Integrated Strategic Environmental Assessment in post-earthquake Nepal 2015-2017

LESSONS LEARNT REPORT

First published in December 2017 by the United Nations Environment Programme
© 2017, United Nations Environment Programme
United Nations Environment Programme
P.O. Box 30552, Nairobi, KENYA
Tel: +254 (0)20 762 1234
Fax: +254 (0)20 762 3927
E-mail: uneppub@unep.org
Web: www.unenvironment.org

This publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder provided acknowledgement of the source is made. No use of this publication may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from the United Nations Environment Programme. The contents of this volume do not necessarily reflect the views of the United Nations Environment Programme, or contributory organizations. The designations employed and the presentations do not imply the expressions of any opinion whatsoever on the part of the United Nations Environment Programme or contributory organizations concerning the legal status of any country, territory, city or area or its authority, or concerning the delimitation of its frontiers or boundaries.

Cover Image: © K. Sudmeier-Rieux
Photos: Unless otherwise credited, images in this report were taken by United Nations Environment Programme staff
Design and layout: Karuna Adhikaree (LEAD Nepal) and Paula Padrino (UN Environment)
UN Environment promotes environmentally sound practices globally and in its own activities. This publication is printed on recycled paper using eco-friendly practices. Our distribution policy aims to reduce UN Environment's carbon footprint.

Table of Contents

Executive Summary 6
1. Introduction 8
2. Nepal background: the 2015 Gorkha Earthquake 10
3. Institutional context for EIAs and ISEAs 13
4. ISEA Process and Methodology 14
4.1. Stage 1. Baseline data collection stage 15
4.2. Stage 2. Synthesis and assessment 22
4.3. Stage 3. Implementation 27
5. Lessons learnt and way forward 28
6. Conclusions and recommendations 29
7. References and additional reading 31
Annex 1: List of Contributors 33
Annex 2: ISEA Process Milestones 34
Annex 3: Government of Nepal Environmental Legal Provisions and International Development Agency Environmental Guidelines 38
Annex 4: Road construction activities, expected impacts and recommended mitigation actions 47

Table of Figures

Figure 1 Situation map of the 14 most earthquake-affected district.....10
Figure 2 Aftershocks of Gorkha Earthquake 2015 recorded between 25 April 2015 to 24 July 2017.....11
Figure 3 ISEA stages followed by the Nepal project.....14
Figure 4 Earthquake-affected districts of Nepal 17
Figure 5 Geographic Areas by level of damages to structures in Nepal 2015 17
Figure 6 River System in 14 earthquake districts, Nepal 18
Figure 7 National Parks and Protected Areas.....18
Figure 8 Geohazard Areas in 14 earthquake affected districts.....19
Figure 9 Earthquake-affected roads for reconstruction and rehabilitation..... 19
Figure 10 PDRF roads requiring EIAs and IEEs in 14 earthquake affected districts.....20
Figure 11 Multihazard map of 14 earthquake-affected districts..... 20
Figure 12 Multihazard map of Sindhupalchok District..... 21
Figure 13 Consultative workshop and technical working group meeting 11 April 2017..... 22
Figure 14 Conceptual Methodology for the preparation of synthesis map to screen for IEE or SIA options..... 23
Figure 15 Synthesis Map1: PDRF Requiring EIAs and IEEs in Sindhupalchok District..... 24
Figure 16 Synthesis Map 2: PDRF Roads Requiring EIAs and IEEs for 14 earthquake affected districts.....25
Figure 17 Synthesis Map3: PDRF Roads with landslide susceptibility Index in Sindhupalchok District..... 26

List of Tables

Table 1. Initial screening results of the PDRF projects 15
Table 2. Screening stages of Integrated Strategic Environmental Assessments of Post-Disaster Recovery Framework projects 2016-2017 36
Table 3. List of approved EIA projects in Nepal through 2017. Source: MOPE, 2017 40
Table 4. Donor Project Screening and Categorization for EIA 43
Table 5. Threshold for EIA and IEE under NRA Working Procedure 2016 for EIA and Environment Protection Rule 1997 44
Table 6. Road construction activities, expected impacts and recommended mitigation actions.47

List of acronyms

ADB	Asian Development Bank
CC	Climate Change Adaptation
DEM	Digital Elevation Module
DFID	Department for International Development
DMG	Department of Mines and Geology
DOLIDAR	Department of Land Infrastructure Development and Agriculture
DOR	Department of Road
DRR	Disaster Risk Reduction
EIA	Environmental Impact Assessment
EPA	Environment Protection Act
EPR	Environment Protection Rules
GIS	Geographic Information System
GPS	Geographic Positioning System
HDDS	Hazard Data Distribution System
ICIMOD	International Centre for Integrated Mountain Development
IEEs	Initial Environmental Examinations
ISEA	Integrated Strategic Environmental Assessment
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
MOFALD	Ministry of Federal Affairs and Local Development
MOFSC	Ministry of Forests and Soil Conservation
MOHA	Ministry of Home Affairs
MOPE	Ministry of Population and Environment
NRA	National Reconstruction Authority
PDNA	Post Disaster Needs Assessment
PDRF	Post Disaster Recovery Framework
PPP	Policies, Plans and Programmes
SEA	Strategic Environmental Assessment
TU	Tribhuvan University
USGS	United States Geological Survey
WB	World Bank

Executive Summary

According to German Watch (2016), Nepal ranked 7th among countries most affected by climate risk. Nepal is thus one of the top 20 most hazard-prone and vulnerable countries in the world. It ranks fourth in terms of relative vulnerability to climate change related hazard, 11th with regards to earthquake risk and 30th prone to flooding among 198 countries, making it difficult to achieve sustainable development goals, manage its disaster risks and promote climate change adaptation. Due to political instability and low government capacities, developing integrated strategies to meet the 2030 development agenda is especially challenging. The 2015 Gorkha earthquake, which killed nearly 9,000 people and incurred damages of USD 7 billion was a considerable setback for the country (MoHA, 2015).

Following this event, UN Environment's Post-Conflict Disaster Management Branch approached the Government of Nepal in 2016 to address sustainable reconstruction efforts. It proposed to enhance government and stakeholder capacities in implementing an Integrated Strategic Environmental Assessment (ISEA) for the earthquake-affected region based on its experience working with the Government of Sri Lanka on sustainable reconstruction following the conflict in the Northern Province, which ended in 2009.

The ISEA is a tool that can be used both as a high level, long-term planning tool and also to fast-track development in a post-conflict and post-disaster situation while integrating conservation of environment and sustainable development with disaster and climate risk reduction. It gives more rapid guidance on which developments can go forward without Environmental Assessments (which can take several years in Nepal). In addition, ISEAs provide a forum for conflict resolution between conservation and development-oriented actors and enable data collection and sharing. The tool was first developed in post-conflict Northern Sri Lanka to fast-track sustainable development and planning. It is currently being piloted in the 14 post-earthquake affected districts in Nepal, with more detailed study in Sindhupalchok district (one of the most affected) to ensure environmental conservation while promoting development in the recovery process. The project was undertaken in collaboration with the Ministry of Population and Environment (MOPE) and the National Reconstruction Authority (NRA), which was established in 2016 to oversee post-earthquake recovery and reconstruction. (See Annex 1 for a full list of contributors).

This lessons learnt report covers Nepal's experience with ISEAs as an integrated approach to post-disaster/ post-crisis sustainable development planning with a focus on the road sector. It details the multi-stakeholder process undertaken to map environmental baselines, landslide susceptibility with regards to the roads designated for reconstruction under the NRA's "Post Disaster Recovery Framework". The resulting synthesis maps provide policy makers with a more integrated analysis and clear guidelines for "Building Back Better" in a post-disaster situation. ISEAs provide data related to environmental and social issues for determining whether to conduct more in-depth EIAs. The ISEA approach is thus very useful for integrated development planning toward achieving Sustainable Development Goals, disaster risk reduction and climate change adaptation.

Key recommendations

- In the present scenario of state restructuring and decentralization, ISEA will be one of the most important tools for sustainable, disaster resilient, environment friendly development planning at every level of government. The first recommendation is therefore to promote ISEAs as a key planning tool in the new decentralized governance system of Nepal.
- Promote ISEAs in order to establish solid spatial baseline data for project monitoring during the implementation phase of approved EIA projects and suggested mitigation measures.
- Although ensuring that these ISEA results are fully implemented is challenging, coordination among concerned stakeholders and willingness of the policy makers can make it successful. Hence, it is important for all policy makers at different government levels and at various scales to understand the ISEA process for the sustainable development of Nepal.

1. Introduction

Effective development planning and preparation can achieve more sustainable development outcomes while significantly reducing the vulnerability of individuals, communities and regions to disasters and the impacts of climate change. Academia and development agencies have developed tools to support the mainstreaming of disaster risk reduction (DRR) in development planning in vulnerable countries. One such tool is the Environmental Impact Assessment (EIA), which is a technical tool to integrate environmental considerations at the project level. This tool has been mainstreamed and used by promoters, development agencies and legislated by most countries around the world. It has recently included provisions to include DRR considerations, although this has yet to become mainstreamed (UNISDR 2014; Benson et al 2007, CDB and CARICOM Secretariat 2004).

As compared to individual projects, however, strategic-level interventions, notably at a larger geographical scale or at the policy-level, are much more influenced by political factors than by technical criteria. Thus, established EIA procedures, methods and techniques have only limited application at the level of policies, plans and programmes (PPP). Especially in the aftermath of disasters and conflicts, affected countries often experience a sense of urgency and intense political pressure to rapidly reconstruct and re-start development. National expertise that enable countries to develop and "build back" more safely and sustainably may be limited. In a post-conflict or post-disaster context (henceforth: post-crisis), dozens of development projects are often proposed simultaneously. EIAs, which are conventionally applied to ensure that new development is conducted do not cause adverse environmental impacts, could be delayed considerably, as the number of new proposed projects overwhelms the regulatory capacity of governments.

To address this challenge, UN Environment has modified a tool used in sustainable development planning - the Strategic Environmental Assessment (SEA). SEAs provide a framework to systematically identify and evaluate the environmental consequences of proposed PPP, to ensure that environmental sustainability and disaster resilience are appropriately addressed at the earliest possible stages of decision-making. SEAs are particularly appropriate tools for integrating disaster and climate dimensions to sustainable development planning, however they are often overlooked. UN Environment thus launched the Integrated Strategic Environmental Assessment (ISEA) approach which emphasizes these dimensions.

The ISEA approach was thus pilot-tested in Sri Lanka (2010-2011) in order to establish a sustainable development framework for its Northern Province, shortly after the end of the 30-year conflict. Presented as an *Integrated Strategic Environmental Assessment* (ISEA), the tool has hence supported decision-making and development planning, while assuring environmental sustainability and disaster risk reduction. A nationally-driven process in Sri Lanka, the ISEA brought together key development actors to produce a "development"; or "opportunity" map for guiding public and private investments, within agreed upon environmental sustainability and disaster resilience parameters.

Following the Gorkha earthquake, UN Environment's Post-Conflict Disaster Management Branch approached the Government of Nepal to address the challenge of sustainable reconstruction. It proposed to enhance government and stakeholder capacities in implementing an ISEA for the affected region based on its experience working with the Government of Sri Lanka on sustainable reconstruction following the conflict in the Northern Province, which ended in 2009. The project was undertaken in collaboration with the

Ministry of Population and Environment (MOPE) and the National Reconstruction Authority (NRA), which was established in 2016 to oversee post-earthquake recovery and reconstruction. (See Annex 1 for a full list of contributors).

MOPE and NRA agreed to pilot the ISEA approach under the technical assistance from UN Environment in the 14 most earthquake-affected districts of Nepal in complying with the Post Disaster Recovery Framework (PDRF) (NRA, 2016). Under the leadership of MOPE and NRA, a capacity-building effort was thus undertaken with key stakeholders (Annex 2). The project was initiated with the organization of a round table meeting on ISEA project on 24 June 2016 inviting officials from key ministries, the NRA, and international agencies to share the post-earthquake reconstruction situations status and mainstreaming environment in the reconstruction process.

This report describes preliminary results from this effort, with the intention that this experience can be used as a further example of mainstreaming DRR and Climate Change Adaption (CCA) into sustainable development planning and building back better in post-crisis situations. It was a combined effort between the MOPE, the NRA and UN Environment. (See Annex 2 for a full list of events undertaken.)

The data generated from this project will be made available on a digital platform. Please contact Head EIA section, Ministry of Population and Environment for more information. http://www.napnepal.gov.np/

2. Nepal background: the 2015 Gorkha Earthquake

Nepal experienced a major earthquake on 25 April 2015 (7.8 magnitude), which devastated large parts of the country. The main shock of 25 April and several other aftershocks including that of 12 May, 2017, killed approximately 9,000 people, injured 22,000, with loss and damage of properties and development infrastructures amounting to USD 7 billion. The earthquake destroyed 604,930 houses completely and 288,856 houses partially destroyed (MOHA, 2015). It was the worst earthquake to strike the country in more than 80 years. Out of 75 districts, 31 were affected, out of which **14 were declared 'hard-hit'** for the purpose of prioritizing rescue and relief operations; another 17 neighboring districts were declared partially affected (Figure 1 and Figure 2).

One of the most affected by the earthquake, Sindhulpalchok District, was chosen for more detailed study. It can be roughly divided into two areas: mountains (with elevations of above 3,500 meters) and the more density populated hilly areas. Around 64,000 houses were severely damaged and 3,000 houses were moderately damaged with more than 3,000 causalities. The district has a relatively high population density, with a large road network connecting the villages which was also damaged by the earthquake.

Roads in the earthquake-affected districts are critical life links, while highly sensitive to impacts by hazards as well as being a key factor in triggering landslides in this highly environmentally sensitive region. While they are considered synonymous to development in

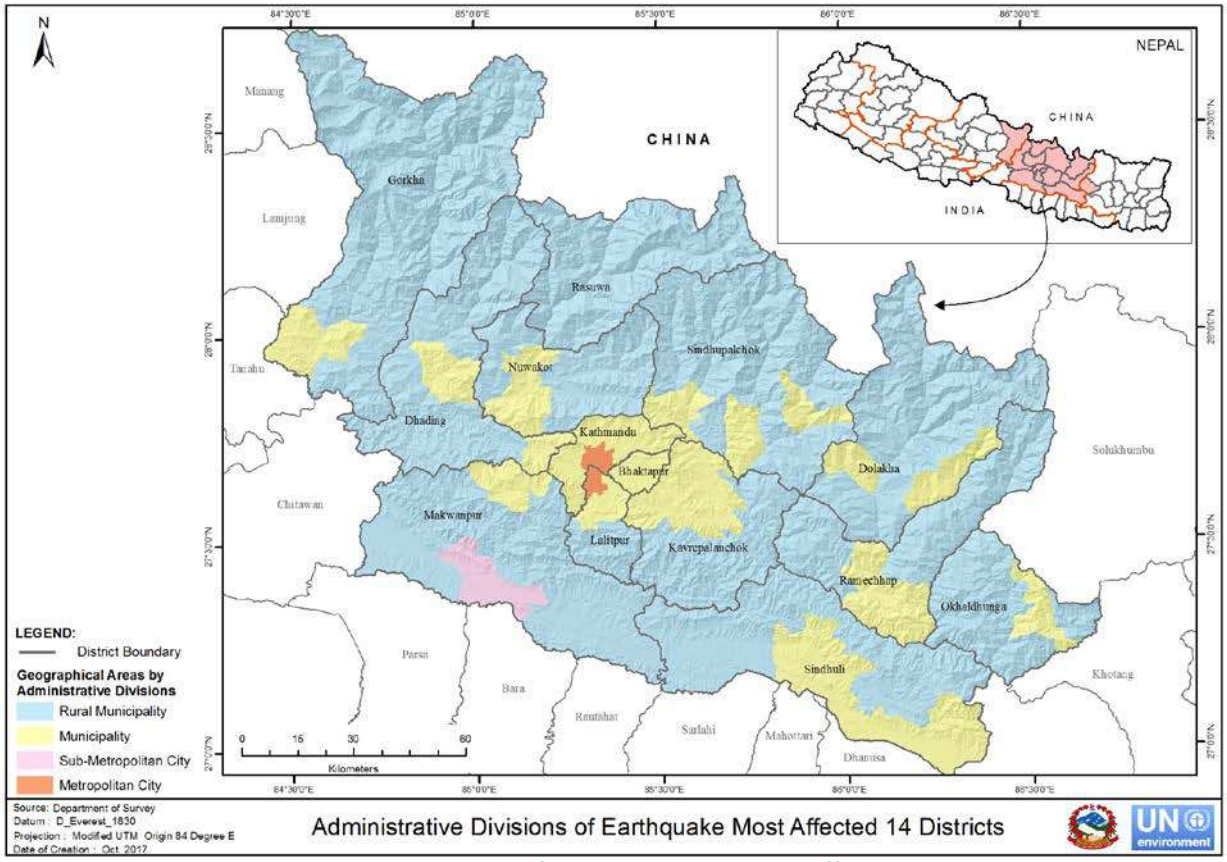

Figure 1. Situation map of the 14 most earthquake affected districts

mountain areas, they can potentially increase environmental and landslide risk, and negative impacts on communities if not constructed sustainably (Petley et al., 2007). According to the Department of Roads, there were 4,740 km of roads documented in 1998, which skyrocketed to over 12,493 in 2014, only half of which were well-engineered, paved roads. In the period between 1978 and 2005, there was a six-fold increase in landslide fatalities (from 20 to 120 on average per year, the average for the last five years is 152 deaths per year (Laban et al, 2016). A primary driver of this increased mortality has been a deadly combination of an increase in poorly constructed roads with more intense monsoon rains due to climate change (Petley et al., 2007).

