conditions (e.g. landslides), and to optimise engineering aspects of the dam. The dam design has also been upgraded to withstand a 10,000-year flood event with a combination of spillway gates and an emergency spillway overflow. The revised dam design will be reviewed by both the Lender's Independent Engineer as well as the Project's Panel of Experts. NWEDC will also be required to prepare and implement detailed Emergency Preparedness and Response Plan, in consultation with potentially affected downstream communities downstream.

The Project's dam access road was partially constructed at the time of the earthquake and was damaged by landslides. NWEDC will prepare a Landslide Management Plan to specifically evaluate potential landslide risks on nearby villages, and to the road itself, from access road construction.

During Project operations, NWEDC will be required to have the structural integrity of the dam regularly inspected by qualified experts. The common public safety risk associated with the sudden release of water from a hydropower dam is less in this case as the Project will be operated in a true run-of-river, rather than peaking, mode of operation.

ES4.5. CUMULATIVE IMPACTS

Six Valued Environmental and Social Components (VECs) were identified as having the potential to be cumulatively impacted by the UT-1 Project, in combination with other proposed hydropower projects within the Trishuli River Basin:

- Water Resources – both quantity and quality;
- Fish and Aquatic Habitat – aquatic habitat fragmentation and effects on fish movement;
- Erosion and Sedimentation Processes – especially the risks of landslides
- Terrestrial Habitat – including protected areas and loss for remaining forest habitat;
- Natural Resources Use – both forest and agricultural land;
- Cultural and Religious Practices – such as effects on cremation sites.

Although the relative contribution of the UT-1 Project to cumulative impacts on these VECs in the Trishuli River Basin appears manageable, there is the potential for over 40 hydropower projects in the Trishuli River Basin, which collectively pose significant environmental and social risks. Since cumulative impacts typically result from the actions of multiple stakeholders, the responsibility for their management is collective. At times, cumulative impacts can transcend a

regional /administrative boundary and, therefore, collaboration in regional strategies may be necessary to prevent, or effectively manage, such impacts. Where cumulative impacts already exist, management actions by other projects may be needed to prevent unacceptable cumulative impacts. NWEDC is participating in a Trishuli River Basin Cumulative Impact Assessment funded by the IFC, and has indicated its commitment to actively participate in a Trishuli Basin Co-Management Platform, which will facilitate multi-stakeholder cooperation and commitment to collaborate in the monitoring and co-management of cumulative impacts in the Trishuli River Basin.

ES5. UPDATED ESIA CONCLUSIONS AND RECOMMENDATIONS

In summary, the UT-1 Project will generate approximately 1,440 GWH of clean, renewable electricity for domestic use and reduce greenhouse gas emissions by up to 26,000 tons annually. Through careful Project siting and design, NWEDC has effectively applied the Mitigation Hierarchy to avoid many potential impacts (e.g. impacts to any IFC-defined Critical Habitat). The proposed instantaneous run-of-river operating mode and the provision of a fish ladder help minimize impacts to aquatic habitat and fish. NWEDC has generally acquired land and compensated affected land owners in accordance with international standards. Where residual impacts exist, NWEDC has proposed measures to restore or mitigate these impacts (e.g. offset LNP land take, comply with Nepal Ministry of Forestry reforestation requirements). Further, NWEDC has committed to developing or implementing a range of Environmental and Social Management Plans to ensure remaining impacts and risks are properly managed.

Tables ES5-1 and 5-2 summarize the key avoidance, minimization, mitigation, and management measures proposed by NWEDC to manage the Project's environmental and social risks and conform with international standards. Taking into consideration NWEDC's efforts at avoidance, minimization, restoration, and offsetting of impact, the Project's residual impacts are quite minimal, and much less than would be expected from alternative 216 MW sources of power.

With the proper application of the Environmental and Social Management Plans and implementation of a robust monitoring program, the UT-1 Project should be in full conformance with the IFC Performance Standards and other lender requirements; and the Project has the opportunity to set the standard for other hydropower projects in the Trishuli Basin and elsewhere in Nepal.

