



LESSONS FROM RESPONSE ACTIVITIES DURING APRIL 25, 2015 GORKHA EARTHQUAKE

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Abstract

The Gorkha Earthquake of M7.8 hit Nepal on April 25, 2015. The epicenter of this earthquake was in Gorkha, 80 km northwest of Kathmandu Valley. The main shock was followed by hundreds of aftershocks including M6.6 and M6.7 within 48 hours and M7.3 on May 12, 2015. According to the Government of Nepal, a total of 9,256 people lost their lives, 22,326 people injured, over 600,000 buildings completely collapsed and more than 250,000 building partially damaged.

The National Society for Earthquake Technology – Nepal (NSET), a not-for-profit civil society organization that has been focused on earthquake risk reduction in Nepal for past 21 years, conducted various activities to support people and the government in responding to the earthquake disaster. The activities included: i) assisting people and critical facility institutions to conduct rapid visual building damage assessment including the training; ii) information campaign to provide proper information regarding earthquake safety; iii) support rescue organizations on search and rescue operations; iv) support local organizations in coordinating and managing relief supplies; and v) provide technical support to common people on repair, retrofit of damaged houses. NSET is also involved in carrying out studies related to earthquake damage, geotechnical problems, and causes of building damages. Additionally, NSET has done post-earthquake detail damage assessment of buildings throughout the affected areas.

Prior to the earthquake, NSET has been working with several institutions to improve seismic performance of school buildings, private residential houses, and other critical structures. Such activities implemented during the past decade have shown the effectiveness of risk reduction. Retrofitted school buildings performed very well during the earthquake. Preparedness activities implemented at community levels have helped communities to respond immediately and save lives. Higher level of earthquake awareness achieved including safe behavior, better understanding of building code, and improvement of skills towards safer construction, helped in saving lives and assets, and also helped to understand better the gaps and shortcomings.

The Gorkha earthquake provided an opportunity to test the effectiveness and impact of the response activities carried out in the backdrop of the preparedness and mitigation actions implemented during the past several years by NSET and many other organizations. Important lessons have been learned which will be helpful in paving further course of action for the future.

This paper will discuss key response activities, achievements, lessons learned, and optimal directions for future activities.

Keywords: Awareness, Response Activities, Resilience



1 Introduction

Nepal faces a multitude of natural hazards. The corresponding risk in terms of human casualty as well as loss of houses and other infrastructure is extremely high because of the physical and social vulnerabilities that already exists, and due to the continued building up of vulnerabilities, especially to earthquake hazards, as well as due to the lack over the years of any systematic hazard preparedness. Statistics for the past 45 years shows that the small-scale, everyday, “extensive” hazards inflict an annual average toll of 618 lives (casualty of about 2 persons per day) and destroy 6133 houses, while the “intensive risk disasters, the larger ones, kill 145 people annually, and inflict a loss of 7,463 dwelling houses annually (NSET, DesInventar Database for 1971-2013). The 50-years statistics on earthquake disasters can not represent the actual level of hazards, the history of Nepal, especially that of Kathmandu Valley is strewn with devastating events, at least one per century, that have killed from kings to the commoners, and caused tremendous economic and political setbacks to this landlocked country. The risk due to natural hazards, especially due to earthquake hazards, has been growing especially in the past four decades because of increasing population densities in urban and urbanizing enters, continued weakness of national economy resulting in weakness in the management of disaster risk governance, and the lack of awareness and scientific knowledge resulting in low levels of disaster risk perception amidst conflicting priorities to meet the basics needs.

Disaster risk management was not in active menu in Nepal until the country was shocked seriously by the 1988 M6.6 Udaypur Earthquake and by the 1993 floods in the south-central part of its territory. The need to develop organized approaches to manage the natural hazards was recognized due to the strong impact of these two events, and also due to the influence of the International Decade of Natural Disaster Reduction (IDNDR 1990-1999) and one of its undertakings, namely, the World Seismic Safety Initiative (WSSI). The government of Nepal started several initiatives including the 1st National Conference on Disaster Management in 1993 resulting in the first national plan for disaster management, National Building Code development (1992-1994), establishment of a National IDNDR Committee for disaster management drawing in representation from pertinent government agencies and also from the academia, professional organizations and NGOs, development and inaction of National Action Plan on Disaster Management (NAP). Academic institutions and professional organizations also started several initiatives of far-reaching consequences: the Nepal Geological Society (NGS) started officially observing the International Day for Natural Disaster Reduction (IDNDR Day).