The Post Disaster Needs Assessment (PDNA) conducted by the Government of Nepal estimated the value of damage and loss at US$7 billion in the 23 sectors including crosscutting issues which require significant reconstruction (Government of Nepal, 2016). Building on the PDNA, the Government of Nepal prepared a PDRF prioritizing recovery requirements across 19 sectors, including six cross-cutting issues with sector plans that were aligned with the strategic recovery vision of the Government of Nepal (NRA 2016). These are:

- **Social sectors:** Cultural Heritage; Education; Health; Nutrition; Rural Housing and Community Infrastructure; Urban Housing and Settlements.
- **Productive sectors:** Agriculture, Irrigation and Livestock; Tourism; Environment and Forestry
- **Infrastructure sectors:** Electricity and Renewable Energy; Transport, Access and Communications; Water, Sanitation and Hygiene; Government Buildings.

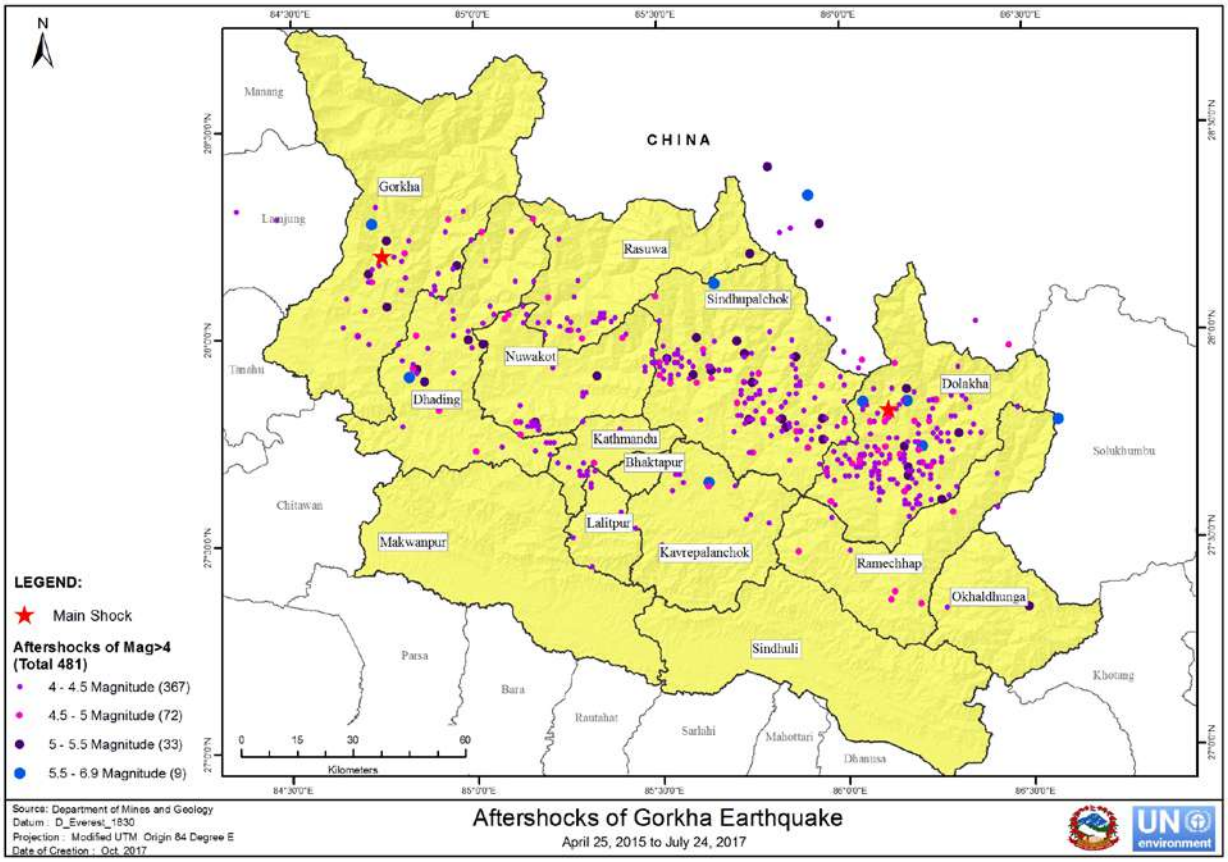

Figure 2. Aftershocks of Gorkha Earthquake 2015 recorded between 25 April 2015 to 24 July 2017

- **Crosscutting sectors:** Disaster Risk Reduction; Employment and Livelihoods; Social Protection; Gender and Social Inclusion; Governance; Social Protection.
- Each sector has prepared sector plans that are aligned with the strategic recovery vision of the Government of Nepal.

A rapid environmental assessment of the earthquake damage identified direct impacts, and also many potential risks to the environment from reconstruction. At the same time, there is a great opportunity to build back not only 'better and safer' but also greener, ensuring healthy ecosystems for disaster risk reduction and natural resources for resilient livelihoods and economic development.

A legally mandated agency for leading and managing the earthquake recovery and reconstruction has been put in place with the establishment of the National Reconstruction Authority (NRA) and National Reconstruction Fund 2015. NRA has been instrumental in the development of Reconstruction and Rehabilitation Policy 2072 (2016), which provides the policy instrument for steering reconstruction and rehabilitation. One of the approved guidelines for the recovery interventions to mainstream environmental conservation in the recovery process is Environmental Impact Assessment (EIA). The institutional context for EIAs and ISEAs will be detailed below.

3. Institutional context for EIAs and ISEAs

The Seventh Five Year Plan (1985-1990) of Nepal was the first to consider the environment as a distinct component in the development planning process, and to stipulate the preparation of EIAs for all major development projects. It was the first plan to enunciate environmental conservation in policies, plans and programme (PPP) formulation and developing an appropriate institutional system in the plan. The Eighth Five-year plan (1991-1995) anticipated the establishment of a national system for EIAs. It stipulated EIAs for all major development projects, particularly roads, hydropower, industry, irrigation, housing, drinking water, and sewerage. The Eighth Five-year plan made EIAs mandatory at the stage of feasibility (Bhatta and Khanal 2009).

In the process of internalizing the Environmental Assessment System in development proposals, the Government of Nepal enacted the Environment Protection Act (EPA) 1997 and the Environment Protection Rules (EPR), 1997, which makes the integration of Initial Environment Examinations (IEEs) and EIAs legally binding to the prescribed projects (See Annex 3 for more details).

The Government of Nepal has over two decades of experience in mainstreaming environmental conservation in achieving sustainable outcomes of development projects. The EPA 1997 and EPR 1997, have legislated that all new development projects or reconstruction projects meeting certain criteria are subject to an EIA process.
MOPE's EIA section has been mandated to oversee the compliance of environmental protection in all development projects through the implementation of standard working procedures of the EIA and IEE approval for the project as directed by the EPA and EPR of 1997.

These two decades of experience demonstrate that the EIA approval process on average takes around one to two years and has led to delayed development across the country. In the aftermath of the 2015 Gorkha Earthquake, the concern was that EIAs are not practical in a post-crisis situation, where urgency and rapid reconstruction are the priorities. Thus, there was need for a more rapid solution, considering the need to fast-track development after the decade long armed conflict, followed by post-earthquake disaster reconstruction and promulgation of new constitution in 2016.

In complying with the abovementioned environmental legislation, the NRA has promulgated a 'Working Procedure' for conducting EIAs for Earthquake Affected Infrastructure Reconstruction 2015. A special committee was formed by the NRA on EIAs, chaired by the NRA Secretary (Ministry level) and with backing by Joint Secretaries (Under Ministry level), with members from MOPE, relevant ministries and independent environmental experts. This committee reviews and approves the EIAs and IEEs conducted for the reconstruction projects. (See Annex 3 – Table 2 for details on the thresholds for conducting IEE/EIAs under NRA procedure/Rule 2016 and EPR 1997).

The Government of Nepal is committed to comply with EIA requirements for all development projects implemented in the country. In addition, there are several international and donor agencies supported development projects which are required to streamline their environmental requirements with the national legislation (See Annex3.Table 3). Annex 3 analyses the difference between international and national legislation with regards to environmental requirements for development projects. This analysis demonstrates that international agencies have more stringent requirements for EIAs than the national legislation. In such cases, international agencies must first comply with the national

requirements and secondly comply with their internal environmental requirements. The present ISEA capacity-building exercise has given an opportunity for the responsible national agencies to consider streamlining the existing EIA requirements as well as specific environmental thresholds. This will strengthen the EPR to address the issue of the length of time for conducting EIAs in order to ensure environmental conservation while fast-tracking development.

At the same time, the ISEA Nepal project has provided opportunity to ensure streamlining of EIA requirements between the local level government and new federal government as the governance system shifts to a federal system. Therefore, the ISEA is very important and timely approach at this time of government transition as an overall overview planning tool to guide PPPs.

4. ISEA Process and Methodology

The ISEA process in Nepal consisted of three main stages (Figure 3).

Stage 1: Baseline data collection
(a) Framing, coarse environmental screening
(b) Data collection and establishment of consultation groups
(c) Data consolidation and baseline map development

Stage 2: Synthesis and assessment
(a) Synthesis map development
(b) Field verification and local consultation process

Stage 3: Implementation

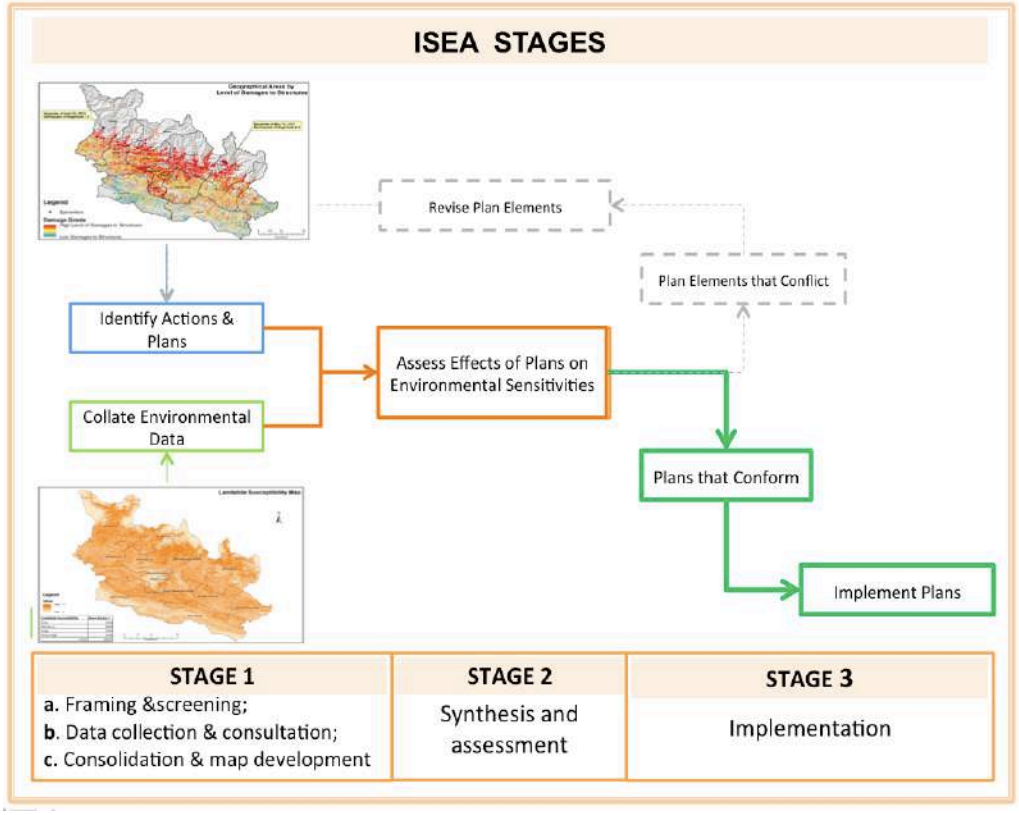

Figure 3. Integrated Strategic Environmental Assessment stages followed by the Nepal project

following sections outline the process and methods which were followed.

4.1. Stage 1. Baseline data collection stage

Stage 1a. Framing and coarse environmental screening

The process began with a number of discussions about the framing of the ISEA exercise and its geographical scope. First, each PDRF (the official framework documenting damaged infrastructure requiring reconstruction) activity was screened by EIA government experts, considering detailed environmental rules and requirements. This expert group found that 77 - 84% of the PDRF work plan activities could proceed with no significant effect on environment; 14 - 16% would require EIAs; and 1 – 8% needed more data for screening (Table 1). This exercise provided a general framing of the issue, which led to a decision to limit this capacity-building exercise to the transportation sector and specifically to roads for reconstruction as listed in the PDRF. The team decided to start the pilot work in one district, Sindhupalchok, one of the most affected before applying the methodology to the 14 most earthquake- affected districts.

Stage 1b. Data collection and establishment of consultation groups

In order to streamline the ISEA process, three groups were formed composed by members of governmental sectoral agencies: Baseline, Development and Assessment groups. Later, a technical committee was formed of all three groups for regular consultations as the project progressed. Mapping was undertaken by a Geographical Information System (GIS) expert at NRA and the UN Environment field coordinator. The Baseline and Development group collected data and spatial information on various types of environmental data: Land cover, National Parks, Geology, Archeology, Settlements, Rivers & drainage, Landslide distributions, Rainfall, Seismic, Road Networks power transmission for all 14 districts. Considering the high importance of natural hazards to sustainable reconstruction of the road sector, landslide susceptibility data and maps were developed by the International Centre for Integrated Mountain Development (ICIMOD), ArcGISv10.3 for data preparation, calculation, interpretation and producing final map output.

Integrated Strategic Environmental Assessment Screening of Post Disaster Recovery Framework 2016-2020			
DETERMINATION		**CONSIDERATION**	**DESCRIPTION**
Proceed 77-84 %	**Exempted**	Actions that are legally exempt from EIA	Project of a type or size that do not require EIA under current regulations
	None	No potential effects	Actions that have no potential to give rise to any environmental effects
	Low	Potential effects not needing mitigation	Actions that appears to be unlikely to give rise to effects that will impinge upon the environment
	Medium	Potential effects that can be readily mitigated	Actions that are indistinguishable from the type of upgrade, repair, renewal, replacement that would occur in normal circumstance
EIA 14 -16 %	**High**	Potential to affect environmental sesitivities	Aactions likely to lead to effects on account of their type and/or scale or because they are located within or near a sensitive environment
	Critical	Potential to affect environmental sesitivities	Actions of significant scale that are likely to significantly affect sesitive, vulnerable or protected parts of the environment
Review 1-8 %	**Unknown**	Actions not finalized or affecting environments with incomplete data	Actions that may require further details about either the proposed action -or further details about the purposed receiving environment

Table 1. Initial screening results of the PDRF projects

The thematic data layers and information used Regression Programming analysis, for producing the final landslide susceptibility map included: landslide inventory, topographic data, Geology, Discontinuities/ Faults / Lineament, PGA (Peak Ground Acceleration), Land Cover and Rainfall. In addition, surface water hydrology data and fault line data were collected and added to the landslide susceptibility map.

