ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: https://doi.org/10.29121/granthaalayah.v5.i12.2017.476

INTERNATIONAL JOURNAL OF RESEARCH – GRANTHAALAYAH
A knowledge Repository

Science

A REVIEW ON ISSUES ASSOCIATED WITH THE SHELTER RECONSTRUCTION AFTER GORKHA EARTHQUAKE 2015 IN NEPAL

Anoj Dhungana [1], Khet Raj Dahal [2], Subik Shrestha [3], Narbikram Thapa [4], Sanchita Neupane [5]

[1, 2, 4, 5] Lumbini International Academy of Science and Technology (LIAST), Nepal
[3] Ground Water Irrigation Development Division Offices, Dhangadi, Nepal

Abstract

A study on "Issues associated with the shelter reconstruction after Gorkha Earthquake 2015 in Nepal" was conducted during the period of March to September 2017 on the basis of secondary literature received from different sources and field observation. Various articles, journal and government documents retrieved from online research database like 'Google Scholars' and topic related government online sites were reviewed. It has been realized that reconstruction after disasters is a long process. To manifest and implement the notion of build back better and successful completion of shelter reconstruction projects, there is a need for an in-depth knowledge of construction project management because 600,000 houses are to be constructed and about 250,000 to be repaired and retrofitted as well. The study reveals that the lack of funding, construction materials, labors and experienced human resources hinder the smooth progress of reconstruction. Similarly, reconstruction projects can take place only when the affected people are also involved in the design and planning process as well as in the implementation phase of the project, ensuring the best utilization of local knowledge and resources as much as possible. The strong coordination among various stakeholders can act as the key to an effective reconstruction in the context of Nepal.

Keywords: Shelter Reconstruction; Raw Materials; Damage; Survivors; Tranches; Sustainability.

Cite This Article: Anoj Dhungana, Khet Raj Dahal, Subik Shrestha, Narbikram Thapa, and Sanchita Neupane. (2017). "A REVIEW ON ISSUES ASSOCIATED WITH THE SHELTER RECONSTRUCTION AFTER GORKHA EARTHQUAKE 2015 IN NEPAL." *International Journal of Research - Granthaalayah*, 5(12), 89-98.

1. Introduction

Nepal is a landlocked country located between India in the South, East and West and China in the North. It covers an area of 1, 47,181 square kilometers and has a Human Development Index (HDI) 0.490 for 2011 as per Global Human Development Report **[1]**. The unstable topography of hills makes Nepal susceptible to various natural calamities including earthquake. It lies in the risky zone, which has a bitter history of facing earthquakes of greater than 7 magnitudes once in

ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.1133605

every eighty to hundred years **[2]**. It has been scientifically proven that the Himalayan ranges in the northern part of the country including Mt. Everest were formed due to tectonic activity **[3]**. National strategies for disaster risk management (2009), Hyogo framework for action (2005-2015), Sendai Framework for Disaster Risk Reduction are some of the dynamic steps taken from Government of Nepal for Disaster Risk Reduction **[4]**.

Similarly, the institutional foundations of responding disasters in Nepal are Disaster Relief Act 1982 and Local Self Governance Act 1999. According to Nepal Government's Regulation for Division of Roles 2007, Ministry of Home Affairs (MoHA) is authorized focal agency to act for necessary rescue, relief and preparedness activities **[5]**. The most awaited Disaster Risk Reduction and Management (DRRM) Act has also been approved in 2017, which prioritizes preparedness activities over response.

On 25th April 2015, an earthquake of 7.8 magnitudes struck the country with an epicenter 82 Km North West of Kathmandu at 11:56 a.m. local time (06:11 a.m. GMT) **[6]**, followed by hundreds of aftershocks, killing 8891 people with casualties of 22,303 **[7]**. About 498,852 houses were completely destroyed and 256,697 houses were partially damaged **[8]**.