Table ES5-1: Project Construction Phase Environmental and Social Risk Management Measures

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
Air Quality	Fugitive dust	<ul style="list-style-type: none"> • Spray water on disturbed surfaces as needed • Place gravel on access roads near villages • Cover truck loads • Provide dust control at crushing and crushing plants • Use high-efficiency dust suppression system for crushers operated at the site • Enforce speed limits along dirt roads near communities • Stabilize disturbed areas as soon as possible after construction with vegetation or other materials 	<ul style="list-style-type: none"> • Air Quality MP • Blasting and Explosives MP 	Minor	EPC Contractor
	Vehicular and Power Emissions	<ul style="list-style-type: none"> • All Project vehicles will comply with national emission standards • Use low-sulphur fuel diesel for diesel-powered equipment and vehicles • Provide regular maintenance of vehicles in accordance with manufacturer specifications • Provide covering for material transport • Enforce appropriate speed limits within construction site • Reduce vehicle idling time to a minimum 	<ul style="list-style-type: none"> • Air Quality MP • Maintenance MP 	Minor	EPC Contractor
Climate Change	Green House Gas Emissions	<ul style="list-style-type: none"> • Regular maintenance of vehicles in accordance with manufacturer specifications • Reduction of vehicle idling time to a minimum • Minimizing vegetation clearing to the extent practicable • Burning of biomass is prohibited in the worker camps 	<ul style="list-style-type: none"> • Air Quality MP 	Minor	EPC Contractor
Noise and Vibration	Noise and vibration	<ul style="list-style-type: none"> • Procure low noise generating compressors and diesel generating sets • Provide regular maintenance of vehicles and equipment in accordance with manufacturers specifications • Install noise control device at adit portal ventilators • Prohibit blasting activities at night • Notify local communities before blasting • Restrict use of horn near school and residential areas by placing signage • Place equipment generating vibrations on strong foundation • Practice controlled blasting near structures 	<ul style="list-style-type: none"> • Noise and Vibration MP • Blasting and Explosives MP • Maintenance MP 	Minor	EPC Contractor

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
Water Quality	Land Disturbance Spoil and Muck Disposal	<ul style="list-style-type: none"> • Avoid spoil disposal sites on unstable land that could cause future landslides, affect drainage or irrigation ditches, or present risk of failure of spoil washing into watercourse • Construct spoil sites that are stable and not susceptible to erosion (e.g. use gabion structures) • Implement appropriate sediment and erosion control • Construct drainage system surrounding disposal sites to control surface runoff • Provide drains as needed within and around the spoil disposal site to manage water levels within the cells • Use spoils for construction purposes to the extent possible to reduce disposal requirements • Dispose of spoil only at authorized disposal sites, no spoil will be disposed in the Trishuli River or tributary streams, steep slopes, farmland, or forest areas • Rehabilitate spoils sites as soon as the disposal operations are complete with native vegetation(e.g. <i>Alnus nepalensis</i>) 	<ul style="list-style-type: none"> • Excavation, Slope Stability, Sediment and Erosion Control MP • Stockpiles, Quarries, and Borrow Pit MP • Spoil Management and Disposal MP • Water Quality MP 	Minor	EPC Contractor
	Rock Cuttings	<ul style="list-style-type: none"> • Evaluate the geologic formation through which the tunnelling will occur for the potential presence of sulphide and other PAG rock • Periodically test the rock to confirm the lack of PAG minerals • Have a plan in place to manage any PAG rock that may be encountered 	<ul style="list-style-type: none"> • Rock Cutting MP 	Minor	EPC Contractor

