IMPACT OF EARTHQUAKE-2015 ON VULNERABLE POPULATIONS IN NEPAL

A Dissertation

Submitted to the Faculty of Humanities and Social Sciences of Tribhuvan University in Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

in

Population Studies

By

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LETTER OF RECOMMENDATION

This is to hereby certify that Mr. Balkrishna Mabuhang has prepared this dissertation entitled **IMPACT OF EARTHQUAKE-2015 ON VULNERABLE POPULATIONS IN NEPAL** under our guidance and supervision. We would like to ensure that this dissertation is an original work and has not been previously made the basis for an award of any Degree from Tribhuvan University or any other University in the World.

We, therefore, recommend this dissertation for final examination by the Research Committee of the Faculty of Humanities and Social Sciences, Tribhuvan University in fulfillment of the requirement for the Degree of DOCTOR OF PHILOSOPHY in POPULATION STUDIES.

Dissertation Committee

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Prof. Bal Kumar KC, PhD
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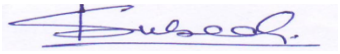
Date: December, 2023



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Prof. Pushpa Kamal Subedi, PhD
Co-Supervisor
Date: December, 2023

DECLARATION

I hereby declare that this Ph.D. dissertation entitled **IMPACT OF EARTHQUAKE-2015 ON VULNERABLE POPULATIONS IN NEPAL** submitted by me to the Office of the Dean, Faculty of Humanities and Social Sciences, Tribhuvan University (TU), is an entirely original work prepared under the supervision of my supervisor and co-supervisor. I have made due acknowledgments of all ideas and information borrowed from different sources in the course of writing this dissertation. The results presented in this dissertation have not ever been presented or submitted anywhere else for the award of any degree or for any other purposes. No part of the contents of this dissertation has ever been published in the form or a part of any book. I am solely responsible if any evidence is found against my declaration.

Signature:

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Name: Balkrishna Mabuhang

Date: December, 2023

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This study is based on the mixed method- quantitative data and qualitative information the Central Department of Population Studies (CDPS) generated for the Ministry of Health and Population (MoHP) in September 2015; in co-operation with UNFPA and IOM. As the research coordinator, I had an opportunity to lead the entire study.

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Balkrishna Mabuhang

ABSTRACT

The purpose of the study is to unravel the impact of earthquakes on vulnerable populations. The impact of the quake is literally measured in different perspectives- social, physical, economic, demographic, and esthetic; however, this study covers to impinging of an earthquake on vulnerable groups or populations from socio-demographic and cultural perspectives. Hazards, vulnerability, and risk are all uniquely intertwined in the development of death and destruction from disasters.

Almost 82 years back, the earthquake in April 2015 triggered the disaster with its epicenter at Barpak; Gorkha situated about 80 kilometers to the North- West from Kathmandu. The moment magnitude of 7.8 MW, with a depth of about 10-15 kilometers down to earth created waves that lasted for almost 50 seconds recorded, followed by numerous aftershocks that hit many lives and physical amenities very severely.

Nepal Government has produced a report on Post Disaster Need Assessment (PDNA) in almost two and half months of the aftermath of the earthquake measured death tolled 8,790 casualties and 22,300 injuries along with lives affected about eight million. Of 75 districts, thirty-one districts were affected, out of which 14 districts declared: 7 mountain districts as 'severely hit,' and 7 hill districts including Kathmandu Valley as 'crisis-hit,' to prioritize rescue and relief operations. The report also says that the death toll of young people could have been much higher considering that nearly 7,000 schools were completely or significantly damaged. But fortunately, the day was Saturday- all schools both private and public were closed for a weakly official holiday in Nepal. Besides children, the elderly, single women-headed households, and all populations were at a high risk of exposure to the disaster victims.

Natural hazard including earthquake does not go along with the line of age, gender, social, cultural, or ethnic settlements; rather it hits disproportionately. But the impact on the affected population lasts for an extended period and varies with a spectrum of vulnerable populations to affluent and accessible populations.

This study uses two data sets- 'Nepal Earthquake, 2015: A Socio-demographic Impact Study: With reference to 14 most affected districts,' which was carried out by the Central Department of Population Studies in 2015, and a study on, 'Community Resilience,' which was conducted by Central Department of Anthropology (CDA) in 2020. Quantitative data sources are triangulated with qualitative information collected during both survey research.

This study has employed descriptive data analysis along with □2 – test and Multiple Linear Regression Analysis. Study findings show that there is a clear discrepancy between socio-economically, culturally, and demographically between dominant populations and vulnerable groups. The findings apparently show the impact with the spectrum where the head of households of severely hit districts, rural families, female-headed households, agricultural occupation, no education or at least primary, Christians in religious, and Dalit (hill) and other hill Janajati groups were very badly hit while head of the households of Kathmandu Valley districts, urban families, male-headed households, salaried wageworkers, head of the households with tertiary education, Hindu religion, and Brahmin and Newar ethnic groups are less likely to be impacted. However, the community resilience survey shows that the recovery revealed just the reverse.

Descriptive analysis clearly shows the relationship that recovery is taking place even in vulnerable populations, but whether it statistically significant or not multivariate linear regression is applied. The result shows the positive relationship that the recovery is well explained by the different categories of explaining variables. Multivariate linear regression analysis is adopted to show the relationship between dependent and independent variables.

Vulnerable populations in general and Dalit communities, in particular, were found to be brought back better than their counterpart who were less likely to be impacted by the earthquake. In the context of Nepal, an own house building is the hallmark indicator of household loss in the disaster, and a gain after 5 years of individual, as well as state support, satisfactorily can be measured as the best indicator of recovery. In the study, a dependent variable such as the opinion of households asked that satisfied with the recovery measures or building back the house building. Cross-variate analysis showed pretty good. However Multivariate linear regression analysis

also indicated a significant relationship between the dependent variable with the Earthquake Affected Domains, Gender, Education, Religion, and Caste/ ethnicity.

The novel findings of the study are that the vulnerable groups- hill Dalit and Janajati got better brought back after 5 years in recovery than the other groups. The plausible reason is that the disparity between the vulnerable groups and their counterparts was huge before the disaster. The disaster hit disproportionately, but the former experienced worse than the latter. Under the reconstruction measure, both the vulnerable groups and their counterparts found recovery more or less the same yield better to the former. In other words, the gap was larger before the quake, disaster hit equally, and the reconstruction measures adopted brought a small gap between vulnerable groups and their counterparts. By caste\ ethnic groups, other hill-ethnic minor groups account for 91 percent completely lost their house. Similarly, households with Christianity in religious faith also account for 92.5 percent; the highest number of houses\huts damaged which is slightly greater than hill ethnic minor groups. As far as the recovery is concerned, the highest proportion of Rai ethnic groups (56.5%) reported that they were fully satisfied followed by Chepang (53.3%). Whereas Majhi reported the least percentage (6.1%) fully satisfied.

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ABBREVIATIONS AND ACRONYMS

CBDRMCs-	Community Based Disaster Risk Management Committees
CBS-	Central Bureau of Statistics
CDA-	Central Department of Anthropology
CDPS-	Central Department of Population Studies
CDPS-	Central Department of Population Studies
CEDIM-	Center for Disaster Management
CEDIM-	Center for Disaster Management and Risk Reduction Technology
CRED-	Centre for Research on Epidemiology of Disaster
DDR-	Disaster Risks Reduction
DDRC-	District Disaster Rescue Committee
DHS -	Demographic Health Survey
DIPNet-Nepal	Disaster Preparedness Network- Nepal
ECO-DRR-	Environment Conservation and Disaster Risk Reduction
EM-DAT-	An International Emergency Events Database on Disasters
EWS -	Early Warning System
FGDs -	Focus Group Discussions
GLOFs-	Glacial Lake Outburst Floods
GoN-	Government of Nepal
GTS -	Ground Truth Solutions
HIV -	Human Immunodeficiency Virus
IN-	Indigenous Nationality
IOM-	International Organization of Migration
KIIs-	Key Informant Interviews
LDRMC-	Local Disaster Risk Management Committees
MDGs-	Millennium Development Goals
MHT-	Main Himalayan Thrust
ML-	Earthquake Aftershocks, Magnitudes
MM-	Modified Mercalli
MMI-	Modified Mercalli Intensity
MoHA-	Ministry of Home Affairs
MoPH-	Ministry of Population and Health

NBC-	Nepal Building Code
NPHC-	National Population and Housing Census
NSC-	National Seismological Center
PDNA-	Post Disaster Need Assessment
PSU-	Primary Sampling Unit
PTSD -	Post-Traumatic Stress Disorder
RC-	Reinforced Construction
RCC -	Reinforced Concrete Cement
SMRR-	Safety Measures, Rescue, and Relief
SPSS -	Statistical Package for the Social Sciences
UNESCO-	United Nations Educational, Scientific, and Cultural Organization
UNFPA-	United Nations Population Fund
UNISDR-	The United Nations Office for Disaster Risk Reduction
UN-OCHA-	United Nations Office for the Coordination of Humanitarian Affairs
USGS-	The United States Geological Survey
USOFDA -	USAID's Office of Foreign Disaster Assistance
WDS -	Well Designed Structure,

CHAPTER I

INTRODUCTION

1.1 Introduction Dalit

Disasters of all major natural hazards, due to earthquakes are distinct since human constructions play an integral role in controlling the severity of hazard impact (Degg, April 1993a). Victims are due to earthquakes resulting from the total or partial collapse of buildings on them; it means inadequate design and construction made by human beings accounted for the degree of disaster. As far as the measurement of the earthquake hit is concerned, there are two parameters used to measure the size of an earthquake- magnitude[1] and intensity[2]. Former provides a quantitative measurement of energy released by an earthquake, and the latter provides a descriptive and relatively subjective assessment of the size of the impact of an earthquake, based on its effects on humans, structures, and ground the surface. When earthquake hazards occur, which is a geological phenomenon, which is out of the control of human beings, people get suddenly commotion and in a moment disaster appear with loss and injuries of both human and other lives; to damage individual and public buildings; obstruct trials and roads due to landslides and avalanches, the tsunami in the sea. Following the disaster, the susceptibility of people increases against human loss and loss of properties and livelihoods.

In 2018, there were 315 natural disaster events recorded with 11,804 deaths, over 68 million people affected, and US$131.7 billion1 in economic losses across the world (CRED, 2019). Asia suffered the highest impact accounting for 45 percent of disaster events, 80 percent of deaths, and 76 percent of people affected. Globally, Indonesia recorded nearly half of the total deaths (47%), while India recorded the highest number of people affected (35%). And earthquakes were the deadliest type of disaster that accounts for 45 percent of deaths.

South Asia is one of the most vulnerable regions of the world with respect to natural disasters and man-made catastrophes since high population densities rampant and unplanned urbanization, widespread poverty, and malnutrition are all further

aggravating factors that make the populations even more vulnerable to the disaster that befalls them on a regular basis (Guha- Sapir et al., 2010).

In comparison to other nations, Nepal accounts for the least number of earthquake events that occurred, but it has hit very badly the human residences and the agricultural fields of remote places of High Mountain.

According to Disaster Risks Reduction (DRR) report, Nepal ranks 11th positions in terms of global risk for earthquake occurrence and impact and top 20th of all the multi-hazard countries in the world (UNDRR, 2019). The hazard, exposure, and vulnerability that combined to make the earthquake in Nepal so deadly and damage from a disaster hazard itself, the exposure of people, property, and livelihoods to these hazards, and their susceptibility to the damaging effects of hazards.

Natural hazards do not go along with the political boundary of any nation or state or province; however, it hits disproportionately the population, where a weaker section of a nation, a state, a region or a group or a community is vulnerable to getting back or recovery. The recovery, at least in its previous condition, becomes a serious matter when a country is crippled with its day-to-day survival. Among South Asian countries, Nepal has experienced all types of disasters as India, Pakistan, and Bangladesh encounter.

Nepal's landscape is predominantly of hills and steep mountains combined with fragile geological formations and heavy monsoon rainfall affecting the country (UNISDR, 2015). The report says that Nepal’s geological characteristics together with torrential rain during the rainy season often result in landslides, debris flows, and floods. Statistics from the EM-DAT show that floods are the most frequent hazard with 50 events reported from 1900 to 2014. Landslides follow this, with 23 events reported in the same period, then epidemics, with 17 events. There have been 6 earthquake events registered in the EM-DAT database. A study published in April 2015 reported that despite the availability of new data and methodological improvements, the available earthquake hazard map showing the probability of tremors happening across Nepal is about 20 years old. Prior to 25 April 2015; there were several discussions, seminars, and training workshops organized by warning against possible disasters Nepal had to encounter, but when it was hit by an

earthquake on 25 April 2015; how much those knowledge, skills, and technology or preparedness was applied in reality is very much muddled.

United Nations Development Program (UNDP) (2012) worked with the Ministry of Home Affairs (MoHA) to launch the National Emergency operation. They are operating at the district level as District Emergency Operation Centers, followed by Regional Emergency Operation Centers, and five Municipal Emergency Operation Centers as well. Similarly, 16 Districts Emergency Operation Centers conduct simulation exercises to test their standard operating procedures and disaster preparedness and response plans responsible for search and rescue, managing the fire services, and providing first aid to save lives and property.

More than 60 Community-Based Disaster Risk Management Committees (CBDRMCs) have been formed in 11 districts with more than 600 community members (51 percent female). Similarly, 37 Local Disaster Risk Management Committees (LDRMC), and more than 50 school-based Environment Conservation and Disaster Risk Reduction (ECO-DRR) Clubs have been established and institutionalized. Likewise, capacity-building initiatives have been organized for over 3,000 community members on search and rescue, first aid, early warning system (EWS), and disaster and climate risk management so that local community members are equipped to respond to disasters. As a result of UNDP's advocacy, 39 Village Development Committees (VDCs) allocated a budget for disaster risk management in their plans in 2012. Similarly, district line agencies, such as the District Soil Conservation Offices, District Development Committees (DDCs), and VDCs have provided financial and technical support to CBDRM committees and ECO-DRR Clubs, particularly to implement mitigation measures against floods and landslides. All these data show the preparedness the state had made in cooperation with different agencies alarmingly.

Some people might have experienced the mega earthquake of 1935 if any survivors were left in a house or community. There is hardly any person or an institution institutionally or academically accountable to update the experiences of mega earthquake occurrence and their adverse impact on the population with a potential unprecedented loss of life and property. People who heard about the previous mega earthquake of 1935, or encountered and survived might have a fear

than any preparedness against the disaster risk reduction strategies in general since people who encountered the mega earthquake, their experiences, observations, lessons learned and unlearned didn't become a matter in the discourse of earthquake disaster preparedness issues.

In the week aftermath of the 25 April 2015 earthquake; geologists, structural engineers, and scientists across the world reached out to Kathmandu and were inspecting the buildings to find out the plausible reasons for fallen buildings, roads or hills, mountains, glaciers, and so on (Fig. 1).

Nepalese geologists, engineers, scientists, or academicians were hardly engaged in a way of study; instead, they were in a serious fear psyche, since they were less likely to be known about the potential features of earthquake disaster on one hand and apparently they were also badly shaken by the earthquake, so were in a commotion and had to look after their family and property. I think no academic person or institution paid time for noteworthy work in the first week look period in the aftermath of the earthquake.

In regards to the preparedness against the earthquake disaster and its effect, one of the parliamentarians of Kathmandu districts, Rajan KC opined:

> We observed the Earthquake Day at Kirtipur on 17 Magh, 2071(31 Jan. 2015). I was invited as a special guest to mark the earthquake day. High-level official dignitaries- Nepal Army, Armed Police Force (APF), Nepal Police, Civil Society, and Media- attended the grand program with different types of simulations and preparedness demonstrated. I was personally impressed with the program and convinced that we are fully equipped, prepared, and able to cope, resist, and recover from disaster. But it is very unfortunate to share our condition here since when Gorkha Earthquake occurred, everybody was looking for support, we were suddenly in such a commotion that we didn't have anything in the store or clearing house to support the needy. We have to ask business persons and retailers for relief materials.