Finally, spatial data on all 14 earthquake-affected districts were collected and divided into Strategic roads and District roads. Strategic roads are roads of strategic interest to the country and often subject to EIAs, under the jurisdiction of the Department of Roads (Ministry of Physical Infrastructure and Transportation) while District roads are smaller and subject to IEEs under the jurisdiction of the Ministry of Federal Affairs and Local Development (MoFALD).

The thematic layers prepared for 14 districts (Figures 4-12) boundary included data on:

- **Road network:** there are two kind of road networks in the affected area which are Strategic Road Network and Rural Road Network;
- **Landslide distribution:** This map has been prepared by using the latest satellite map after Earthquake even of April 2015;
- **Land cover:** this map shows the land cover area, which include, forest, agriculture, shrub, water body, settlements etc;
- **River drainage:** This map shows the river networks which drains the water from the affected areas;
- **Settlement (individual houses):** this shows the distribution of settlements with individual houses;
- **Hydro power plant distribution:** Collected information of the completed and under construction hydro power plant distribution has been mapped based on the location provided by the EIA section of MOPE based on the EIA approved hydropower in 14 affected districts;
- **Power transmission lines:** This shows the alignment of the electric power lines which is strategically important for the development of the area;
- **Geological:** it will show the rock formation and the faultlines in the affected areas.
- **Rainfall:** Data of Annual rainfall, monsoon and extreme event has been collected from Department of Hydrology and Metrology for generation of map to be used for the landslide susceptibility map preparation by ICIMOD
- **Landslide susceptibility:** This map was prepared by ICIMOD to map the landslide susceptibility of 14 most earthquake affected districts area. It is based on Regression Programming, ArcGISv10.3 for data preparation, calculation, interpretation and producing final map output. The thematic data layers and information used for producing final the landslide susceptibility map included:
- ***Landslide distribution:*** Google earth images and Digital globe image downloaded from Hazard Data Distribution System (HDDS), US Geological Service (USGS);
- ***Topographic data:*** Slope, Aspect, Curvature are generated from Digital Elevation Model (DEM).
- ***Geology:*** collected from Department of Geology Tribhuvan University (TU) and Department of Mines and Geology (DMG);
- ***Discontinuities / Faults/ Lineaments:*** This information was manually traced from geological maps of Department of Mines and Geology;
- ***PGA (Peak Ground Acceleration) :*** Collected from USGS
- ***Land cover:*** ICIMOD mapped from Landsat images
- ***Rainfall:*** Collected from Department of Hydrology and Meteorology (DHM).

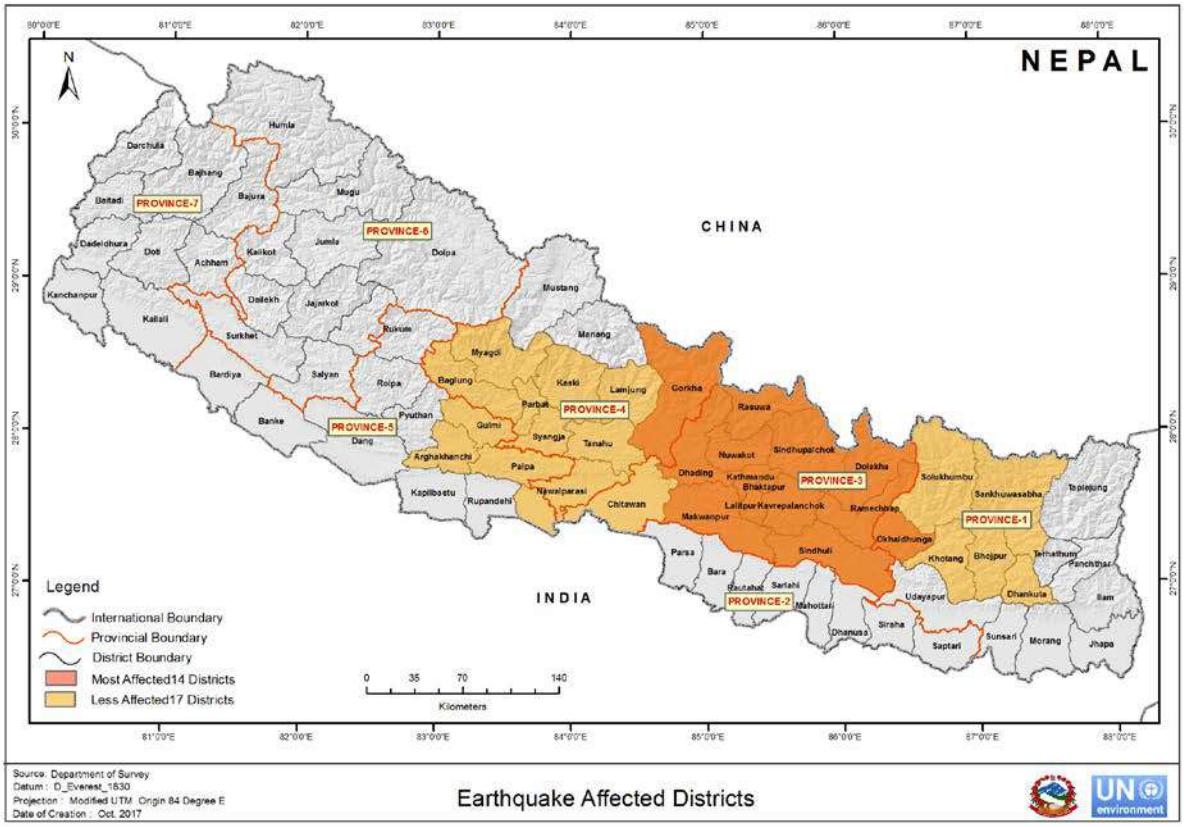

Figure 4. Earthquake-affected districts of Nepal. Source: Dept of Survey, GoN, 2017

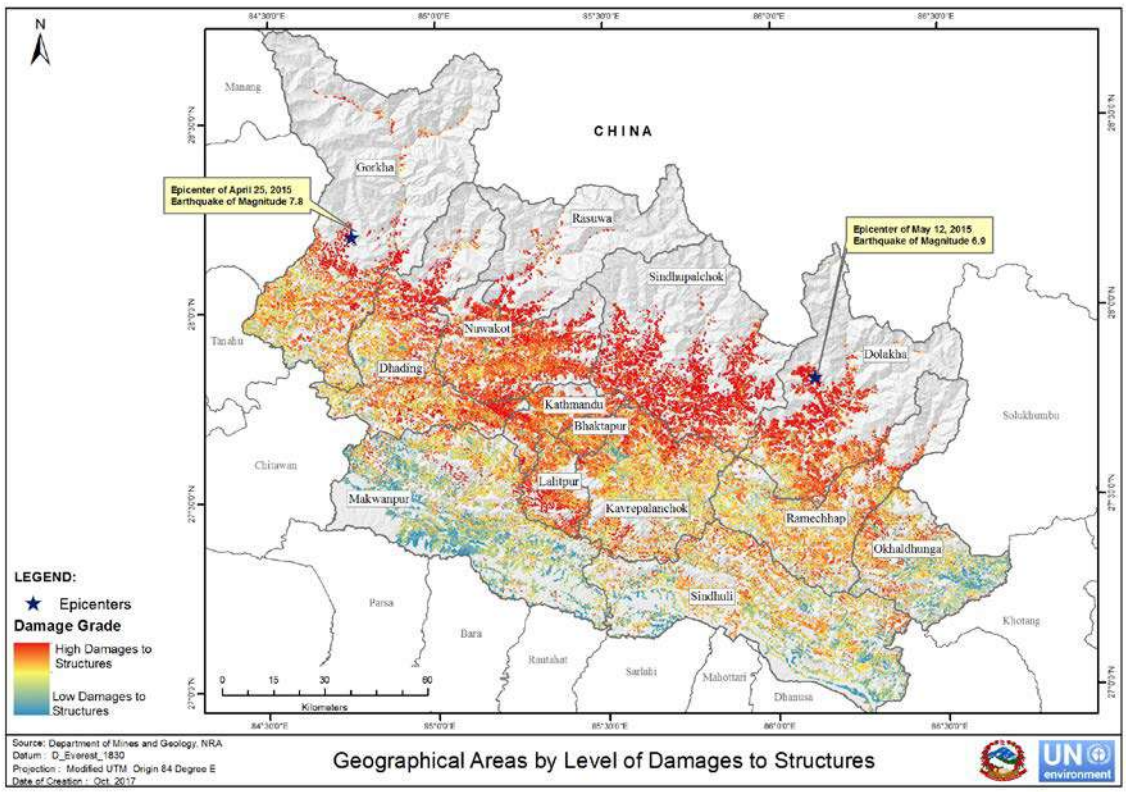

Figure 5. Geographical Areas by level of damages to structures in Nepal, 2015. Source: Dept of Mines and Geology, NRA, GoN, 2017

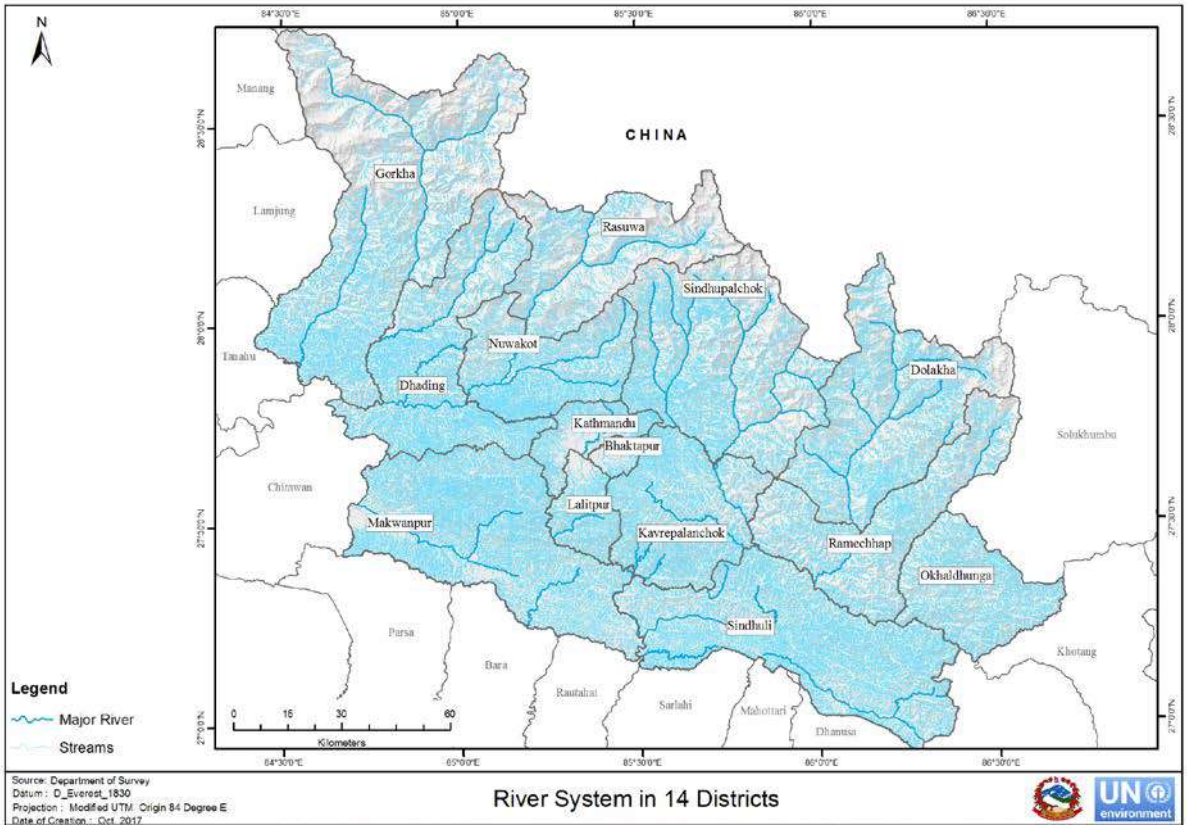

Figure 6. River System in 14 earthquake-affected districts, Nepal. Source: Dept of Survey, GoN, 2017

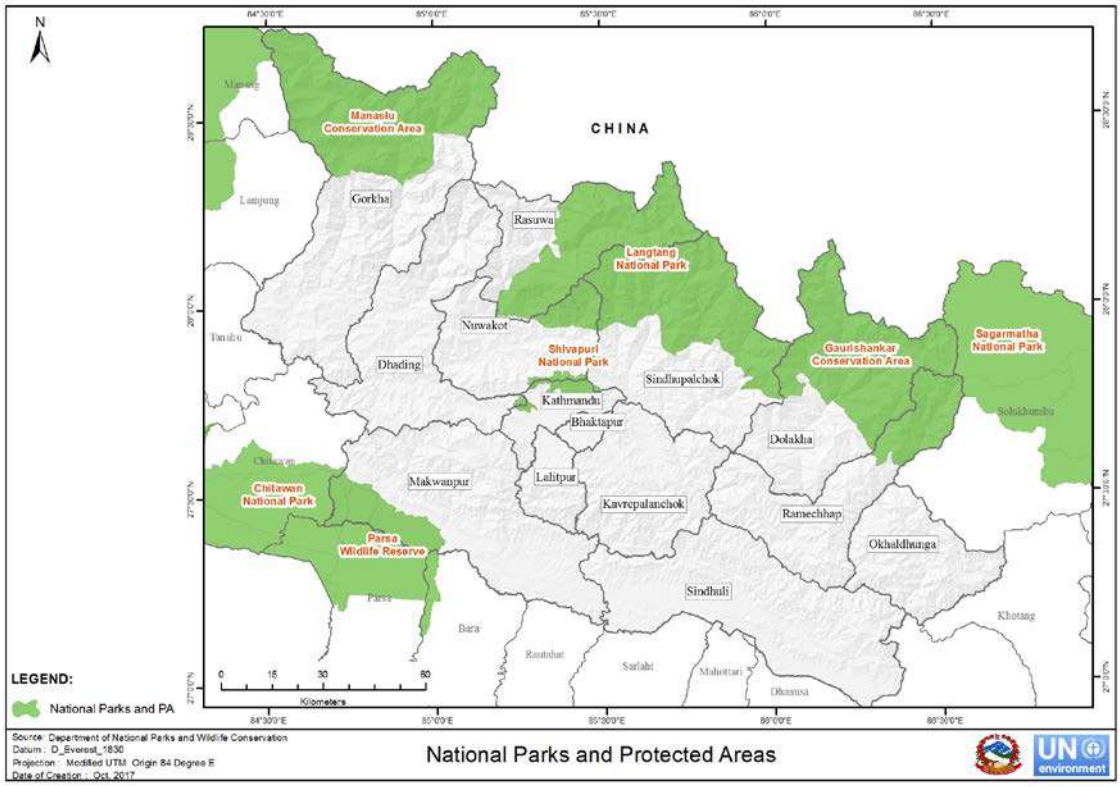

Figure 7. National Parks and Protected Areas. Source: Dept of National Parks and Wildlife Conservation, GoN, 2017