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
Water Quality	Solid and Hazardous Material Use and Waste Disposal	<ul style="list-style-type: none"> Establish a system for collection, segregation, and disposal of solid waste in the worker camps Apply appropriate storage, transport and use practices to recognized standards for fuels, chemicals, explosives, hazardous substances Explosives, chemicals, and hazardous substances to be handled by authorized personnel Diesel to be stored in truck tankers or in overhead tanks to a maximum of 5000 litres and on flat ground at least 50 metres from a waterway Dikes to capture 100 percent of fuel must be placed around fuel storage area All refuelling to be done on flat ground Spill kits and emergency procedures should be used and staff trained Collect and store liquid wastes (e.g. lubricants, paints, cleaning, chemical, and oil-based materials) in a suitable storage tank with concrete floor for ultimate disposal at an authorized disposal facility; Prohibit deliberate discharge of oil, diesel, petrol or other hazardous materials to the surrounding soils and waterways. 	<ul style="list-style-type: none"> Materials Handling and Storage MP Spill Prevention and Response MP Waste MP Wastewater MP Water Quality MP 	Minor	EPC Contractor
	Wastewater Discharges	<ul style="list-style-type: none"> Provide an on-site package wastewater treatment plant or community septic system to treat domestic wastewater at the worker camps Use oil/water separators for drainage from repair and maintenance facilities Provide settling ponds to manage runoff from work areas (e.g. crushing and batching plants) Collect, test, and treat if necessary tunnel process water All wastewater discharges (e.g. domestic, stormwater runoff, tunnel process water) will comply with the IFC General EHS Guidelines and Ministry of Environment standards 	<ul style="list-style-type: none"> Wastewater MP Water Quality MP 	Minor	EPC Contractor

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
Biodiversity	Aquatic Habitat and Fisheries	<ul style="list-style-type: none"> • Provide environmental flow • Construct fish ladder for upstream fish migration • Provide guidance mechanisms for downstream fish migration • Provide awareness training and prohibit hunting, fishing, or poaching by construction contractors • Implement Connectivity Assessment, fish studies and continual monitoring of fish species and quantities • Hire international fish specialist to oversee construction and initial operation of the fish ladder and Eflow Adaptive Management Program • Terminate any employees found trapping or fishing in the diversion reach 	<ul style="list-style-type: none"> • Biodiversity MP 	Moderate	NWEDC/EPC Contractor
	Terrestrial Habitat	<ul style="list-style-type: none"> • Primarily sited in Modified Habitat • Establish clearing limits • Demarcate in the field the approved limits of clearing • Collect and store topsoil for use in restoration • Stabilize and rehabilitate/reforest temporarily disturbed areas • Acquire, reforest, and donate area equivalent government land required for project to LNP • Mitigate the loss of trees on a 2:1 basis in accordance with Ministry of Forest requirements • Install fencing around the dam site to prevent unauthorized worker access to LNP forest • Provide awareness program to construction workers regarding LNP and protected species • Inform contractor staff that unauthorized entrance to the LNP or damaging natural forest areas is prohibited and could result in the termination of their employment • Terminate any employee found collecting firewood, timber, or other forest products from the local community forests or LNP • Provide staff to monitor activities in the LNP buffer zone at the dam site and in community forests to ensure no illegal activity by construction workers 	<ul style="list-style-type: none"> • Biodiversity MP • Rehabilitation and Landscaping MP • Spoil Management and Disposal MP 	Minor	NWEDC/EPC Contractor

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
	Impacts to Wildlife	<ul style="list-style-type: none"> • Provide awareness training and prohibit hunting, fishing, or poaching by construction and operation contractors • Terminate any employees found illegally hunting, poaching or trading protected species • Include terms in contracts with EPC and O&M contractors indicating that exploitation of biodiversity resources will result in penal action. • Use signage and speed humps in areas where wildlife crossing is likely. • Train vehicle drivers regarding the driving risks through biodiversity sensitive areas and along remote roads. • Prohibit wildlife meat at the worker camps 	<ul style="list-style-type: none"> • Biodiversity MP 	Minor	NWEDC/EPC Contractor
Biodiversity	Impacts to Birds related to Transmission Lines	<ul style="list-style-type: none"> • Raise the transmission poles with suspended insulators • Require bird-safe strain poles with insulating chains of at least 60 centimetres length. • Check for vacuums or holes in the towers to avoid nesting by any of the birds; • Monitor bird carcasses electrocuted on a monthly basis and record any threatened or migratory species observed 	<ul style="list-style-type: none"> • Biodiversity MP 	Minor	NWEDC/EPC Contractor
Community Health, Safety, and Security	Dam Safety	<ul style="list-style-type: none"> • Modified Project design to account for better defined seismic hazards and climate change predictions • Dam design to be reviewed by Project's Panel of Experts and Lender's Independent Engineer 	<ul style="list-style-type: none"> • Emergency Preparedness and Response MP 	Minor	NWEDC/EPC Contractor