1.2 Nepal: Exposure to Earthquake

A mega earthquake, over eight decades ago occurred in 1935, which is very commonly known as Nabbesalko Bhukamp literally means an Earthquake of 90' (B.S. 1990). Following this, there are many earthquakes hit Nepal in different parts and times, with different magnitudes but the latest one went on 25 April 2015 with a moment magnitude of 7.8 Mw struck in a severe devastating manner at 11:56 a.m. local time with Barpak village of Gorkha District as the epicenter, about 80 km northwest of Kathmandu (Manandhar, Hino, Soralump & Francis, 2016a). The intensity at the epicenter was determined VIII while the intensity in the Kathmandu Valley was VI-VII. Similarly, the largest in a series of hundreds of aftershocks was a very strong magnitude of 7.3 Mw with an epicenter at the border of Sindhupalchowk and Dolakha Districts (about 35 km east of Kathmandu) occurred on 12 May 2015 at 12:50 p.m. local time. The intensity VI was measured both in Kathmandu Valley and Arniko Highway (USGS, 2015). The main shock destroyed a large number of buildings and infrastructure in urban and rural areas, and triggered numerous landslides and rock/boulder falls in the mountain areas, blocking roads, and hampering rescue and recovery activities. Moreover, aftershock occurrence has been active since the main shock; several major aftershocks (e.g., w6.7 and *M*w7.3 earthquakes in the Kodari region, northeast of Kathmandu) caused additional damages at rural towns and villages in the northern part of Central Nepal.

As far as the exposure to hazards is concerned, for a 100-year return period, on average 35 percent of permanent houses in Nepalese districts were exposed to a very high-hazard earthquake zone. Baitadi, Darchula, Kathmandu, Baglung, and Doti were the five districts with the highest percentage of permanent houses exposed to a very high-hazard zone (UNISDR, 2015). Other critical infrastructures such as education, health, and transportation were also highly exposed to hazards. For example, 84.8 percent of schools in the districts of Nepal were located in hazard-prone areas. For hospitals, 20 districts have 100 percent health post-exposure to high-hazard zone areas and another 19 districts have health post-exposure to moderate-hazard zone areas. Similarly, it has been shown that in more than 20 districts roads were located in hazard-prone areas, and in 15 districts 100 percent of the roads were located in

earthquake-prone areas. This data showed overall increased exposure of Nepal to the disaster.

As of 26 May 2015, the earthquake damage statistics for Nepal from the 25 April 2015 main shock stood at a total number of 8,510 deaths and 199 missings (GoN, 2015). In 1934, an earthquake of magnitude 8.4 Mw killed 8,519 people and damaged over 80,000 buildings in Nepal (Rana, 1935). Later, the 1988 Udayapur earthquake also resulted in heavy loss of life in the eastern region and also in the Kathmandu Valley (Thapa, 1935). Past records have shown that Nepal may experience two major earthquakes of magnitude 7.5-8 every 40 years. Thus, there is cause for great concern that the next great earthquake may occur at any time, after around 70 years of silence (Chaulagain, Rodrigues, Spacone, & Varum, 2015).

According to Mugnier et al. (2013), Kathmandu has a long history of biggest earthquakes. Of them, one event occurred in 1255 AD, hit the Kathmandu basin very badly, and followed the event of 1344 AD (Mw 7.6) which ruptured the surface far away as Kumaon, and 1934 AD (Mw 8.1). The 1934 AD earthquake induced strong shaking in eastern Nepal and even in Bihar Province of India. It killed 20 percent of the population and damaged 40 percent of all the buildings in Kathmandu Valley. According to the UNDP (2004), 24 of the world's 49 least developed countries, including Nepal, face high levels of disaster risks.

The account says that, on 25 April 2015 and over the next several weeks, or series of displacements occurred ~15 km deep along the buried Main Himalayan Thrust without breaking the surface. Landslide-initiated process chains involve gains in mobilized mass and destructive power through energy and mass transfer cascades. Process chains involving GLOFs are particularly worrisome. The study group identified 4,312 earthquake-induced (co-seismic and post-seismic) landslides.

The landslides caused by the Gorkha earthquake and aftershocks appear to be far fewer than expected when compared to other mountainous regions with similar magnitude earthquakes. This might be due to the lack of surface ruptures induced by the earthquakes and the concentration of deformation along the subsurface thrust fault at 10-15 km depth. In regards to the landslides distribution, authors argue that the earthquake phenomenon is the wide-field land surface deformation pattern, which

appears to have influenced the distribution of landslides. In general, differences in earthquake-induced landslide densities can also be related to the magnitude of strong high-frequency ground motions. As far as earthquake-induced landslides and their impact on the population is concerned, Langtang Valley, 70 km north of Kathmandu, is one of Nepal's major trekking regions that experienced moderate shaking. An analysis of post-event satellite imagery and oblique aerial photographs suggests that co-seismic snow and ice avalanches and rock falls and their powerful concurrent air blasts contributed to the destruction in Langtang Valley that killed or left missing at least 350 people. The distribution of landslides shows positive associations with slope and shaking intensity. The distribution of Gorkha earthquake-related landslides and the terrain susceptibilities to earthquake-induced mass movements provide a basis to predict future patterns of land sliding of earthquake-weakened ice, rock, and sediments especially as aftershocks, precipitation, and snowmelt events continue over the next few years.

One cannot imagine the human and physical loss that would have occurred if the earthquake occurred amidst children being in the class roof of a school or if most people were sleeping at midnight. One eminent earthquake risk expert, Wyss (2015) published a fact sheet immediately in the aftermath of the Gorkha Earthquake when the Government of Nepal roughly estimated the population affected was about 10 thousand around. He suggested that if areas, where the shaking intensity was greater or equal to 6 IMM, were considered, about 22.8 million people and 2,288 settlements would be affected, and 57,700 would die.

Kit Miyamoto, the president of the structural engineering firm Miyamoto International, who just arrived in Katmandu is also on California's Seismic Safety Commission and worked for years in Haiti, spent the day examining which buildings fell and or stayed standing — and why said that Nepal government's projection of 10,000 deaths was more likely than Wyss's higher number.

The fact that the estimations are discrepant is not surprising: individuals and agencies are more concerned with rescue and relief than with developing the sort of exact database a researcher needs at the moment of disaster. A more accurate prediction, using an average mortality rate of about 2 percent of the total population, would reduce that figure to 45,000 fatalities. The estimate of the UN Resident

Coordinator in Kathmandu was much lower: 8 million people in 39 districts, 2 million of whom lived in the 11 most affected districts and about 1.4 million of whom needed immediate food assistance.

The major aftershock occurred on 12 May 2015 caused 163 deaths. Center for Disaster Management and Risk Reduction Technology (CEDIM) (2015) reported that the total economic loss is about 10 billion U.S. dollars, which is about half of Nepal's gross domestic product. The 2015 earthquakes will have a grave long-term socioeconomic impact on people and communities in Nepal [United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA) (2015)].

Nepal Government (GoN) (2015) produced a report on Post Disaster Need Assessment (PDNA) almost two and half months after the aftermath of the earthquake reported the catastrophic earthquake main shock with a magnitude of 7.3, followed by more than 300 aftershocks greater than magnitude 4.0 (as of 7 June 2015). Four aftershocks could be greater than magnitude 6.0, including one measuring 6.8 which struck 17 days after the first big one with the epicenter near Mount Everest. So far, there are over 8,790 casualties and 22,300 injuries. 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 districts have been affected, out of which 14 were declared 'crisis-hit' (see Figure 3) for the purpose of prioritizing rescue and relief operations.

Numerous estimates are being carried out as impact studies or assessments; however, the population dynamics induced due to natural hazards, especially earthquake hazards point of view what we have learned from such a mega magnitude of earthquake needs to be unraveled and discussed among academia, policymakers, and humanitarian discourse by and large.

In particular, from the vulnerability perspective, a real disaster occurs when it strikes an underprivileged population (Donner et al., 2011) since vulnerable groups bear a higher risk of casualties, loss, and recovery compared to able groups.

1.3 Impacts of Main-shock and Aftershocks

Most people usually shared their experiences mostly related to the commotion during the quake, but less heard about the aftershocks. USGS (2015) and Yagi (2015) developed several earthquake rupture models for the 2015 main shock, following the thousands of aftershocks. A common feature of the estimated slip distributions is that large slips occurred north and northeast of Kathmandu, and the rupture propagated from the hypocenter (northwest of Kathmandu) toward the east as well as south (deeper to shallower depth). The fault length and width of the rupture plane are 220 and 165 km, respectively, and its strike and dip are 295° and 10°, respectively. The USGS source model has its maximum slip of 3.11 m (north of Kathmandu), followed by the estimated slip near the hypocenter (1.29 m). In post-earthquake situations, one of the major concerns for evacuees and emergency response teams was the occurrence of major aftershocks and triggering secondary hazards. A larger earthquake is followed by more aftershocks, and returning to a background level of seismic activities takes longer time. Immediately after the main shock, a moderate (*M*w 6.6) aftershock occurred near the hypocenter. On the other hand, the majority of aftershocks occurred in the Kodari region (northeast of Kathmandu); a notable event was the 12 May 2015 *M*w 7.3 aftershock, which caused additional damage and casualties. Comparison of the aftershock distribution with respect to the slip distribution of the main shock indicates that the major aftershocks do not occur very near to the main shock asperity (with a large slip) but they occur in the surrounding areas of the main shock asperity. This is because the spatial and temporal characteristics of aftershocks and the manifestation of internal crustal dynamics involving the redistribution of stress and displacement fields (Stern, 2002; Heuret et al., 2011).

Normally people were unaware of the visible and sensible aftershocks it would occur in the aftermath of an earthquake. A number of aftershocks went on, following the main shock creating wretchedness among the people. Since the first shock, over the span of five months, almost 400 aftershocks greater or equal to 4 ML have been recorded by National Seismological Center (NSC)(2015), while there were some high-magnitude shocks of low magnitude. During the first 24 hours after the main shock, there were about 60 aftershocks (Parajuli, et al., 2015). For example, the first

aftershock occurred 27 minutes after the first shock; the second aftershock occurred 7 minutes after the first aftershock; and the third aftershock was 11 minutes after the second aftershock. Over time, the inter-occurrence time of earthquakes started to increase and it took to cease for more than a year.

As far as the damages due to the earthquake are concerned, out of ten World Heritage sites, UNESCO has declared in Nepal, seven World Heritage cultural sites which Pashupatinath (Hindu pilgrim), Boudhhanath (Buddhist Stupa), Swayambhunath-Monkey temple (Buddhist Stupa), Kathmandu Durbar Square (living god premises), Patan Durbar Square, Bhaktapur Durbar Square, and Changunarayan all heritages are affected (UNESCO, 2015).

Many historical buildings in the Kathmandu Durbar Square were devastated. The complete destruction in the Durbar Square was in sharp contrast with undamaged buildings surrounding the Durbar; several wall cracks can be found on these buildings however, the majority of the masonry buildings are structurally stable. This indicates that the ground shaking experienced in this area was sufficient to cause the collapse of the old historical buildings but was not to cause severe damage to the surrounding buildings. This observation was confirmed by walking through the Indra Chowk area where many old masonry buildings (three to six stories) were densely constructed. Several buildings collapsed completely and some search and rescue activities were undertaken. There were numerous building collapses in the northwest section of the Ring Road along the Bishnumati River.

The local geomorphological map, sites within about 300 m from the river were found alluvial (Holocene) soil deposits, followed by the sites farther east were Pleistocene soil deposits. Thus, site amplification effects due to different soil conditions may be expected in this area. A walk-through survey carried out to investigate the spatial distribution of collapsed and severely damaged buildings in this area. Out of 28 collapsed buildings or severely damaged, 19 buildings were in the alluvial deposit area, followed by 9 buildings in the Pleistocene deposit area but nearer to the boundary. This qualitatively confirms the effects of local site conditions on building damage and collapse. Currently, the apartments are unfit for living and residents were evacuated. The causes of the major damage to the Horizon apartments (and similar high-rise buildings in Kathmandu) may be attributed to the long-period

ground motions. In addition, local topological features may have contributed to extensive damage there.

Along the Arniko Highway between Kathmandu and Bhaktapur, a section of the highway (about 200 m in length) built upon embankments was damaged due to the ground settlement. The amount of settlements was about 0.5–2.0 m, depending on location. The central section of the highway was constructed using reinforced soil retaining wall and overall, earthquake damage in Kathmandu was not widespread but more localized. This may suggest that the overall strong shaking experienced in Kathmandu was not extremely large. The areas that suffered from major destruction tend to have local characteristics, such as soft soil conditions along with some structural deficiencies.

The survey was conducted along the road to Melamchi (about 30 km northeast of Kathmandu). Melamchi and the surrounding areas were close to the locations of major aftershocks (i.e., 26 April Mw6.7 aftershock and 12 May Mw7.3 aftershock; and suffered from devastation due to these earthquakes. On the way to Melamchi, there were many small villages found with extensively damage house buildings. During interviews with local residents, they expressed serious concerns about incessant aftershocks and the urgent need for repairs of the damaged houses before the arrival of the rainy season. To the north of Melamchi, the occurrence of earthquake damages became more frequent. Melamchi is a small town along the Indrawati River, and residents in the town have been involved with a major Melamchi Water Supply project, which diverts the river and channels its water to Kathmandu through tunnels. Overall, the earthquake damage in Melamchi found to be severe, mostly vulnerable masonry buildings than RC buildings (4- to 5-story). For instance, the main street of Melamchi was not completely destroyed, most buildings looked undamaged based on their appearance, although several buildings collapsed. The majority of the damaged buildings were made of brick and stone. Along the road, several sections of the slope suffered from shallow landsides, their debris blocked the road at one time but was removed. There was a steel truss bridge with an RC deck for vehicle crossing; the bridge was not damaged (inspected from the backside). It has been reported that further damage occurred in Melamchi due to the 12 May Mw7.3

aftershock. A further damage survey in Melamchi is needed to investigate the effects of the (although it is beyond the scope of this study).

Baluwa (about 70 km northwest of Kathmandu) is a small twon at the bank of Daraudi River, which is close to the epicenter of the Mw7.8 main shock shows no any sign of earthquake hit. Along the Kathmandu–Pokhara highway (e.g., Abukhaireni, a town located at an intersection between the main highway and the Daraudi link road; about 30 km from the epicenter), no major earthquake damage was observed. Houses observed in distance of about 18 km from the epicenter. Earthquake damage to; proceeding further north toward Baluwa, the extent of earthquake damage to houses became severer. The first stone house that collapsed due to the earthquakes was about 4.5 km from the epicenter. Similarly, many shallow landslides and rock falls were observed along the road to Baluwa; the first middle-size landslide was observed at distances of about 15 km from the epicenter.

The spatial distribution of the collapsed houses and landslides was limited to the locations near the epicenter (within a 10–15 km radius) and were in contrast with Melamchi and Trishuli (i.e., farther from the epicenter). This can be understood by referring to the slip distribution of the main shock. A large slope failure was observed at the northern boundary of Baluwa; the length and height of the slope failure were 300 and 100 m, respectively. The fallen boulders and debris blocked the road completely, disconnecting villages upstream of the Daraudi River (e.g., Barpak, 5 km north of Baluwa); people can reach these places on foot only. This hampered rescue and recovery activities by governments and international aid teams significantly, highlighting the importance of functional critical infrastructure during a natural disaster emergency. The houses in Baluwa were completely devastated, so many residents lived in tents. Local residents said that the fatalities in Baluwa was negligible, since many of the residents were in the agricultural work during the quake. Major concerns about the arrival of the rainy season were expressed by the local residents.