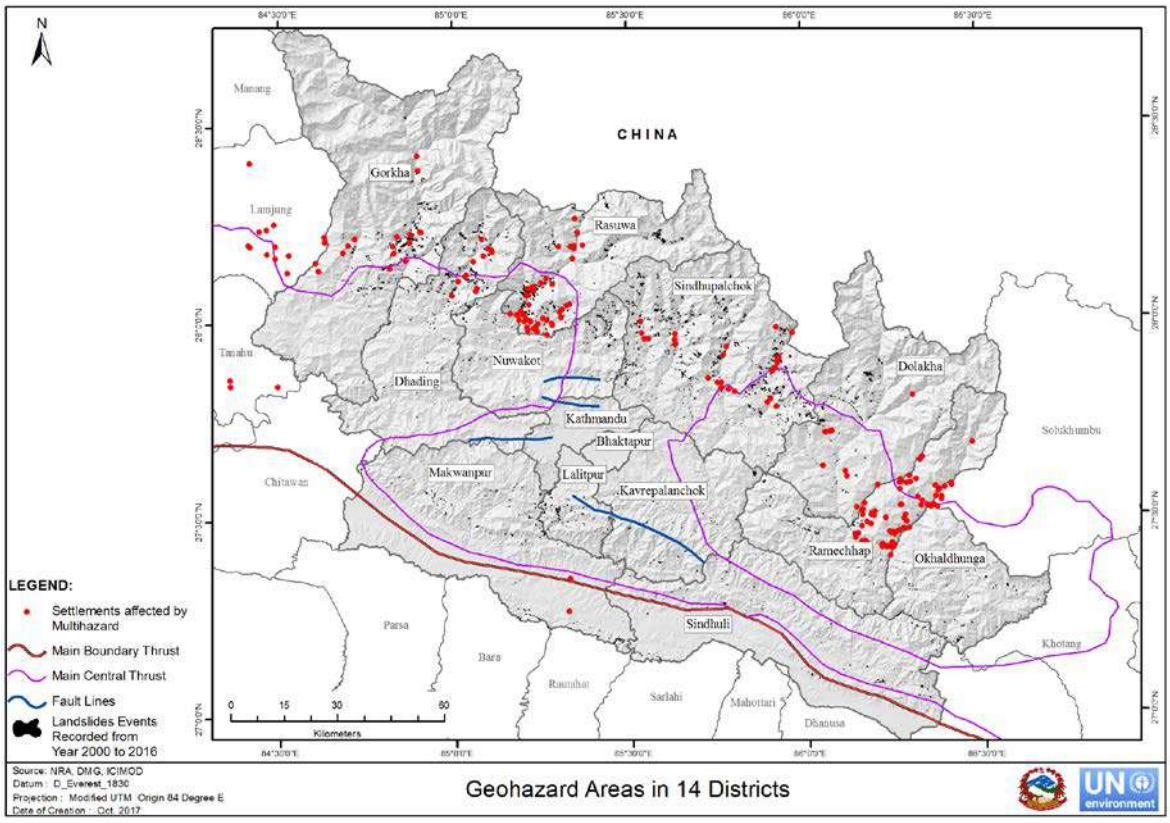

Figure 8. Geohazard Areas in 14 earthquake-affected districts. Source: NRA, Dept of Mines and Geology, GoN, ICIMOD, 2017

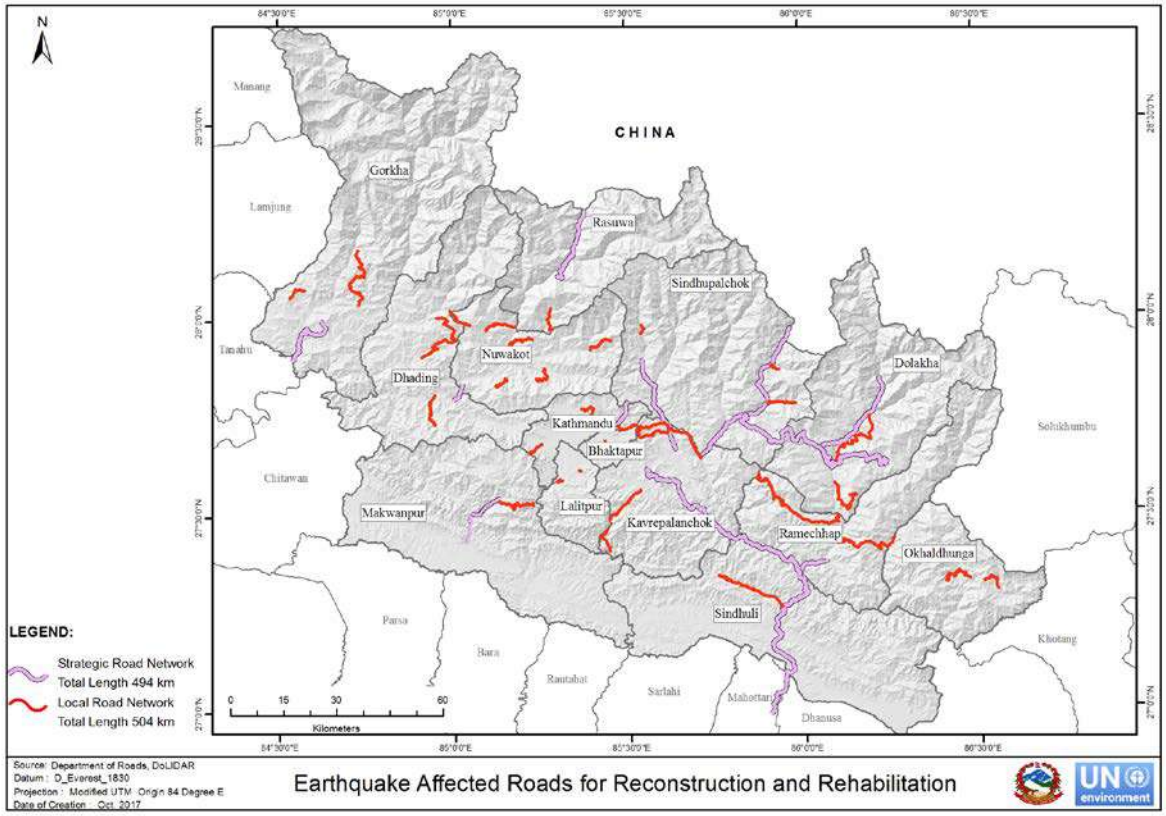

Figure 9. Earthquake affected roads for reconstruction and rehabilitation. Source. Dept of Roads and DOLIDAR, GoN, 2017

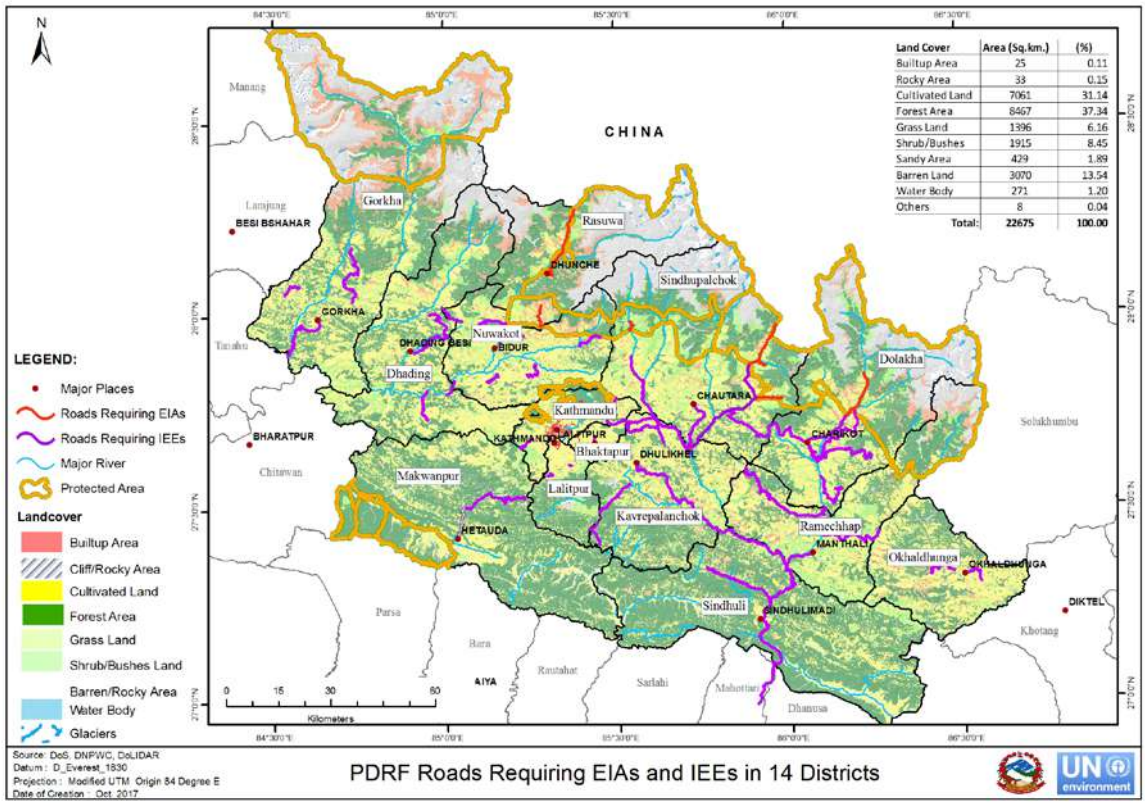

Figure 10. PDRF roads requiring EIAs and IEEs in 14 earthquake affected districts. Source: Dept of Survey, Dept of National Parks and Wildlife Conservation, DOLIDAR, GoN, 2017

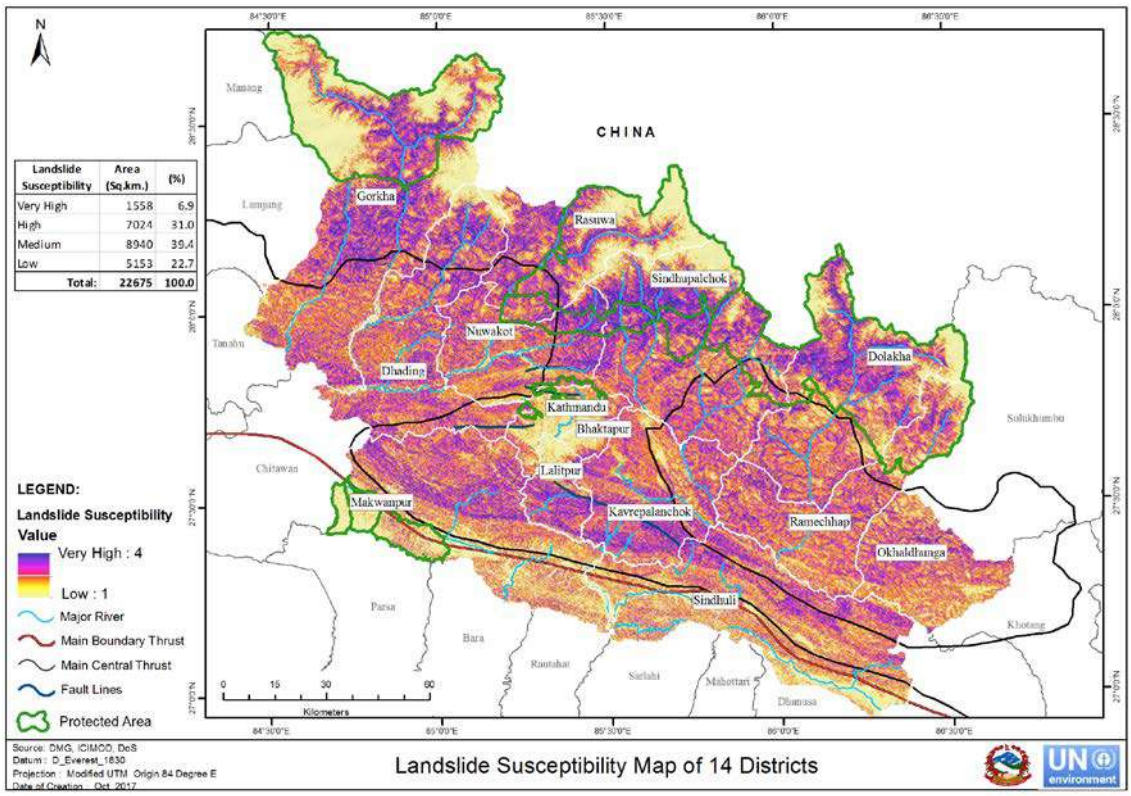

Figure 11. Landslide Susceptibility Map of 14 earthquake-affected districts. Source: Dept of Mines and Geology, Dept of Survey, GoN, ICIMOD, 2017

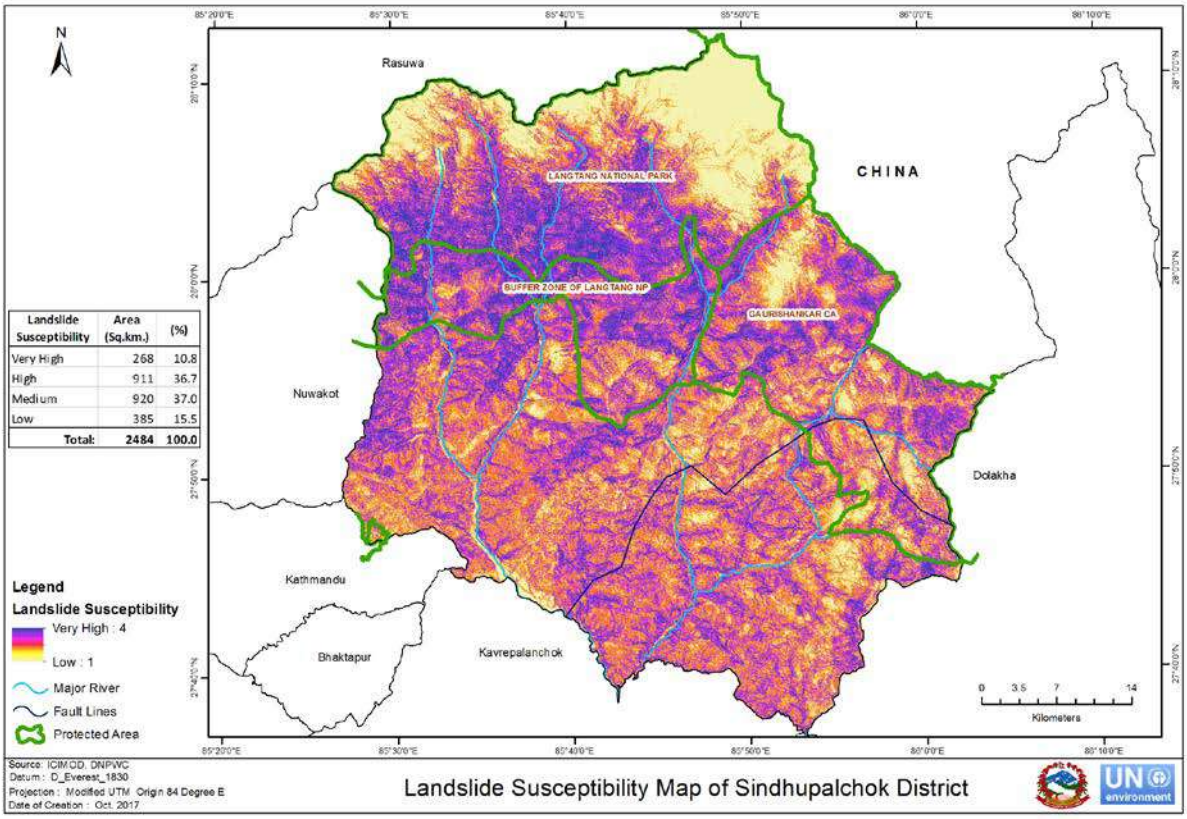

Figure 12. Landslide Susceptibility map of Sindhulpalchok District. Source: ICIMOD, Dept of National Parks and Wildlife Conservation, GoN, 2017

Stage 1c. Data validation and map development

The abovementioned data were presented at a "National Consultation Workshop" and to the ISEA technical committee, which validated certain data and identified further data gaps, especially archeological sites and quarries (Figure 13). The technical committee consisted of NRA, MOPE, Ministry of Federal Affairs and Local Development (MOFALD), Ministry of Forests and Soil Conservation (MOFSC), Department of Survey, International Centre for Integrated Mountain Development (ICIMOD) and the International Union for Conservation of Nature (IUCN) and was further expanded to include other technical experts. Additional data were collected and consolidated into raster data in a Geographic Information System (GIS) in order to develop environmental baseline maps.

Three main groups of data: environmental baseline, multi-hazard and development constituted the basic data for the assessment process for identifying areas where there are special environmental sensitivities (e.g. protected areas), high susceptibility to landslides, flooding and seismicity in relation to proposed road reconstruction and rehabilitation.

Figure 13. Consultative workshop and technical working group meeting 11 April 2017. Photo credit: LEAD Nepal

4.2. Stage 2. Synthesis and assessment

2a. Synthesis map development

As the exercise developed, it became clear that one of the most important outputs of the ISEA process was to collect data in order to identify which roads required either IEEs or EIAs, considering potential environmental and multi-hazard impacts. Based on the spatial data and information a conceptual methodological framework was developed (Figure 14) for preparation of synthesis table (Table 2) and maps (Figures 15,16,17). These maps combine relevant PDRF roads with key environmental baseline and hazard data for screening the IEE or EIA requirement.

