First South Asia Conference on Earthquake Engineering (SACEE'19)
21-22 February 2019, Karachi, Pakistan

The Gorkha Earthquake Sequence of 2015, and the Role of Women in Earthquake Reconstruction of Nepal

Ms. Rita Thakuri, Dr. Amod Mani Dixit
Executive Secretary, National Society for Earthquake Technology-Nepal, Lalitpur, Nepal,
rthakuri@nset.org.np, adixit@nset.org.np

Mr. Ranjan Dhungel
Program Manager, National Society for Earthquake Technology-Nepal, Lalitpur, Nepal,
rdhungel@nset.org.np

Mr. Manish Raj Gouli
Civil Engineer, Baliyo Ghar, National Society for Earthquake Technology-Nepal, Lalitpur, Nepal
manishgouli@nset.org.np

ABSTRACT

The Mw 7.8 Gorkha Earthquake sequence of 2015 destroyed approximate 750,000 houses resulting homelessness of nearly 7 million people in the affected 32 districts of Nepal (NPC, 2015). It brought casualties of 8,790 people with economic loss of Approximate US$ 7 Billion (NPC, 2015). The Reconstruction mission of Nepal is leading by the National Reconstruction Authority of Nepal with close collaboration with national and international, government and non-government institutions in the 14 severely affected districts of Nepal. The Reconstruction has raised the huge need of skilled human resourced as trained mason in the construction field of country to build back better.

According to the population census 2011 of Nepal 51.50% are women (CBS, 2011). The recent study of HRRP shows that there are 30% households which are led by women in the reconstruction districts of Nepal (HRRP, 2018). The contribution of women are significant in the reconstruction process of Nepal, they are involved in the policy level to implementation level and from construction worker to trained mason and petty contractors.

This paper intends to study the role of women in earthquake reconstruction of Nepal.

KEYWORDS: Gorkha Earthquake, Reconstruction, Women, Mason Training, Capacity Building

1 The Gorkha Earthquake and its Effects

Nepal is in high seismic zone of earth as it lies between the two seismically active tectonic plates; Eurasian and Indian plate they are converging at the rate of 2 cm per year. The sudden release of the built up stress, due to the subduction of the Indian plate below the Eurasian plate causes earthquake in this region (Dixit, 1993; Dixit 2004). The history of big earthquakes in Nepal proves its seismic fragility (Rana, 1994).

Nepal was hit by the Mw 7.8 Gorkha Earthquake on April 25, 2015 which was followed by 553 aftershocks of local magnitude greater than 4.0 within first 45 days (Adhikari et al., 2015). It was the first large earthquake after 1934 Nepal-Bihar earthquake (Dixit, 2018). The earthquake brought human casualties of 8,970, and serious injury of 22,302 (MOHA, 2015; NPC, 2015). The devastation was huge in terms of infrastructural damage and economic loss; the number of housing damage was 7,55,549, and the estimated economic loss of 7 Billion Dollars (NPC, 2015). It brought million people under the poverty line by including them in the list of homelessness.

1.1 The Major Source of Earthquake Risk in Nepal

Dating back to 2001, the study under the KVERMP program shows that the major source of earthquake risk are the poorly constructed buildings where the 80% of building are constructed by untrained masons, petty contractors and owners themselves (GESI, 2001; Shrestha & Dixit, 2008). Moreover, prior to Gorkha Earthquake various affirmative efforts were made in urban municipalities of Nepal, where masons were trained on earthquake resistant construction. The Figure 1. shows the result of study that claimed that the cause of casualty during earthquake in Kathmandu would be largely of building collapsed whereas the lack of health care facility, and proper emergency response are other significant causes. The earthquake induced landslide and fire could be the other causes of human destruction. Nonetheless, the parameters would be somehow different in the case of rural terrains; the construction of buildings was particularly non-engineered, where neither building codes were enforced nor skills were imparted towards the construction workforce regarding seismic resistant construction.