Government of Nepal had announced to provide the financial support of 300,000 Nepalese Rupees in three installments for the earthquake victims. However, the victims have not been able to receive the amount in timely manner. A total of 765,618 households are eligible for financial grant from the Government. Among them, 603,690 households have received the first installment, 62552 households have received the second and third tranche by 3776 households as of August 2017 **[9]**. The main reason for not being eligible to receive the third and second installments is that the reconstructed houses do not meet the standards proposed by the government. The government has prescribed standards, but has not yet provided the workmanship and skills necessary to build cost-effective and earthquake resistant homes.

Similarly, government has prepared many models of shelter design. There are 51 models of shelter designs published in volume 1 and 2. These volumes are designed by Nepal Government to support rural households to guide the ways of constructing earthquake resilient shelters. In the sample design, the catalogue contains various models of stone and brick masonry **[10, 11]**.

The models of shelters in the design catalogue are more expensive than the amount of support provided by the government. Also, many affected families do not design their houses as per the design catalogue as the prototype houses do not match in the rural context of Nepal. In addition to this, people are unaware about the latest technology for earthquake resilient shelter. On the other hand, they are depending upon the traditional craftsman in many parts of the country. The financial grant provided by the government is also not sufficient to construct even the lowest cost model of shelter mentioned in design catalogue.

The rigid guidelines, the time line allocated and the plight faced by the sufferers in post-disaster scenario are the major threats that make housing reconstruction program more complicated in developing countries like ours **[12]**. The supply and transportation of the materials to the affected areas is challenging as rural roads of Nepal are inaccessible during monsoon season. Similarly,

 ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.1133605

manpower and resources from the government sector are not enough for community mobilization more effectively.

The objective of the study is to discuss the issues associated with shelter reconstruction after earthquake 2015, focusing upon the sufficiency of the fund provided by the government, narrowing the gap of human resources with their level of expertise for massive construction, and acceptance of the models of shelter proposed by the government.

Currently, there are a very few numbers of researches done in the field of post-disaster reconstruction and recovery in the context of Nepal after earthquake 2015. This research will contribute to determine the various issues associated with post-disaster shelter reconstruction. This study will further contribute to identify the ways to tackle those issues to achieve 'Build back better'. Similarly, this study will be useful for government organizations dealing with the reconstruction, policy makers, NGOs, INGOs, CBOs, professional engineers, social activists, leaders, as well as the local people would be benefitted.

2. Materials and Methods

The study is an output of many relevant publications and studies that were published in within the timeframe of 1982 to 2017. Various online databases of articles, government reports, journals related to the issues and sustainability of shelter reconstruction were reviewed from different sources like "Google scholar" and online Government sites. Some keywords like "*shelter reconstruction", "raw materials", "damage", "survivors", "tranches", "sustainability", "disasters"* were searched to get the desired output of the study. The relevant sources were taken from different countries that were apt to the topic. In addition to this, the reference lists of those sources were also brought into consideration to get a new and more relevant idea. The Endnote library was used to outline the references of various sources for the review.

3. Results and Discussions

3.1. Earthquakes in Nepal

According to Disaster Preparedness Network, Nepal **[13]**, the first ever recorded history of earthquake in Nepal was on 7th June 1255 with 7.7 Richter scale magnitude, killing one third population of Kathmandu valley, including King Abhay Malla. The earthquake on 1260 A.D damaged a number of buildings and temples. The third, on 1408 A.D, hit Kathmandu valley and the surroundings when Rato Macchindranath Temple collapsed with heavy loss of lives. The next was on 1681 A.D with comparatively less damage information. The fifth recorded was on 1767 A.D with no account of recorded damage.

In 1810 A.D, another earthquake occurred although the lives lost and livestock damage were not high. The next recorded was on 1823 A.D with nominal information of destruction. Further, on 1833 A.D, two big tremors caused huge damage. Numerous lives were lost, infrastructures and the tower of *Dharahara* was severely damaged. On 1834 A.D, four back to back earthquakes caused more than 18000 houses over the country to collapse. The next was great Bihar earthquake of 8.3 Richter magnitude that took place on 1934 A.D that resulted to a high number

ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.1133605

of casualties and destruction of infrastructures. On 1988, there was a record of another earthquake **[13]**. The history shows that Nepal lies in the belt of active seismic activity hence contingencies planning for preparedness and mitigation should be done before hand.

