

## Rapid Environmental Assessment of Gorkha Earthquake 2015 in Nepal FIELD STUDY REPORT

### BACKGROUND

On 25 April 2015, a 7.8 magnitude earthquake struck Nepal. The epicenter of this massive earthquake was Barpak in Gorkha. This was followed by several strong aftershocks with epicenters in Dolakha and Sindhupalchowk. The impact was catastrophic with human casualties over 8790, and 22,300 injuries (PDNA 2015). It is estimated that the lives of eight million people, almost one-third of the population of Nepal, have been impacted by these earthquakes. Thirty-one of the country's 75 districts have been affected, out of which 14 were declared 'crisis-hit' for the purpose of prioritizing rescue and relief operations; another 17 neighboring districts are partially affected (PDNA 2015). In response to the immediate need of environmental assessment, a multi-disciplinary team under the leadership of the Ministry of Science, Technology and Environment to undertake a rapid environmental assessment of the 2015 earthquake was formed. Among the major objectives of the REA was to identify, map and prioritize environmental impacts, hazards and risks resulting from the earthquake itself, and from subsequent recovery/reconstruction.

Dr Dinesh Raj Bhujju, a research scientist working in the field of environmental science, signed a contract with Hariyo Ban Program, WWF Nepal for a consultancy service to work as a member of a multi-disciplinary team to undertake a rapid environmental assessment of the 2015 earthquake, contributing to the process of the REA. In particular, his responsibility was to coordinate the field survey as Field Research Coordinator. The overall objective of the service was to coordinate data collection and consultation in the field, and subsequent data analysis, in support of the rapid environmental assessment, including leading and coordinating a team of field assistants. This work was to be done in coordination with Resource Himalaya Foundation, which was providing field assessors (graduates of environmental science) for the assessment (details in ToR). This report summarizes the work and services performed under the contract.

### FIELD SURVEY SITES

For the purpose of REA, seven field study sites including six districts and Kathmandu valley were selected: 1) Dolakha, 2) Gorkha, 3) Kavre, 4) Nuwakot, 5) Rasuwa, 6) Sindhupalchowk, and 7) Kathmandu valley. This selection was done through a consultative meeting of REA expert team, which mainly considered severity of earthquake impacts and geographic coverage as selection criteria. It is important to take into account the fact that environmental impacts of the earthquake were different in urban and rural areas. In the densely populated urban centers of Kathmandu valley (Kathmandu, Lalitpur and Bhaktapur) an urban perspective was followed for the study, which considered major pollution emanating from damaged laboratories and factories. While for the scattered settlements in the rural mid-hills and mountains, an approach that relied on ecosystem services for food, energy, water and shelter, as well as disaster risk reduction (landslides and flooding) was taken into consideration.

### FORMATION OF FIELD SURVEY TEAM

A competent team of young researchers was formed. An open call was made targeting the self-motivating graduates of environmental science through Resources Himalaya Foundation, a

Kathmandu based research NGO which have been mentoring young researchers for over two decades. There was an independent selection committee of experts to interview the applicants (total 34) and recommend the high-quality candidates (total 20). Among the selected 20 candidates, nine were women. The list of the selected candidates is in Table 1:

**Table 1.** List of the Field Researchers

SN	Name	Address
1	Amrita Pokhrel (Ms)	Nuwakot
2	Jagdish Adhikari (Mr)	Dolakha
3	Kamana Jha (Ms)	Baglung
4	Kumod Lekhak (Mr)	Baitadi
5	Manisha Maharjan (Ms)	Kathmandu
6	Mukesh Rai (Mr)	Khotang
7	Nabin Nepali (Mr)	Gorkha
8	Rabina Sipai (Ms)	Bhaktapur
9	Rajesh Gautam (Mr)	Jhapa
10	Ram Gotame (Mr)	Gorkha
11	Ramesh Neupane (Mr)	Lamjung
12	Ranjita Thapa (Ms)	Morang
13	Rashmi Maharjan (Ms)	Kathmandu
14	Salina Bajracharya (Ms)	Dhading
15	Sangam Rai (Ms)	Sarlahi
16	Saroj Koirala (Mr)	Kavre
17	Shanta Bastola (Ms)	Jhapa
18	Subin Kalu (Mr)	Bhaktapur
19	Chitra Magar (Mr)	Morang
20	Yadav Raj Joshi (Mr)	Dadeldhura