These national initiatives and the international enabling environment were the motivating factors for NSET to develop its vision of earthquake safety for Nepal, its mission on helping people and the government in developing and implementing organized approaches for earthquake risk management, and its strategic objectives of learning modern technologies globally and indigenous knowledge locally, adapting it to the present-day needs in the local context, and implementing risk reduction initiatives in partnership and collaboration.

NSET started a program for earthquake risk management for Kathmandu Valley which taught several fundamental lessons that became subsequently one of the most influencing directions in earthquake risk management in Nepal and the region by initiating several milestone programs such as the school earthquake safety program, annual earthquake safety days, mason training for earthquake resistant construction, program for enhancement of emergency response, community-centered disaster risk management program, municipality earthquake safety program, public private partnership for earthquake risk management, community level disaster preparedness and planning and so on. These works were acknowledged positively nationally and globally.

The lessons and the experience gained from the implementation of several past initiatives gave much confidence, and were instrumental to quickly mobilize NSET for responding to the recent April 25 earthquake. We discuss several response activities conducted by NSET immediately after the earthquake and highlight the lessons learned.

2 The Gorkha Earthquake of April 25, 2015

The 7.8 Mw Gorkha Earthquake struck at 11:56 am Nepal Standard time on April 25, 2015 with an Epicenter at Barpak of Gorakha district (Lat. 28.24°, Long 84.75°, about 80 km northwest from Kathmandu) with a low angle thrust mechanism. Largest four aftershocks were recorded as magnitude 6.7, 6.9, 6.8 and 6.2, the last one centered at Dolakha. The fault ruptured thus from Gorkha in the West to Dolakha in the East, a distance of about 100 km. Kathmandu Valley witnessed mostly long-period shaking of varying intensities, causing damage mainly to historically old temples built in stone and brick in mud mortar with timber elements, very old buildings with mud-based construction, very poorly constructed modern buildings of different typologies, and the high-rise apartment buildings.

The earthquake resulted in 9,256 human death, 22,326 injury, damage to the extent of reconstruction of about 850,000 houses, and loss of assets over several billion US dollars (MoHA-GoN, 2015). The earthquake has also inflicted social, economic and psychological stressors to the people and government of Nepal. In this condition of immense shock, we are proud at the positive impact of the earthquake risk management efforts implemented by NSET and national and international partners and the efficacy of the approaches, philosophy and methodologies adopted in Nepal in the past 22 years.

3 Major Response Activities

1. Post-Earthquake Rapid Visual Damage Assessment

Immediately after the earthquake NSET performed Rapid Visual Assessments of critical facilities including hospitals, schools, offices, hotels, apartments and other buildings on request. Generally, rapid evaluations are done just after an earthquake to quickly assess the safety of buildings to judge buildings are safe using the Post-Earthquake Damage Assessment Guidelines developed by Department of Urban Development and Building Construction (DUDBC). Buildings are sorted into three categories, Green (Inspected), Yellow (Restricted or Limited Use) and Red (Unsafe).

The NSET team assessed 72 buildings in 32 hospitals, 41 buildings in 13 Banks, 123 office blocks, 31 private schools and 380 residential buildings on request. The status of all the buildings assessed is shown in Figure 1. Among 790 building blocks assessed, 58% were deemed habitable without any intervention, 27% of the building blocks were habitable only after repairs and 15% of the building needed either demolition or detailed investigation and retrofitting before use.

Figure 1 shows the status of usability of building blocks of different offices, banks, hospital, hotels and apartments, schools and requested residential buildings by 12 April 2015.