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
	Landslide Hazard	<ul style="list-style-type: none"> • Assess geologic hazard of access road alignment, including pegging and flagging of landslide area boundaries • Survey structure located within 250 metres of tunnels and access road to document conditions of these structures • Install temporary and permanent slope stabilization using appropriate civil structures (e.g. gabions, concrete, benches) • Provide for both vertical and horizontal drainage to avoid erosion and safely divert water from steep slopes • Maintain slopes at less than the angle of repose to the extent possible • Control blasting and use of explosives, especially near landslide susceptible areas • Provides compensation to structures damaged by blasting or other Project activities • Stabilize disturbed areas using bioengineering techniques where feasible and rehabilitate the site with native species 	<ul style="list-style-type: none"> • Landslide Stabilization MP • Quarry Management Plan 	Moderate	EPC Contractor

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
Community Health, Safety, and Security	Spoils and Muck Management	<ul style="list-style-type: none"> • Use excavated material for road construction, aggregate, and backfilling of quarries and borrow pits to the extent possible and suitable • Locate spoil disposal sites above the flood line of the Trishuli River and avoid disturbance of agricultural land and forestland to the extent possible • Remove and retain any topsoil for use in rehabilitation at closure • Provide retaining walls/ wire-crates at each disposal site • Provide appropriate erosion and sediment control, including routing drainage through sediment traps prior to release • Prohibit the disposal of spoils and mucks at unauthorized locations • Conduct regular training and awareness programmes for drivers transporting muck and spoil to designated site • Stabilize, revegetate, and rehabilitate the spoil disposal sites once it reaches capacity using stockpiled topsoil to the extent possible • Access Roads Stability and Traffic Safety • Procedures to notify nearby communities of proposed traffic volumes and patterns • Provide educational materials to nearby residents and schools to inform children about traffic safety • Establish speed limits for all traffic, especially in proximity to villages • Provide training to all staff with driving responsibilities to sensitize them to potential safety risks such as children playing, livestock, and driver fatigue • Provide as needed warning sign and speed bumps to alert drivers that they are approaching sensitive receptors 	<ul style="list-style-type: none"> • Emergency Preparedness and Response MP • Excavation/Slope Stability MP 	Minor	NWEDC/EPC Contractor

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
Community Health, Safety, and Security	Natural Disasters and Accidents	<ul style="list-style-type: none"> • Project components have been modified relocating many underground • Project design to withstand a 10,000-year flood event • Include an emergency communication and notification system to alert downstream communities of flooding and other natural disasters • Coordination with upstream and downstream hydropower projects for monitoring and coordinated response to natural disasters • Develop an Emergency Preparedness and Response MP in consultation with local health care providers, hospitals, and community leaders. • Provide traffic safety awareness training to both construction workers and local residents, including signage 	<ul style="list-style-type: none"> • Emergency Preparedness and Response MP • Site Safety and Security Management Plan • Occupational Health & Safety MP • Blasting and Explosives MP • Worker Accommodations MP 	Minor	NWEDC/EPC Contractor
Social	Land Acquisition	<ul style="list-style-type: none"> • Minimized Project physical resettlement requirements • Provided compensation for loss of land, structures, crops, and other forms of economic displacement in accordance with the requirements of IFC Performance Standard 5 and Government of Nepal • Provide counselling services to Project Affected Families on the effective use of their compensation payment 	<ul style="list-style-type: none"> • Land Acquisition and Livelihood Restoration Plan 	Minor	NWEDC
	Forest Land Loss	<ul style="list-style-type: none"> • Support to the community forest management initiatives as agreed to with the Nepal Ministry of Forest • Provide payment for extra losses of tree during the access road construction or during further construction • Implement a Grievance Redressal Mechanism • Prohibit firewood usage by the construction workers • Provide training and capacity building of the Community Forest User Groups 	<ul style="list-style-type: none"> • Land Acquisition and Livelihood Restoration Plan 	Minor	NWEDC/EPC Contractor