The *M*w7.8 subduction earthquake occurred along the Main Himalayan Thrust arc and triggered numerous major aftershocks. The earthquake damage was catastrophic, causing fatalities of more than 8,500 and billions of dollars in economic loss. It was an important earthquake field observation in Nepal in the aftermath of the

*M*w7.8 main shock. A unique aspect of the earthquake damage investigation is that the data were collected 6–11 days after the main shock, and thus first-hand earthquake damage observations were obtained. To share the gathered damage data widely, geo-tagged photos with observation comments were organized using Google Earth, and made publicly available. The updated version of the Google Earth file, contained more damage photos. Viewers can download them and directly for research and educational purposes.

To gain a deeper understanding of the observed earthquake damage in Nepal, the seismotectonic setting and regional seismicity in Nepal were reviewed and available aftershock data and ground motion data were analyzed. In addition to ground motion data analysis, scenario shake maps were generated by trialing different combinations of applicable ground motion models and source-to-site distance measures to highlight the potential biases caused by estimated ground motion maps and prompt earthquake impact assessments for a large subduction earthquake.

1.4 Statement of the Problem

When the earthquake hit in the early afternoon, about 12 o'clock, everybody was supposed to be in a relaxed mood, especially in the hill and mountain regions, except Kathmandu Valley, since people usually take their food at 10.0 o'clock. But that day was Saturday so, the household or family might take time to take their meal followed by the rest. When the quake hit, everybody must be shocked by the tragic commotion. Of course, everybody felt that the disaster hit more or less proportionately without knowing rich and poor, able and not able, educated and uneducated, powerful and not powerful.

According to the National Population and Housing Census (NPHC) of 2011, the total population of Nepal is 26.5 million living in 5.4 million households. By ecological region, the hills account for 46.7 percent of the total households, followed by the Terai with 46.6 percent, and the mountains with 6.7 percent (Central Bureau of Statistics (CBS), 2012). Of the total population, about 85.3 percent reside in their own houses, followed by 12.8 percent in rented accommodations, 1.3 percent in other arrangements, and 0.63 percent in institutional houses, including barracks, hostels, monasteries, and the like. In urban areas, about 40 percent of households live in

rented accommodations; of households that rent, about 59 percent are found in Kathmandu District.

It is also reported that there are 5 types of foundations of houses: mud-bonded bricks or stones account for 44 percent, followed by wooden pillars (24.2 %), cement-bonded bricks or stones (17.6 %), reinforced concrete cement (RCC) with pillars (9.9 %), and mud-bonded bricks (2.3%). In urban areas, 28.4 percent of households are founded RCC with pillars. As NPHC reported the majority of households (41.4%), particularly those who reside in the mountains and hills, live in houses that have outer walls made of mud-bonded bricks or stones. This is significant as houses built with mud mortar are particularly vulnerable to several types of natural disasters, including earthquakes and floods. There are mixed buildings like stone and adobe, stone and brick in mud, brick in mud and brick in cement, and wooden and brick cement mortar.

It indicates that the population with rented rooms is largely affected by the quake in urban areas, especially in Kathmandu Valley since most of them might be residing under the mud-bonded bricks or stone walls. There are only 1 out of 10 buildings are RCC across the country.

1.4.1 Vulnerability

It is very hard to stipulate the criteria to designate the guidelines and definitions of vulnerability and vulnerable populations. However, various protective guidelines are set forth for the special protection of vulnerable populations. There are questions precisely arise, for example, who are the vulnerable?

The word "vulnerability" stems from the Latin vulnerare, "to wound" as Oxford Encyclopedic English Dictionary (1995) says. Thus, the term vulnerable generally applies to individuals who are susceptible to coercion, such as children, prisoners, pregnant women, and persons who are handicapped, mentally disabled, economically disadvantaged, or educationally disadvantaged. The vulnerability of these individuals is characterized by race, ethnicity, age, sex, and factors such as income, insurance coverage (or lack thereof), and the absence of a usual source of care.

According to Wisher et al. (2004), vulnerability is formally defined as: "…the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard like an earthquake."

Implicit here is that vulnerability varies with social diversity as different populations face different levels of risk means a differential vulnerability goes along with the social, cultural, national, and economic status of a person or a group. Although the sources of vulnerability are multiple and quite diverse, some of the most important factors that affect vulnerability include population distribution and social diversity.

Vulnerability contributes to disaster, which is the susceptibility of people, properties, and livelihoods to the damaging effects of the hazard. Historical damage and loss data provides insights into the vulnerability of people and assets in Nepal. After 82 years, Nepal is very badly hit by earthquakes with almost equal number of death tolls in 1934 and 2015, followed by injuries and house damages. A large proportion of destructive disasters in Nepal are small-scale disasters, averaging more than 90 percent of all disasters, which accounted for more death, affect more people, destroy more houses, and cause more economic damages compared to large but infrequent disasters. This shows that there is a very high vulnerability of both people and assets in Nepal (UNISDR, 2015).

The Pacific Disasters Center ranks Nepal 37th out of 172 countries in disaster vulnerability index. But there is a serious problem with the database. If we compare the death tolls in 1934 (8,519) and 2015 (8790), there are more or less equal, but if we look at the damage to houses, the latter accounts for more than 5 hundred thousand complete damage whereas that of the former accounts for both completely and partially damaged houses about 2 hundred thousand.

Nevertheless, the data collected during the emergency period would not be the priority of the concerned agencies during the emergency period. After six months after the earthquake occurred, GoN (2016) conducted a Socio-Demographic Impact Study by the Ministry of Population and Health in 14 districts: Seven districts were categorized as severely hit, and seven districts were categorized as the crisis hit, as the

PDNA classified. The survey was based on sample households selected on the data pulled from the District Disaster Rescue Committee (DDRC) of 14 districts. There are 10,426 death tolled found against the PDNA has reported an 8,790 death toll in 31 districts, which is 1636 less.

1.4.2 Who are vulnerable Populations?

As a means of prioritizing the allocation of health resources, Brock asks whether justice in health and healthcare should differentiate vulnerable populations from society at large or if just treatment should be derived from a general system of social justice (Brock, 2004). Brock goes on to discuss why this question has received relatively little attention to date in bioethics. He explores complexities in defining vulnerable populations and distinguishes three different moral categories of vulnerable populations:

a. those whose conditions are caused by injustice,
b. those whose conditions are caused by misfortune, and
c. those who are at fault for their conditions

Vulnerable populations account for the economically disadvantaged, racial and ethnic minorities along with many other groups. It also includes rural residents, who often encounter barriers to accessing healthcare services.

From a food security point of view, the definition of vulnerability refers to the propensity to fall or stay, below a pre-determined food security threshold in the future. Vulnerability is a function of exposure to risks/shocks and of resilience to these. Risks/shocks are events that threaten people's food access, availability, and utilization of food security status. Resilience of the food security context is determined by the effectiveness of risk management strategies at different levels and by the resources (household, community, extra-community) that can be drawn upon. Vulnerability correlates positively with the probability and impact of a shock and negatively with resilience and its determining factors ((ESAF), 2004).

In the aftermath of the April 25 earthquake, the groups who are often the target of discriminatory treatment in Nepal, including women who head households,

Dalit (broken/scattered"), also some of them previously known as untouchables, is the lowest stratum of the castes in the Indian subcontinent), Indigenous Peoples or Janajati (a tribe or community as mentioned in the Schedule having its own mother language and traditional rites and customs, distinct cultural identity, distinct social structure and written or unwritten history), and disabilities, are also facing increased challenges when accessing urgently needed relief (https://www.amnestyusa.org/reports/nepal-must-end-discrimination-in-earthquake-relief-effort/).

Survivors reported that in some communities the aid effort has been politically manipulated with 'muscle' – political connections – end up claiming desperately needed supplies meant for everyone. All actors involved in the relief and reconstruction effort must ensure that human rights principles are fully respected.

A rapid assessment report of the situation of Dalit communities, traditionally marginalized in Nepal, has found that Dalits are discriminated against in the distribution of relief materials in Nepal, receiving less aid than the dominant castes and being allocated leftovers from castes that rank higher in Nepal's caste system https://idsn.org/Dalit-short-changed-in-aid-delivery-in-nepal/**).**

Disasters such as earthquakes are natural phenomena but their impacts are not. Various studies shown that the impacts of natural disasters are unevenly distributed and in the post-disaster relief and reconstruction phase, pre-existing discriminatory practices and inequalities along the lines of gender, age, caste, class, ethnicity, and disability are exacerbated and further reinforced (http://blogs.lse.ac.uk/southasia/2016/04/25/women-in-disaster-gendered-vulnerabilities-and-intersecting-identities-in-the-wake-of-the-nepali-earthquakes/).

1.5 Research Questions

Thus, regarding the April earthquake, 2015; what sort of impact it has affected on the population in general and to vulnerable populations? The following specific research questions have been raised.

1. What are the socio-demographic characteristics of the affected population?

2. Why did earthquake hit population account for varied level of knowledge on disaster, rescue operation, and relief distribution in the disaster?
3. How does an earthquake impact living conditions and health? and
4. To what extent did the vulnerable groups recover from the impact of the earthquake in the 2015-2019 periods?

As the literature suggested, the vulnerability concerned, its susceptibility to people, its properties, the livelihood of the population, and its social diversity often come to the mind of the researcher. The Gorkha Earthquakeseverely hits the demography with diversity, and among the diverse population and groups, certain groups are socially, culturally, linguistically, and by gender pre-existing unequal conditions prior to the disaster, therefore, the research questions are more focused on the effect of those vulnerable groups.

However, a review of available literature support identifying the forms and degree of vulnerability intended to measure the dynamics of vulnerability in the aftermath of the earthquake. In order to answer the research questions, the research study needs to set broad and specific objectives.

1.6 Objectives

The ultimate goal or general objective of the study would be to utilize the findings to the study by local and international agencies to plan better vulnerable groups' sensitive disaster preparedness and national Governments in bringing about policy-level changes to better serve the population of vulnerable groups during the time of disaster. Apart from this, the findings will contribute to the academic discourse that how vulnerable groups would be affected by a disaster like an earthquake.

The specific objectives of the study will be:

1. to study the socio-demographic and cultural characteristics of the affected population,
2. to examine a level of knowledge, rescue operation, and relief distribution among population the earthquake disaster hit disprotionately.

3. to reveal the impact of the earthquake on living conditions, health and elderly, and
4. to assess the recovery of vulnerable population that the disaster has impacted by using data sources of in 2015 and 2019.

1.7 Significance

Population in its socially diverse and ethnic composition responds to earthquake disasters on the one hand, and the disaster also hit the weakest group of a society with a high degree of severity. The hazards and vulnerability literature reveals that categories of people living in disaster-stricken areas are not affected equally (Flanagan et al., 2011). Evidences indicate that the poor are more vulnerable at all stages—before, during, and after—of a catastrophic event. The findings are similar for racial and ethnic minorities Nepal has experienced various disasters including earthquakes, and it lies in a high seismic risk region. However, there is a severe lack of academic discourse on the effect of the disaster on vulnerable populations and literary writings in comparison to others. In fact, disaster events and their effect and exposure of the population to disaster are phenomenally quite common, particularly in developing and the least developed countries. And it is also true that the discourse of disaster to possible population hazards yet to be discussed, in Nepal has been dealt with. So, the study on the effect of earthquakes on vulnerable populations signifies both in academic discourse as well as in policy approach for the state or nonstate party.

1.8 Limitations

As the government of Nepal has declared that there are 31 districts wrapped up by the waves of an earthquake with the epicenter at Barpak Village Development Committee of Gorkha District, CDPS (2016) conducted a socio-demographic impact study in 2015 in 14 districts. So, the secondary data used in this study only represents the 14 districts. The study covers the household information of 14 mostly affected districts; however, the earthquake disaster doesn't go along with the political boundary of the 14 districts. So, the study brings the issues, relations, and experiences of earthquakes relevant to policy as well as academic discourse. There are severe cases due to earthquakes, 2015 in out of 14 districts, but this study does not necessarily represent them. So, any statistical analysis and inferences drawn cannot be generalized for the whole 35, districts or more the Gorkha Earthquake has shaken.

1.9 Justifications

When the earthquake hit severely in 2015, Kathmandu was very badly shaken. It happened after 82 years, almost a century. There were narratives heard from aged people about how the mega earthquake, in 1934 hit Kathmandu Valley, and the entire country. There might be very few left who experienced that disaster, so individually they were mentally and physically prepared for the natural hazard and its consequences of earthquake 2015. But none of their experiences are studied, recorded, or documented from a policy, academic, or disaster risk reduction point of view. There is only one book, written by Rana (1935) that is the out of print or unobtainable; so, it is largely felt at the moment of earthquake hit, a rigorous work should be done, is the main justification aim to carry out this research.

A large population in the radius of the 7.5 rector scale hardly knew about thousand and thousand tremors and their unpredicted impacts. Everybody was in great shock with fear; very few might have the preparedness, since they were aware of the outcomes of the hazard, and measure to be taken right after the event.

In such a discrepancy, nobody knew what would happen. There was a large gap between what institution is dealing with such natural or manmade hazards and induced disasters to cope with. Largely people know about the hazards and do believe to mitigate such a hazard literally depends on God. So, everybody worships or prey on god might be the reason not to do research on hazards and disasters, since if god is the reason, then what would be the reason to document the events, measures the impact, and create a discourse that reduces the risk or mitigate the disaster. There is a lack of institutions dealing with hazard-induced disasters in all spheres of human life. There are many global initiatives on Disaster Risk Reduction across the world that engages both policy practitioners and academicians in disaster reduction and mitigation. But, Nepal lacks grossly; so a rigorous study is needed that deals with the natural and manmade hazards, induced disasters, and ways to risk reduction or mitigation. Therefore, this study is spearheading to meet the academic need on the impact of the disaster, especially on vulnerable populations

CHAPTER II

REVIEW OF LITERATURE

2.1 Natural Hazard: Earthquake

Disaster is caused due to natural hazards or manmade conflicts. Natural hazards include drought, landslides, flooding, earthquake, cyclones, volcano, tornadoes, tsunamis, etc. Similarly, manmade hazards are killer fog, fire, nuclear power explosions, waste dumps, radiation leaks, etc. Since Nepal is a mountainous country and it's under a seismic zone created by the collision of the Eurasian and Indian plates. For at least 40 million years, the Indian subcontinent is considered to be penetrating deeper into the rest of Asia. In this process, it has lifted the Himalayas and the Tibetan plateau in front of it. Nepal is located along the active Main Himalayan Thrust arc, where Indian plate and the Eurasian plate are overriding subducting and interacting.

Molnar (1986) argues that the Tibetan plateau, the world's highest and largest, is no mean tribute to the most spectacular consequence of the collision between the subcontinent and the rest of Asia in the world's tallest mountain range- the Himalayas[3]. With each great earthquake, a segment of the Himalayas, perhaps two or three hundred kilometers in length, lurches several meters farther onto the plains; or from another perspective, the Indian subcontinent surges several meters more below the Himalayas. This type of continental collision is not unique to Asia. For at least half of the earth's history, and perhaps longer, continents have split apart, and fragments of the have collided and become stitched together. And it is also believed that the forces pushing the continents invariably cause mountain ranges to form along the structure.

According to Avouac (2003) and Ader et al. (2012), this region accommodates approximately a half of the tectonic convergence between these two plates, i.e., about 20 mm/year. The locked part of the subduction interface has a low-dip angle (about 10°) and is located at depths of 4–18 km (Bilham, 2004), and has the potential to generate *M*w8+ earthquakes (Gupta, 2006). The earthquake rupture propagated from west to east and from deep to shallow parts of the shallowly dipping fault plane

(USGS, 2015), and consequently, strong shaking was experienced in Kathmandu and the surrounding municipalities. This was the largest event since 1934, *M*w8.1 Bihar–Nepal earthquake (Ambraseys and Douglas, 2004; Bilham, 2004).