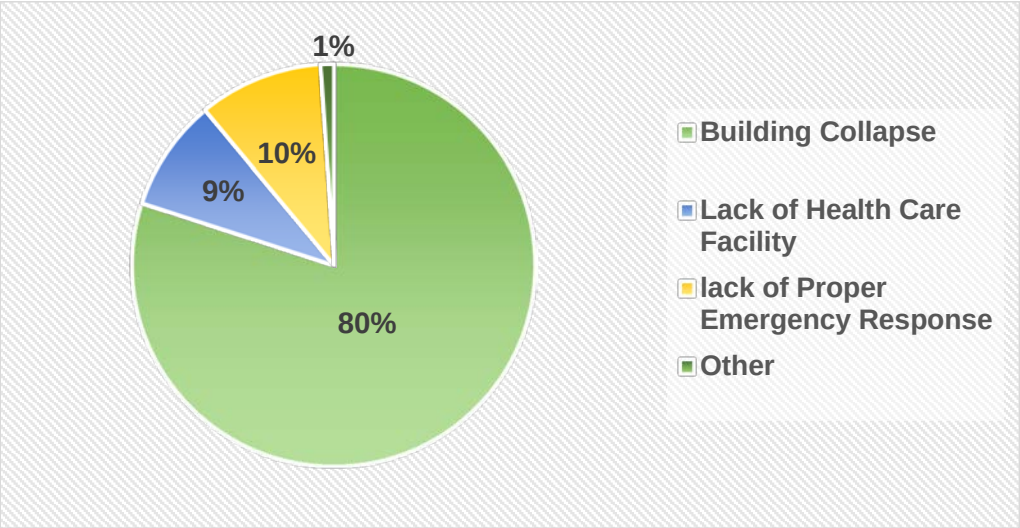

Figure 1: The Major Sources of earthquake risk in Nepal (GESI, 2001; Dixit, 2018)

1.2 The Statistics of Reconstruction Need

The huge number of building need to be reconstructed. The statistics shows the number of private housing need to be reconstructed are more than about eight hundred thousand; educational buildings to be reconstructed are 7,553; the heritage and cultural monuments need to be reconstructed are 753 and the health facilities need to be reconstructed are 1,197. In addition to this the public infrastructures need to reconstructed are hundreds in numbers (Datasets, NRA, 2018).

The majority of building collapsed were constructed largely by traditional materials such as mud, stone, adobe bricks, born bricks, where as in the semi-urban and urban area the building materials used were cement structure, column and bars, and steel structures.

Figure 2: A rural building damaged by the Gorkha Earthquake.

1.3 Demand of Skilled Mason and Construction Worker for Reconstruction

In total 32 districts of Nepal were affected by Gorkha earthquake out of 77 Districts. The huge destruction of housing and infrastructure in those affected districts has demanded the need of thousands skilled mason and construction workers. The study shows that before the Gorkha earthquake the number of building construction per year was 50,000 in Nepal, however after the massive destruction of earthquake the demand has rose to nearly 170,000 houses per year. The estimated requirement of masons for the reconstruction in 14 most affected districts are 60,000 out of 100,000 in 34 earthquake effected districts (NPC, 2015; NSET, 2017). The 14 declared most effected districts are highlighted in the Figure 3 below.