## TRAINING AND ORIENTATION

Before going to the field sites, a two-day training was organized for the selected candidates at RHF. The objectives of the training were:

- To introduce the university graduates about REA and highlight their role in field data generation in the quake aftermath scenario
- To guide the participating graduates on information collection and field techniques (questionnaire, FGD, etc.) relating to various thematic areas of REA

The REA experts, as resource persons, gave training to the field researchers, and they highlighted their respective thematic area. Table 2 presents the activity topic and name of the resource persons from REA expert team.

**Table 2.** Activity topic and resource persons of the training program

<b>Day I (11 June Wednesday)</b>	
Topic/Activity	Resource Person/s
Participants' introduction	
Introduction to REA-Nepal in Recent Earthquake Context	• Dr Shankar Sharma
Introduction to REA and Objectives of the Assessment	• Mr Santosh Mani Nepal
GRRT	• Mr John Randall
International experience of REA	• Dr Erica Clesceri
Part I: Environment focused to Brown Part	• Mr Chiranjibi Gautam
Theme II: Forests and Biodiversity	• Dr Ram Prasad Chaudhary • Dr Shant Raj Jnawali
Theme III: Agriculture, Livestock and Livelihood	• Dr Prahlad Thapa • Dr Sunil Regmi
Group Formation	• Group work
<b>Day II (12 June Thursday)</b>	
Theme IV: Geology and Landslide	• Dr Jaganath Joshi
Theme V: Gender and Social Inclusion	• Ms Bharati Silawal-Giri
Theme VI: Policy and Legal Instruments	• Mr Narayan Belbase
Theme VII: Infrastructure, Energy and Tourism	• Dr Shant Raj Jnawali
Field Techniques and Ethics	• Dr Dinesh Raj Bhujju

## FIELD VISIT AND SURVEY

Two field visits were organized during the work period: the first visit was from June 2 to 3, 2015 and the second visit was from June 13 to 20, 2015. The first one was a kind of preliminary visit which involved the REA experts. The visits covered six districts: Gorkha, Kathmandu, Kavre, Nuwakot, Rasuwa and Sindhupalchowk. The visiting team had meeting with the line agencies functioning in the districts, such as agriculture, livestock, soil conservation, forests, water supply, solid waste, irrigation, building construction, women and children.

The second visit or the field survey involved the field researchers. In each site, the REA expert/s led the team and guided in the first two days. The field survey team comprised as follows (Table 3).

**Table 3.** Field survey team

SN	District	Group Coordinator	Members	Resource Person
1	Dolakha	Jagdish Adhikari (Mr) 9860-439750 <jaguadhikari@gmail.com>	Rajesh Gautam (Mr) 9860-022003 Sangam Rai (Ms) 9844-248940	Jagannath Joshi 9851-112404
2	Gorkha	Rabina Sipai (Ms) 9841-582614 <rabinasipai@gmail.com>	Salina Bajracharya (Ms) 9841-006592 Nabin Nepali (Mr) 9849704544	Bharati Silawal-Giri 9851-184200
3	Kavre	Saroj Koirala (Mr) 9841-892855 <envsaroj@gmail.com>	Shanta Bastola (Ms) 9862-612463 Kamana Jha (Ms) 9841-454214	Prahlad Thapa 9851-105441 Sunil Regmi 9803-017417
4	Nuwakot	Amrita Pokhrel (Ms) 9841-154995 <amritapokharel@yahoo.cm>	Ranjita Thapa (Ms) 9841-793759 Mukesh Rai (Mr) 9849-071039 <mukeshraee@gmail.com>	Dinesh R Bhujju 9841-992216
5	Rasuwa	Kumod Lekhak (Mr) 9843-397501 <lekhako45@gmail.com>	Yadav Joshi (Mr) 9843-283534 Manisha Maharjan (Ms) 9841-119071 <manimaharjan24@gmail.com>	Dinesh R Bhujju 9841-992216
6	Sindhu-palchowk	Ram Gotame (Mr) 9849-107279 <rpgotame1990@gmail.com>	Ramesh Neupane (Mr) 9843-199202 Chitra Magar (Mr) 9842-414777	Ram P Chaudhary 9841-283652
7	Kathmandu	Rashmi Maharjan (Ms) 9841-732351	Subin Kalu (Mr) 9813-939330 <kaluunique@gmail.com>	Chiranjibi Gautam 9851-032627