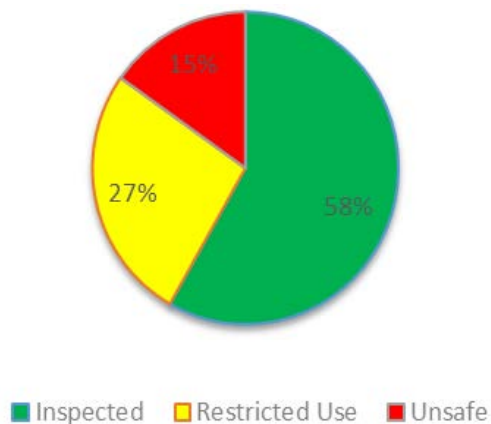


Fig.1: The status of all buildings in terms of usability



Fig. 2: Chart showing status of different facilities

2. Search and Rescue Efforts During the Emergency Period

NSET's Collapsed Structure Search and Rescue (CSSR) trained professionals extensively supported the Nepal Police, Armed Police Force and Nepalese Army Search and Rescue (SAR) teams in conducting the search and rescue operations in different parts of the Kathmandu Valley.

Furthermore, NSET also took the initiative and mobilized its earlier-trained volunteers on Community Light Search and Rescue (CLSAR). To support NSET's rescue efforts in the local communities, the CLSAR volunteers widely assisted NSET's SAR teams at various pockets around the valley.

The NSET SAR Squad consisted of six emergency responders. Within a few hours of the earthquake, NSET was able to mobilize its SAR Squad in the field. In the week following the earthquake, NSET's SAR teams joined hands with various government, non-government, national, international bodies as well as local level community groups in executing extensive rescue activities involving site examination, rubble removal, excavation, clearing debris, victim extrication, information gathering, and communication coordination. NSET focused its SAR operations on some of the most affected sites within the Kathmandu Valley.

Further, NSET has been implementing a program for enhancing emergency response (PEER) capacity in Nepal and in the region. PEER program has assisted the emergency response organizations of Nepal: the Nepal Police, Armed Police Force, Nepalese Army and Nepal Red Cross Society to train emergency responders on Collapsed Structure Search and Rescue (CSSR), Medical First Response (MFR), and several other emergency response actions. Approximately 245 are from Nepal Police, Nepal Armed Police Force, Nepalese Army and the Nepal Red Cross Society.

During the SAR operations by Nepal Police Central Police Disaster Response Squadron in Kathmandu, PEER-trained staff were assigned to lead their local SAR teams. In a team of 15 to 20 responders, Nepal Police ensured the involvement of at least two or three PEER certified responders, and most of the time the PEER responders led the team.

The Armed Police Force (APF) dispatched a total of 45 emergency response teams, including 35 PEER graduates, for search and rescue in the Kathmandu Valley and Gorkha, Sindhupalchok, Nuwakot and Dolakha districts. The APF saved 345 lives and jointly recovered 340 bodies with other national and international SAR teams. In addition to SAR efforts, APF provided shelters within its premises for earthquake victims, distributed relief items, cleared debris, retrieved historical artifacts of world heritage sites and demolished collapsed houses.

Similarly 678 CADRE national volunteers were mobilized as part of the earthquake response by Nepal Red Cross Society. Community Action for Disaster Response (CADRE) is a new PEER course introduced in 2009, targeting participants at the community level.



The road to recovery doesn't end with successful rescue stories. There may still be a long way to go until Nepal reaches the benchmark of an efficient emergency response system, but Nepal's responders exceeded expectations during the Gorkha earthquake. It is worth noting the skills applied in searching and safely extricating trapped survivors and bodies, complemented by effectively using modern search and rescue equipment, are attributed to the years of embedding the MFR and CSSR skills in PEER partner organizations in Nepal. It was also evident that non-PEER certified responders followed the same skills and lifesaving procedures delivered in PEER courses. This was due to their in-house training courses being facilitated by PEER-certified instructors and therefore using the same standards and curricula.

3. Emergency Relief Coordination and Communication

NSET has long been advocating for disaster preparedness. However, the vast scale devastation in Nepal from the Gorkha earthquake brought life to standstill. NSET being a pioneer institution working solely in earthquake risk reduction for the last two decades, had to meet people's expectations in providing immediate relief. As a part of our Emergency Response, NSET was involved in the following activities: Collaboration with different organizations in relief distribution and Counseling of the community to overcome the anxiety caused by the earthquake.