Figures 15 illustrates which roads require EIAs/ IEEs, or special measures to mitigate impacts in environmentally sensitive zones (e.g. protected areas, land cover, right of way issues) for Sindupalchok. Figure 16 illustrates the same information for the 14 most earthquake affected districts. The second synthesis map (Figure 17) proposes a classification of the roads, based on a landslide susceptibility index. This index has been generated creating a buffer zone of 300 meters width on each side of the road. The road segments were subsequently categorized with a landslide susceptibility (LS) index, from very high to low, as follows:

- Index between 1 and 1.75 corresponds to an average low landslide susceptibility area
- Index between 1.75 and 2.5 corresponds to an average medium landslide susceptibility area
- Index between 2.5 and 3.25 corresponds to an average high landslide susceptibility area
- Index between 3.25 and 4 corresponds to an average very high landslide susceptibility area

For Sindhupalchok, no road segment was categorized as passing through a very high landslide susceptibility area, but this can still be the case at the 14 district level, therefore this class is still relevant.

The synthesis maps and attribute tables detailing PDRF listed road alignment clearly present the ground situation of the roads and two main variables: whether an EIA/IEE is needed and road segments affected by hazards (high/medium landslide susceptibility, river crossings and active fault lines). This information will greatly contribute in the screening and scoping of the EIA process and in highlighting which road segments require special mitigating measures. The information presented by the ISEA process will help the concerned institutions for preparing IEE/EIA report by simplifying the process in terms of screening, scoping, collecting baseline information, assessing impacts and giving mitigation measures. The anticipation is also that the ISEA process will provide amenable conditions for promoting greater foreign investment in infrastructure.

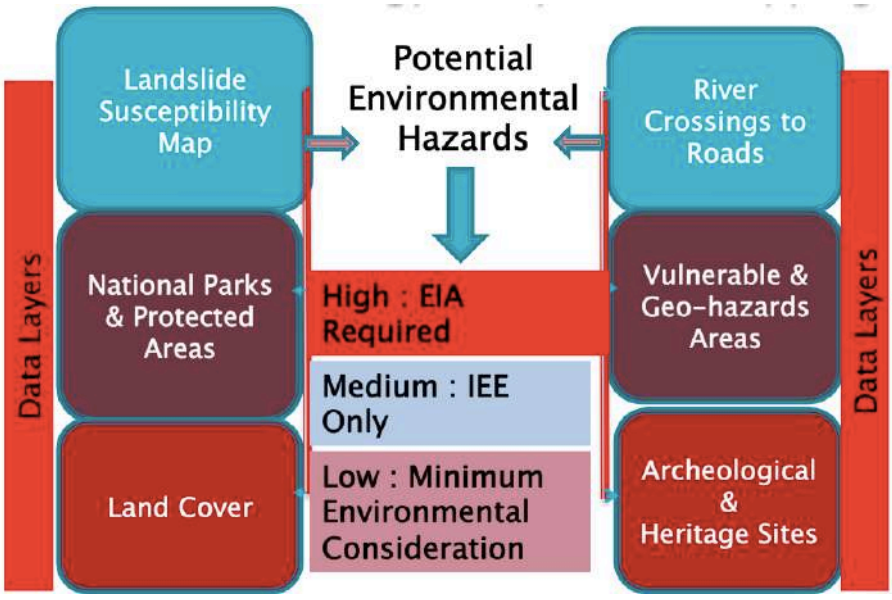

Figure 14. Conceptual Methodology for the preparation of synthesis map to screen for IEE or EIA options

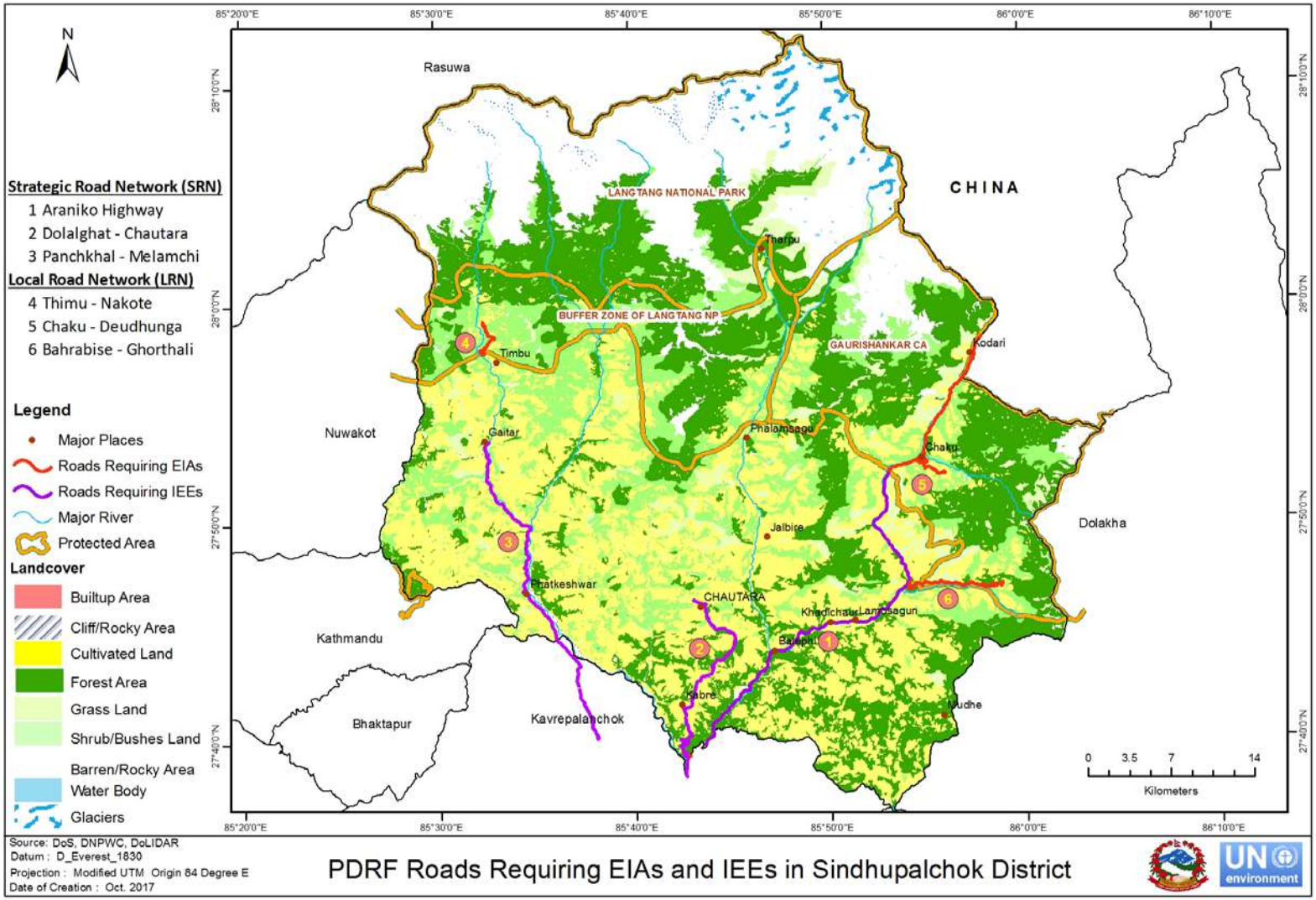

Figure 15. Synthesis map 1: PDRF Roads Requiring EIAs and IEEs in Sindhulpalchok District. Source: Dept of Survey, Dept of National Parks and Wildlife Conservation, DOLIDAR, GoN, 2017

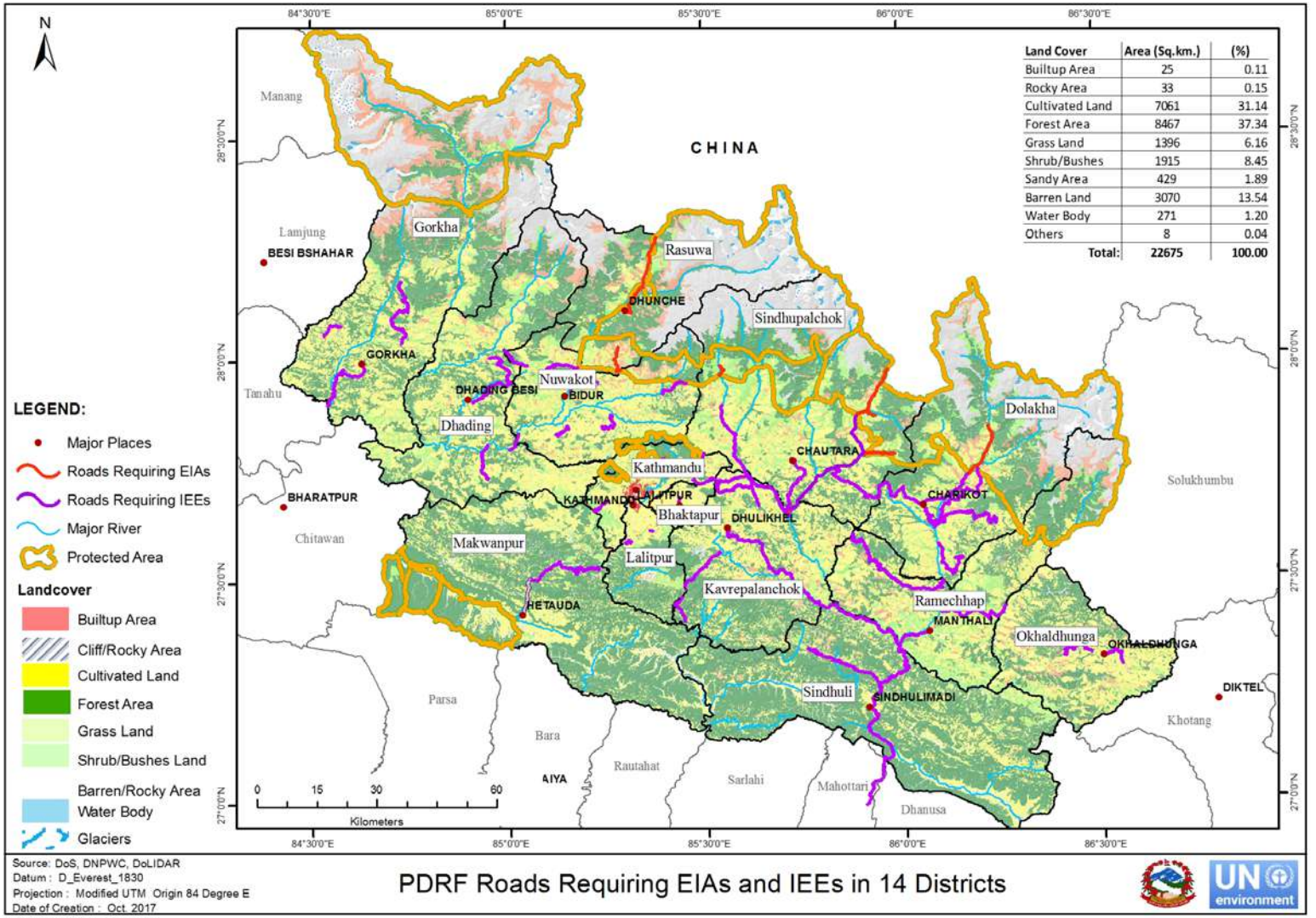

Figure 16. Synthesis map 2: PDRF Roads Requiring EIAs and IEEs for 14 most earthquake-affected districts. Source: Dept of Survey, Dept of Nat. Parks and Wildlife COnservation, DOLIDAR, GoN, 2017

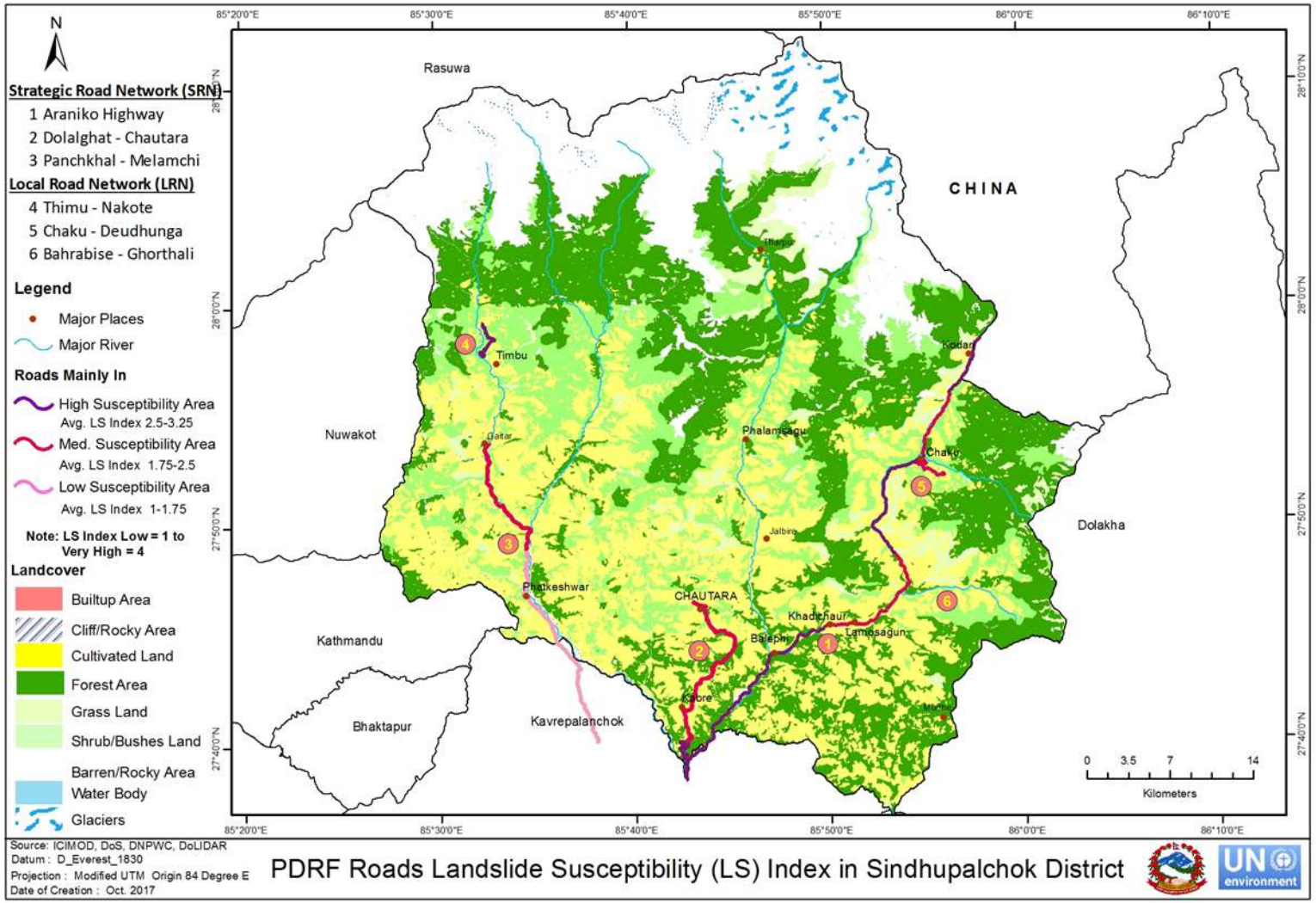

Figure 17. Synthesis map 3: PDRF Roads with landslide susceptibility Index in Sindhupalchok District. Source: ICIMOD, Dept of Survey, Dept of National Parks and Wildlife Conservation, DOLIDAR, GoN, 2017

2b. field verification and local consultation process

Next, the synthesis maps and attributed table were tested through a field verification process: the ISEA team travelled across the road alignment and mapped crucial landslide susceptible points considering river and stream crossing points and distribution of vulnerable settlement along the right-of-way. Comparing field observations with mapped results built confidence of the mapping team in order to develop more accurate final maps for local level planning and recommending appropriate mitigation measures.

As the ISEA is a planning tool for sustainable development, it was important to consult with the local stakeholders (government officials and civil society representatives) of the two municipalities of Sindhupalchok district. This process provided a two-way dialogue for sensitizing stakeholders who, in their turn, provided feedback on the ISEA maps and the proposed road projects in order to reduce vulnerabilities and mitigate hazard impacts.

4.3. Stage 3. Implementation

As the ISEA Nepal process was still underway at the time this article was submitted, it is too early to report on the implementation process.