The present-day structure of the Himalayas results from the progressive under-thrusting of the Indian tectonic plate along the Main Himalayan Thrust (MHT) beneath the Tibetan Plateau. Bilham, Gaur, & Molnar (Aug. 2001) argues that great earthquakes (with magnitudes exceeding Mw 8) have periodically ruptured segments of the brittle upper part of the MHT several hundred kilometers long. A major question as yet unanswered is whether an earthquake of the magnitude of the 1934 earthquake releases all the strain stored by the Tibet-India convergence during the preceding inter-seismic period and only that strain or whether it can also release a background store of energy that remained unreleased through one or earlier earthquakes and so potentially engender a giant event or a relatively random sequence of events.

The main shock (Mw 7.8) of 15 April 2015 originated at *Barpak* and the major aftershock (Mw 7.3) occurred on 12 May 2015 and extended in the east between the border of Sindhupalchok and Dolakha district. Manandhar et al. (2016b) argue that the hypocenters for both the main quake and aftershock were at the depths of 8.2 km and 18 km respectively. Since the hypocenters are of shallow type, the consequences of such tremors produce strong shaking at the ground surface causing more damage across the affected area. These tremors have affected traditional cities/towns, rural villages, new reinforced concrete buildings, world heritage sites, and historic temples together with landslides and slope failures along the highways causing great loss of life. The authors tried to highlight some major geological, tectonic, geotechnical, and structural causes of damage around the area of strong seismic wave propagation. Furthermore, authors have identified directional movements of partially tilted, fully damaged, and cracked infrastructures due to both major shocks. They concluded that buildings older than 82 years were generally severely damaged/ collapsed, since many renovations on these old buildings were performed without considering any engineering designs, and hence have high vulnerability. Manandhar, Soralump, Hino, & Kitagawa (2015c) contrast by arguing that newly built buildings were also demolished because they were poor design and improper construction. Strong base

shear at the columns of the ground floor caused the collapse of buildings in several places. Another reason the RCC buildings collapsed at Gongabu-Samakhusi area was reclaimed from swamps and a rice paddy field, authors said. The rapid urbanization starting more than twenty years ago did not consider the proper treatment of these swampy lands. The poorly compacted ground experience large shaking-induced deformations and settlements causing building damage. This reflects not only geotechnical/geological causes but also improper structural designs producing severe vulnerability and causing greater damages compared to other city core areas.

A common question most frequently asked, and likely to answer is ‘god knows’. The questions asked of scientists after an earthquake are "Why was it not predicted?" and "When will the next one be?”

The ultimate goal of earthquake prediction is, so far, to forecast the magnitude, location, and timing of earthquakes. From the outset, it is important to recognize that although there have not been significant advancements in earthquake prediction in recent years, no guaranteed method has yet been found, nor is it likely to be found in the foreseeable future.

According to Wang, Chen, Sun, and Wang (June 2006), there have been some prediction successes, most notably the February 4, 1975, (magnitude 7.3) earthquake at Haicheng in China, which was based upon seismological research, as well as data from community monitoring programs aimed at detecting earthquake precursory phenomena in the local environment (e.g. from water levels in wells, radon gas content of groundwater, water temperatures, tilt meters, seismographs, magnetometers, and animal behavior patterns). Following the abnormal symptoms observed, the people of Haicheng were first evacuated from their houses on December 20 and slept in the snow for two nights. They were also evacuated again at 2.00 pm the following February 4, and the earthquake struck at 7.36 pm. This saved thousands of lives.

According to Wang et al. (June 2006), in the United States, hundreds of millions of dollars have been spent installing equipment to monitor possible

earthquake precursory phenomena along the San Andreas Fault system in California. The mass of data collected from each new major earthquake in the region serves to increase the chances of predicting the next. However, social conditions in the USA are clearly very different from those in China, and in making earthquake predictions American scientists have to contend with the possibilities of generating mass hysteria and public exodus (which might themselves prove costly in terms of lives lost) from the predicted area of impact.

2.2 Impact on Population

According to the National Population and Housing Census (NPHC) of 2011, the total population of Nepal is 26.5 million living in 5.4 million households. By ecological region, the hills account for 46.7 percent of the total households, followed by the Terai with 46.6 percent, and the mountains with 0.7 percent. Of the total population, about 85.3 percent reside in their own houses, followed by 12.8 percent in rented accommodations, 1.3 percent in other arrangements, and 0.63 percent in institutional houses, including barracks, hostels, monasteries, and the like. In urban areas, about 40 percent of households live in rented accommodations; of households that rent, about 59 percent are found in Kathmandu District (CBS, 2012).

According to the Central Bureau of Statics (CBS), NPHC (2011) reported 5 types of foundations of houses: mud-bonded bricks or stones account for 44 percent, followed by wooden pillars (24.2 %), cement-bonded bricks or stones (17.6 %), reinforced concrete cement (RCC) with pillars (9.9 %), and mud-bonded bricks (2.3%). In urban areas, 28.4 percent of households are founded RCC with pillars. As NPHC reported the majority of households (41.4%), particularly those who reside in the mountains and hills, live in houses that have outer walls made of mud-bonded bricks or stones (CBS, 2012). This is significant as houses built with mud mortar are particularly vulnerable to several types of natural disasters, including earthquakes and floods. There are the mixed buildings like stone and adobe, stone and brick in mud, brick in mud and brick in cement, and wooden and brick cement mortar.

Chaulagain et al. (2015) portrayed eight different types of existing building typologies in Nepal with brief explanations: (a) Adobe, (b) Brick in mud mortar, (c) stone in mud mortar, (d) Brick in cement mortar, (e) Stone in cement mortar, (f) Wooden, (g) Non-engineered building, and (h) Engineered building (Annex I). As the authors described Adobe Buildings are more popular in rural communities in Nepal, since the poor economic condition, people built their houses using materials locally available such as sand, clay, water, and domestic products such as sticks, straw, and/or manure). These buildings are also constructed in sun-dried bricks (earthen) with mud mortar for the construction of structural walls with a thickness of, usually, more than 350 mm. Brick/stone in mud mortar buildings (BM/SM) are low-strength masonry buildings built with fired bricks in mud mortar whereas stone in mud mortar buildings constructed using dressed or undressed stones with mud mortar is common in hill and mountain regions. These types of buildings have flexible floors and roofs. Brick/stone in cement mortar (BC/SC) buildings are possible when/ where advancement or availability of cement in Nepal replaced the brick/ stone buildings with mud mortar by cement mortar. The brick with cement mortar made building walls are constructed for permanent residents. For stone in cement mortar buildings, dressed or undressed stones are used with cement mortar. Wooden buildings are more popular near the forest area in Nepal (mostly in the Terai region) or inner Terai and even the lowlands of the hill as well. In these buildings, tree trunks are used for wooden pillars whereas a dressed piece of wood is usually used for columns. The walls of these buildings are constructed with wooden planks or bamboo net. Reinforced concrete buildings (RC) consist of a frame assembly of cast-in-place concrete beams and columns. The authors have also scrutinized the RC^4 buildings that currently exist in Nepal.

Goda et al. (2015) extensively carried out a study of right aftermath of an earthquake that occurred in Nepal in 2015 and concluded that, in Kathmandu, earthquake damage to old historical buildings that were severe than the surrounding buildings. The damaged buildings were made of stone/brick masonry structures with wooden frames. The RC frame buildings performed well during this earthquake. This indicates that ground motion intensity Kathmandu experienced was not so intense, in comparison with those predicted from probabilistic seismic hazard studies for Nepal. Therefore, caution is necessary related to future earthquakes in Nepal because the

2015 earthquake is not necessarily the worst-case scenario. The local soil characteristics and/or structural deficiencies were found to be cause of building collapse. In this regard, studies provide valuable insights into earthquake damage occurrence.

Some buildings that were severely damaged by the main shock collapsed due to major aftershocks. The aftershock forecasting, building evacuation procedure, building inspection and tagging, and building repairs and retrofitting (low-cost solutions) need to be improved to avoid the earthquake damage potential. Fortunately the buildings in Kathmandu were largely unaffected by the long-period ground motions in the Kathmandu Valley because of non-resonance. However, Takewaki, Murakami, Fujita, Yoshitomi, and Tsuji (2011) argue that earthquake engineers should pay careful attention to long-period ground motions when tall buildings are constructed in the central part of the Kathmandu Valley. Adequate structural design is the key to reducing the earthquake risk in Nepal.

Anhorm, Lennartz, and Nusser (2015) studied rapid urban growth and earthquake risk in Musikot, a mid-western hill in Nepal aiming for the mid-size trade and service center in rural Nepal to increase the vulnerability of its inhabitants to natural hazards. The authors tried to analyze the increasing local earthquake risk in light of insufficient seismic building code implementation and risk-sensitive urban planning. As a study approach, the authors used photography and field mapping of the urban development of Musikot which reflects the increasing fragility of the building stock. They also assessed by using a modified seismic evaluation scheme for local building types. As the findings of the study, almost one-fourth of all construction was found to be at high risk of damage to earthquakes. They argue that without proper training in earthquake-resistant construction techniques and awareness campaigns, the (mal-) adoption of modern construction materials will amplify earthquake risk in rural centers. The study stresses the need to broaden the research of disaster risk reduction and adequate adaptation strategies beyond the current focus on large agglomerations to include rapidly urbanizing rural areas.

Most target big cities are located in seismic active regions such as Santiago de Chile and Tokyo (Stein and Toda, 2013), Tehran (Shakib, Joghan & Pirizadeh, 2011), or Kathmandu (Dixit, Yatabe, Dahal, & Bhandary, 2013).

And it is also true when we take the devastating earthquake events that occurred in Gujarat in 2001 in and Kashmir in 2005 in India, Sichuan in 2008 in China, and the most recent one in Gorkha in 2015 in Nepal. All have shown the devastating effects of earthquakes in regions outside such large urban agglomerations. Poorly located and substandard housing poses a high risk to resident populations; leading them to be figuratively called “weapons of mass destruction” (Bilham & Gaur, 2013).

According to Halvorson & Hamilton (2007a), a large body of literature on 'seismic culture', a broad concept that encompasses, a range of cultural adaptations to seismic risk and hazard exists. They highlight the deteriorating local knowledge of hazards, demographic dynamics, the livelihood transformations, and the concentration of knowledge in internationally well-connected urban agglomerations. Nepal is an example of a country experiencing a profound loss in 'seismic culture', as manifested through a decline in local building practice in preference to new substandard buildings, for which this study will contribute quantitative evidence on the degree of building susceptibility to the earthquake. The authors compared the settlement pattern in urbanization taking place in Musikot, Rukum in 2004.

The Gorkha Earthquake of April 2015 has revealed the fragility of the built environment and the resulting social vulnerability in Nepal. Rukum District, despite its distance from the epicenter, sustained considerable damage to its built-up area (71 damaged, and 136 partly damaged buildings (GoN, 2015). Authors argue that the continuing risk of large earthquakes in the future requires the Government of Nepal to make serious efforts to implement spatial planning tools beyond the Kathmandu basin and enforce updated building codes. Risk-sensitive land-use planning, as recommended by the Earthquakes and Megacities Initiative for the Kathmandu Valley (Kathmandu Metropolitan City, Nepal, 2010), needs to be developed and enforced for a multitude of small and rapidly urbanizing towns throughout the country.

Ground Truth Solutions (GTS) (2015) conducted the Community Survey in the first week of August, right after about 4 months of earthquake occurred. There were 9 questions (Annex- II), asked the earthquake-affected respondents of 14 severely hit districts. It was the first round of what would be a monthly survey as part of the Inter-Agency Common Feedback Project in Nepal.

The question of whether earthquakes affected the population's main problem was being addressed. The majority of respondents did not feel their most important needs were addressed. About 50 percent responded 'not at all'. Districts with the lowest scores were Makwanpur, Sindhupalchowk, Nuwakot, and Kathmandu; People in the districts of Ramechhap and Gorkha were less negative. Those working for the government and NGO/business sector are less negative than the average. People from the Gurung ethnic group were slightly more positive than the rest. People reported to be no ethnic group were mostly negative. The least proportion of females than men, 25 to 39 years of age groups than the others, and Janajati than the other groups reported that their main problem was hardly addressed yet. The most needed items of the earthquake-affected population were long-term shelter (housing), followed by financial support and short-term shelter (tent/ shelter box). Following this, in a second question, affected people were asked if they were satisfied with the government's doing. Slightly more than one-third of the respondents expressed their satisfaction with almost two-thirds of the efforts the government did for earthquake-affected people. Slightly less than one-third of respondents were found to be neutral to opine on this question. About 13 percent of respondents were found to be completely satisfied with the state's maneuvering.

It is interesting since only one-third didn't opine whereas slightly over one-third was found not satisfied, and out of the remaining one-third population about 13 percent is slightly over one person is satisfied out of the ten earthquake-affected people.

Studies revealed that by ethnic groups, Gurungs were significantly more positive than other groups, while Newar and other Janajati groups are most negative. A most urgent concern of affected people with the government is the building materials and cash for work. Another question is whether people have had the information that they needed to get relief and support. Two out of five respondents didn't have any information about the relief and support. Only 13 percent of respondents were completely informed about the relief and support they would get. By gender, females were found to be uninformed, followed by the age, 55 years plus, by ethnic groups, Tamang and Janajatis were found to be least informed about it. In regards to the NGOs' performance and level of satisfaction, earthquake affected

population was found to be less satisfied (32%) than the GOs (37%). It is right since the presence of GOs cannot be undermined against NGOs. Except for Gurung, the rest of all Janajati ethnic groups are found to be dissatisfied even with the efforts of NGOs.

In a question about the support provided in a fair way, more than half of the respondents expressed negative views. Mostly Janajati excluding Gurung, and ethnic groups without any identity said that the support during the emergency was unfair. It is interesting, since in a question of preparedness against the upcoming monsoon, about 20 percent reported that they were completely prepared for the monsoon. Another question is whether they were heard. Almost half of the respondents said that they were not heard at all. Among the various ethnic groups, Dalits expressed their concern that they are often not heard by others.

In a question about the particular problems of women that were addressed, only 6 percent of women reported that their problems are completely addressed. From ethnic groups point of view, Brahmin women account for the largest percentage that their particular problems were not addressed.

UKaid from the British people (September, 2015) carried out Information and Communications Needs Assessment by Communicating with Communities Working Groups using an interagency approach in 8 earthquake-affected districts. A total of 222 key informant surveys across 10 affected districts were completed during the period of July and August.

A total of 69 percent of respondents had been displaced from their homes and were staying in a temporary shelters or designated camps; this may have an impact on how information is communicated among affected people and others. ‘While the local language remains critical for effective communications, more than 80 percent of respondents do regularly communicate in Nepali’ the findings say. An overwhelming majority respondents used and preferred radio and television to receive information. Mobile phone was also an identified key source of information. While these sources were important for respondents, access remained a challenge with respondents citing lack of electricity as the main barrier to information. Despite this, a majority (94 percent) of respondents have had regular access to radio with fewer (72 percent) able

to regularly access television. As an effective medium of communication, Mobile phones are primarily used to send and receive calls. In addition, nearly 50 percent of respondents also use mobile phones to listen to the radio or receive information/alerts. While internet access is limited, those who do access the internet primarily do so through mobile phones (60 percent). A majority of respondents (87 percent) could recall receiving information related to earthquakes. However, the action taken on the information received is unclear and requires additional investigation.

Prior to the disaster, about 96 percent of people relied on Television and Radio to get/ receive the information. In contrast, among people surveyed in the Dolakha district, 20% of people did not know the ways of finding the information before the disaster. About 94 percent of interviewees reported that they use mobile phones to call their friends and family members. An interesting observation is that 34 percent of respondents said the main question people are frequently asking was about 'what was happening there,' followed by information about relocation (19%), and weather (13%), and so on. In contrast, half of the interviewees in Sindhuli were concerned about the relocation and 40 percent were concerned about the weather. Regarding NGOs working with recovery, relief, and recovery activities, among those interviewed about 55 percent said not at all. Of the interviewed, about 2 percent reported that they had a lot of health problems, followed by some difficulty (12%) against no difficulty (86%).