3.2. Damage Facts Due to Gorkha Earthquake 2015

On 25th April 2015, an earthquake of 7.8 magnitudes struck the country with an epicenter 82 Km from North West of Kathmandu **[6]**, with hundreds of aftershocks causing a death toll of about 8891 people and 22303 people were injured **[7]**. An estimation of around 7 billion USD was made upon total damages and losses due to the disaster **[8]**. Figure 1 shows the shaking perceived due to 2015 Nepal earthquake followed by three major aftershocks. The severe intensity was at the 14 periphery districts of Kathmandu from Gorkha to Sindhupalchowk with gentle reflex in some parts of India and China.

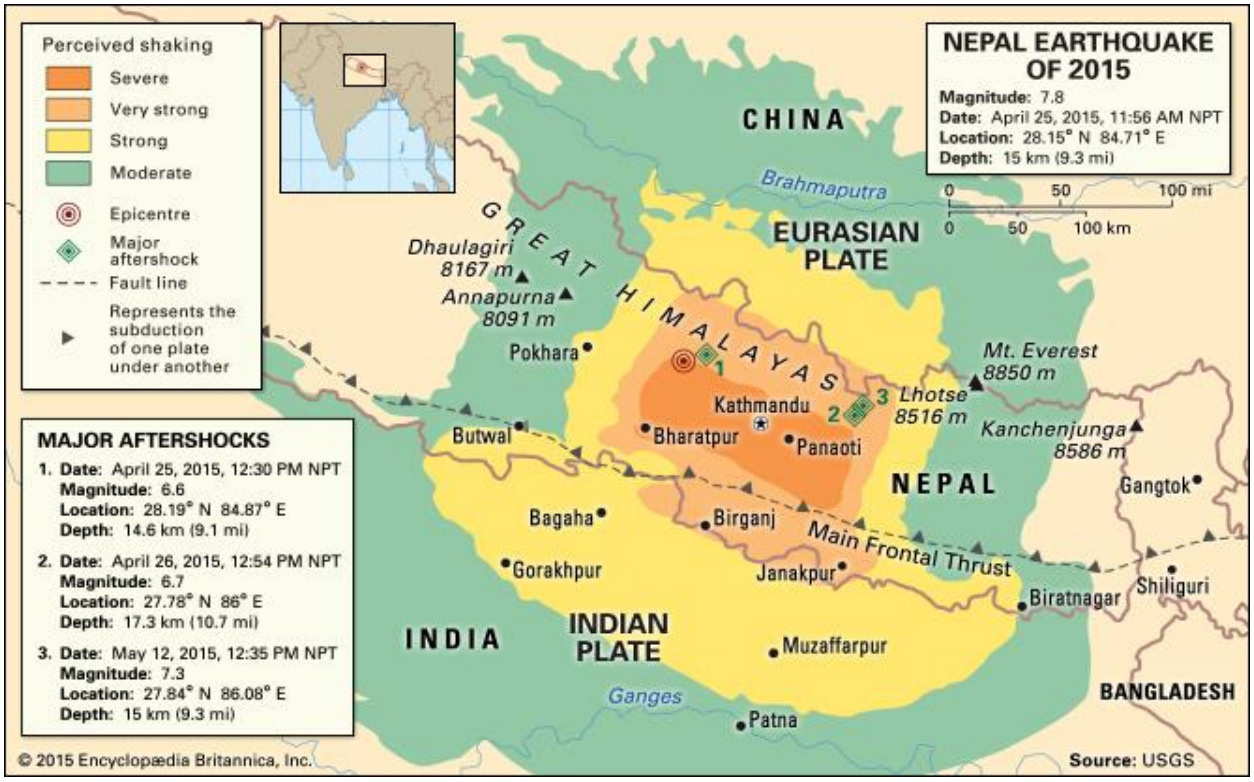

Figure 1: Plate tectonics movement and effect during earthquake 2015 (source: USGS 2015)

Table 1 shows the damage upon various types of houses due to earthquake 2015. The damage upon mud mortar masonry is 44.2 %, wooden building is 24.9 %, cement mortar masonry is 17.6 % and that of RCC framed structure is 9.9 % **[8]**. The stone masonry in mud mortar is large in numbers, mostly in the rural and hilly context of Nepal and the materials used are of low strength which increases its seismic vulnerability **[14]**. The estimated total damages and losses upon housing sector was about NPR 350,379 million **[8]**. The root causes of damages were the use of faulty designs, lack of bonding between structural members and fragile characteristics of the materials **[8]**. The list of total damages is presented in the table (table 1).

ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.1133605

Table 1: Total damages and losses upon housing sector as per May 28 2015

Parameters	Types of houses	No of houses	Damage (NPR million)
Collapsed Houses	Low strength Masonry	474,025	199,091
	Cement based Masonry	18,214	19,671
	R.C framed	6613	30680
Total		**498,852**	**258,442**
Damaged Houses	Low strength Masonry	173,867	7302
	Cement based Masonry	65,859	7113
	R.C framed	16,971	10,182
Total		**256,697**	**24,597**

*Source: National Planning Commission **[8]***

3.3. National Reconstruction Authority

With a mission of completing the reconstruction of earthquake affected infrastructures, National Reconstruction Authority (NRA) was established **[15]**. NRA will also provide grants on the basis of some terms and conditions for reconstruction. Table 2 shows the grant releasing procedures prescribed by Nepal Government for the reconstruction of damaged shelters.

Table 2: Beneficiary Identification and process of Grant Disbursement

Activities	Responsibility	Description
Identification of Beneficiaries	Central Bureau of Statistics (CBS), Ministry of Federal affairs and Local Development and National Reconstruction Authority	Beneficiaries are identified after evaluating the data of Post-Earthquake Damage Assessment form developed by CBS.
Sign the Grant Agreement	Beneficiaries and Local Authority (Supervision of District level project implementation Unit (DLPIU)	The Beneficiaries sign the Agreement Forms on their areas.
Bank Account	Beneficiaries and authorized banks	The tranche will be deposited in the respective beneficiaries' bank account.
First tranche distribution	Local Authority	The first tranche of NPR 50,000.00 will be deposited in bank account mentioned in the Grant agreement.
Technical Inspection – 1	Technicians authorized by Ministry of Urban Development (MoUD), District Level Project Implementation Unit (DL-PIU)	Provide certification by inspecting whether the foundation and plinth level work has been completed or not meeting compliance and quality
Second tranche distribution	Local Authority	Deposit second tranche of NPR 150,000.00 in beneficiaries' accounts.
Technical Inspection – 2	Technicians authorized by MoUD, DL-PIU	Regular inspection of all task of superstructure following guidelines and provide final tranche when wall is completed
Final tranche distribution	Local Authority	Third tranche of NPR 75,000.00 is deposited in beneficiaries' accounts to

ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.1133605

		complete remaining works.
Final Technical Inspection	Technicians authorized by MoUD, DL-PIUs	Certification of the house as Earthquake resistant design and provide a grant of NPR 25,000.00 for those assuring basic facilities.

Source: National Reconstruction Authority (Unofficially translated by Housing Recovery and Reconstruction Platform HRRP Nepal) ***[16]***

The Ministry of Urban Development (MOUD) and Department of Urban Development and Building Construction (DUDBC) have a combined responsibility in the reconstruction process of resilient housing **[17]**.

3.4. Indigenous Technology for Construction

The popular and traditional seismic technologies adopted by the people have been ignored in modern building codes especially in developing countries **[18]**. There are many old monuments, temples, durbar, etc. where the application of traditional seismic technologies can be observed. It is essential to conduct a scientific study over all those seismic resistant characteristics employed on the ancient monuments of Nepal to bring it under meaningful application **[19]**. In the rural context of Nepal, the stone masonry in mud mortar were affected mostly due to earthquake. People fear to live in stone masonry houses as they perceive it highly vulnerable.

Most of the houses in the rural areas have been constructed without the technical advice of certified engineers. We can draw form this that people are leaving far behind the traditional knowledge of constructing earthquake resistant houses **[17]**.