Next steps include:

- Including additional data into the matrix, including data on safe areas for relocation, archeological sites, quarry areas for sourcing road construction materials;
- Develop a mitigation plan for those roads which have been highlighted as highly susceptible to landslide risk and work together with the authorities in charge of roads works to ensure these are implemented;
- Specific mitigation measures for road construction that this report recommends include (see text box and Annex 4 for more details):

Key recommendations for mitigating road construction impacts:
(See Annex 4 for full table of road activities / impacts / mitigation measures)

Key activity / Mitigation measures
Fresh cut and earthwork excavation • Construction of dyke around stockpiled material, spoil, fresh cuts, • Maintain slope with gabion edge wall and bio-engineering • Control water flow through construction sites by using live grass barriers and rock, • Maintain and reapply erosion control measures until vegetation is successfully established
Road cuts through forest / wildlife areas • Forest and vegetation will be felled only in the required area and no use of horns in the forest area • Provision of animal crossing/underpass/overpass • Avoid camps near the forest areas
Operation of quarry sites for construction materials • Prepare quarry and borrow operation plan • Unstable sites, erosion prone area, dense forest area, settlements, fertile farm land will be avoided
Socio-economic issues / land acquisition • Vulnerable groups will be provided special assistance • Land acquisition and other involuntary impacts will be avoided or minimized exploring all viable alternatives • Provision of income restoration and rehabilitation

(Source: MOPE, EIA section, 2017)

5. Lessons learnt and way forward

The landscape of Nepal is very fragile, so any development activities need to be very carefully planned in addressing multiple fragility parameters. Based on spatial analysis, the ISEA approach takes all such parameters into account, while focusing attention on areas with high environmental sensitive, thus enabling planners to prioritize EIAs requirements and shorten the time consuming EIA approval process.

Nepal is under an administrative restructuring process in which new political and administrative boundaries are delineated. In this context, ISEA lessons learnt will help in preparing thematic development suitability maps under the new decentralized governance system for provinces and municipalities. This ISEA was developed as a consultative and field verification process, which is anticipated to greatly enhance awareness among the political and administration institutions about the fragility of their geography. It provides an opportunity to decide what type of development is suitable for local levels based on the natural resources with which they are endowed. This process will greatly contribute in addressing environmental sensitivity and landscape fragility in achieving sustainable development as well as supporting livelihoods of local people who are dependent on the resources which their forefathers enjoyed.

Implementing the ISEA process has been a learning experience for the Government of Nepal in using spatial analysis. Key lessons include:

- ISEA tool may lead to different outputs in different scenarios;
- ISEA tool is being used in the context of post-conflict and post-disaster scenario. However, in Nepalese context, its scope can be broadened towards sustainable development planning of local government in the context of newly established federal structures in addition to post earthquake reconstruction and recovery;
- The main output of ISEA tool is the development of baseline maps, sensitivity maps and synthesis/opportunity maps. One can explore key sites (i.e. protected areas, areas of historical and cultural importance, biodiversity hotspots, etc.) to ensure that these areas are protected, while promoting development activities. Likewise, sensitivity maps help to identify the vulnerable sites where infrastructure building should be avoided and suitability/opportunity maps give an opportunity to identify suitable sites for development.
- These outputs help to focus attention on areas requiring mitigation or which projects should be prioritized in order to make the IEE/EIA process more effective. Once the maps are produced, one can screen project to determine whether it requires an IEE/EIA or can be advanced without an environmental assessment. There will be a strong basis for demarcating more clearly the impact area of the project. Similarly, the baseline information is more readily available, the seriousness of the impacts and its mitigation measures will be more valid. All the above elements directly help in reducing the time required for conducting IEE/EIAs.
- Finally, these data provide information to support mitigation measures for road segments at high landslide risk to increase the likelihood that they are more safely reconstructed and thus more sustainable. ISEA is also one of the key approaches for attracting foreign direct investment as it clearly highlights risks, proposes mitigation strategies, areas for protection and areas where there are opportunities for sustainable development.

6. Conclusions and recommendations

With over two decades of experience with EIAs, and 303 EIA proposals approved by MOPE to date, the process of EIA study and approval is creating a major, yet inevitable bottleneck for development activities in Nepal. The EIA process often requires consent of several relevant ministries due to which some development projects require considerable time for approval.

Therefore, fast-tracking development, while highlighting conservation goals through an ISEA process can address some of the issues of IEE/EIA processes as well as providing baseline information for more informed decision making. ISEAs greatly contribute to the IEE/EIA project screening and scoping steps as well as making early decisions for avoiding vulnerable and disaster risk-prone areas for infrastructure development and also to propose specific mitigation measures according to environmental sensitivities of specific areas. ISEA can play a vital role in establishing coordination between different stakeholder institutions as it can also streamline environmental plans and policies by minimizing any contradictions or potential conflicts. Not only can such information assist decision makers understand the ground reality in advance, it can thus minimize the time required for project approval. As the ISEA combines spatial environmental and hazard data, overlaid with proposed development projects (e.g. road network, or other infrastructure), it provides administrators a planning tool for more sustainable development in their respective local administrative units.

ISEAs can be helpful in establishing solid spatial baseline data for project monitoring during the implementation phase of approved IEE/EIA projects and suggested mitigation measures

Hence, the ISEA approach has great potential, especially as Nepal is going through a government restructuring process from a centralized system to a highly decentralized system with 7 provinces and 753 local governance units (classified as either Metropolitan, Sub-metropolitan, Municipality or Rural Municipality). Newly elected political leaders will have the challenge to bring development projects to their constituencies in order to generate revenue under the federal system to sustain their local government body. Hence, ISEAs can be an authentic planning tool to identify the specific infrastructure development zones resources richness area, while avoiding environment sensitive and disaster risk-prone areas. With political will power, the mandatory EIA process can be carried out more effectively while addressing sustainable development goal in a short time period.

Thus, ISEAs can be considered as a scientific tools which enable decision-makers to engage in evidence-based planning. It is also a leaning tool for mainstreaming DRR and Climate Change Adaption (CCA) into sustainable development processes, which should not be confined only to government stakeholders. It is critical that civil society and academia also be part of the stakeholder consultation process, to include data gathering and the assessment process. Communities may have local knowledge and informal data on key environmental sensitivities and risks that must be included during the data collection process.

To conclude, the ISEA approach is a multi-stakeholder integrated development planning tool and process which can lead to more sustainable planning outcomes, while creating a data pool which can save considerable time and effort.

Key recommendations

In the present scenario of state restructuring and decentralization, ISEA will be one of the most important tools for sustainable, disaster resilient, environment friendly development planning at every level of government. The first recommendation is therefore to promote ISEAs as a key planning tool in the new decentralized governance system of Nepal.

- Promote ISEAs in order to establish solid spatial baseline data for project monitoring during the implementation phase of approved EIA projects and suggested mitigation measures.
- Although ensuring that these ISEA results are fully implemented is challenging, coordination among concerned stakeholders and willingness of the policy makers can make it successful. Hence, it is important for all policy makers at various scales to understand the ISEA process for the sustainable development of Nepal.
- As a part of sustainable local level government planning and to achieve Sustainable Development Goals (SDGs), the Government of Nepal is keen to extent the ISEA approach to other municipalities and has recommended to undertake an ISEA for Seetganga municipality. It is one of the largest in terms of territory in Nepal and one of the most diversified municipalities in terms of biodiversity, topography and demography

7. References and additional reading

Benson, C. Twigg, J. and T. Rossetto (2007) *Tools for Mainstreaming Disaster Risk Reduction: Guidance Notes for Development Organisations* (Guidance note 7 Environmental Assessment p79-90), ProVention Consortium, January 2007

Bhatt, R.P and S.N. Khanal (2009) Environmental Impact Assessment System in Nepal- An Overview of Policy, Legal Instruments and Process, Kathmandu University *Journal of Science, Engineering and technology,* Vol.5, No II, September 2009, pp 160-170

CDB and CARICOM Secretariat (2004). *Sourcebook on the Integration of Natural Hazards into Environmental Impact Assessment (EIA)process: NHIA-EIA Sourcebook.* Bridgetown, Barbados: Caribbean Development Bank. http://www.caribank.org/uploads/2012/03/Source-Book5.pdf
http://www4.unfccc.int/nap/Country%20Documents/General/1066_toolsformainstreamingDRR.pdf

Dalal-Clayton, B. (2013) *The Role of Strategic Environmental Assessment in Promoting A Green Economy: Review of experience and potential, Background document for the OECD DAC SEA Task Team workshop on SEA and Green Economy, Lusaka, 17-18 January 2013* (http://www.oecd.org/dac/environment-development/SEA%20and%20Green%20Economy%20Background%20note.pdf)

DoR [Department of Roads] (2015) Road Network Data. Government of Nepal, Department of Roads. http://www.dor.gov.np/road_statistic_2008/Report%20Pages/tables/1.pdf. Accessed 1 October, 2017.

Fischer, T.B and V.Onyango (2012) Strategic environmental assessment-related research projects and journal articles: an overview of the past 20 years*. Impact Assessment and Project Appraisal.* Vol. 30, No. 4, December 2012, 253–263.

Government of Nepal, 2015, Post Disaster Needs Assessment. www.npc.gov.np/images/category/PDNA_volume_BFinalVersion.pdf
Accessed 1 October, 2017

Government of Nepal (2016) Post Disaster Recovery Framework http://www.np.undp.org/content/nepal/en/home/library/crisis_prevention_and_recovery/post-disaster-recovery-framework-pdrf2016-2020.html. Accessed on Oct 3, 2017

Kelly, C. (2013) Strategic Environmental Impact Assessments and Disasters: Building Back Smarter, AON Benfield UCL Hazard Centre, Disaster Studies and Management Working Paper no. 29, 15 pp. https://www.ucl.ac.uk/hazardcentre/resources/working_papers/working_papers_folder/wp29

MOHA [Ministry of Home Affairs] (2015), Nepal Disaster Report 2015, Government of Nepal http://www.drrportal.gov.np/uploads/document/329.pdf

Netherlands Commission for Environmental Assessment (2017). Accessed October 11, 2017 http://www.eia.nl/en/environmental-assessment

NRA [National Reconstruction Authority] (2016) Post Disaster Reconstruction Framework Sector Plans and Financial Projection Working Documents Nepal Earthquake 2015, May 2016 http://nra.gov.np/resources/details/Qaq17UBPKw4fBp8g52D5c1vVSttTwbaIvKH92CJfvAI.

OECD (2006) Applying Strategic Environmental Assessment: Good Practice Guidance for Development Cooperation DAC Guidelines and Reference Series, 164 pp. https://www.oecd.org/environment/environment-development/37353858.pdf

OECD 2010, Strategic Environmental Assessment and Post Conflict Development, SEA Tookit, November 2010, 20 pp. http://content-ext.undp.org/aplaws_publications/2078176/Strategic%20Environment%20Assessment%20and%20Post%20Conflict%20Development%20full%20version.pdf

Laban, P. McAdoo, B. and K Sudmeier-Rieux (2017) Eco Safe Roads; Poor road construction and climate change contribute to near record landslide mortality in 2016 http://kathmandupost.ekantipur.com/news/2016-10-02/eco-safe-roads.html

Petley, D., Hearn, G.J., Hart, A., Rosser, N., Dunning, S., Oven, K., Mitchell, W. (2007). "Trends in landslide occurrence in Nepal, *Nat Hazards* 43: 23–44.

Verheem, R., Post, R., Switzer, J. and B. Klem (2005) *Strategic Environmental Assessments: Capacity-building in Conflict-Affected Countries*, Social Development Paper, World Bank, Washington DC.

UNISDR (2014) *Progress and Challenges in Disaster Risk Reduction: A contribution towards the development of policy indicators for the Post- 2015 Framework on Disaster Risk Reduction.* Geneva, Switzerland. The United Nations Office for Disaster Risk Reduction (UNISDR). http://www.unisdr.org/files/40967_40967progressandchallengesindisaste.pdf

Annex 1: List of Contributors

Ministry of Population and Environment

- Ms. Laxmi Kumari Basnet, Joint Secretary
- Ms. Jwala Shrestha, Chief EIA Section, Under Secretary
- Mr. Raju Babu Pudasaini, Chief of Adaptation and Sustainable Development Section Under Secretary
- Mr. Ihswori Dutta Paneru, Senior Officer, EIA Section
- Mr. Sunil Niraula, Senior Officer, EIA Section
- Mr. Surendra Raj Panta, Ecologist, EIA Section

National Reconstruction Authority

- Mr. Prakash Thapa, Joint Secretary
- Mr. Yam Lal Bhoosal, Joint Secretary
- Dr. Bhishma Kumar Bhusal, Chief Foreign Aid, Under Secretary
- Mr. Deepak Neupane, GIS Expert

LEAD Nepal

- Ms. Aisha Khatoon, Executive Director
- Ms. Karuna Adhikari, Project coordinator

ICIMOD

- Mr. Deo Raj Gurung, Remote Sensing Specialist

UN Environment

- Mr. Purna Chandra Lal Rajbhandari, Field Coordinator, Nepal
- Dr. Karen Sudmeier, ISEA project coordinator, Disaster Risk Reduction Unit, Post-Conflict and Disaster Management Branch, Geneva, Switzerland
- Ms. Louise Schreyers, Project assistant, Disaster Risk Reduction Unit, Post-Conflict and Disaster Management Branch, Geneva, Switzerland
- Ms. Marisol Estrella, Programme Coordinator, Disaster Risk Reduction Unit, Post-Conflict and Disaster Management Branch, Geneva, Switzerland
- Mr. Muralee Thummarukudy, Operations Manager, Post-Conflict and Disaster Management Branch, Geneva, Switzerland

Annex 2: ISEA Process Milestones

a. Round Table Meeting on ISEA project (Friday, 24 June 2016):

A round table meeting was organized on 24th June 2016 by inviting officials from key ministries, NRA, and international agencies to share the post-earthquake reconstruction situations status and mainstreaming environment in the reconstruction process. UN Environment shared findings from the ISEA Sri Lanka project for the post conflict reconstruction process and contribution of ISEA to facilitate the development activities in the post conflict southern Sri Lanka. MOPE also presented the experience of implementing the EIA process, a time consuming and process oriented tool which engages several ministries. The round table discussion emphasized the need to comply with environmental screening thresholds for all reconstruction activities of the NRA.

b. Field Trip to Nuwakot to observe Earthquake Damage (Saturday, 25 June 2016)

A one-day observation visit was organized with representatives from MOPE, NRA and UN Environment officials in to the Nuwakot district, which was severely affected by earthquake. The team interacted with the locals regarding earthquake damage and present reconstruction efforts.

c. Introductory Training on ISEA, (15-16 September 2016):

An interactive two-day training was organized by UN Environment, facilitated by an international expert on ISEA. Total of 15 participants at Under-secretary level participated from the line ministries and relevant agencies (MOPE, NRA, MOF, NPC, one from each clusters).

The training program was composed of presentations, including: overview of Impact Assessments, need for ISEA, tools and technique of ISEA, methods and application of ISEA, Sri Lanka ISEA case study, environmental challenges of recovery in Nepal, experience of EIA's in Nepal. A group work session covered an assessment of recovery activities in thematic area and discussion about differences between EIA, SEA and ISEA tools.

d. Sharing and Sensitization of ISEA in the context of PDRF, (18 - 19 September 2016)

An interactive one & half day **Sharing and Sensitization on ISEA session** was organized with the technical support with ISEA expert by UN Environment for 30 Under-secretary level officers from different line ministries, MOPE and NRA. The participants were introduced to the ISEA process and its application as a tool to implement reconstruction projects which comply with environmental mainstreaming in during post disaster and conflict situations. Three groups were created based on the need to implement the ISEA process, which included: Baseline; Development; and Assessment. The group screened the PDRF listed activities with the requirement of the EIA and consideration for detail environmental screening. The exercise with the knowledge of the government officials working on EIA along with international expert found that 77 - 84% of the PDRF work plan activities could proceed with no significant impact on environment; 14 - 16% will require EIA; and 1 – 8% need more data (Table 2).

e. High-Level Policymakers Roundtable Meeting Agenda on ISEA, (19 September 2016)

A round table meeting was organized inviting the high-level policy makers on agenda of ISEA. The high-level policy makers who participated were Chief Executive Officer of NRA, Secretary & Joint-Secretaries of MOPE, Joint-Secretary of National Planning Commission & Ministry of Finance. The output of the ISEA training was shared with the high-level policy maker and the need of the ISEA process to fast track the reconstruction process by implementation of PDRF. Presentations were made by NRA under-secretary on status of the Post -2015 Earthquake National Reconstruction and UN

Environment facilitated consultant presented the need for ISEA. The ISEA presentation covered: Impact assessments in post-disaster situations, Environmental protection, avoiding delays and controversies, Building back better, Environmental resilience, Issues and Challenges in the application of ISEA. The program was concluded with distribution of the certificate to the training participants.

f. Study Tour on Lessons learnt on ISEA for the Northern Province, Sri Lanka (19 -24 March 2017)

Four government officials from MOPE and NRA participated in the study tour on lessons learnt on ISEA for the Northern Province of Sir Lanka along with the government officials from Ivory Coast during 19-24 March 2017. The main objective of the Sri Lanka study tour is to provide an interactive opportunity for participants from the three ISEA countries to learn about the use of ISEA as a development planning tool for post-crisis reconstruction and recovery.