Flowminder.org (2015)[5] conducted a study on, 'Nepal Population Estimates 19th August 2015' in severely affected by earthquake 14 districts including Kathmandu Valley. The study had extensively updated the earlier report on movement and displacement patterns in Nepal following the Gorkha Earthquakeand aftershocks. In addition to updated versions of earlier analysis the study focuses on a) longitudinal trends in the estimated number of displaced per district, b) trends in return among people who left their district after the earthquake, and c) VDC level estimates of displacements and returns for selected districts.

After the earthquake, fewer people move into Kathmandu Valley than the normal situation, but the trend has now been reversed, and estimated 130,000 persons more than expected come into the Valley since the earthquake. Except for Kathmandu Valley, the majority of the districts received above-normal levels of

people after the earthquake, whereas people moving into districts apart from the earthquake affected gradually decreased. Notable exceptions are Ramechhap and Dhading where the number of people in migration is increased since mid-July. In all districts, most people who left the district early after the earthquake have now returned (between 4-14% have not, depending on the district). Most of the returns took place shortly after the earthquake. Contrary to expectations, Sindhupalchok, Rasuwa, Ramechhap, Gorkha, and Dhading have the smallest proportion of people who have not yet returned. However large parts of these districts have no mobile coverage and are therefore excluded from analyses.

The Flowminder team have made a pioneere analysis of mobile network data to support responses to natural disasters and epidemics. Changes in mobility patterns are identified by comparing SIM card movements before and after the earthquake to normal pre-earthquake movements. This is done through the estimation of pre-earthquake 'home locations' and comparison of these locations between a pre-earthquake baseline period (1 Jan to 7th April, 2015) and the present (13th-19th August). Estimated normal movements (based on the pre-earthquake period) are subtracted. Mobile phone use was relatively lower in several groups including women, children, the elderly, and the poorest. If these groups have had substantially different movement patterns than groups with high mobile phone use, results would be biased. In general, the relative distributions of flows across the country were more reliable than absolute numbers given per area.

Study shows that an estimated 63,000 people more than expected had left Kathmandu Valley after the earthquake (ratio to the population 2.3%). An estimated 130,000 persons more than normal had come into Kathmandu during the same period (ratio to the population 4.7%).

Abnormal flows from Kathmandu were directed towards many districts; but are particularly apparent to the surrounding districts of Nuwakot, Dhading, and Ramechhap as well as to the district of Inaruwa to the South-East of Nepal. The largest inflow is to the city center of Kathmandu itself. VDCs neighboring the city center also show relatively large inflows. Kathmanduits were still away from home.

Parajuli and Hayness (June, 2016) published an article entitled, 'The earthquake impact on telecommunications infrastructure in Neal, as a preliminary spatial assessment. The main argument of the paper was to spatially describe and examine the distribution and correlation of the epicenters of the 2015 Gorkha earthquake and telecommunications infrastructure. It was found that the epicenters and WiMAX base stations are spatially clustered. However, the clustering patterns are different – telecommunications infrastructure was more clustered with increasing distance compared to the epicenters. In both cases, the clustering pattern became more dispersed over distance. In addition, the spatial association statistics suggest that there is a significant positive local spatial correlation for the distribution of the epicenters and WiMAX base stations. Essentially, the results obtained from distribution and correlation analyses for the epicenters should be contingent upon the fault zone and of the base stations upon the population and terrain conditions of the entire country.

The response to the 2015 Gorkha earthquake suggested that the Nepalese government and telecommunications operators were capable of working together to deal with a disastrous event.

However, as Nepal lies on a seismically active region and earthquakes are random and unpredictable, the consequences of another large earthquake and its aftershocks would less likely to reflect the 2015 Gorkha earthquake. Although, government agencies and operators learned a lot from the recent earthquake, a piecemeal effort might not be sufficient to deal with a new situation.

Fisher (1998) suggested that, in the immediate post-impact period, individuals rarely panic and behave in an orderly fashion. Instead, they got involve in activities, such as search and rescue, debris clearance, and utility service restoration. Emergency organizations and governments also started responding to the aftermath. By the recovery period, normalcy would have returned to the society.

In any case, the general public, government officials, first responders, security forces, and agencies that were involve in search and rescue efforts, relief and restoration operations, and disaster management rely extensively on telecommunications networks to share, exchange, and gather information. Hence,

telecommunications systems were not only relevant to societal functioning and economic activity, but are central to support response capabilities.

2.3 Vulnerability

According to Fordham (2004), the vulnerability perspective has shifted the dominant perspective of control of physical hazard agents to engage with social structures and inequalities. And vulnerability approach also shifted the emphasis from post-disaster response to pre-disaster mitigations of conditions that create a disaster. Blackie et al. (1994) argue that vulnerability is deeply rooted, and any fundamental solutions involve political change, radical reform of the international economic system, and the development of public policy to protect rather than exploit people and nature. It means a real change from vulnerability to resilience cannot be made without a political economy approach and without disturbing the status quo. The vulnerability approaches have now emerged in the community engagement model with participatory forms emphasizing bottom-up approaches in which community groups have a clear place (Fordham, 2000).

The vulnerability has received a substantial amount of scholarly attention in recent years (Cutter, 1996; Comfort et al., 1999; Lewis, 1999; Bankoff, Frerks, & Hilhorst, 2004). However, relatively few empirical studies have examined the specifics of earthquake vulnerability in Central Asia. Vulnerability has been taken to mean the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard (Wisner, Blaikie, Cannon & Dav, 2003). The central concern of this vulnerability analysis is attributed to political, cultural, and economic factors that influence overall societal exposure and susceptibility to seismic hazards. Thus vulnerability in the earthquake disaster process is fundamentally shaped by social divisions drawn along gender, class, clan, age, religion, and/or ethnic lines. As with environmental hazards, in general, the differential vulnerability of women, in particular, is evident in the injury and mortality data are associated with recent events (IFRC, 2006).

Vulnerability research is critical at a time when natural disaster-related mortality figures have reached an all-time high, since 1600 (Jackson, 2006) with

mountain-based populations in the less developed world experiencing greater post-earthquake vulnerability due to the remoteness of settlements, the difficulty of accessing humanitarian aid, and lack of funds for reconstruction in marginalized areas. The 2005 Kashmir Earthquake, with 7.8 magnitudes, was particularly catastrophic and underscored the need to expand vulnerability science in the region, a high probability that an earthquake of similar magnitude may strike in two decades near a Central Asian population center (GHI, 2006).

The damage and upheaval associated with major earthquakes in highland Central Asia have exacerbated challenging social and material realities. Present challenges are associated with several observable trends:

1) the destabilizing nature of colonial/postcolonial experiences and current geopolitical tensions;
2) intense internal struggles that manifest themselves in civil wars, violence, and weak institutions;
3) increasing dependency of local communities on the global economy via wage labor, markets, and foreign capital;
4) rapidly expanding urban construction and transportation networks to facilitate industrial development and global tourism; and
5) population pressures at lower elevations which drive the expansion of settlements into marginal areas and landslide-prone slopes (Kreutzmann, 1995; Halvorson, 2005; Jackson, 2006; Olimova & Olimov, 2007a).

The interactions between these complex factors have led to the slow erosion of what Degg and Homan (2005) term "seismic culture." In a seismic culture seismic hazards could have been adapted and ingrained in society through knowledge sharing, indigenous building practices, vernacular architecture, and so forth (EUCCH, 1993; Degg & Homan 2005). Seismic culture as a broad concept that we use encompasses a range of cultural adaptations to seismic risk and hazard. We also bring the mountain-based experiences of women that bears the relationship between vulnerability and seismic culture by underscoring women's roles in reducing seismic risk and "building the resilience of nations and communities to disaster" (UNISDR, 2005). In this study empirical data collected as part of a research project on the geological and societal impacts of earthquakes analyzed in the predominantly Muslim cultural realm

encompassed by the Tien Shan, Pamir, Hindu Kush, Karakoram, and Western Himalaya ranges.

The analysis of data underscores several interrelated factors—diminishing levels of indigenous hazard knowledge, demographic shifts, gendered livelihood transformations, and the lack of public access to earthquake information—that interact in ways that reduce the capacity of mountain communities to resist or recover from the harmful impacts of earthquakes

2.4 Diminishing Levels of Indigenous Hazard Knowledge

Recent earthquake disasters have exposed evidence of diminishing levels of indigenous hazard knowledge, specifically about geophysical hazards and approaches to coping with the high levels of seismicity is evident in indigenous building practices and vernacular architectural styles (Ambraseys & Douglas, 1975; Spence and Coburn 1984; Gardner and Dekens 2007). The traditional timber-laced construction pattern and stone masonry, for example, proved highly resistant to the earth movements caused by the Kashmir Earthquake (Rai & Murty 2006). Learned from ancestors and personal experiences, a base of the hazard knowledge is embedded in local traditions, skills, and culture. Unfortunately, traditional approaches to home construction have been gradually replaced by "modern" architectural styles. Less on indigenous engineering practices sensitive to seismic loading and more on quick construction and cheaper materials unable to resist extremely dangerous situations.

The diminishment of indigenous seismic knowledge which is a self-reliance and kinship based system and friendship networks utilizes in house construction are being replaced by contractors who provides housing for payment. Individuals in low-income categories, recent migrants- refugees, and women as a whole tend to have little to no role in designing and building the dwellings in which they live or in ensuring that construction meets codes.

Another important area in which seismic culture has been diluted is in the realm of indigenous monitoring of earthquake indicators. Women and men in northern Pakistan reported anomalous animal's behavior in the days and hours preceding the earthquake. These types of behavior included birds flocking and leaving the area the

day prior to the earthquake and normally docile buffalos breaking chains and escaping just hours before the earthquake struck. While similar earthquake indicators have been examined elsewhere in Asia (Tributsch, 1984; Ikeya, 2004), various observations suggest that little credence is given to locals' intimate knowledge and careful monitoring of physical surroundings and behavioral changes in animals. Interestingly, in Tajikistan scientists have successfully forecasted impending natural disasters using a set of natural cues; however, the Western scientific approach to disaster risk reduction tends to place the role of these macro-anomaly earthquake precursors in the realm of quackery (Halvorson, 2005).

2.5 Demographic Shifts

Relatively, the demographically young age of the population has contributed to the erosion of seismic culture. All four countries show a young median age: 23.9 years in Kyrgyzstan; 19.2 years in Tajikistan; 16.4 years in Afghanistan; and 20.3 years in Pakistan (UNDESA, 2007). The relatively young age of the population influences the level of preparedness, planning, response, and recovery of mountain communities. A significant portion of the population lacked experiences and skills that would, first, help quell fears and encourage hope among earthquake victims that people survived these events in the past; and second, serve as guides for what to do to stay alive or, at the very least, propagate what strategies worked in the past to help mitigate earthquake damages. Such experiences, skills, and memories were fundamental to the development, maintenance, and transmission of seismic culture. Instead, hazard-related information is typically held and shared by elders and passed on orally to younger generations. One of the Kashmir Earthquake survivors commented that children didn't previously, but now they ask why the earthquake happened so the teachers also talked about it. Yet, the trends in migration, human movement, and social change (Olimova & Olimov, 2007b) implied the uprooting and relocation of younger segments of the population with an overall erosive effect on cultural adaptations to seismic exposure.

2.6 Gender, Livelihood, Transformations

Gender, a dimension of livelihood transformations, is also taken as another important factor affecting earthquake vulnerability. Mountain-based livelihood

strategies are being reoriented within the global economy (Kreutzmann, 1995; Pandey & Misnikov 2001). As such, the high rates of poverty, unemployment, and increasing pressures for cash have encouraged men and boys to seek employment elsewhere in the region, in distant urban areas, or overseas. Consequently, the outmigration of men from rural communities is now commonplace.

On the local level, the effects of male off-farm employment and outmigration in weakening seismic culture in Central Asia are manifold. First, there is a marked increase in women's agricultural and household responsibilities in the absence of men. Women have been left with little or no time for supervising house construction let alone community organizing or attending disaster preparedness information sessions. Second, there was a concomitant draining of skills, such as in the areas of literacy and community leadership, and able-bodied men engage in physically demanding construction. This loss of skilled manpower affects all social and economic sectors, particularly the capacity to cope with disasters. We have found that post-earthquake health problems have been exacerbated by the lack of residents trained in first aid and emergency medical assistance. Third, livelihood transformations affect demographic shifts, such as imbalance sex ratio, and dependency ratio, and their spatial location places locate them more at risk of seismic impact. And fourth, men who have left rural areas indefinitely to pursue opportunities in urban centers may gain access to skills, training, and knowledge, yet are less like to pass to family members back home. This leaves one of the most vulnerable populations— mountain women and their children—isolated from information about seismic hazards, disaster preparedness, and emergency services.

There is a lack of public access to earthquake information. The lack of public access to information about the geophysical processes which cause earthquakes and awareness of the steps individuals could take to protect themselves from impact produces a form of "informational vulnerability" (Degg & Homan, 2005). Nearly half (45%) of the interviewed women and men believed that the Kashmir Earthquake occurred because of God's will and God's will and destiny choose who survives and what places get destroyed. There was also a disturbing campaign alleging that the Kashmir Earthquake was due to women's sins, inappropriate behavior, and dress. The superstitions do exist in a lack of sound information on metaphysical phenomena

focusing on the physical hazard, preparedness, and planning. Information dissemination among the public found to be heavily scrutinized and censored in Central Asian countries marked by powerful urban elites and hierarchical socioeconomic structures. Degg and Homan's (2005) study on earthquake vulnerability in the Middle East also shows a similar situation where existing power relations and informational disconnect between government officials, scientists, and the public sentiments. That expands the gap between community members' weak perceptions of earthquake risk and vital life-saving information. Nonetheless, the individuals who were interviewed in northern Pakistan hoped for greater knowledge transfer and disaster risk reduction measures.

2.7 Vulnerable Population

Seager (2005) noted:

> In the 1995 Kobe (Japan) earthquake, one and a half times more women died than men; in the 1991 floods in Bangladesh, 5 times as many women as men died; in the Southeast Asia 2004 tsunami, death rates for women across the region averaged 3 to 4 times that of men (p.35).

These figures accentuate the situation that women experience levels of risk and impact disproportionately owing to spatial location, patriarchy, gendered social structures, and political marginalization (Enarson & Morrow, 2000; Chew & Ramdas, 2005).

Empirical data shows that during earthquake disasters women's vulnerability is apparent. For example, they are found more likely than men to die as a direct result of a seismic event; they have been at a increase risk of physical violence and domestic abuse following an earthquake; they do not have access to equal levels of healthcare as men; they might be denied relief aid or compensation for losses if male family members are not present to navigate the available aid channels; and they suffer from voicelessness in the political process of recovery and reconstruction (Hamilton & Halvorson, 2007).

Widespread poverty in combination with a highly patriarchal social structure that places constraints upon women's lives and mobility (Ishkanian, 2003 & Halvorson, 2005) results in women being least likely to have access to information prior to an earthquake. And women are the least likely to have a place to go in case of an evacuation; if a safe place to go is given, they are the least likely to go there.

The characteristics of recent earthquake disasters in highland Central Asia and their consequences at local and regional levels seemed to be comparable to and illustrative of many earthquake-prone areas elsewhere in the world. Careful research has advanced the scientific understanding of the dynamic processes associated with the high-energy tectonic collisions between the Eurasian, Arabian, and Indian plates (Dricker, Roecker, Vinnik, Rogozhin, & Makeyeva, 2002). Despite the progress in analyzing the seismic threat in Central Asia, mountain communities remain vulnerable to earthquake disasters structure, destroyed agricultural land, and buried villages.

2.8 Social Vulnerability

According to Levine, Esnard and Spat (August, 2007), Hurricane Katrina displaced more than one million people of whom were low-income minorities. Morrow (2005) noted that twelve years after Hurricane Andrew struck Miami-Dade County in South Florida, many vulnerabilities still remained, particularly with respect to rental housing and certain groups, notably the poor, minorities, the elderly, large households, and female-headed households, were disproportionately affected. The relationship between the physical and social aspects of vulnerability has been acknowledged by many scholars.