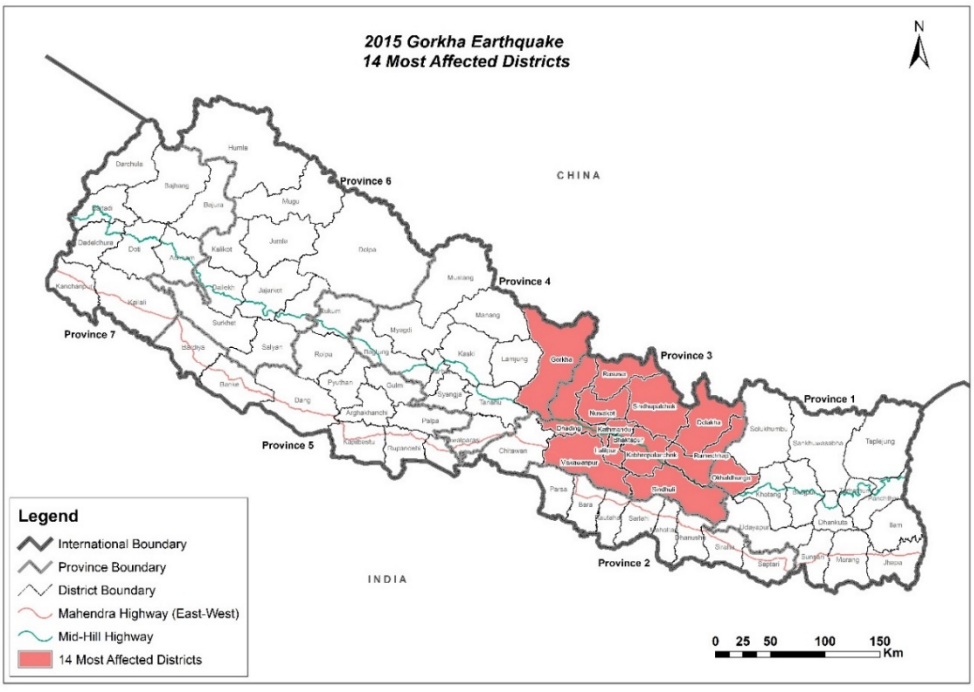

Figure 3: Map of Nepal showing 14 most affected districts (Map Source: NSET)

These 14 most affected districts are located in the mountain areas where agriculture is the main source of living. The male migration to the Gulf countries is the trend in those mountain regions of Nepal. The key for the success of building back better process of reconstruction are the skilled manpower such as masons and construction workers. The migration of male population to Gulf counties has affected the

reconstruction pace to slower than expected. To fulfil the demand of skilled manpower women came as the significant source, hence the government and non-government sector has started to train women as skilled masons. This initiative is also important to make the reconstruction gender and social inclusive (HRRP, 2018; Regby, 2017)

2 Masons Training for Earthquake Resistance Construction

In the context of Nepal more than 80% of the buildings are built by owner builders under the sole supervision of Petty cash Contractors/Head Masons both being unaware about the catastrophic effects which may occur (Dixit A.M et al, 2000). Despite the fact that Nepal Building code was introduced by 1994, the process of granting the building permit without considering the strength criteria was prevailing afterwards too. In this situation, without the knowledge of seismic resistant components that is to be incorporated, the built dwellings cannot withstand when hit by quake. To that end, the essence of training masons was realized by the stakeholders, mostly who were engaged in the construction of non-engineered buildings. This state when compared with the rural areas of our country, almost all the buildings prior to the earthquake neither had engineers to supervise nor had knowledge regarding the earthquake resistant components. Importantly, certain historical monuments that were constructed centuries ago were able to sustain massive earthquakes in every few centuries and could withstand the recent earthquake too. This sheds light upon the skills and knowledges on earthquake resistant practices inherited by our ancestors which was however forgotten in the course of new construction. Moreover, this factor brought the swiftly transiting the same inherited skills among the workforce with modern approaches as the rural topographies of Nepal still today are deprived of basic infrastructures and retaining skilled technical professionals is very difficult. In one way the massive movement of youths towards abroad countries

2.1 Efforts of NSET in Mason Training and Reconstruction

National Society for Earthquake Technology-NSET, from last twenty five years had been making assenting efforts towards disaster risk reduction to promote earthquake safe communities in Nepal. Through different programs like retrofitting and building code implementation in different municipalities of Nepal, it was realized that the capacity of masons regarding the earthquake resistant construction must be enhanced in order to make them self-realize on resilient construction **(Dixit,2014)**[1]. Nearly two decades ago, NSET along with the Government of Nepal and Department of Urban Development and Building Construction (DUDBC) had develop the unique concept of Mason training comprising both technical and theoretical knowledge importance of which is valued till date. It is a positive effort that 6,000 more masons are trained in the aftermath of Gorkha Earthquake who are contributing in ongoing reconstruction. (NSET, 2018).