Visit programs allowed the government officials to observe the post conflict recover areas on way to Jaffna from Sri Lanka and interacted with the ISEA experts and government officials in Sri Lanka to learn the issues and challenges in implementing ISEA. The officials had also interacted with the Minister of Environment of Northern Province of Sri Lanka while presenting the ISEA for the post conflict recovery development activities.

g. Consultation Workshop on Post-Earthquake Integrated Strategic Environmental Assessment with focus on road reconstruction (11 April 2017)

MOPE and NRA organized a half-day consultation workshop on Post-Earthquake Integrated Strategic Environmental Assessment (ISEA) with focus on road reconstruction on 11 April 2017 at Annapurna Hotel in Kathmandu. Around 35 Officials from the key line agencies and international organizations were invited to participate in the workshop. A presentation and interactive question and answer session was organized to present about the progress of the ISEA project activities and make aware about the ISEA tools. The presentations included: Objectives of Consultative workshop and issues to be consider on towards Eco-Safe Roads; review of the progress of the ISEA projects to date and outcomes; lessons learned from ISEA Sri Lanka Study tour; mapping activities; build back better principle and Integrated Strategic Environmental Assessment; Road to ISEA

h. Core Group Meeting and Action planning (11 April 2017)

A core group with around 20 participants from the key line agencies directly involved in the ISEA process attended the meeting for discussion on the action plan and next steps on taking ISEA activities forward and addressing the data and information gaps. The issues discussed: Technical mapping issues (the prioritization process); Data gaps and how to fill these; Identify areas of sensitivity; Ground verification; District and local consultations. The meeting recommended having a technical committed to address the data and methodology validation related issues.

j. Study Tour on Lessons learnt on ISEA from Ivory Coast (9-15 March 2017): Three government officials from MOPE and NRA participated the study tour on learning the lesson on implementation of ISEA in Abidjan, Ivory Coast
along with the officials from Sri Lanka during 9-15 September 2017. The main objective of the Ivory Coast to the government officials on learning the ISEA implementation model adopted in Ivory Coast and compare the Nepal ISEA implementation process and products.

Table 2. Screening stages of Integrated Strategic Environmental Assessments of Post-Disaster Recovery Framework projects 2016-2017

Stages of Integrated Strategic Environmental Assessment of Post Disaster Recovery Framework 2016 – 2020				SCREENING		ASSESSMENTS		
				Assessment 1 List	Assessment 2 List	Assessment 3 List	Assessment 4 Mapping	Assessment 5 SEO
DETERMINATION		CONSIDERATION	DESCRIPTION	External [UNEP]	National Workshop	Agency [MOPE]	Working Group	Working Group
PROCEED 77 – 84%	Exempted	Actions that are legally exempt from EIA	Project of a type or size that do not require EIA under current regulations	38% Initial estimate based on description of action	21%Initial estimate based on description of action	Confirm EIA Exemption Applies	Confirm sensitive location does not trigger EIA	Confirm conflicts with sensitive environmental objective does not trigger EIA
	None	No potential effects	Actions that have no potential to give rise to any environmental effects	37% Initial estimate based on description of action	34%Initial estimate based on description of action	Confirm EIA is not triggered	Confirm sensitive location does not affect environment	Confirm conflicts with sensitive environmental objective
	Low	Potential effects not needing mitigation	Actions that appear to be unlikely to give rise to effects that will impinge upon the environment	0% Initial estimate based on description of action	6% Initial estimate based on description of action	Confirm that EIA is not required	Confirm that Action is not in a sensitive Location	Ensure Action does not conflict with SEO
	Medium	Potential effects that can be readily mitigated	Actions that are indistinguishable from the type of upgrade, repair, renewal, replacement that would occur in normal circumstance	10% Initial estimate based on description of action – subject to confirmation that mitigation is robustly plausible	16% Initial estimate based on description of action – subject to confirmation that mitigation is robustly plausible	Confirm that EIA is not required	Confirm that mitigation will not affect a sensitive Location	Confirm that mitigation will not affect a sensitive Objective
EIA 14 –16%	High	Potential to affect environmental sensitivities	Actions likely to lead to effects on account of their type and/or scale or because they are located within or near a sensitive environment	13% Identify Potential need for EIA	14% Identify Potential need for EIA	Confirm that EIS is Required	Confirm scope of Issues to be addressed by EIA	Confirm scope of Indicators and Targets for EIA
	Critical	Potential to significantly affect environmental Vulnerabilities	Actions of significant scale that are likely to significantly affect sensitive, vulnerable or protected parts of the environment	1% Identify Potential need for EIA	2% Identify Potential need for EIA	Confirm that EIS is Required	Confirm scope of issues to be addressed by EIA	Confirm scope of Indicators and Targets for EIA
REVIEW 1- 8%	Unknown	Actions not finalized or affecting environments with incomplete data	Actions that may require further details about either the proposed action – or further details about the proposed receiving environment.	2% Identification of Uncertainties about Action or Location	8%Identification of Uncertainties about Action or Location	Identification of Uncertainties about Thresholds or Sensitivities	Identification of Uncertainties about Sensitivity of Location or interaction with other Projects	Identification of Uncertainties about effects on sensitive Objectives

k. Technical Committee Meetings for validation of the information used in the ISEA process

First meeting (20th June 2017): Based on the recommendation in the core group meeting, a technical committee representing the institutions and experts and invited guests was formed to validate data collected to date. The meeting raised the question about the scale of the spatial information used and provided inputs on strengthening the spatial information. Recommendations included incorporating rainfall information in strengthening the landslide susceptibility maps which is used as base information for overlaying the PDRF listed road. The objective was to determine the status of road alignments as compared to landslide susceptibility.

Second Technical Committee Meeting (6 August 2017): The meeting was organized after the updating the Landslide Susceptibility map incorporating the rainfall information with the support from ICIMOD. The committee also suggested including the quarry site location for the construction and maintenance of the PDRF listed Local Roads. It was also suggested to have the field verification of the map on alignment passing through land cover and land susceptibility areas.

Third Technical Committee Meeting (29 October 2017): This meeting further validated data collection efforts and brought in a few new stakeholders especially from the government agencies working on roads.

l. Visit to Sindhupalchok (& Rasuwa) for the field validation and interaction with District officials (30 October 2017)

A field validation with the field visit and interaction program with the district level key line agencies officials was organized on at Chautara with the participation of the Mayor, Chair of District Coordination office, Local Development Officer and representatives of development offices. Brief presentations were made on ISEA process and its application for identifying areas for development opportunity in the municipality and district. The participants found the ISEA tools very useful for the municipal level development planning.

Field validation in the Sindhupalchok and Rasuwa district was conducted with collection of the data using Geographic Positioning System (GPS) to identify the major landslides along the roads. These data were used to validate the maps used for the analysis.

m. Africa-Asia Regional Forum on ISEAs, with a focus on Post-Conflict situations (27-29 November, Bangkok, Thailand). A Nepal delegation from MOPE and NRA attended the three day programme which brought together 50 participants from 10 different countries to share various ISEA experiences and explore opportunities for up-scaling.

Annex 3: Government of Nepal Environmental Legal Provisions and International Development Agency Environmental Guidelines

1. Introduction and background

The purpose of this Annex is to compare environmental provisions for reducing impacts of development projects as instituted by Nepal law (Environmental Impact Assessments and Initial Environmental Examinations) and as practiced by international agencies and development banks in Nepal. The purpose is to better understand if there are major overlaps and entry points for better streamlining between the two sets of safeguards.

The need for EIA integration of major development infrastructure projects was first time recognized in the Sixth Development Plan (1980-'85) of Nepal. Environmental conservation related policies were further elaborated in the Seventh Development Plan. A series of guidelines were developed considering environmental factors from the project formulation stage of development planning to the policy enforcement stage. The first "EIA lesson learnt" document in Nepal was the Environmental Assessment Guideline 1993 which has played a facilitation role in the EIA process.

The Government of Nepal has established an EIA system for development projects with the formulation of the Environmental Protection Act (EPA) and Environmental Protection Rules (EPR) 1997, as well as a sectoral policy, acts and guidelines. Based on the formulated Act, chapter 2, regulations, and guidelines, criteria for EIAs and the Initial Environmental Examination (IEE) process were established for required environmental assessment studies as per the nature of the projects. The IEE is conducted for small projects which are expected to have significant impact, whereas the EIA is mandatory for projects which are anticipated to have a major impact at the project level on the environment. The specific requirements of EIAs and IEEs are explicitly mentioned in the EPR 1997.The Act has identified the following development areas and the requirement threshold for conducting IEEs and EIAs for the development projects: forest; industry; mining; road; housing, building and urban development, water resources and energy; tourism; drinking water; waste management; agriculture; health. This rule also explicitly mentioned that it is mandatory to conduct an EIA if any development sector activities are implemented in historical, cultural and archeological areas; National parks, wild life reserves, wetlands and conservation areas; and near public drinking water supply main source areas.

Nepal's environmental protection rules, acts and guidelines, which have implications for conducting IEE and EIAs processes, are presented below. The Environment Protection Rule and Act of 1997are presented in the **Annex I & Annex II.** The National Environment Impact Guidelines which are still being used in practice were prepared in 1993, prior to the EPR 1997. They are currently under review and an updated draft is under preparation. The EIA guideline of 1993 is presented in **Annex III**.

1. List of Nepal's Environmental Protection related Laws for IEE and EIA

Environmental Protection Act (EPA), 1997 and Environment Protection Rules (EPR), 1997, which made IEE/EIA mandatory for the governmental as well as the private sector projects if it falls under schedule 1 or schedule 2 of EPR.

Provision of IEE/EIA in Sectoral Law

Forest Act, 1993 calls for carrying out IEE/EIA of the development proposals if they are to be implemented in the forest areas and/or passes through the forest area

National Parks and Wildlife Conservation Act, 1973 contains a number of environment-friendly provisions and prohibit activities that will have adverse impacts on the environment.

Forest Rules, National Parks Rules, and Conservation Area Management Rules

Aquatic Animal Protection Act, 1961 and First Amendment, 1998 (AAPA)

Water Resources Act 1993

Electricity Act, 1993 also contains provisions to minimize soil erosion, floods, air pollution and damage to the environment while producing and transmitting electricity (Section 24)

Tourism Act, 1978 also contains provisions to minimize waste and environmental pollution in the trekking areas

Mines and Minerals Rules, 2000 obliges the proponent to adopt environmental protection measures and ensure environmental conservation (Rule 19)

Sectoral Acts with environmental considerations supporting the EPR (1997) and EPA (1997)

Explosive Material Act, 2018; Public Road Act, 2031; Road Board Act 2002; Plant Protection act 2029 (1972);Land Acquisition Act 2034*(1997); Local Government Implementation Act, 2017;Buffer Zone Management Regulation 1992; Himalayan National Park Regulations, 1979; Solid Waste Management Act/Rule 2017*;Labour Act 2017and Labour Rules 1993*; Child Labour Act 2056* (*Nepali years)

National Conservation Strategy (NCS) in 1990, the government of Nepal in collaboration with The World Conservation Union - IUCN developed a national system for Environmental Impact Assessment.

National EIA Guidelines for Nepal was drafted, tested and finalized through a participatory approach and within two years of continued efforts the government endorsed the guidelines on 27 September 1992 through an administrative decision (Cabinet decision) and gazetted it on **19 July 1993.**

It contains objectives, methods of screening projects which will determine the level of environmental assessment (IEE or EIA), scoping, impact identification and prediction, report review, monitoring and evaluation and impact auditing

Within the broad framework of the National EIA guidelines, two separate EIA guidelines of Forestry and Industry Sector were prepared and the Government of Nepal endorsed them in 1995

Sectoral policies and laws related to roads or linked with the EPA or EPR (1997) (indicated by Nepali years)

Department of Road (DOR) Environmental Management Guideline 2054; Environmental Assessment in Road Sector 2057; Land acquisition, Rehabilitation and Resettlement Policy (Purbadhar Bikas Ayogana Ka Lagi Jagga Prapti, Punarbas Tatha Punarstapana Sambandhi Niti 2071); Roadside Geotechnical Problem: A practical guide to Their Solution 2066 (2009); Interim Guideline for Enhancing Poverty Reduction Impact of Road Projects 2064; Environmental Social Management Framework (ESMF) 2064; Reference Manual for Environmental and Social Aspect of Integrated Road Development 2060(2003); Reference Manual and Site Handbook for Roadside Bio-engineering 2059(2002);Nepal Biodiversity Strategy 2059 (2002); Department of Road Policy and Strategy 2061; Guideline for Inspection and Maintenance of Bridge Vol.1; Design Standard of Feeder Roads 2053; Environment Standards of Diesel Generator; National Bridge Standards

The Government of Nepal has established a dedicated EIA section headed by Undersecretary with dedicated staff under Population and Environment division of Ministry of Population and Environment. The Ministry has so far approved 303 EIA proposals for development projects related to mega hydro power plants, roads, hotels industries etc. Table 3 outlines a list of approved EIA projects in Nepal through 2017.

Table 3. List of approved EIA projects in Nepal through 2017. Source: MOPE, 2017

S. N	Thematic Area	No. of Approved EIA
1	Hydro Power plants	98
2	Industry establishment	27
3	Hospital , Medical Colleges	23
4	Power Transmission line	23
5	Road	28
6	Apartment	17
7	Drinking water, Irrigation	14
8	Hotel	11
9	Community Forest	10
10	Solid Waste Management	6
11	Airport	3
12	Miscellaneous	28
	Total	**293**

2. Environmental Compliance and Requirements for Donor and Bank-funded Development Projects

In Nepal, most of the mega and major development projects are funded by development banks and bilateral government aid agencies, especially: India, China, Japan, DFID, USAID, EU, JICA, World Bank, Asian Development Bank

Each of these agencies have their own environmental compliance requirements for the approval of development projects. All development projects need to comply with the Environment Protection Act (EPA) 1997 which make IEE and EIA processes mandatory based on Government guidelines and processes in order to obtain approval of projects for implementation (Tables 4 and 5).

Several donor agencies' Environment and Social safeguard policies and guideline provisions are more stringent and require more impact assessments and mitigation measures than the 1997 EPA. In this case, the donor agencies conduct the study and develop project specific impact details and recommend

mitigation measures.

For donor agencies, the examination of recipient country's EIA-related Rule and guidelines is also one step in the IEE /EIA process. They are required to compare a country's EIA legislation with donor agencies' guidelines to ensure there is minimum environment impact from the supported projects.
Based on this rule, there are three cases:

Case 1: The recipient country's EIA guidelines are fully sufficient. Project is implemented using the recipient country's Guidelines.

Case 2: The contents of the recipient country's guidelines are not sufficient. The recipient country's guidelines are used as a base and donor agencies guideline on screening and scoping items will be added.

Case 3: The recipient country has no EIA guidelines. In this case donor country guidelines will be used.

The EIA Section of Ministry of Population and Environment has established that all donor-driven mega projects in Nepal are required to pass through the EIA approval process in order to comply with the 1997 EPR. In case Nepal's EIAs guidelines do not mention impacts and mitigation options, then it is compelled to conduct a detailed study as well as conduct mitigation measure. For example, if a mega hydro project in Nepal inundates a large area with a number of settlements, supporting agencies must develop a resettlement plan of the displaced settlement household as requirement of the Asian Development Bank. This issue is not explicitly mentioned in Nepal's EIA guidelines. Therefore, in order to address similar issues related to mega hydro power development potential, the Ministry of Population and Environment in collaboration with the International Finance Corporation has been working on a separate improved EIA guideline for Nepal.

The donor agencies have their own screening and scoping guidelines which are discussed here:

World Bank

The World Bank project staff prepare an "Environmental Data Sheet" for environmental screening of each project. The team determines the nature and magnitude of the proposed project's potential environmental and social impacts, and assigns the project to one of the environmental categories of A, B, or C.
Category A: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.