Social vulnerability involves the relative ability of an individual, household, or community capacity to respond appropriately to threatening conditions. Lack of income, lack of transport, age, gender, minority status, lack of information, and numerous other factors may contribute to social vulnerability (Bogard, 1989; Dow, 1992 & Smith, 1992). They have noted that vulnerability is a function not only of immediate physical conditions but also of society's capacity to withstand disasters. Dow and Downing (1995) defined vulnerability as a multi-dimensional construct captured in physical and socioeconomic factors. Other researchers have integrated

social response with physical risks in a wide array of spatial contexts (Degg, 1993; Lewis, 1987).

Kamel and Loukaitou-Sideris (2004) found that following the Northridge earthquake, marginalized groups continued to encounter problems in accessing residential aid and assistance. By vulnerability, the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard (an extreme natural event or process). It involves a combination of factors that determine the degree to which someone's life, livelihood, property, and other assets are put at risk by a discrete and identifiable in nature and in society (Winser et al., 2003). They pointed out:

> the vulnerable groups are also those that also find it hardest to reconstruct their livelihoods following a disaster, and this, in turn, makes them more vulnerable to the effects of subsequent hazard events. The word 'livelihood' is important in the definition. We mean by this the command an individual, family, or other social group has over an income and/or bundles of resources that can be used or exchanged to satisfy its needs. This may involve information, cultural knowledge, social networks, and legal rights as well as tools, land, or other physical resources (p.320).

Later they developed the livelihood aspect of vulnerability as an 'Access model'. The Access model analyses deal with the impact of the hazards they face in terms of what level of access they have (or do not have) to the resources needed for their livelihoods before and after a hazard's impact.

There are three important differences between the vulnerability of the rich and the poor; fiirstly, few rich people would be affected if we compare the number of victims of landslides in various cities around the world. Money can buy design and engineering that minimized (but of course does not eliminate) the frequency of such events for the rich, even if they were living on an exposed slope. Secondly, living in the hazardous canyon environment is like a choice made by some of the rich in California, but not by the poor Brazilian or Philippine job seekers who wouild live in hillside slums or on the edge of waste dumps. The distribution of disaster deaths today skewed towards low- and middle-income developing countries. Why? Within these

countries, the rural and urban poor and marginalized are more heavily affected. Why? What is the distribution among nations and within countries to do with power and its distribution? Although human beings generally have to tread carefully and with great ingenuity on a restless planet, whilst the hazards dealt with are natural, disasters are not natural. They are more a matter of power and social justice (Wisner et al., 2004).

According to Coburn and Spence (1992), almost half of this total has occurred in China, which also suffered the most devastating single event in the 1976 Tangshan earthquake which resulted in 242,000 deaths (cited in Blaikie et al.,1994). As authors said that at the end of the 20th century, there have been an estimated 1.52 million officially reported deaths from earthquakes.

Marable (June 2006) articulated the human tragedy that Hurrican Katrina created in New Orleans highlighting where an interesting and important debate about the underlying causes of black suffering and oppression. The question being debated was whether race and racism were most responsible for the Katrina crisis that disrupted the lives of hundreds of thousands of African Americans, or whether class and poverty were relatively more significant in explaining this human catastrophe. The media and other reports were taken into account as the sources of information to analyze the situation.

As far as racial inequality and its impact on disaster are concerned, most of the people affected in New Orleans were poor; in terms of poverty, nearly 70 percent of African Americans had 30 percent of its residents living below the federal poverty line. In the flood-devastated Ninth Ward, with a 98-percent black population, the poverty rate exceeded 40 percent meanwhile about 40 percent of working-age adults were accounted for as unemployed. In a debate on Race and Class and its impact on disaster, the authors suggest that several examples pointed out that the poor Blacks in New Orleans had to face discrimination due to race rather than class factors. One example of this was the comprehensive study done by the National Fair Housing Alliance, a coalition of 220 civil rights and nonprofit fair housing organizations in 2005. The study suggested that there was the unequal racial treatment of black Vs white Katrina victims in their attempt to secure temporary housing after the disaster.

In a question of why people relocate or stay or what factors led to the household relocation- temporary or permanent, Girard and Peacock (1997) carried out a survey at different intervals after Hurricane Andrew involving the respondents from South Dade to understand the ethnic relocation patterns. In their findings, Anglo households in general were most likely to leave their homes where as Blacks were the least to leave and Hispanics showed an intermediate tendency. The findings also suggest that blacks were less likely to relocate after the hurricane not only because of economic constraints but because of barriers created by residential segregation. It implies that residential segregation may be considered a cause and not simply a consequence of racial disparities in opportunity. Several proponents of this view suggested that racial segregation multiplies the effects of economic deprivation – poverty, crime, family dissolution, welfare dependency and so on. In parallel to this effect of segregation, in disasters, it appears to limit the movement out of disaster areas and stifle recovery for the blacks. Racial inequality must be considered when assessing the urban landscape's vulnerability to natural disasters. There also needs to be more focus on urban ethnic ecology and residential segregation. It shows that disasters simply reinforce the effects of segregation and marginalization and hence Blacks face more barriers to recovery. The policy implication for this is that issues related to maintenance and creation of segregation must be examined and addressed long before disaster strikes because they have an impact on the recovery of the impacted communities. Further vulnerability mapping which takes physical risks further by overlying them with social factors that produce vulnerability would be an important step in ensuring disaster mitigation.

Paton (2006) argues that communities can be benefited from disasters. Communities can adapt and even grow does not mean that they should be left to fend for themselves. A corollary is that in many places the adaptive capacities are lacking, so when communities are included in emergency planning, they can adapt the ecological and social level strategies. A corollary is that how risk is conceptualized, assessed, and managed needs to be thought through. The contemporary use of 'risk' focuses on potential losses as it focuses on vulnerability. This does not represent the risk paradigm in a way that encapsulates the evidence of adaptive and growth outcomes from disasters. A return to the original concept of risk – as a probability of an event accounting for gains and losses that the event could represent could deal with

this problem. This would mean conceptualizing 'Risk' as how hazard characteristics interact with those individual, community, and societal elements that facilitate the capacity to adapt (increased resilience) and those that increase susceptibility to experiencing a loss (i.e. increased vulnerability). Thus in this framework, risk management is considered as consisting of two coexisting elements of vulnerability and resilience. The authors suggest that while vulnerability factors increase the susceptibility – it does not mean that their presence means automatically increased risk. Rather vulnerability factors may coexist with factors that facilitate resilience to adapt to adverse circumstances. It is the relative balance between vulnerability and resilience factors when mobilized when confronting hazard effects that determine risk. In conclusion, the authors suggest that 'Resilience is about nurturing and sustaining capacities of the people, communities and societal institutions to adapt and experience benefits from the disaster'.

On the other hand, Buckle (2006) argues that people do not exist solely as individuals but also as social beings- they belong to: Families, tribes, or clans, localities, and communities, social associations- for clubs, faith associations; Organizations (Pvt. Firm or bureaucracy) and systems (economic and environmental systems). All these different levels indicate a level of autonomous capacity at each level that can be used to act upon and therefore exists and is semi-independent of their constituents of individual members. That is they are quasi-independent entities- who possess assets such as networks and values that facilitate daily life.

The authors also suggest that the traditional characterization of particular groups of people- such as aged, etc as being vulnerable does not tell us which people in a particular situation may be vulnerable- this is because the people or groups of people have a specific mix of vulnerabilities and coping strategies that depend upon their circumstances and context of the hazard and interaction with the personal and group. The traditional lists, therefore, have only an indicative value at best. Instead, the functional approach defines resilience and vulnerability as characteristics that can be reduced or enhanced with observable and measurable effects.

The elements that support resilience at the community level are knowledge of hazards, shared community values: commitment to community goals; established social infrastructure: information channels, social networks, and community

organizations (e.g. churches, and clubs) positive social and economic trends – viable economy contributing to sustainability partnerships: between agencies, community groups, and private enterprise resources and skills: can be generic attributes (management or financial skills, human resources potential). Thus what was suggested was, therefore, a functional approach where vulnerability was assessed on the basis of the ability of a person or a group or community to work towards and to attain certain basic goals, such as the capacity to manage their own affairs, to have access to appropriate and appropriate levels of resources, including food, water, shelter, health care, education, and cultural activity, social inclusion and information and access to other necessary and desirable services. However, a situational/contextual assessment is needed so that local circumstances are taken into account to assess capacity and vulnerability. This in turn can provide a framework for developing appropriate mitigation, remedial, and support mechanisms.

Hilhorst and Bankoff (2004) worked on mapping vulnerability, referring to Cannon (1994), they argued that hazards are natural disasters that are social and need to be understood in terms of individual, households, a community, or society's vulnerability. Further, the characteristics of class, gender, and ethnicity determine vulnerability by linking risks with people's abilities- social, economic, and cultural abilities to cope with the damages incurred.

Authors opined that vulnerability rather than poverty is a useful concept than poverty in disaster policy making although there are useful overlaps. All three – disaster, poverty, and vulnerability are a part of the framework – through which humans and individuals cope with the risks in their lives. However, vulnerability is sometimes looked upon as a property and not as a result of social relations. Lewis suggests that vulnerability could be looked upon as a changing, social, and economic condition in relation to hazards and is dynamic in nature (Lewis, 1999). Development processes also create vulnerability. Further, understanding vulnerability means understanding people's experiences and perceptions of vulnerability – local knowledge. Vulnerability does provide a conceptual link between disasters, development, and people.

Wisner (2006) has instantiated the participatory approaches developed by Robert Chambers and Paulo Freire that encouraged local communities to reflect on

their own realities, analyze them and develop an action plan to change their situations. Here the participatory approaches and techniques have been applied to communities in risk-prone areas and/or have been impacted by some disaster. Termed Community-based disaster management (CBDM), this approach leads to local self-assessment, planning, and action based on people's knowledge about their own environment. CBDM also emphasizes an understanding of the vulnerability of people to hazards, and their capacity to cope with them. Hazard mapping and planning are integrated into this approach. The author suggests that the social vulnerability perspective which drew on the taxonomic approach of listing vulnerable social groups has a utilitarian value – however before disasters, whilst working proactively with the government and other stakeholders to assess vulnerability in advance, the taxonomic approach would be inadequate. Instead, he discusses the situational and proactive approach - whose goal is to enable people through reflection and action to improve their self-protection and demand or fight for social protection.

Chen, Chen, Keith, Leong, and Airriess (2007) carried out a rigorous study aiming to examine factors contributing to differential health outcomes among New Orleans Vietnamese community in response to Katrina on post-traumatic stress disorder (PTSD) symptoms, and physical and mental health post-disaster due to the Hurrican Katrina. Findings suggest that financial strain was the strongest risk factor for Vietnamese survivors' post-traumatic stress disorder (PTSD) symptoms, and physical and mental health post-disaster; while social support was a strong protective factor for health. Survivors who have perceived higher impact from previous traumatic experiences had poorer physical health, but not PTSD symptoms or poor mental health after controlling for financial strain and social support, suggesting complex relationships among these measures in predicting PTSD symptoms and health. Less-acculturated individuals also reported higher levels of PTSD symptoms and poorer physical health. The study concluded that catastrophic events like Katrina can result in the disproportionate risk of negative health outcomes among vulnerable populations. Nurses should be taken into account prior trauma, financial strain, social support network, and acculturation level, to adequately address survivors' needs.

Rao (2006) outlines psychological interventions in providing care and support to disaster-affected communities. The impact of a disaster can be looked at in two

ways: firstly by ascertaining the characteristics of the event itself, and secondly, by how that event is appraised by those affected. Depending on the different phases of the impact of the disaster, individuals will respond in different styles. Psychosocial interventions must tailor the needs of the target population, with special attention paid to vulnerable groups such as children, women, and the elderly. They should modulate according to the phase of recovery following the event occurrence because each phase will highlight different needs. The four phases of intervention, although determined separately, might show an overlap. In the initial phases, the emphasis is on a social intervention that can be delivered by community-level workers. Later psychological issues that emerge necessitate the services of trained professionals. Social care in the beginning will need to give way to psychological care, and on occasion, both will need to be combined for a considerable period. Since psychosocial care is a long-term, continuous process, disaster management, and preparedness programs must invest in training for capacity building by training community workers and primary care health professionals.

Ecevit and Kasapoglu (2002) conducted a survey of 500 male and female survivors (aged 19-80yrs) of the 1999 earthquake in Turkey aiming to investigate their levels of alienation and forms of preparedness for future disasters. Findings show that the level of alienation, in general, is not very significant and that level of education is the most important influential independent variable. The only alienation component found may have a negative impact on the responsible behavior related to preparedness for earthquakes was the social isolation variable.

As level of education increases and social isolation decreases, responsible behavior increases. The existence of little such research in developing societies like Turkey increases the importance of this work and it is expected that it will have a positive impact on similar future studies.

2.9 Vulnerable Population in Nepal

According to Robert Wood Johnson Foundation (2001), vulnerable populations include the economically disadvantaged, racial and ethnic minorities, the uninsured low-income children, the elderly, the homeless, those with human immunodeficiency virus (HIV), and those with other chronic health conditions,

including severe mental illness. The vulnerability of these individuals is enhanced by race, ethnicity, age, sex, and factors such as income, insurance coverage (or lack thereof), and the absence of a usual source of care. Robert Levine has defined as vulnerable "those persons who are relatively or absolutely incapable of protecting their own interests through negotiations for informed consent. We then must ask: How do we identify those persons? Some regulatory bodies specify *subpopulations* that should be considered vulnerable. For example, the U.S. Federal Regulations of Human Research require that ethics committees consider special problems of research involving vulnerable subpopulations such as children, prisoners, pregnant women, mentally disabled persons, and economically or educationally disadvantaged persons[6].

The question, "How do we identify the vulnerable and how should we protect them?" takes on new meaning as we recognize that we need to understand specific contexts or circumstances of those we deem possibly vulnerable.

In the context of Nepal, are vulnerable populations, a debatable issue? In a very generic way, vulnerable populations are traced in the caste and ethnic composition of the Nepalese population. Bennett et al. (2008) carried out a further analysis of Demographic and Health survey (DHS) data and tried to identify the different social groups as socially excluded from the very beginning of the state formation. In the 2001 Census around 81 percent of Nepalese reported their religion as Hindu, thus locating them within the caste system. But most part over the last several hundred years and even earlier in some areas, whether they were Hindu or not, all Nepalis were socially defined by the caste system as the nation-state was defined with Hindu religious kings and kingdoms.

Some in high-mountain areas may have been more influenced by Tibetan Buddhism and others in remote valleys and hills, were known with the practices of Shamanism or Animism. For them, contact with the Hindu worldview may have been minimal, but for most people living in the territorial boundaries of the modern Nepali state – especially after the promulgation of the National Code or Muluki Ain in 1854 AD– the caste system has been a major determinant of their identity, social status and life chances. In this system, everyone was entitled in terms of their relative ritual purity into the four broad varnas of the classical Hindu caste system: the Brahman

priests, the Kshatriya kings and warriors, the Vaisya traders and businessmen, and the Sudra are peasants and laborers – with an additional group technically "outside" the caste system because of their ritually defiling occupations which rendered them "untouchable" by others.

The detailed record of the caste system operating in Nepal occurred in the Kathmandu valley during the reign of the Newari King Jayasthiti Malla (1380- 1394) where 64 different castes rigid or widely practiced these rules were not known yet. It is clear however that during the 17th century as Shah king conquered the various petty kingdoms in the territory that is now Nepal, the Shah rulers used.