In the wake of Gorkha Earthquake 2015, the Baliyo Ghar - a housing reconstruction technical assistance program has supported government in developing curricula for mason training. Previously, there was a single manual for training masons. However, after the earthquake realizing the importance of training related to rural- low strength masonry construction a separate course has also been designed. The new amended curricula has two different modules for construction of earthquake resistant Urban and Rural buildings. The curriculum has also been endorsed by DUDBC in order to ensure the uniformity. Training for skills in building construction, to make earthquake resistant buildings. Additionally considering the surge reconstruction to take place in the rebuilding process, new women masons are also produced from vocational trainings. The better part of this training is it imparts skill to the ones who want to work as trained masons and in the other part constructs the house of vulnerable people among which single women led households and marginalized groups are focused (NSET, 2017). The figure 4 are the photographs of mason training guidelines development by NSET along with

[1] Cited in Dixit's article "Earthquake Disaster Risk Management Efforts in Nepal"

Government of Nepal, Department of Urban Development and Building Construction and National Reconstruction Authority.

Figure 4: Mason Training Guidelines developed and endorsed by DUDBC with contribution of Baliyo Ghar (Picture Source: NSET).

3 Women mason in Reconstruction

3.1 Methodology

Qualitative method was used for the primary data collection in case of this study. The method conduction of Focus Group Discussions (FGD) among a group of women in which a set of open questions were asked to the participants and their views were discussed among the group to bring out a pertinent solution. FGDs are an effective tool in finding out the answers to the "What, Why and How" questions.

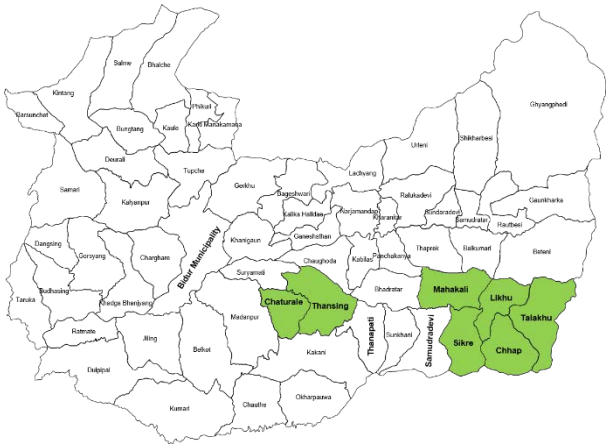

Figure 5: VDCs in Nuwakot where Focus Group Discussions were conducted

To ensure the adequate responses from women on present reconstruction scenario, their involvement in reconstruction and challenges they had to face, a total of seven focus group discussions were conducted in seven previous VDCs in Nuwakot. The group discussions consist of 8 to 10 women participants representing various demographic status. Similarly, it was ensured that the each participants represented each ward of previous VDC. Especially, representative of women's group, Dalit (marginalized) ward representative, female social leaders were targeted.

Likewise, secondary data were collected from various data sources from governmental as well as non-governmental organization's reports.

3.2 Discussion

In context of Nepal, the male members are generally involved in making decisions and mobilizing the household resources. This has moreover, limited the access of women in organizing the possessions which have been a long term practice in the country as the society is male dominated. This is not only problem of Nepal, but same is the situation in many developing countries. However, in the wake of earthquake with various organizations promoting different awareness raising and training related programs specially targeting the upliftment of women the scenario has made a lot of change. The different skills imparted regarding the construction, livelihood and other sectors has increased the sense of entrepreneurship as well as the access to information.

Moreover, similar conditions are there in sectors of reconstruction. As a result of brain drain, many male youths are massively moving to foreign countries in search of employment. In this situation the overall role of handling domestic life as well as reconstructing the house has come towards the Women. In previous days, it was considered that the involvement of women in construction would delay the process because of limitation in strength and technical skills among women. As a result, the role of women used to be limited in labors. Nevertheless, being as labors too they had help much in works like aggregate crushing, molding the mud for mortars and support in carrying the construction materials as helping hands for their counterparts. To that end, women after being provided with Mason and On the Job Trainings have been able to proceed towards more advance works like laying of walls, concreting and reinforcement bending too. The On the Job trainings have helped women to learn new skills and contribute in reconstruction process. Moreover, while looking in long term such trainings is expected to enhance their livelihood and they can retain in same profession to earn their lives (NSET, 2017a). The Figure 6. below illustrates the women who have been trained in different sorts of construction skills by Baliyo Ghar program.