3.5. Application of Building Code in Nepal

It is believed that the non-engineered construction on rural area covers 60 to 70 percent of the total housing. However, the minimum attention is provided to these types of buildings in the codes and guidelines proving the ignorance of traditional seismic technologies in the modern building codes in the context of Nepal **[18]**. In contrast, around 90% of houses in rural context of Nepal are constructed using indigenous technologies. And in such houses, technical aspects have always been neglected **[19]**.

3.6. Concept of Sustainable Shelters

Quarantelli **[20]** differentiated between sheltering and housing. Sheltering is a term used for a shelter constructed in temporary and emergency situation and housing is referred to permanent housing. Flinn and Beresford **[21]** categorized shelter response activities into 3 phases according to disaster management cycle as preparedness, recovery and reconstruction. The post disaster management context varies from different countries and regions. ZARGAR **[22]** illustrates that in developing countries, many permanent houses, mostly in rural areas, in the pre-disaster context technically belong to temporary shelters. The way to achieve sustainability is by strengthening the workmanship and endorsing the use of locally available materials **[23]**.

 ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.1133605

Sustainable shelters are not only attributed by a large shelter but it should also focus upon socially secured and reliable shelters **[24]**. The shelter should assure basic facilities of water and sanitation, transportation, health, education and others. Sustainable shelters not only prioritize the need of safe house, but also it should improve the social and economic living standard of the affected people **[23]**.

When disaster hits, victims lose shelter, which is normally constructed utilizing the entire life's earnings. Hence, the strong involvement of these victims in the planning to implementation phase of shelter construction can bring optimal benefits to them **[25]**. ZARGAR **[22]** describes housing reconstruction as a huge economic activity where bulk amount of resources will be utilized. Therefore, housing strategies should be designed depending not only upon the volume of damage but also the real needy victims should be distinguished.

3.7. Problems of Successful Reconstruction

Davidson, Johnson **[12]** introduces several challenges of post-disaster reconstruction, which are very popular. The first challenge is tedious government guidelines which makes following the housing guidelines undesirable due to constraint on the budget. The second one is the time frame assigned and the third one is the crucial social situation of victims. The difficult topographic features and the gaps in resources restrict better settlement conditions of the community exposing them to future vulnerability.

The progression phases between pre and post-disaster phase is the troublesome part as disaster deforms regular social operation of the victims **[26]**. The recognition of the safest settlement areas, huge financial fund, adjustment in policies and the coordination among various stakeholders are some of the major challenges faced during the reconstruction after disasters **[27].** And, these are found in the context of Nepal too.

After any natural disaster, a new body is formed to take charge of reconstruction although the process takes more time for installation, institutionalization and capacity building, but has advantages over the existing bureaucratic institutions **[28].** The reconstruction process necessitates a symmetrical relationship between many stakeholders from the international community, the government institutions and communities themselves. **[17].**

The assurance of availability of material and human resources is essential for successful reconstruction after disasters **[8].** The uncertainties and usual complications are most challenging task encountered during reconstruction projects at various stages of reconstruction from planning to completion stage **[29].**

3.8. Keys for Successful Reconstruction

Reconstruction is interlinked with the socio-economic status of the community where the people with strong economic background have better disaster coping capacity; a comprehensive planning should be done to maintain equity in access of lower status people to the allocated resources **[30].** The affected communities should be addressed as agents of change **[12].**

ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.1133605

The foundation of successful reconstruction requires a detailed plan that may take more time in the beginning but can act vital during the implementation **[26]**. The keys to successful reconstruction could be the integration of best policies, effective coordination among stakeholders, proper financial management, active community participation and sound community mobilization with proper risk management measures **[31].** A strong coordination between central and local level should be made that will reinforce good guidelines and policies to achieve successful reconstruction **[25].**

A good coordination is necessary among central level, district level and community level disaster management committees **[32].** The main objective of post-disaster shelter reconstruction is to provide shelters to the affected people and identify the clear roles for different human resource directly or indirectly involved in reconstruction process **[33].** The practicality and architecture should be considered basically while designing low-cost shelter strictly following the guidelines **[34].** A brief assessment should be done to identify the beneficiaries that need additional support in a transparent manner **[25]**. It is realized that the relief support done through banking system rather than distributing cash scrutinizes mal practices and corruption.