In an effort to help the people affected by the Gorkha earthquake in the short term, as well as in recovery and reconstruction, NSET collaborated with various national and international organizations and private institutions such as Jagdamba Steel, Rotary Club of Sainbu, BHainsepati, Seeds India, and Seeds Asia, Asia Pacific Alliance for Disaster Management and Peace Winds Japan, Sadh Samaj Charitable Trust etc. NSET facilitated the distribution of various relief materials such as tents, tarpaulins, family shelter kits, food and non-food items and other relief items in the affected areas.

4. Informing the Community

In the immediate aftermath of the Gorkha earthquake, NSET was flooded with in-person and telephone enquiries from concerned members of the public. NSET conducted counseling to overcome the anxiety at two levels.

Local Community at Bhaisepati – A spontaneous camp appeared on the open field near NSET's office. This camp included people with unsafe or collapsed houses, and those with undamaged houses who were nervous about aftershocks. A team of NSET professionals visited the camp-site and interacted with people, providing information on earthquake safety, aftershocks and addressing rumors. Similar activities were also carried out at the NSET premises for people visiting the office.

Mass Media – NSET professionals were constantly in touch with media across the country, both existing partners and other outlets. Staff provided vital information to address public concerns; providing scientific information on earthquakes and practical post-earthquake safety measures.

5. Policy Advocacy and Coordination

NSET has been a part of various high-level policy advocacy meetings and UN Cluster meetings organized to formulate strategies and actions as part of the post-earthquake response.

4 School as a positive result/impact of decade long efforts on NSET

School buildings retrofitted as part of NSET's School Earthquake Safety Program (SESP) became rays of hope to the community, as they remained standing without any damage, while other nearby buildings collapsed. Many of these school buildings were used by communities as emergency shelters in the aftermath of the Gorkha Earthquake.



All 160 school-buildings retrofitted and reconstructed with technical support from NSET were safe, and none suffered any structural damage. This proved that the technology used to strengthen the school buildings is appropriate in the Nepali context. Some minor cracking of plaster was seen, and two buildings were affected by ground ruptures passing through them, but no significant damage has been observed in any of the buildings. 35 buildings are to receive minor repairs as a result of the assessment.

Effect to retrofitted school buildings in Kathmandu Valley

District	Undamaged	Minor repairs	Major repairs	Total
Kathmandu	66	12	0	78
Lalitpur	29	17	0	46
Bhaktapur	30	6	0	36
Total	125	35	0	160

NSET has been implementing the School Earthquake Safety Program (SESP) since 1997. One of the strongest components of SESP is seismic vulnerability assessment and the retrofitting of school buildings. NSET started this initiative through the support from USAID/OFDA, in collaboration with different NGOs and government institutions.

The Ministry of Education institutionalized SESP in 2010 under Flagship 1 of the Nepal Risk Reduction Consortium (NRRC). NSET provided technical support to the Department of Education during the entire process of planning, budgeting and the implementation of SESP in 260 schools of Kathmandu Valley, with 160 school buildings retrofitted to date.

Feedback from Schools

Tilingtar Higher Secondary Boarding School - Tilingatar Higher Secondary Boarding School in Dhapasi, Kathmandu served as a temporary shelter for around 200 people in the aftermath of the Gorkha Earthquake. Dhapasi was one of the worst hit areas.

According to Principal Saroj Pandey, two of the five school buildings were already retrofitted, hence are completely safe, while the remaining three buildings have suffered partial damage. Looking at the retrofitted buildings of Tilingatar School, you would hardly guess that a major earthquake recently struck the country.

Bal Bikash School - The principal and the school management committee expressed their thanks to NSET and USAID/OFDA for strengthening the school building before the earthquake. The majority of buildings in the community have been heavily damaged, but the school building remains strong.

The earthquake preparedness message disseminated to children and their parents was considered very much helpful in protecting them during earthquake. As the school management committee heard the majority of school buildings in the affected districts had been severely damaged, they requested NSET implement a massive retrofitting and earthquake education program to protect the children from future disasters.

Tri Padma Higher Secondary School – a building at this school was chosen for retrofitting in 2011, and was one of the first sample buildings retrofitted in Lalitpur. After the Gorkha earthquake, this building was the immediate shelter for more than 500 people including family members of school staff, parents and community members.