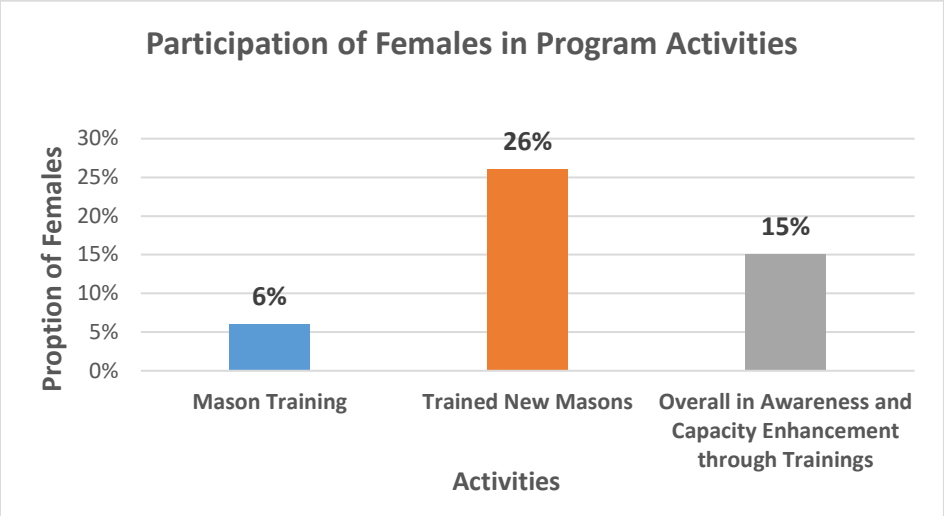

Figure 6: Proportion of Females in Different Activities of Baliyo Ghar.

The figure represents the participation of females in different activities (Awareness and Capacity Enhancement through trainings) being organized under the program. It depicts that more than one fourth of newly trained masons through vocational training called OJT are females. As a result of this training, the females who prior were limited to either household works or labors are now disseminated with construction skills. They through various practical as well as theoretical sessions can now take leading role in construction fronts. Likewise, since only few women masons were there who were prior involved in construction works moreover in some sort of skilled tasks like wall laying and concreting, 6% of such working masons have also been trained under the short courses. As a result, they are conveyed with seismic resistant construction skills and contribute in formation of earthquake resilient community. In addition, whilst looking at the overall activities participation from awareness building, capacity

enhancement and institutionalization of achievements the participation of female is 15%. The program has its separate Gender Equality and Socio Inclusion (GESI) guideline with which it promotes participation of females, marginalized community and disadvantaged groups in reconstruction.

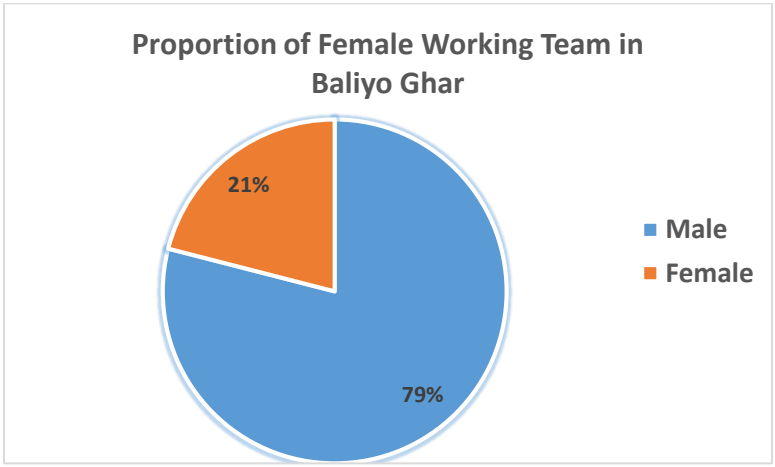

Figure 7: Proportion of Female Staffs in Baliyo Ghar Work Team.

Likewise, the proportion of females in working team of Baliyo Ghar is as illustrated in Figure 7 above. They work at different sectors of the program and are contributing from the policy to grass root level of program implementation. Distributed from Mobile Teams to Reconstruction Centers in different roles of engineers and social mobilizers, they are cordially making contribution in coordination activities as well as in field are promoting the disaster resilient housing reconstruction.