3.9. Relationship between Construction Project Management and Reconstruction

Reconstruction process resembles to the common development projects, where scarce source, quality of the work and effective coordination among stakeholders need to be prioritized **[27].** Planning should be systematically done to set objective after analyzing nature of disaster. The ways of mainstreaming disaster risk reduction during construction is advocated in the design phase. Finally, the principles of construction management are applied to identify strategies during implementation **[35]**. Post-disaster construction management is similar to public management projects; the keys to success are proper institutional management and coordination among stakeholders **[36]**. Construction management is crucial for timely completion of construction of shelters. It will ensure efficient spending of the available funds too **[35].**

4. Conclusions

Whenever disaster hits, it not only causes damage over human life and properties but also reduces the coping capacity of the community with existing resources. In general, the newly formed bodies to take charge of reconstruction process have both pros and cons.

The traditional indigenous technologies have significance in cases of rural housings, but the people at local level should all be trained to enhance the seismic resistance capacity. It is important to train the masons at the local level about the techniques of constructing earthquake resistant building as the community is the first responder after the disaster strikes. The affected people should be included in every phase as design, planning and implementation. Reconstruction is not a day's work but requires a series of activities. A contingencies fund should be managed beforehand with advanced planning for better response during disasters. **[32].** And the responsible government agencies should co-ordinate for all concerned organizations to provide relief funds and allocate funds for reconstruction for the victims at timely manner.

ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.1133605

Acknowledgement

We would like to thank Mr. M.P. Kharel and Ms. Pritisha Shrestha for their support and relentless guidance during the preparation of this paper.

References

[1] National Planning Commission. Nepal Human Development Report, . Kathmandu: Government of Nepal; 2014.
[2] Hossain A, Adhikari TL, Ansary MA, Bari QH. Characteristics and consequence of Nepal earthquake 2015: a review. Geotechnical Engineering journal of the SEAGS & AGSSFA. 2015; 46:114-20.
[3] Dixit AM editor Promoting safer building construction in Nepal. Thirteen World Conference on Earthquake Engineering Paper; 2004.
[4] Ministry of Home Affairs & Disaster Preparedness Network Nepal. Nepal Disaster Report 2015. Kathmandu: Government of Nepal; 2015.
[5] Ministry of Home Affairs. National Disaster Response Framework (NDRF), . Kathmandu: Government of Nepal 2013.
[6] Wald L. A small Push to Mount Everest, : United States Geological Survey (USGS) 2015. Available from: https://earthquake.usgs.gov/research/everyone/nepal2015/.
[7] Ministry of Home Affairs. Situation Updates as of 5th May 2015, . In: Government of Nepal, editor. Kathmandu2015.
[8] National Planning Commission. Post Disaster Needs Assessment. Kathmandu: Government of Nepal; 2015.
[9] National Reconstruction Authority. Survey of Private Housing Grant Distribution. Kathmandu: Government of Nepal; 2017
[10] Department of Urban Development and Building Construction. Design Catalogue for Reconstruction of Earthquake Resistant Building, . In: Ministry of Urban Development and Building Construction, editor. Kathmandu: Government of Nepal,; 2016.
[11] Department of Urban Development and Building Construction. Design Catalogue for Earthquake Resistant Building. In: Ministry of Urban Development and Building Construction, editor. Kathmandu: Government of Nepal; 2017
[12] Davidson CH, Johnson C, Lizarralde G, Dikmen N, Sliwinski A. Truths and myths about community participation in post-disaster housing projects. Habitat international. 2007;31(1):100-15.
[13] Disaster Preparedness Network Nepal. History of Earthquakes in Nepal, Kathmandu2015 [cited 2015]. Available from: https://www.dpnet.org.np/index.php?pageName=earthquake.
[14] Goda K, Kiyota T, Pokhrel RM, Chiaro G, Katagiri T, Sharma K, et al. The 2015 Gorkha Nepal earthquake: insights from earthquake damage survey. Frontiers in Built Environment. 2015; 1:8.
[15] Van Berlaer G, Staes T, Danschutter D, Ackermans R, Zannini S, Rossi G, et al. Disaster preparedness and response improvement: comparison of the 2010 Haiti earthquake-related diagnoses with baseline medical data. European Journal of Emergency Medicine. 2017; 24(5):382.
[16] National Reconstruction Authority (Unofficially translated by Housing Recovery and Reconstruction Platform HRRP Nepal). Grant Distribution for Completely destroyed private Houses by 2015 Earthquake, . Kathmandu: Government of Nepal, ; 2015.
[17] Stedronsky S, Johnsen M. Rebuilding a more resilient Nepal: University of Stavanger, Norway; 2017.
[18] Krüger F, Bankoff G, Cannon T, Orlowski B, Schipper ELF. Cultures and disasters: understanding cultural framings in disaster risk reduction: Routledge; 2015.