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
Social	Labour and Labour Influx	<ul style="list-style-type: none"> Established Grievance Redressal Mechanism Provide benefits to the local community from the Project, in keeping with the benefit-sharing plans formulated as part of the Project Development Agreement requirements Prohibit child labour Adopt a Worker Code of Conduct Notify local law enforcement in the case of any prostitution activity Provide community awareness program on sexually transmitted diseases and girl trafficking Prioritize Project employment of Project Affected Families Maximize use of local labour Provide support to local schools receiving children of Project workers Provide a health clinic for use by construction workers at the worker camps and require regular health check-ups Provide equal employment opportunities for both men and women Provide financial assistance to local health institutions Provide water supply and wastewater treatment to meet Project demands without affecting local community systems Provide financial assistance to the local District Police Office to maintain security in the Project area Provide awareness training for non-local workers regarding respect for local traditions, culture, and religious practices Provide fencing around the worker camps and not allow access to any unauthorized person 	<ul style="list-style-type: none"> Labour Influx MP Site Safety and Security Management Plan Worker Accommodations MP Local Benefits Sharing Plan Nepal Employment/Skill Training MP 	Minor	NWEDC/EPC Contractor
Indigenous and Vulnerable Peoples	Indigenous and Vulnerable Peoples	<ul style="list-style-type: none"> A formal FPIC process will be implemented Support preservation of Tamang traditions, culture, identify, and traditional occupations Prioritize employment for Dalit group in accordance with their skills and capacities 	<ul style="list-style-type: none"> Indigenous and Vulnerable Peoples Development Plan 	Moderate	NWEDC – for FPIC process EPC Contractor – for other measures

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Management Plan	Residual Risk	Responsibility
Cultural Heritage	Impacts to cultural heritage sites	<ul style="list-style-type: none"> Minimized impacts on known cultural and religious sites Implement a Chance Finds Procedure during construction and ensure it is widely socialized and understood by the Project contractors; and Establish a grievance mechanism to allow local residents to report concerns associated with cultural heritage impact (e.g. loss of access) and loss of cultural values 	<ul style="list-style-type: none"> Cultural Heritage MP 	Minor	EPC Contractor
Cumulative Impacts	Cumulative Impacts	<ul style="list-style-type: none"> Participate in the Trishuli River Cumulative Impact Assessment funded by the IFC 	<ul style="list-style-type: none"> Cumulative Impacts MP 	Moderate	NWEDC

EHS = environmental, health, and safety; EPC = engineering, procurement, and construction; FPIC = Free, Prior, and Informed Consent; IFC = International Finance Corporation; LNP = Langtang National Park; MP = Management Plan; NWEDC = Nepal Water and Energy Development Company Limited; O&M = operations and maintenance

Table ES5-2: Project Operation Phase Environmental and Social Risk Management Measures

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Operations Management Plans	Residual Risk	Responsibility
Air Quality	<ul style="list-style-type: none"> Fugitive dust Vehicle Emissions Climate Change 	<ul style="list-style-type: none"> Enforce speed limits along dirt roads near communities Regular maintenance of vehicles in accordance with manufacturer specifications Reduction of vehicle idling time to a minimum 	<ul style="list-style-type: none"> Air Quality MP 	Minor	NWEDC
Noise	<ul style="list-style-type: none"> Noise 	<ul style="list-style-type: none"> Provide regular maintenance of vehicles and equipment in accordance with manufacturers specification Restrict use of horn near school and residential areas by placing signage Employees working within powerhouse shall be provided with earplugs and other required PPE. 	<ul style="list-style-type: none"> Noise and Vibration MP 	Negligible	NWEDC

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Operations Management Plans	Residual Risk	Responsibility
Water Quality	<ul style="list-style-type: none"> • Solid and hazardous wastes • Wastewater • Sediment 	<ul style="list-style-type: none"> • Manage sediments by periodic flushing of desanders • Manage solid waste generated from the powerhouse, dam, and accommodations areas through proper collection system and stored at designated locations. • Maintain vehicles, machineries, and equipment's in designated areas. • Lubricants, oils, grease, chemical shall be stored at designated area with impervious surface and a secondary containment system. • Ensure hazardous waste (used oil, transformer oil, and oil soaked cloths) is properly labelled, stored onsite at a location provided with impervious surface, shed and secondary containment system, and ultimately transported offsite to an approved disposal facility. • Spill Prevention and Response Plan shall be implemented for immediate cleaning of spills and leakages. • Sludge generated from a wastewater treatment plant shall be used in garden and landscaping. • Discharge of all sanitary and process wastewater to waterbodies must meet IFC EHS Guidelines and Government of Nepal standards. 	<ul style="list-style-type: none"> • Water Quality Management Plan 	Minor	NWEDC