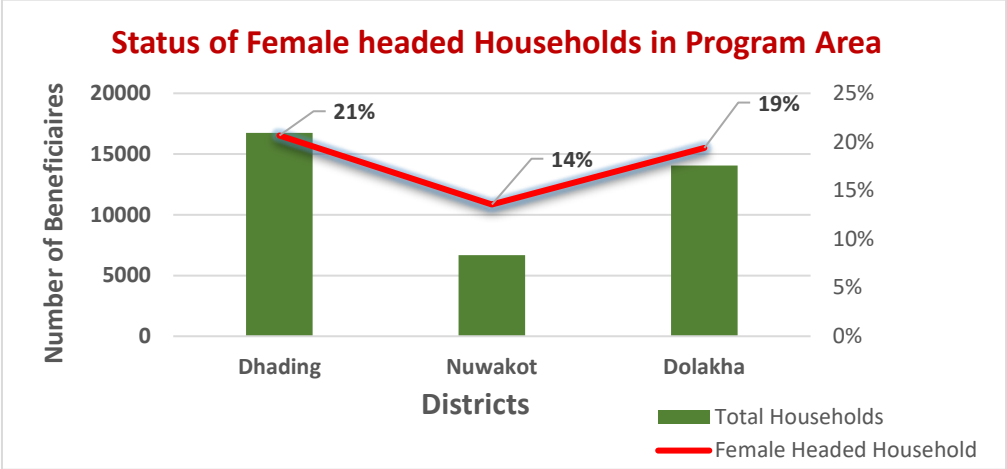

Figure 8: Percentage of Female Households being served by Baliyo Ghar program. (Source: Door to Door Assistance)

The aforementioned figure 8 illustrates the current Female Headed Households being served by program in the working area. Dhading is seen to have higher percentage of female households compared to other two districts with nearly one-fifth of the total. Likewise, Dolakha and Nuwakot comprise 19% and 14% of the total households, where door to door technical assistance has been provided. Moreover, the program is providing socio-technical assistance there in order to increase perception of households on importance of brining women in front, with back supporting them whenever needed. Hence, the number of female headed households may also tend to increase in future. Keeping this in mind, the separate sessions have been designed in the trainings & orientations being provided, in order to orient participants on necessity of considering gender inclusion to contribute in sustainable reconstruction.

Figure 9:Women masons working on the OJT site of Matra Village in Thansing, Nuwakot District (source: NSET)

3.3 Representative Case Study: The success story of Ms. Bal Kuamri Kafle, One of the trainee from Baliyo Ghar program

Ms. Bal Kumari: A Leading Female Mason

A simple literate women, Bal Kumari Kafle, 52, has already involved in constructing 50 more houses at Kathmandu and Dolakha. Now she is engaged in housing construction as a skilled mason and contractor at different wards of Bhimeshwor Municipality, Dolakha. After Gorkha Earthquake, she has completed two RCC houses at Bhimeshwor Municipality. She started working as a helper in the construction site in Kathmandu and worked for a decade as a helper. Then, she returned back to her own district and started to work as a contractor for housing reconstruction. Figure 10 shows Ms. Kafle working in the construction side with other female colleague in the Dolakha district.

Figure 10: Bal K Kafle and Damber Karki working together

Mason Training; a turning point for Kafle

Kafle, permanent resident of Jhule-9 and currently dwelling in Bhieshwor Municipality is residing with her daughter seeking for working sites. She was involved in constructing RCC frame structured houses where she used her own techniques though not well informed about the earthquake resisting elements. But on July 20, 2016, when BaliyoGhar commenced mason training at Simpani Dolakha, Kafle got participated and acquired ample opportunity to enhance her knowledge and skills. At the first day of training, she was quite hopeful to know the unpracticed techniques. She said, "I am very happy to join 7 days training where, I hope I would be a better contractor and mason in rebuilding houses."

Again at the last day, she seemed quite quenched. She expressed, "I think it's a turning point for me to build back better. I learnt the new techniques like lapping, landing beam, slab detailing, spacing between stirrups, vertical reinforcement of doors and windows, which were not practiced by us in housing construction before. I express my gratitude to the BaliyoGhar team, we will try to convince the house-owners to implement these basic earthquake resistant elements for safer housing construction."