In 1854, during Rana rule, a National Legal Code (Muluki Ain) was proclaimed that laid out detailed codes for inter-caste behavior and specified punishments for their infringement. Many excellent accounts of the Nepali version of the Hindu Varna (Four Fold) system are available but here we have presented a table based on the scholarship Andreas Hofer (1979) did and later modified by Gurung (2002) shown how groups were ranked. Occupying both the top and the bottom of this system were the hill Hindus or Parbatiya who migrated into Nepal from the western hills. They were from the Indo-European language group and spoke a Sanskrit-based language (Khas) from which the modern Nepali language is believed to emerge. They brought with them their traditional caste-based social structure which already allocated the highest rank to the Bahuns (Brahmans) and the Chhetris and Thakuris (Kshatriya). Both of these were classified as tagadhari, or 'wearers of the sacred thread' signifying their status as 'twice-born' or those initiated into the sacred Hindu texts.

People characterized the 'pure' middle-ranking Vaishya and Sudra Varnas do not seem to have come along with these Hindus on their migration eastward through the hills, but the occupational groups, Kami (blacksmiths), Damai (tailor/musicians) and the Sarki (cobblers) did. Falling within the 'impure' group, collectively called pani-nachalne or 'those from whom water cannot be accepted', they were ranked at the very bottom and classified as achhut or 'untouchable'.

In Nepal hill and mountain areas, the middle rank was accorded to the existing indigenous groups belonging to mainly the Tibeto-Burman language group. Since

many of these groups consumed homemade beer and spirits, they were called 'liquor-drinkers' or matwali by the Brahmans and Chhetris whose caste status did not allow them to take alcohol which was considered polluting.

Authors found that despite Nepal's impressive progress in meeting the MDGs, there are some groups that have been left behind. The illiteracy, poverty, and low social status of many of these excluded groups means that they are facing higher barriers in accessing services taking advantage of economic opportunities – and- Dalit – and especially Dalit from the Terai – Muslims, and Terai/Madhesi Other Castes all have consistently low indicators across most dimensions covered by the 2006 NDHS survey.

Janajati groups also performed poorly on many indicators, but not all. For example, the Terai Janajati is doing very well in the knowledge of ORT, contraceptive usage, and TFRs – even though they have the highest levels of anemic women and above-average levels of underweight women and children. There is also marked variation in the performance of Hill/Mountain and Terai Janajatis across different indicators that depend on having services nearby.

Although gender and other social inequalities appear to be more rigid in the Terai, economic inequalities are less extreme. In contrast, among Terai/Madhes-origin groups only 9 percent of the population falls into the lowest wealth quintile and 12 percent in the top.

CHAPTER III

METHODOLOGY OF THE STUDY

3.1 Introduction

Nepal's earthquake of 25 April 2015 and its aftershocks had such a devastating impact on the human population and physical assets that it was the top disaster-stuck country in the world in 2015. A press release issued by the United Nations International Strategy for Disaster Reduction on 11 February, 2016 claims that 17,796 people died in the 10 countries in 2015, topping the list, Nepal's earthquake put it in first position with 8,831 deaths (49.6% of the total), followed by France (18.4%), and India (12.6%). To assess the losses and costs due to the disaster, Nepal conducted a PDNA study applying an internationally standard methodology. Such a need assessment, however, is largely retrospective and does not really begin to address the implications of the cumulative effect of a series of earthquakes (Seddon, 2015). In the standard PDNA, the assessments of both damage and need are based on physical and macroeconomic criteria and tend to overlook a micro-economic and social model of damage and need.

At the request of the Ministry of Health and Population in 2015, the Central Department of Population Studies carried out a survey called, 'Socio-demographic impact study of the Earthquake, 2015,' where I played a key role as a research coordinator. Measuring that impact in the 14 most earthquake-affected districts in the time allocated by the Government of Nepal was a challenge. One of the challenges the study team encountered at the forefront was the households accounted in the 2011 NPC on which the sample household has to be selected, meanwhile, there is no idea what percentage of them collapsed due to the earthquake. Second, how to locate the selected household where almost all households were fallen down.

Another challenge was that an extended household accounted for in the 2011 NPC might be split into multiple households so how to carry out the survey based on the households accounted for in the 2011 NPC. Other complications were the respondents' readiness to listen to research questions since their priority might be to feed their families, manage the place for shelter, and how ensure the security for

women, children, and the aged population in a household even at the moment of repeated aftershocks were coming.

To address these challenges, the study team developed a mixed-method approach using both qualitative and quantitative methods to carry out the study. This methodology is presented in three sections, the screening, the household, and the community surveys.

3.2 Study Area

The main earthquake of 25 April, 2015; and its aftershocks had an impact on 31 districts. The degree of that impact varied: of them, seven districts were classified as severely hit, seven as crisis-hit, five as hit with heavy losses, six as hit, and six as slightly hit. The Ministry of Health and Population (MoHP, 2015) chose 14 districts[7] in which to conduct a socio-demographic impact study.

How to get the list of households in the severe and crisis districts? So, the first and foremost task was to pull the data sheet the district authorities maintained right after the earthquake.

About 150 wards of various VDCs and municipalities were visited during the household survey; these wards were the population sample units (PSUs) and their number was determined by scientific sampling methods. Eight of the 150 PSUs had to be changed[8] as the expected numbers of affected households were not found.

3.3 Mixed Method Approach

In order to meet the challenges prevailing in the survey area calm, flexible, and comprehensive approach requires getting into the affected household. At the same time measurement in terms of the effect of earthquakes on the population is accomplished.

An overview of mixed methods research, including its origins and philosophical basis, rationales, basic steps in designing a mixed methods study, and procedural notations are presented here.

The credit does not go to a single author or source on the historical evolution of mixed methods research, although Datta (1994) and Tashakkori and Teddlie (1998, 2003) have identified many of the major developmental milestones.

There are many definitions of the mixed method approach in the literature. It is an approach or methodology which focuses on research questions that call for real-life contextual understandings, multi-level perspectives, and cultural influences; employs rigorous quantitative research assessing the magnitude and frequency of constructs and rigorous qualitative research exploring the meaning and understanding of those constructs; utilizes multiple methods; intentionally integrates or combines different methods to draw on the strengths of each; and frames an investigation within philosophical and theoretical positions (Creswell, Klassen, Plano, & Smith, 2011).

The study team used three surveys. A survey, by definition, is a detailed study made by gathering information through observations, interviews, and/or questionnaires and analyzing it (CIEDRS, 2003:13). The first survey was an initial or screening survey using the lists of affected households provided by DDRCs; the second was the household survey comprising a close-ended self-administered questionnaire designed to collect quantitative information; and the third, comprising focus group discussions (FGDs), key informant interviews (KIIs), and participant observations, collected qualitative information. Such an approach is termed a "mixed method approach."

In assessing the impact of a disaster on a human population, the triangulation of both quantitative and qualitative methods produces the best results. Quantitative data helps researchers understand the magnitude and scale of a humanitarian crisis by providing a numerical picture of its impact on affected communities. It addresses the questions "How many?" and "How much?" Qualitative infortation on the other hand, focuses on determining the nature of the impact of a disaster upon affected populations. Qualitative information answers about how and why various coping strategies have adapted, or failed to adapt, to the changed circumstances. When undertaking a need assessment, a combination of different types and sources of data is required to build a holistic picture of the affected population. Sources for information include both primary and secondary data. Types of information include both qualitative and quantitative data (ACAP, 2012).

3.3.1 Screening Survey

An initial assessment called a screening exercise by USAID's Office of Foreign Disaster Assistance (USOFDA)(2002) is conducted in order to identify the impact on society, its infrastructure, and ability to cope; identify the most vulnerable population groups; identify the level of local response; identify the level of response from the international community; identify urgent relief needs and effective methods of providing service; make recommendations that define priorities for action and resources needed for immediate response; and identify areas and issues for further, in-depth assessment.

The Ministry of Home Affairs (MoHA, 2015) collected information about the loss of lives, both human and other animals, as well as the damage to both residential buildings and cattle sheds. Since the Central Disaster Rescue Committee does not have a database, the study team visited the DDRCs of each of the 14 selected districts to get information. In order to verify the reliability of the secondary data and find out the issues to incorporate in the survey instrument to ensure it would measure what it was intended to measure, 14 two-member study teams, a leader and an assistant, visited at least three types of communities in their assigned district, the severely hit, the partially hit, and the slightly hit, and conducted spontaneously held FGDs with community groups. The data generated by the screening survey was important for two reasons, sampling and questionnaire designing. The empirical data generated was also useful for both quantitative and qualitative data analysis.

3.3.2 Household Survey

Where purely scientific quantitative methods were applied, representative households were the main thrust of the study. The study team designed sampling sizes; developed a structured questionnaire, pre-tested it, and trained the 43 surveyors who would administer it; edited, cleaned, and processed data; and analyzed and drew inferences from the data using bivariate and multivariate analysis to explain dependent variables. The representative sample size was drawn from seven severely hit and seven crisis-hit districts, three in and four outside of Kathmandu Valley. It took 19-22 days for the surveyors to interview 3,000 households using the 20-page

questionnaire. The questions were written in Nepali and translated into local languages in the field as necessary.

3.3.3 Qualitative Survey

Qualitative research is, by definition, exploratory. It is used when researchers don't know what to expect and how to define the issues. In this case, it implies the researchers' lack of understanding of why and how affected populations were impacted by the earthquake. The key contribution of qualitative data is that it provided information about the human aspect of the emergency by recognizing the specific local contexts of the top-priority needs of the affected populations. Data gathered through qualitative methods is often presented in the form of a case study, but it can also be presented in pie charts, pictorial forms, graphs, and the like.

Qualitative research inquiry tools vary. Among them, FGDs, KIIs, and participatory observation are very popularly used in report writing and academic research. FGDs are a technique for eliciting information from specific population subgroups. The issues addressed may be little known or relatively well-known to the researcher. The method is most effectively used when the objective of the investigation is to elicit the points of view of client or consumer groups which may differ from those of providers. Despite the frequency with which focus group discussions are used, few published materials describe the practical application of the method (Bender & Ewbank, 1994).

Qualitative information was generated for specific caste and ethnic groups concurrently with the collection of quantitative data. The study team conducted 42 FGDs with different caste and ethnic groups affected by the earthquake and 42 KIIs and put together about 42 case studies using direct observation. Interviews, whether for FGDs or key informants, were recorded and later transcribed into writing. Analyzing qualitative data is cumbersome and time-consuming, so only a few glimpses were incorporated in the zero drafts. More descriptions and cross-analysis were incorporated in the final report.

3.4 Survey Design

The survey collected information from a representative sample of the earthquake-affected households in the 14 most earthquake-affected districts in Nepal. The primary focus of the survey was to present the situation of these households regarding damage, rescue, relief, and rehabilitation and the impacts of the earthquake on socio-demography, employment and lively hood, education of children, health, and population mobility. The sample was designed to provide information on these key variables for the sample as a whole as well as separately for the three survey domains (severely hit districts, crisis-hit districts excluding Kathmandu Valley, and Kathmandu Valley), rural and urban areas, and background variables, including family type, sex of household head, education, occupation, caste and ethnicity, and religion.

3.4.1 Sampling Frame

The study team used the lists of affected households provided by the DDRCs of local development offices and/or district statistics offices as their sampling frame. These lists were obtained during the screening survey of this main survey, which was conducted in the last week of August 2015 and the first week of September 2015. About 795,000 of 937,000 houses were damaged by the earthquake (Screening Survey, 2015) in the 14 most earthquake-affected districts.

The PSU of the survey was the ward, or, if a ward had more than 200 affected households, the sub-ward.

3.4.2 Determination of Sample Size

The sample size, n, was determined using the formula

$$n = \frac{z^2 \cdot p(1-p)}{d^2} \cdot deff \cdot k$$

Where

n = sample size in terms of the number of households;

z = statistic defining the level of confidence; *z* was 1.96 for a 95% level of confidence;

p = an estimate of a key indicator of the survey; *p* was assumed to be 0.5 based on the estimation for the largest sample size;

deff = sample design effect; *deff* was assumed to be the default value of 2.0 since supporting empirical data from previous surveys did not suggest a different value, since the 2011 NDHS had calculated a design effect of less than 2 for most variables, and since it was equivalent to the figure used when comparing the clustering component of the design effect for intra-cluster correlations of 0.05 and cluster sizes of 20 households;

k = a multiplier to account for the anticipated non-response rate; *k* was assumed to be 1.1 because of Nepal's history of non-response rates of under 10%. The 2011 NDHS, for example, had a non-response rate of only 4.8% only;

d = margin of error (desired precision); *d* was set at 0.05 (±5.0%), or 10 percent of *p*.

Using the formula,

$$n = \frac{z^2 \cdot p(1-p)}{d^2} \cdot deff \cdot k = \frac{1.96^2 \cdot 0.5(1-0.5)}{0.05^2} \cdot 2.0 \cdot 1.10 = 845$$

The sample size was determined to be 845 households.

- The sample size calculated was for a single domain, so the sample size for the three domains (severely hit districts, crisis-hit districts except Kathmandu valley, and Kathmandu Valley), was 2,535.
- However, to increase the representativeness of the sample, especially in severely hit districts, the sample size of the survey was increased to 3,000 households with 150 PSUs of 20 households each. The values for the number of PSUs and number of households in each PSU were chosen since a large sample of small clusters is more efficient than a small sample of large clusters and since many recent surveys in the country used a cluster size of 20 households.

- For each domain, 1,000 households in 50 PSUS were surveyed.

3.4.3 Sample Selection

The sample for the survey was based on a two-stage stratified representative sample of earthquake-affected households. In the first stage of sampling, 1,000 PSUs were selected using systematic sampling with probability proportional to size (PPS) in each of three survey domains. The complete list of earthquake-affected households in each selected enumeration area, whether a ward or sub-ward (PSU), obtained during the screening survey was then used as a sampling frame for the second stage selection of households.

First, the number of affected households at the VDC or municipality level in each of the 14 districts was determined and the VDCs and municipalities were placed in the same order of geographical location used by the Central Bureau of Statistics in the 2011 census. Then, the total number of affected households in all the VDCs and municipalities in each district was calculated. Next, the total of affected households for each of the three domains was calculated, and, finally, using that value, PSUs were selected using the PPS method.

In the second stage of sampling, systematic random samples of 20 households in each selected PSU for all three domains were selected from the complete list of affected households in that PSU. If a PSU cluster had more than 200 or more than 400 affected households, it was divided into two or three segments respectively and one was selected randomly.

Rough maps of the positions of houses in the selected enumeration areas were made during the screening survey and maps locating the selected households precisely were sketched during the fieldwork.

3.4.4 Sample Weights

Since the proportions of earthquake-affected households were different in each of the three sample domains, the samples were weighted and the sample weights were used to provide statistically reliable estimates for each of the three domains as well as

for the 14 most earthquake-affected districts as a whole, for rural and urban areas, and for different background variables.

3.5 Survey Tools

The main survey tools were the 20-page structured questionnaire for collecting quantitative data from affected households and two checklists for gathering qualitative information, one for use with FGDs with different communities and genders in different locations and one for use in KIIs with knowledgeable persons engaged in different sectors and professions.

The questionnaire was specifically designed to obtain information from households about certain socio-demographic characteristics of the population as well as damage to houses; materials used in constructing a house; the rescue, relief, and rehabilitation process; employment; livelihood; the education of children, health, population mobility, access to different facilities, ownership of a variety of consumer durable items, and other quantitative data. The checklists comprised questions about similar issues but were designed to gather qualitative information through FGDs and KIIs.

3.6 Community Resilience Survey

After 5 years, the Central Department of Anthropology (CDA) has conducted a Community Resilience Survey (CRS) in 2020. The purpose of the study was to measure the recovery from the impact and the community resilience. The study has also adopted a mix method: quantative and qualitatative methods. There were 3300 representative households selected to quantify the community resilience and recovery of Gorkha Earthquake. In order to get qualitative information ethnographic studies was adopted. More or less both quantitative and qualitative methods adopted similar approach. Hence the

3.7 Data Quality

Data quality is affected by sampling and non-sampling errors. Non-sampling errors can arise at various stages during the collection and processing of data. In order

to minimize the non-sampling errors in the survey, various efforts were made before, during, and after the survey. These are discussed below.