Category B: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas-including wetlands, forests, grasslands, and other natural habitats are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects.

Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts.

Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds, through a financial intermediary, in subprojects that may result in adverse environmental impacts.

Asian Development Bank (ADB)

The proposed projects are screened based on the environmental and social impacts and categories in to A, B, C, and FI

Category A. The project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented.

Impacts may affect an area larger than the sites or facilities subject to physical works. A full-scale environmental impact assessment, including an environmental management plan (EMP), has to be prepared by the borrower/client.

Category B. The project's potential environmental impacts are less adverse and fewer in number than those in category A. Impacts are site-specific, few of which, if any, are irreversible. Impacts can be readily addressed through mitigation measures. An initial environmental examination (IEE), including an EMP, has to be prepared by the borrower/client.

Category C. The project is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, but ADB will conduct a desk review of the project's environmental implications.

Category FI. The project involves the investment of ADB funds to or through a financial intermediary.

Department for International Development (DFID) U.K.

DFID polcy states that procedures in the "DFID Environment Guide: A Guideline to Environmental Screening" should be followed. Environment Screening **must** be carried out for all DFID interventions with a value of £1 million or more. Screening is also recommended below that threshold, as there may still be environmental impacts.

DFID's commitment to environmental sustainability is reflected in two White Papers on International Development. These include: 1. *Eliminating World Poverty: A Challenge for the 21st Century; 2.Eliminating World Poverty: Making Globalisation Work for the Poor* (December 2002).

Where DFID provides technical assistance to support infrastructure developments financed by other agencies, the EIA must be undertaken. An EIA will usually be undertaken under the auspices of the national government of the partner country. Most partner countries have statutory environmental standards or advisory guidelines that must be applied to development interventions. In the absence of such standards, DFID's approaches to develop specific standards with the partner government, which take into account local environmental conditions, costs of compliance, obligations under international law etc.

DFID explicitly mention about the environmental interventions with supported projects **must comply** with any partner country regulations. The environmental examination of certain proposed PPP of the partner countries need to be conducted before agreement and implementation.

Japan International Cooperation Agency (JICA), Japan

Based on the proposed projects and site description, the JICA team go through the preliminary screening and also examine the recipient country's EIA guideline to decide whether it is sufficient or require an additional impact study. After the field study and data analysis, the expert team will identify whether it should go through IEE or EIA. It has emphasized the need to comply with national EIA requirements by rule of land and will undertake additional studies based on expert opinion and field visits.

Table 4. Donor Project Screening and Categorization for EIA

ADB	WB	DFID	JICA
Category A. The project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. Impacts may affect an area larger than the sites or facilities subject to physical works. A full-scale environmental impact assessment (EIA), including an environmental management plan (EMP), has to be prepared by the borrower/client. **Category B. The project's potential environmental impacts are less adverse and fewer in number than those in category A. Impacts are site-specific, few of which, if any, are irreversible. Impacts can be readily addressed through mitigation measures. An initial environmental examination (IEE), including an EMP, has to be prepared by the borrower/client.** **·Category C. The project is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, but ADB will conduct a desk review of the project's environmental implications.** **Category FI. The project involves the investment of ADB funds to or through a financial intermediary.**	**Category A:** A proposed project is classified as Category A if it is likely to have **significant adverse environmental impacts that are sensitive, diverse, or unprecedented**. These **impacts may affect an area broader than the sites or facilities** subject to physical works. **Category B**: A proposed project is classified as Category B if its **potential adverse environmental impacts on human populations or environmentally important areas-including wetlands, forests, grasslands, and other natural habitats-are less adverse** than those of Category A projects. These **impacts are site-specific**; few if any of them are **irreversible**; and in most cases **mitigation measures can be designed more readily** than for Category A projects. **Category C:** A proposed project is classified as Category C if it is **likely to have minimal or no adverse environmental impacts**. **Category FI:** A proposed project is classified as Category FI if it involves investment of Bank funds, through a financial intermediary, in subprojects that may result in adverse environmental impacts.	Environment Screening must be carried out for all DFID interventions with **a value of £1 million or more**. Screening is also **recommended below that threshold**, as there may still be environmental impacts. **EIA must be undertaken** where **DFID provides technical assistance** to support infrastructure developments financed by other agencies.	After field study and data analysis, the **expert team will identify whether it should go through IEE and EIA.** It has emphasized the need to comply with n**ational EIA requirements by rule of land** and provide additional study based on expert opinion after field visit.

Table 5. Threshold for EIA and IEE under NRA Working Procedure 2016 for EIA and Environment Protection Rule 1997

National Reconstruction Authority Working Procedure/Rule 2016 with amendment for IEE & EIA		Environment Protection Rule 1997 for IEE & EIA	
Initial Environment Examination (IEE)	**Environment Impact Assessment (EIA)**	**Initial Environment Examination (IEE)**	**Environment Impact Assessment (EIA)**
		Forest:	
To clear up to 7.5 ha of forest area	To clear more than 7.5 ha of forest area	Clearance of vegetation up to 5 hectares .in forest area	**Clearance of vegetation of more than 5 hectares in forest area .**
		Road	
New construction, reconstruction and rehabilitation of 1 to 10 km road length.	New construction, reconstruction and rehabilitation of more than 10 km road length.	Construction of the following roads: (a) District roads; (b) Urban roads	**Construction of the following roads: (a) National highways ;(b) Main feeder roads**
		Improvement, up grading and reconstruction of national highways and feeder roads.	
		Construction of 1 to 5 Kilometers long agricultural road.	
		Residential, Building and Urban Development Area	
to construct 10,000 to 20,000 sq m of built-up area or floor area	to construct more than 20,000 sq m of built-up area or floor area	to construct residential, commercial and their combination having 5,000 to 10,000 sq m of built-up area or floor area	**to construct residential, commercial and their combination having more than 10,000 sq. m of build-up area or floor area**
to construct building more than 10 floor or 25 m height up to 16 floor or 50 m height	to construct building more than 16 floor or 50 m height	to construct building of 10 to 16 floor or 25 to 50 m height	**to construct building of more than 16 floor or more than 50 m height**
settlement and village area development from 4 ha to 20 ha area	settlement and village area development for more than20 ha area	Construction of Movie theater, community hall, stadium, concert hall sport complex with having arrival and departure of 1000-2000 people at a time	**construction of Movie theater, community hall, stadium, concert hall, sport complex with having arrival and departure of more than 2000 people at a time**
	Water supply area covering people of more than 4 ha	Development of settlement in 1 to 4 hectares area	**Development of settlement in more than 4 hectares area**
		Land development of the area ranging 10 ha to 100 ha	**Land development in more than 100 ha**

Land Cover Change			
Change of the land cover/use having the area covering 4 ha to 20 ha.	Change of the land cover/use having the area covering more than 20 ha.		
Development of site with filling or cutting of the soil with more than 20,000 cu. M		Development of site with filling or cutting of the soil with more than 20,000 cu. M.	
Electricity and Transmission line			
construction of transmission line having capacity more than 132KV	construction of transmission line having capacity more than 132KV	Supply of electricity though the constructions of transmission lines of from 132 KV or more than that capacity.	
Construction of Electricity transmission line more than 10 Km	Construction of Electricity transmission line more than 10 Km	Construction of hydropower project of 1 MW to 50 MW capacity	**Construction of hydropower project of more than 50 MW capacity**
Construction of Electricity distribution line more than 20 Km	Construction of Electricity distribution line more than 20 Km		
Water supply & Sewerage			
Water purification system plant having more than 25 cum/sec		**Processing of water at the rate of more than Twenty Five liters per second.**	**Operation of multi-purpose projects relating to sources of drinking processing at the rate of more than 25 liters per second.**

Water supply system supplying drinking water for 10,000 to 50,000 people	**Water supply system supplying drinking water for more than 50,000 people**	**Supply of drinking water to a population ranging between Five Thousand to Fifty Thousand.**	**Supply of drinking water to a population more than 50,000 .**
connecting the new water source to supply 10,000 to 100,000 people	connecting the new water source to supply more than 100,000 people	Supply of drinking water to a population ranging between Ten Thousand and Hundred Thousand upon connecting new sources.	**Supply of drinking water to a population of more than One Hundred Thousand upon connecting of new sources..**

Construction of Drinking water system including treatment facility with the sewerage system		Collection of rain-water in an area up to Two Hundred hectares and use of water sources (Spring/wetland) located within the same area	**Collection of rain-water in an area of more than Two Hundred hectares and use of water sources (springs/wetlands) located within the same area.**
		Surface water sources with more than 1 Cu. ft./sec safe yield, and the use of its 50% during the dry season	**Surface water sources with more than 1 cu ft. / sec. safe yield, and the use of its entire part during the dry season.**
Waste generation from house and settlements			
Waste generation of 1,000 to 5,000 metric ton with landfill facility for waste management	Waste generation of more than 5,000 metric ton with landfill facility for waste management		**Waste management activities to the undertaken with the objective of providing services to a population of more than Ten Thousand.**
		Disposing 1000 to 5000 tons of wastes annually in land	**Disposing more than 5000 tons of waste annually in land**

Annex 4: Road construction activities, expected impacts and recommended mitigation actions

Table 6. Road construction activities, expected impacts and recommended mitigation actions. Source: MOPE, 2017

Activity	Impact	Mitigation measures
Fresh cut and earthwork excavation	• Slope failure, landslides and erosion, • Disruption of road, • Water Pollution nearby water bodies • Dust pollution • Poor drainage	• Construction of dyke around stockpiled material, spoil, fresh cuts, • Maintain slope with gabion edge wall and bio-engineering • Control water flow through construction sites by using live grass barriers and rock, • Maintain and reapply erosion control measures until vegetation is successfully established • Roadside drainage will be maintained regularly • Damage to the drains will be repaired immediately
Spoil disposal	• Disruption of road, damage to farmland, water pollution etc.	• Cut and fill approach will be used • Avoid the disposal of spoils on fragile slopes and natural drainage path
Road cuts through forest areas	• Fire hazard is increased • Forest area loss and other vegetation/ protected plants • Pressure on biodiversity hot spots • Pressure on forest and forest products (firewood, timber) • Loss of protected and rare species and habitats • Impact on community forest	• For fire hazard, establish all the relevant safety measures as required by law, and good engineering practices to improve safety • Awareness and safety instruction to the worker • Compensatory plantation • Avoid camps near the forest areas • Strict prohibition of cutting of trees for any other purpose • Provide LPG as an alternative of firewood • Monitor use of kerosene, diesel or gas fuel to melt the bitumen • Forest and vegetation will be felled only in the required area and no use of horns in the forest area
Road cuts through wildlife areas	• Disturbance to wildlife and their movement • Illegal hunting and poaching	• Forest and vegetation will be felled only in the required area and no use of horns in the forest area • Provision of animal crossing/underpass/overpass • Ban hunting and poaching
Transportation of construction materials, waste disposal	• Dust pollution • Noise pollution	• Sprinkling water frequently • Vehicles transporting soils, sand and other construction materials should be covered with tarpaulin sheets • Bitumen plants and rock crusher will not be located in any sensitive area
Construction work, use of heavy equipment's	Noise pollution	• Construction machinery should be operated only during the day time • Suitable noise controlling devices such as exhaust silencers will be used to control noise • All construction vehicles, machinery and equipment's must be properly maintained to comply with the national environmental standards

		• No horns signal should be kept in the forest area and settlement area • Ear mufflers should be provided to the workers
Road construction employment	Gender and vulnerable groups discrimination	• No discrimination will be made on wages, will give priority to vulnerable groups
Operation of quarry site, burrow pits	Damage to farmland, property, slope instability, river bank cutting,	• Prepare quarry and borrow operation plan • Unstable sites, erosion prone area, dense forest area, settlements, fertile farm land will be avoided • Suitable sizes and quarry sites will be operated as per the volume of the materials • Quarry site will be rehabilitated by providing appropriate civil engineering structures and bioengineering measures • Restoration of those sites after completion of work
Stockpiling of construction materials	• Air pollution, land pollution, surface water pollution, permanent land use change • Standing crop or future cultivation on such land is disrupted • Possibility of road accidents	• Stockpiling shouldn't be placed where considerable vegetation is available • Avoid stockpiling at flooding and water logging area • Avoid stockpiling near settlement area • Will use signboards at accident prone spots
Use, repair and maintenance of vehicles	• Leakage of oils and chemicals • Impact on aquatic life and its habitat on river system	• Water quality test will be carried out to compare with baseline data during construction phase. • Washing of vehicles will not be allowed into river system • Repair and maintenance will be done in specific sites
Diversion of water flow	• Disruption in natural water flow due to construction of activities • Causes number of risks impairment in water bodies like obstruction of natural flows and water logging • Risk to downstream people	• Adequate numbers of drainage structures will be provided in order to have minimum interference on natural drainage pattern of the area • Avoid the drain water discharge into farmland or risky locations • No diversion of water away from natural water course • Avoid any blockage or diversion of natural channels due to disposal of spoil • Install cascade, steps, energy dissipaters, check dams including bio-engineering measures as per design for gully protection to avoid depth and side erosion of natural course including river beds • Restoration of diversion after completion of work
Establishment, operation and closure of crusher plant	Prone to air, noise and water pollution	• Setting the crusher plants as per the existing GoN rule/standard • Fit and operate stone crushing equipment with dust control devices • Construction of de-settling pond before disposing the water into the natural drainage system • Decommissioning of crusher plant after the completion of work • Restoration of the area and maintain greenery

Blasting activity	• Impairment in landscape as it triggers loosening of existing land formation due to vibration • Landslide and erosion • Damage on some dwellings and other structure • Drying or change in direction of water sources	• Powered mechanical equipment and lot of local labor with hand tool method will be used • Blasting will be carried out in line with the rule under the Explosives Act • Blasting shall carried out only at day time at regular interval after siren warning • Residents nearby the project area shall be kept informed of the plans and progress of blasting and residents shall be temporarily evacuated and provided with alternative accommodation • Proper measure should be taken while doing blasting nearby water sources • Restoration of water sources
Socioeconomic environment		
Road cut through historically/culturally important areas	• Impact on historical sites. • Extinction of traditional culture • Impact on heritage sites	• Re-align the road if it is likely to pass through those areas • Reconstruct those sites in co-ordination with local people • Propose a program for the promotion of traditional culture for local people
Involuntary acquisition	Loss of land, property and other private properties, population displacement and their resettlement and Rehabilitation	• Vulnerable groups will be provided special assistance • Land acquisition and other involuntary impacts will be avoided or minimized exploring all viable alternatives • Provision of income restoration and rehabilitation • The land holders will be compensated by cash at replacement cost decide by compensation Fixation committee • Cash compensation will be made for structure replacement • Training assistance and income generation per household
Land acquisition	Loss of agricultural products, Impact on communities properties	• Compensation for the loss of crops at current market price • Compensation replacement cost of reconstruction of the community governmental structure
Construction of camp sites	Impact on health, sanitation, occupational and safety, pressure on drinking water and natural resources	• Avoid camps in settlement areas • Maintain temporary and permanent drainage facilities • Provide first aid facilities to the workers • Access to trained doctor at least once a week
Movement of workers, sharing of common resources	Pressure on infrastructure, impact on cultural and religious places	• Maintain close liaison within local communities to ensure any potential conflicts related to the common resources • Alternative trail should be used in order to maintain the local people mobility • Loss of any religious site will be compensated by cash compensation or reconstruct • Prior consultation to the local communities shall be accomplished
Increase in vehicular movement, lack of enforcement of traffic rules	Accidental impacts	• During design, informative board will be included • Traffic safety and warning signs and heading boards with various messages will be placed along the road

		• Service trails and crossing will be made in the road design for safe movement of peoples and animals across the road
Settlement growth along road alignment	Reduce road capacity, road accidents	• Regulation of resettlements with proper planning; plantation of trees
Inflow of workforce	• Alcohol consumption, gambling and prostitution • Increase in girl trafficking • Sexual harassment	• Awareness program will be launched to the communities about possible entry of negative behavior gambling, excess use of alcohols, HIV aids, girl trafficking, child labor and gender and caste based discrimination
Movement of workers and re-construction of road	• Encroachment of the land nearby road • Growth of illegal squattered settlement	• Strict prohibition of illegal settlements in the RoW • Inform and co-ordinate with local authorities to clear the illegal settlements if any • Open/barren land on Row should be utilized by Government sector properly

Note: Mitigation activities will be implemented by the concerned responsible agency

UN
environment
United Nations
Environment Programme