During the training sessions she was a keen observer and learner as she showed her positive attitude in learning the new technical skills throughout the training period.

Changes in behavior

Not only she is confident enough to build earthquake resistant building construction but also, she is motivating other female masons to participate the mason trainings. She says, "I encourage the other female masons as well to take part in the training and be a part of the reconstruction program."

After the training, she is involved in rebuilding the collapsed houses by Gorkha Earthquake where she not only convinces house owners to invest little more to make their houses safer and better but also uses the techniques she learnt during the training. "Due to high rise in the cost of construction materials, most of the house-owner hesitates to apply the new technology in housing construction. Being a female contractor I have to bargain my wages in construction work"- she shares. In spite of problems she vows of being one of the reconstruction champion. "I had to seek the working sites myself for earning, but now I am called frequently by the house owners, this is my great achievement" she shares her pleasure. (Source: Baliyo Ghar Program of NSET, 2016)

4 Challenges and Learnings

As per depicted by the discussion results, one of the major challenges for women's involvement in reconstruction process is the society's disbelief towards them. The social and cultural setting of the country assumes women's involvement in household works rather than being employed and leading the family. They if want to work outside can't be dedicating full time because of their dual responsibility of handling the family itself. Such obstruction has been demotivating women from being involved in reconstruction works. Such scenario needs strong modification in order to exacerbate women participation. Furthermore, the perception such that women are less efficient than their male counterparts has also lessen the participation horizon of women which has created dissimilarity in the wages they obtain.

Nevertheless, of these challenges, women have learned to overcome them, the research shows that the significant number of women are involved in equal decision-making position on the reconstruction of their houses with their male head, or as the main decision-maker due to being a single women or migration of male family member (HRRP, 2018). Additionally, they have paved the way out by formation of women's groups in their communities to share their issues and challenges and work with innovative to create a better environment. The effects of capacity enhancing trainings and other

programs supports and groom the one who want to contribute in the construction sector. As well as it enhances the confidence level as a perennial source of motivation. Similarly, women groups have been able to impact other aspects of life, like livelihood, health, sanitation and economy. As men are more probable to take part in trainings and other activities outside their homes or community, they only have the radios with them as the major source of information. As women are bound at home all day, they tend to leave their radios on all the time to listen to anything, from news, songs to important government decisions and information. Thus, they feel that radio programs should be more inclusive about women's issues and should be easy to understand. Taking example of the BBC Milijuli Radio Program, it has been very effective to increase awareness as the program represent the similar notions being experienced by women and its broadcasting time is also appropriate.

5 Conclusions

To that end, in order to upgrade the quality of life of women, enhancement of awareness level as well as conduction of specific training programs should be there which can meet their demands and as that of society in a balanced way. These training must be able to ground break the obstructions and should be able to well equip women- comprehending the barriers and limitations by providing them with adequate opportunities to participate. Until and unless, women are supported by their family members and community the journey for them will really be difficult. Hence helping hand must be extended in order to aid them a favorable environment to work outside. Similarly, a deliberation regarding the disparity of wages and social status of men and women equally involved in construction is required, both at the policy level and within their communities. Vocational and Livelihood training like On the Job and Horticulture aid in embracing the livelihood aspects in reconstruction make it further sustainable. As women are the caretaker of their families, certain strategic programs must be conducted for them to make them aware, not only about the present reconstruction, but also to prepare and concern them for future to be safe from disasters. As the reconstruction process is gradually coming to a closer, it is of paramount importance to use this platform to work towards creating not only earthquake resistant, but altogether disaster resilient communities. For this, women groups in the community must be oriented and trained regarding preparedness, first aid, mitigation which can ultimately help to widen the coverage of disaster resilient knowledge and capacity for a sustainable learnings in the community.

6 Acknowledgement

We express our sincere acknowledgement to the organizing committee of First South Asia Conference on Earthquake Engineering (SACEE' 19) for giving us this very important platform to present our learning of Women involvement in the Gorkha Earthquake Reconstruction. We would also like to thank USAID Nepal, Nepal Reconstruction Authority, Department of Urban Development and Building Construction (DUDBC) for extending their support for the implementation of safer construction trainings, various earthquake risk reduction programs and reconstruction program in Nepal. We are also thankful to the Executive Director. Baliyo Grar Program Team, and other Senior NSET professionals for their continuous support and guidance during the preparation of this paper.