What people said about retrofitted schools

Saraswati Subedi (Local resident, now using school as a temporary shelter):

My name is Saraswati Subedi and I am 50. My house is adjacent to the school and as it has suffered some damage, we are here at the school as our second home after the earthquake. Before the earthquake I was scared that the school building would affect my house if it collapsed, but to my surprise the school building is completely fine while my house has been damaged.

Having seen the destruction all over this area, I now feel that this school is our shelter and living base in this critical situation.

I strongly believe that the retrofitted school buildings are safe, hence I have been staying here with my family since the major shaking. I extend my heartfelt thanks to all the people who helped to build this earthquake resistant building, we are really stress free and feel relaxed living here.



Hari Bol Kafle (Parent):

My name is Hari Bol Kafle and I am a businessman, both my son and daughter study here. My house has partial cracks and cannot be used, so I along with my family am taking shelter in this school. I feel that besides the retrofitted ones, other buildings of the school are not safe. These two buildings aren't new ones but as they were retrofitted in time they feel safer. So I and my family have been staying here. I want to convey my message to other parents of the school as well that it is a big relief and we are lucky that the school where our children study is strong and safe.



Krishna Rayamajhi (Student):

My name is Krishna Rayamajhi and I study in Grade Six at this school. I am very happy that my school is alright after such a massive quake. We have been informed that the school will re-open from Jestha 15 (May 29) and that the school environment is the same as before so the students can come to school without any hesitation.

We are taught in our school about safe behaviors to follow during earthquakes but luckily the day of earthquake was a Saturday and the school was closed. While at home also I did Drop Cover and Hold underneath the table. I want to say that like my school, I hope all other schools are safe.





5 Challenges in Responding to the Earthquake

Data

One of the key challenges in the earthquake response was a lack of consistent, reliable information. There was inadequate damage assessment data in terms of households and needs identification by location. Additionally, damage assessment was subjective which eventually affected the relief supplies received. Adding to the confusion was varying damage data from different sources, such as Ministry of Home Affairs, Nepal Red Cross Society, Village Development Committees, political parties and the census. Finally, the aftershocks caused disruptions in data by increasing the number of affected households.

Identification of affected people

There was extreme difficulty in identifying and verifying affected people because of difficult terrain and inaccessibility of some areas. Many people did not have identity cards, which further added to the difficulty of processing their claims. While there was a lot of conflicting information from various sources, there was no disaggregated data on vulnerable populations, making it much harder to specifically address their needs.

Policy and guidelines

Customs policies were very unclear, making it very difficult to obtain clearance for relief supplies to reach the affected areas, with frequent changes of rules and decisions by the government. Many decisions from the government were made without a proper implementation mechanism at ground level. Exacerbating this issue, many government organizations were unaware of their roles and responsibilities in the post-disaster situation.

Coordination of relief efforts

There was a lack of coordination among different government departments, between government and relief providing agencies, and among donor agencies. Many donor agencies appeared to be most concerned about the visibility of their relief efforts.

Distribution

Another key issue was the unequal distribution of relief materials in terms of quantity of relief items, varying quality of relief items and the time it took for relief supplies to arrive. Location was another factor, with relief agencies focusing on the areas which were accessible by road, leaving those in remote areas with little or no relief. Finally, it was controlling crowd behavior in relief distribution areas was challenging.

6 Lessons Learned

Data

The most effective way to gather information is asking the villagers or existing local disaster management committees to prepare a beneficiary list.

Village or ward level disaster management committees should be formed or reactivated.

Data collection mechanisms need to be established at village and ward level. Detailed baseline disaggregated data with maps should be prepared and maintained in every ward and village.

Data collection formats need to be designed so disaggregated data on all population groups can be maintained.

Data collection formats should be standardized, agreed upon and followed by all stakeholders.

Local level management committees should be asked to identify the most vulnerable groups to help avoid conflict during distribution.

Building the capacity of local management committees to conduct preliminary damage assessment is necessary.

Damage and Needs Assessment

Consensus on the definitions of assessment terminologies needs to be built among the agencies.



Assessment formats need to be agreed upon, standardized and reviewed regularly.

Each type of assessment should be done by one agency to avoid duplication of work and joint assessments are encouraged.

Rapid assessment to be conducted prior to relief package distribution.

Database needs to be periodically updated with new data as it becomes available.