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Operations Management Plans	Residual Risk	Responsibility
Biodiversity	<ul style="list-style-type: none"> • Flow • Habitat • Species 	<ul style="list-style-type: none"> • Operate in true run-of-river mode • Operate fish ladder and fish guidance system to guide fish to the fish ladder and away from the turbine intake • Provide required Eflow at all times • Monitor Common snowtrout upstream migration and implement the Adaptive Management Program if needed • Monitor the fauna, flora and specific habitats within the impact areas • Monitor bird carcasses electrocuted on a monthly basis and record any threatened or migratory species observed along the transmission line route • Enhance riparian vegetation by developing a Riparian Vegetation Restoration Program • Designate vehicular routes to avoid soil compaction in other areas. • Provide signage and speed bumps where wildlife crossing are likely • Inform contractor staff that unauthorized entrance to the LNP or damaging natural forest areas is prohibited and could result in the termination of their employment • Install fencing around the dam site to prevent unauthorized worker access to LNG forest • Provide staff to monitor/patrol activities in the LNG buffer zone at the dam site and powerhouse worker camp to ensure no illegal activity by construction workers • Terminate any employee found collecting firewood, timber, or other forest products from the local community forests or LNP • Provide awareness training and prohibit hunting, fishing, or poaching by construction and operation contractors • Terminate any employees found illegally hunting, poaching or trading protected species • Prohibit trapping or fishing in the diversion reach 	<ul style="list-style-type: none"> • Biodiversity MP 	Moderate	NWEDC

Resource	Activity/ Impact	Avoidance, Minimization, and Mitigation Efforts	Applicable Operations Management Plans	Residual Risk	Responsibility
Community H&S and Security	<ul style="list-style-type: none"> • Dam Safety • Landslide Hazard • Traffic • Natural Disasters 	<ul style="list-style-type: none"> • Monitor structural stability of tunnels • Maintain drainage and slope stabilization structures • Install a warning siren network along the diversion reach to provide warning of any sudden release of water • Provide training and exercises to ensure Project is prepared to respond to any natural hazards or accidents in accordance with the Emergency Response and Preparedness Plan • Implement Employee Code of Conduct • Ensure access to a grievance redressal mechanism for employees and the local community. • Ensure adequate and timely disclosure of information to the local community in terms of Project activities and available opportunities, in keeping with Stakeholder Engagement Plan formulated for the Project. • Security personnel will be posted around the site to ensure that there are no unauthorized personnel within the Project site. 	<ul style="list-style-type: none"> • Community Health, Safety and Security MP • Occupational Health and Safety MP • Employee Code of Conduct • Grievance Redressal Mechanism 	Minor	NWEDC
Labour Influx		<ul style="list-style-type: none"> • Control hiring practices to limit labour influx 	<ul style="list-style-type: none"> • Labour Influx MP 	Minor	NWEDC
Indigenous Peoples		<ul style="list-style-type: none"> • Comply with requirements of the Indigenous and Vulnerable Peoples Development Plan 	<ul style="list-style-type: none"> • Indigenous and Vulnerable Peoples Development Plan 	Moderate	NWEDC
Cultural Heritage	<ul style="list-style-type: none"> • Intangible Heritage 	<ul style="list-style-type: none"> • Grievance Redressal Mechanism 	<ul style="list-style-type: none"> • Grievance Redressal Mechanism 	Minor	NWEDC
Cumulative Impacts	<ul style="list-style-type: none"> • Cumulative Impact management 	<ul style="list-style-type: none"> • Participate in a future Trishuli Basin Co-Management Platform to collaboratively monitor and manage impacts. 	<ul style="list-style-type: none"> • Cumulative Impact Management Plan 	Moderate	NWEDC

LNP = Langtang National Park; MP = Management Plan; NWEDC = Nepal Water and Energy Development Company Limited