7 Reference

Adhikari, L. B. et al., (2015). "The aftershock sequence of the 2015 April 25 Gorkha–Nepal earthquake. Geophysical Journal International 203(3): 2119-2124.

Dixit, A.M., (1993). Nepal – Status of Seismic Hazard and Risk Management in Nepal. Paper presented on the WSSI Bangkok Workshop on Seismic Risk Management February, 1993. Bangkok, Thailand

Dixit, A. M., (2004). Promoting Safer Building Construction in Nepal. Paper presented on the 13th World Conference on Earthquake Engineering (13WCEE), (pp. 1–9). August, 2004. Vancouver, B.C., Canada.

Dixit, A. M. et al., (2018). Risk Management, Response, Relief, Recovery, Reconstruction and Future Disaster Risk Reduction. The Impacts and Insights of the Gorkha Earthquake. Gautam, D. and Rodrigues, H. (Eds.). Elsevier. 2018

Dixit. A. M. et al. (2000). NEPAL BUILDING CODE - NEED, DEVELOPMENT PHILOSOPHY AND MEANS OF IMPLEMENTATION. Paper presented in the 12th World Conference in Earthquake Engineering (12WCEE), (pp. 1–7). February, 2000. Auckland, New Zealand. Retrieved from 12WCE2000 https://doi.org/10.13140/2.1.4100.7366

GESI (2001); A Report on Global Earthquake Safety Initiative Pilot Project Final Report, implemented by GeoHazards International (GHI) AND UNCRD, 86p. Retrieved from http://www.preventionweb.net/files/5573_gesireport.pdf

HRRP, (2018). Women in Reconstruction Research Report. Housing Recovery and Reconstruction Platform, Nepal. May, 2018. Kathmandu, Nepal.

MOHA, (2015). Gorkha Eathquake Report. Ministry of Home Affairs, Government of Nepal. 2015. Kathmandu, Nepal.

NPC (2015). Nepal Earthquake 2015 Post Disaster Damage Needs Assessment, National Planning Commission, Government of Nepal, 2015. Kathmandu, Nepal.

NRA (2018). Reconstruction Update. (2018, October 25). Retrieved October 25, 2018, from http://www.nra.gov.np/en/mapdistrict/datavisualization.

NSET (2015). NSET PEER Experiences, In-house report on PEER Country Planning Meeting, Nepal.

NSET (2016). Success Stories of Baliyo Ghar Program, NSET. 2016. Kathmandu, Nepal. Retrieved from In-house report.

NSET. (2017). Safer Society-NSET Report 2017. Retrieved from http://www.nset.org.np/nset2012/images/publicationfile/Safer%20Society_Annual%20Report_FINAL_Small_1.pdf

NSET. (2017a). Training Systems of Baliyo Ghar. Two Pager information kit of Baliyo Ghar Program. 2017. Kathmandu, Nepal

NSET. (2018). Safer Society Report 2018 (Unpublished). Retrieved from in-house dataset of NSET. 2018. Kathmandu, Nepal.

NSET. (2016

Rana, B.S.J. (1934), “The Great Earthquake in Nepal (1934 A.D.)(Lall, K, Trans.).” 1st English Edition, Ratna Pustak Bhandar, Kathmandu

Regby, J. (2017). Women Stonemansons Help Rebuild Nepal After Earthquake Devastation. https://www.newsdeeply.com/womensadvancement/articles/2017/04/24/women-stonemasons-help-rebuild-nepal-after-earthquake-devastation

Shrestha, S. N. and Dixit, A. M., (2008). A Hierarchical System for Training and Awareness Raising at Grass Roots Level: Experiences of NSET from Earthquake – resistant Housing Reconstruction in Pakistan. Paper presenting on the 14th World Conference on Earthquake Engineering (14WCEE), October, 2008. Beijing, China

YSFN, (2018). Gorkha Earthquake Damage and Housing Reconstruction: Service to National by Young Professionals initiated by Young Scientist Forum Nepal. Case Study submitted to the IRDR ISCU, China. October, 2018.