## FIELD SURVEY DESIGN

For field survey, in consultation with the REA expert team, eight thematic areas of study were recommended: 1) General earthquake impact, 2) Agriculture and livestock, 3) Forests and biodiversity, 4) Landslides and soil, 5) Water resources and energy, 6) Solid waste management, 7) Tourism and business, and 8) Gender equality and social inclusion. The field survey technique included two major activities, viz. 1) Meeting with the major stakeholders or the line agencies including the District Disaster Relief Committee headed by the Chief District Officer, and 2) Conducting case studies to cover each of the thematic area in the district. Both the activities followed KII (key informants' interview) techniques, and considered FGD (focus group discussion) where applicable. The field visit emphasized on direct observation and note keeping with photographs. Appropriate field visit sites for case studies were determined based on the KII or consultation with the local people. The REA team also prepared a general format of questionnaires.

During the week long field survey (June 13-20, 2015), the field survey team visited 80 organizations, government and non-government, and had meeting with over 174 persons. The major organizations visited were: District Administration Office, Office of District Development Committee, District Agriculture Office, District Livestock Service Office, District Forest Office, and District Soil Conservation Office. Similarly, the survey team visited office of irrigation, water supply, women and children welfare, were solid waste management. The visiting team also contacted and interviewed non-governmental organizations (local and international), community based organizations, media houses or journalists. The list of the persons met/interviewed and their affiliations is given in Table 4.

**Table 4.** Number of persons interviewed and organizations visited

SN	DISTRICT	MEETING/INTERATION		CASE STUDIES
		Persons	Organizations	
1	Dolakha	43	13	8
2	Gorkha	36	21	8
3	Kavre	15	7	6
4	Nuwakot	30	6	7
5	Rasuwa	18	10	8
6	Sindhupalchowk	27	13	7
7	Kathmandu valley	12	10	10
	TOTAL	181	80	54

## SUMMARY OF THE OUTCOMES

### **Agriculture and livestock**

In agriculture sector, the loss was from both ways: i) Directly as the farm lands along with crops were washed away or covered by landslide-debris triggered by earthquake (example Rayobari, Kavre); and ii) Indirectly as many of the people abandoned farmlands for shelter somewhere. Rasuwa presents a distinctive case study on how agro-based enterprise was damaged due to earthquake, but indirectly. There are some 600 tomato tunnels in Rasuwa, producing 90 kg of tomato each day. When the earthquake hit, many desperate families came to take shelter in these tunnels, obviously it severely damaged the blossoming tomato. It is estimated that some 400 tomato tunnels were used as temporary shelter after the earthquake.

In recent years, one booming agro-based industry in Nepal is the rainbow trout farming and Nuwakot has been leading it with eight hatcheries out of 16 such in the country producing 48% of the total 915,000 fingerlings (Value Chain Development Plan for Rainbow Trout, Ministry of Agriculture Development 2013). As the earthquake hit on April 25, the flow of cold water in Trishuli was intercepted for over two weeks, and the production was doomed. In the same

district, the poor farmers in remote Ghyangfedi were having the trout farming as a promising alternative of livelihood to discourage their young daughters leaving the village for earnings; but the quake spilled out not only the waters of trout farms but also their dreams.

### **Forests and biodiversity**

The impact of earthquake on forests and biodiversity was first by habitat destruction due to the landslides and second by chopping the poles for shelter. Many forests in the steep mountains, the safe habitats for wildlife, were destroyed as the earthquake triggered landslides. Landslides also killed the wildlife when they were trapped on their way. Local people in Rasuwa reported death of at least 50 mountain goats (tahr) and five wild boars in one small area of the Langtang National Park. One case study in Sindhupalchowk (Sangeli Bhanjyang) observed 19 temporary houses constructed soon after the quake using the poles of nearby community forest.