Relief Materials

It is much faster to purchase relief materials locally rather than transporting them even from a neighboring country.

Contents and quality of items included in relief packages should be consistent.

Prepositioning of relief materials in strategic locations is necessary for timely relief support. Alternatively, a roster of local suppliers and a supply chain should be established.

Special items should be added to relief materials to meet the specific needs of vulnerable groups, such as pregnant and lactating women, the elderly and persons with disability.

Policy and Guidelines

Orientation on the National Disaster Response Framework (NDRF) and cluster approach, defining roles and responsibilities at all levels (particularly for the government) needs to be implemented.

Decisions by government should include proper implementation mechanisms at working level and be communicated in a timely fashion.

Different working documents such as custom clearance and tax exemption forms and a distribution strategy need to be developed and disseminated.

Policy level decisions should not be made without considering the implications and the practical aspects of implementation.

Distribution

Establish at least one storage facility in every district for stockpiling and designate a storage space in every VDC and ward.

Assess and utilize locally available materials when possible.

A contingency plan for transport should be developed, with rosters of local transporters prepared in the event of a disaster.

Identify and involve community people and people from local organizations and political parties to assist in transportation in remote areas.

Involvement of the local security forces is necessary during the distribution process to avoid conflict.

Effectively communicating to the targeted beneficiary exactly what they will receive and when they will receive is extremely important. This way they can plan ahead as well as make sure the local management committee is held accountable.

Coordination

Emphasis should be placed on collaborative effort between governments, line agencies, political parties, civil society, international and local NGOs, UN Agencies and private actors.

Coordination mechanisms should be strengthened at the District Disaster Relief Committee level.

District monitoring mechanisms for disaster response need to be established.

Maintain transparency and share information with affected communities.

7 Acknowledgements

We would like to express our gratitude to all those team who were involve in the response activities and who has helped in compilation of this paper. We are very thankful to the NSET management to be a part of response team in NSET.

8 References

1. Armed Police Force (APF) (June 2015): APF Operation Search and Rescue in Earthquake 2015, Role of PEER Certified graduates from NSET, Nepal.
2. Ministry of Home Affairs-Government of Nepal (MoHA-GoN a) (August 2013): National Strategic Action Plan on Search and Rescue 2013.
3. Ministry of Home Affairs-Government of Nepal (MoHA-GoN b) Risk Profile of Nepal, <http://drrportal.gov.np/risk-profile-of-nepal> (accessed September 27, 2015).
4. National Planning Commission, Government of Nepal (2015): Nepal Earthquake 2015 Post Disaster Damage Needs Assessment, Kathmandu, Nepal.
5. National Society for Earthquake Technology-Nepal (NSET) (September 2015): NSET PEER Experiences, PEER Country Planning Meeting, Nepal.
6. Nepalese Army (June 2015): Deployment of PEER Graduates, Nepal.
7. Jimée, G. K., Upadhyay, B.U., Shrestha, S.N. (2012): Earthquake Awareness Programs as a Key for Earthquake Preparedness and Risk Reduction: Lessons from Nepal. *The 14th World Conference on Earthquake Engineering*.
8. M. R., Tandingan and A.M. Dixit (2012): Experiences on Implementing Program for Enhancement of Emergency Response (PEER) in Six Countries of South East Asia. *The 14th World Conference on Earthquake Engineering*.
9. Nepalese Army (2015), Life turning to normal in Devastating Earthquake Affected districts by the ‘Sankat Mochan’ operation of Nepalese Army. <http://www.nepalarmy.mil.np/sankatmochan/view-news>, posted on June 16, 2015
10. Nepalese Army (2015): Nepalese Army in Devastating Earthquake: Experiences and Lessons Learned. *The Government of Nepal*.
11. NSET/GFDRR (2010): Final report on Developing a Strategy for improving seismic safety of schools of Nepal – NSET/SESP
12. NSET, 2014, DesInventar Database for 1971-2013, <http://www.desinventar.net/DesInventar/main.jsp?countrycode=npl>
13. ADB/GON (2010) - Concept paper for vulnerability reduction of schools in Kathmandu Valley
14. NSET- KVERMP (2010): ADB/ Amod Mani Dixit/ Surya Prasad Acharya- Report on National Workshop on School Safety