ISSN- 2350-0530(O), ISSN- 2394-3629(P)
DOI: 10.5281/zenodo.1133605

[19] Dixit AM, Parajuli YK, Guragain R, editors. Indigenous skills and practices of earthquake resistant construction in Nepal. Proc 13th World Conference on Earthquake Engineering Vancouver, BC, Canada; 2004.
[20] Quarantelli E. Sheltering and Housing after Major Community Disasters: Case Studies and General Observations. OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS, 1982.
[21] Flinn B, Beresford P. Post-Sidr Fam ily Shelter Reconstruction Bangladesh. UNDP Report. 2009.
[22] ZARGAR A. RECONSTRUCTION OF WAR-DAMAGED RURAL AREAS OF KHUZESTAN, IRAN.(VOLUMES I AND II). 1990.
[23] Ali ZZH. Sustainable shelters for post disaster reconstruction: an integrated approach for reconstruction after the South Asia earthquake: Massachusetts Institute of Technology; 2007.
[24] Chiu RL. 12 Social sustainability, sustainable development and housing development. Housing and social change: East-west perspectives. 221: Routledge; 2003.
[25] Lyons M, Schilderman T, Boano C. Building back better. delivering people-centred housing reconstruction at scale: Practical Action Pub; 2010.
[26] Shearer L. Evolution and Recovery: Adaptable Housing Reconstruction in Post Disaster Scenarios. 2011.
[27] Hidayat B, Egbu C, editors. A literature review of the role of project management in post-disaster reconstruction. Procs 26th Annual ARCOM Conference; 2010: Association of Researchers in Construction Management.
[28] Inam A. Planning for the unplanned: Recovering from crises in megacities: Routledge; 2013.
[29] Ismail D, Majid TA, Roosli R, Ab Samah HN. A review of project management for post-disaster reconstruction project: from international NGOs (INGOs) perspective. Research in Civil and Environmental Engineering. 2014; 2(4):9.
[30] Alexander D, editor planning for post-disaster reconstruction. I-Rec 2004 International Conference Improving Post-Disaster Reconstruction in Developing Countries; 2004.
[31] Jha AK. Safer homes, stronger communities: a handbook for reconstructing after natural disasters: World Bank Publications; 2010.
[32] Sanderson D, Ramalingam B. NEPAL EARTHQUAKE RESPONSE: Lessons for operational agencies. The active learning network for accountability and performance in Humanitarian action ALNAP. 2015.
[33] Limoncu S, Celebioglu B. Post-disaster sustainable housing system in Turkey. Turkey,(available online http://www grif umontreal ca/pages/LIMONCU_Sevgul pdf [accessed on 25/05/2007]). 2006.
[34] Erkelens P, Akkerman M, Cox M, de Haas T, Brouwer E, editors. Innovative shelter for disasters. Proceedings CIB World Congress; 2010.
[35] Da Silva J, Lubkowski Z, Batchelor V. Lessons from Aceh: key considerations in post-disaster reconstruction: Practical Action Publishing Limited Warwickshire; 2010.
[36] Lin Moe T, Pathranarakul P. An integrated approach to natural disaster management: public project management and its critical success factors. Disaster Prevention and Management: An International Journal. 2006; 15(3):396-413.

*Corresponding author.
E-mail address: dhungana.anoj@ gmail.com