### **Landslide and soil**

Landslide is an inherent characteristic of the young Himalayan mountain range. It was found that the recent earthquake triggered the already fragile landscape in many parts of the mountains, while in some places it developed deep fissures. In a short travel of about 24 km from Syafrubesi to Timure in Rasuwa, the survey team counted 56 loose sites. Similar features were noted in other routes in Rasuwa and Nuwakot. These sites can bring landslides anytime, especially once the monsoon down pouring starts in July.

### **Water resources and energy**

People in the visited district reported change of water source after the earthquake. In many places, natural water springs were dried up, though in few others water swelled. The scarcity of drinking water prompted social conflict at times in some places; One example is Katteldanda in Gorkha, where 85 households were badly affected as the normal water sources dried up in the quake aftermath. A serious threat was observed in Melamchi (Sindhupalchowk), where some infrastructure of Melamchi drinking water project were damaged and continued rock-fall near the tunnel was observed. Melamchi is long-awaited project under construction to supply drinking water to quench the denizens of capital, which is facing acute shortage of water.

In the rural communities elsewhere in Nepal, ICS (improved cooking stoves) and bio-gas are becoming popular among the housewives because they not only lessen the pressure on forests but also keep the house smoke-free. However, the Gorkha earthquake destroyed some 10,000 units of ICS and almost same number of bio-gas. This has compelled the local people to go back to the forests to collect firewood, which is now increase at least by 50%. One such case was observed in Jyamdi, Kavre.

### **Solid waste management**

The rubbles in the city areas were seen as one most visible impact of earthquake. In the rural areas or outskirts of the cities; however, the unmanaged solid waste produced mostly from the temporary shelters (tents) is becoming a challenge to the public health and sanitation. The improper dumping of waste, including hazardous hospital waste and dead bodies is causing yet

another daunting problem. In Sipaghat of Kavre and such wastes have made the river polluted, and in Shyaule Kerabari of Sindhupalchowk, there is problem of contamination.

### **Tourism and business**

The earthquake hit districts with epicenters; Gorkha, Sindhupalchowk and Rasuwa are the trekking route for high mountain tourism. The field study traveled the important trekking routes: Helambu (Sindhupalchowk), Gosaikund (Rasuwa), and Barpak (Gorkha). The Rasuwa team found at least 18 fissures and 13 landslide spots in Gosainkund route. The Sindhupalchowk and Gorkha teams also found the lodges and routes severely damaged by the earthquake.

### **GESI**

In the social environment, several cases of violence were noticed during the field survey. In Thulo Sirubari Sindhupalchowk, a woman was thrashed by her husband in pretext of their son's death in the earthquake. Similarly, in Batase of the same district, a woman was manhandled and displaced when she used some materials of her neighbor to build temporary shelter. Reports were there, particularly from Gorkha and Nuwakot that the young girls were lured taking advantage of the difficult situation in their families after the earthquake.

### **CONCLUSION**

The REA of the post earthquake situation in Nepal involved 20 university graduates, who went to survey in nine high hit districts, viz. Dolakha, Gorkha, Kavre, Nuwakot, Rasuwa, Sindhupalchowk and Kathmandu valley (Kathmandu, Lalitpur and Bhaktapur). This is a novel feature of the REA practice in Nepal, as it also constituted a capacity building process in one of the needy areas of assessment. Beside meetings and interaction with nearly 200 people at work, the field survey also produced 54 case studies, some of which expose the intricate relations between environment and livelihood of the quake victims. The on-the-spot field visit and information collected from the local communities and stakeholders experiencing the quake aftermath have made the basis of REA report and its analysis strong and verifiable. One key finding of the field survey was that, beyond the physical damage of the infrastructure and human loss, the Gorkha earthquake have brought far-reaching impacts to the environment and livelihood of the people. Such impacts are remarkably visible in agriculture and livestock, water resources, forests and biodiversity, energy, solid waste, tourism and business. Some of the relief measures also pose environmental threats, for example, the rampant use readymade packing food stuff.