3.8 Training and Pre-testing

Forty-two field researchers participated in a six-day training session on administering the survey held in Kathmandu from 3 to 8 November 2015. These researchers were hired based on their academic qualifications, past experiences in fieldwork, and language skills. The majority had Master's degrees in one of the social sciences. The training consisted of a review of the questionnaire and checklists, instruction in interviewing techniques, field procedures for the survey, mock interviews and FGDs among participants, and practice interviewing in the field during the pre-tests of both the questionnaire and the checklists.

These pre-tests were conducted in two different locations of Kathmandu Valley, Phutung and Jharuwarasi, on 7 November 2015. The determination of which field researchers would lead (supervisors) and which assist (enumerators) was made on the basis of their performances during the training and pre-tests.

3.9 Data Collection and Processing

To maintain the uniformity of the survey data, the study team prepared an interviewer's manual which included a detailed discussion of the contents of the questionnaire as well as the interviewing techniques and procedures needed for completing the questionnaire. The selected supervisors selected were also trained to supervise fieldwork, edit completed questionnaires in the field, and take other various measures to maintain data quality.

Fieldwork was carried out between 20 November 2015, and 15 December 2015. During the fieldwork, experts from the Population Division of the then MoHP, the UNFPA, and the members of the study team, research associates, and research assistants from the Central Department of Population Studies of the Tribhuvan University (CDPS-TU) were in constant contact with field researchers through both direct communication and spot-checking during monitoring visits. To ensure the quality of the data, the 42 field researchers were closely supervised by 10 different

monitoring teams who conducted monitoring visits in the field; observed interviews, FGDs, and KIIs; checked completed questionnaires; and provided feedback.

Quantitative data were collected from 3,000 households in the 14 most earthquake-affected districts of Nepal, 1,000 each in three domains (severely hit districts, crisis-hit districts excluding Kathmandu Valley, and Kathmandu Valley) by administering a structured household questionnaire, 1,000. In addition, 37 FGDs were conducted among different communities and caste and ethnic groups and 43 KIIs were conducted with people engaged in different professions in different locations.

Once the field operation was over, completed questionnaires and transcripts of FGDs and KIIs were sent to the CDPS-TU for data processing. Research associates and research assistants involved in the survey checked the filled-in questionnaires and transcribed the qualitative data. They also post-coded the answers to those questions which were not pre-coded in the questionnaire after checking manually for inconsistencies in the data filled in the questionnaires.

3.10 Double Entry of Data

Once the post-coding and manual editing of all the filled-in questionnaires were complete, the data were entered into Microsoft computers using Version 6.0 of CSPro software. After the first entry of data was complete, all the data were entered again to check for errors. The two data files were then matched using of the same CSPro software and all cases of entered data that did not match were checked with reference to the appropriate filled-in questionnaires and edited or deleted as necessary. Altogether 1.3 percent of the total 1,872,229 data entry units were found to have been entered incorrectly. All were fixed. Data cleaning was carried out once more by producing frequency and cross tables after transforming the data into SPSS software, Version 18 (PASW Statistics). Once the data cleaning was complete, the data were analyzed and the required tabulations were produced using the same SPSS software package.

3.11 Sampling Errors

The estimates made by any given sample survey are affected by sampling errors, whose degree can be evaluated statistically from the survey results themselves. Sampling error is usually measured in terms of the standard error for a particular statistic, which is the square root of the variance. The standard error can then be used to calculate confidence intervals, design effect, and relative error.

As this sample survey has a multi-stage stratified design, the Taylor linearization method of variance estimation for survey estimates of proportions or means was used to estimate the standard errors of selected key variables. This method treats any percentage or average as a ratio estimate, r = y/x, where 'y' represents the total sample value for the variable 'y', and 'x' represents the total number of cases in the group or sub-group under consideration. The variance of 'r' is computed using the formula below, and the standard error is the square root of the variance.

$$var(r) = \frac{1-f}{x^2} \sum_{h=1}^{H} \left[\frac{m_h}{m_h - 1} \left(\sum_{i=1}^{m_h} z_{hi}^2 - \frac{z_h^2}{m_h} \right) \right]$$

where $z_{hi} = y_{hi} - r \cdot x_{hi}$

$z_h = y_h - r \cdot x_h$

h = the strata, which varies from 1 to H

m_h = the total number of clusters selected in the h^{th} stratum

y_{hi} = the sum of the weighted values of variable 'y' in the i^{th} cluster in the h^{th} stratum

x_{hi} = the sum of the weighted number of cases in i^{th} cluster in the h^{th} stratum, and

f = the sampling fraction (n/N), which is very small and ignored

Sampling errors were calculated for 70 selected key variables of the survey. Standard errors were less than 2 percent for 30 variables and less than 5 percent for another 22 variables. For half of the selected variables, the relative errors, errors of estimates based on standard errors, was less than 10 percent. The confidence limits of the estimates based on standard errors did not cross the value of 1 or 0 for most of the selected variables, a result suggesting statistical significance. That said, the fact that

the design effects for most of the variables considered were more than 2 suggests the errors in estimates could have been reduced if the sample size had been larger.

3.12 Completeness of Reporting

All 3,000 households were enumerated using the replacement method but there were some cases of no response and missing answers for 10 of the 616 variables included in the questionnaire. However, the rate of non-response was minimal, less than one percent for four of the variables, 2-3 percent for another three variables, and 5 and 10 percent for one variable each. The tenth variable had one missing case out of a total of 4. The non-response rates for various variables are presented.

CHAPTER IV

ORGANIZATION OF THE STUDY, IDENTIFICATION OF VARIABLES, AND ANALYSIS

4.1 Introduction

In a study of the impact of earthquake disasters on vulnerable populations, there are multiple dimensions and issues come into account. And obviously, all these dimensions and issues are of human interest, but hard to incorporate and also impractical to deal with. As research questions pointed out the issues and the review of literature reflected the potential variables to be measured, and the conceptual framework maps out a clear picture of the study.

According to Alexander (1985) over ninety-five percent of all deaths in earthquakes result from building failures, variations in mortality among different countries are primarily due to differences in building styles and density of settlements (cited in Blaikie, Cannon, Davis, & Wisner, 1994). Seaman et al. (1984) argue that the overwhelming majority of people who die in earthquakes are killed by the collapse of manmade structures, particularly domestic dwellings (cited in Blaikie et al., 1994). Thus, when we talk about the vulnerability of the human population, the impact of events on human populations along with live stocks, food grains, and properties to varied socio-economic and cultural groups come into account.

4.2 The Vulnerability Paradigm

According to Fordham (2003), the disaster research field has traditionally been dominated by the Hazards research which has been criticized for its lack of attention to social theory. However, there have been some incremental changes following critiques of the hazards approach (Blackie et al., 1994; Varley, 1994; Comfort,1999 & Cannon, 1994), who then pioneered the social vulnerability perspective whose focus was on underlying socio-political, root causes of disaster processes. The vulnerability paradigm draws upon qualitative methods geared toward providing contextual and rich descriptions of local realities. These have long been used in disaster studies. Anthropologists and geographers, in particular, have provided multiple and detailed

qualitative accounts of people's resilience that have deconstructed or challenged the centrality of natural hazards in explaining the occurrence of disasters and their impacts (Hewitt, 1983; Oliver-Smith, 1996). Resilience to natural and other hazards is viewed here as a process or an attribute and through the lens of the concept of vulnerability.

According to Wisner (2006):

> Vulnerability to disasters is usually inversely related to the ability of people to access adequate resources and means of protection. People affected by disasters are usually disproportionately drawn from the margins of society and include, depending on the context, children, elderly, people with disabilities, women, and gender and ethnic minorities (p.325).

Vulnerability thus reflects how power and wealth are shared within society and traces its roots to cultural, social, economic, and political structures, which lie beyond the reach of those who are vulnerable (Gaillard, 2010). People's vulnerability to natural hazards is context specific and varies in time and space and mirrors the nature, strength, and diversity of their everyday livelihoods. It acknowledges, therefore, that all people are different in facing disasters triggered by natural and other hazards, depending on factors such as age, gender identity, physical ability, ethnicity, and income level.

4.3 Paradigm Shift

In earlier days, people do curse the 'hazard' for everything lost. And of course, people are still blaming the natural hazard, so they worship god for not to occur such a hazard in their vicinity. So, the shock of natural hazards was more than the political, economic, social, or cultural setup in the past days. What about the economy that enables you to resist the disaster? What polity that set up the rescue, the relief distribution, and the appropriate mechanisms set up to help the needy people? Hazard is out of our control, but how do we build our buildings? Where we do like to build our houses? And what sort of health and sanitation measures we set up? We never worry about them. The information on natural or manmade hazards potential to occur

that we can share makes a difference in disaster outcomes. So, the hazard approach is being shifted to the vulnerability approach in the early days of the 20th century.

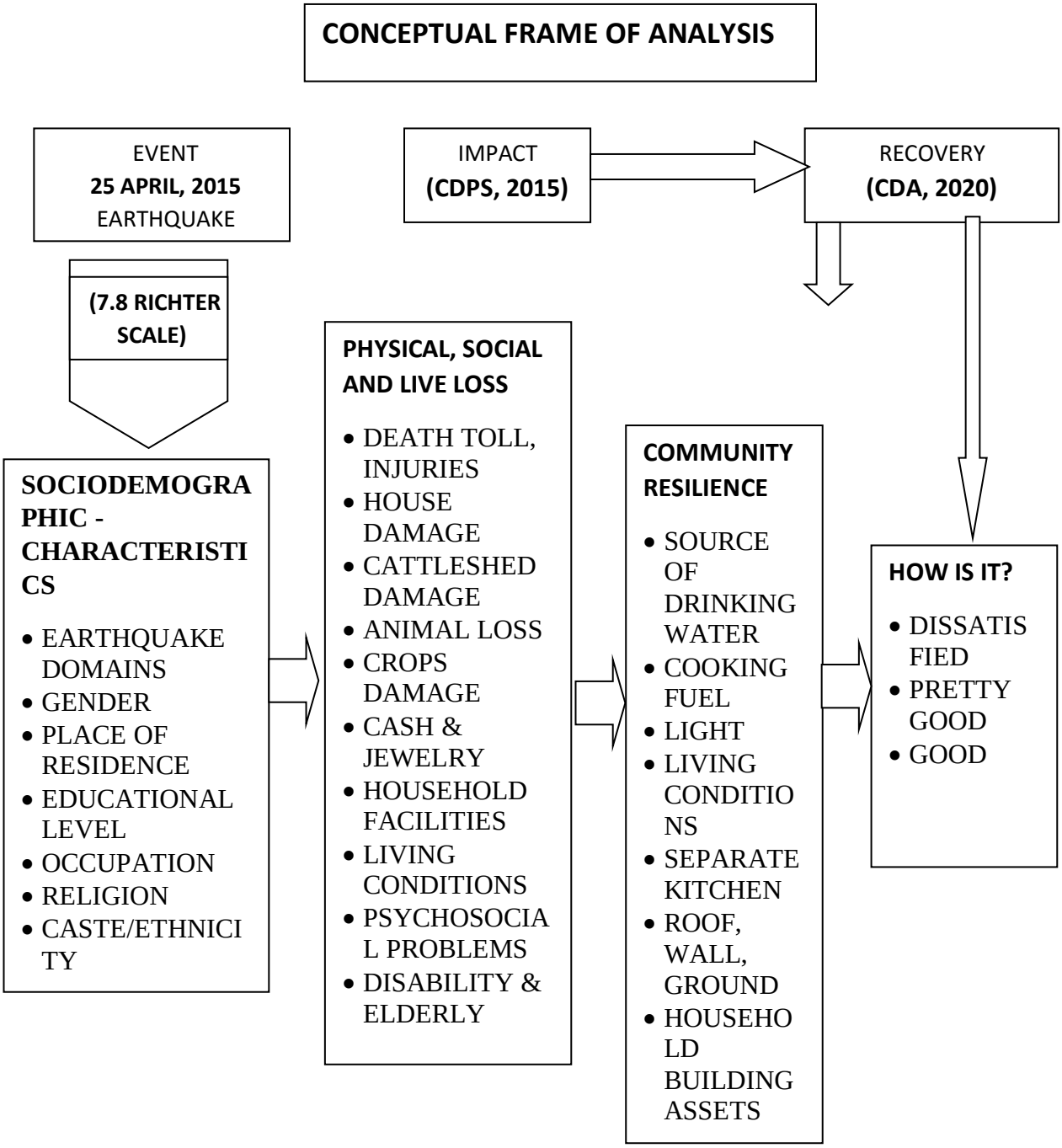
4.4 Theoretical Framework and Variables

In a broader framework, when an event occurs whether it is natural or manmade, our concern would be how it has affected the people- number, habitat, livelihood, culture, gender, socioeconomic, or political status, etc. The event with geomorphologic phenomenon expressed in earthquakes, tsunamis, volcanoes, and so on, how it happened, is not our study; and it is out of our capacity to control as well. But our prime concern is how the 'event' has affected the people and their surroundings, environment, resources, livelihood, and so on. So, the event occurred in the socioeconomic, cultural, and demographic surroundings that influence all the surrounding factors, eventually turning into a disaster. Thus, the main interest in this study is 'Impact', but to whom?

According to Kottow (Octo. 2002), "vulnerability," is the universal human condition of being intact but fragile, and "susceptibility," is the condition of being biologically weak or diseased, with an increased predisposition toward additional harm. So, vulnerability falls under the principle of justice, which affords equal protection to all members of society, whereas susceptibility is a determined state of destitution and must be specifically designated in order actively to apply social systems of targeted palliative treatment.

Morawa and Alexandar (June 2003) stated that there is no single approach to defining vulnerability. The term has no purposeful definition, yet it is a qualifying factor that can have concrete consequences in human rights litigation. Focusing on international human rights law and the adoption of specialized rights for vulnerable groups, Morawa analyzes classification criteria and the consequences of such a classification.

4.5 Overview and Concepts



There are certain terms used frequently in the lexicon of disaster-related literature such as hazard, disaster, event, impact, resistance, reconstruction, recovery, etc. Among them, certain terms are defined and elaborated as follows.

4.5.1 Hazard

Lavel (2004) argues that hazard (probability of a physical event occurring) and vulnerability (propensity to suffer loss and recover) were dependent concepts in the understanding of risk. Along with disaster risk was considered 'everyday risk', the everyday risk were the permanent living conditions of the poor populations that were a permanent threat to their physical and mental well-being – malnutrition, health, unemployment, and social and domestic violence.

A hazard is anything that may pose a danger; thus, it is used to mean a natural or manmade phenomenon or a mixture of both that has the potential to adversely affect human health, property, activity, and/or the environment. The specific hazard to which we are exposed varies in space and time and also may vary between different populations: what is recognized as a hazard in one community may not be so in another. A hazard that has not been converted into an event cannot become a disaster (TFQCDM/WADEM, 2002). In the absence of a disaster, in many settings, a hazard may not be recognized.

4.5.2 Event

An event occurs when the hazard is realized or becomes manifested (ibid, 2002:40). For the current discussion, it means an occurrence that has the potential to negatively affect living beings and/or their environment. Such occurrences have a characteristic type of onset, intensity, duration, scale, and magnitude that temporally events might be sudden, gradual, slow, or delayed in onset. Sudden-onset events include those with onsets lasting seconds to hours (e.g. earthquakes, tsunamis, cyclones, fire, etc.). Gradual-onset events have an onset over days to weeks (e.g. floods, climate changes, epidemics, armed conflict), and may or may not present with a warning of several days to weeks. Slow-onset events have a prolonged and gradual onset (famine, drought, epidemics, nuclear contamination, etc.). Delayed onset events occur sometime after the discovery of the likelihood that the hazard will become

realized. Such events usually allow for warnings to the population that potentially will be impacted by the event (cyclones, tsunamis, bursts of weakened dams, famine).

4.5.3 Impact

According to TFQCDM/WADEM (2002:43), impact is defined as:

> Impact is defined as the actual process of contact between an event and a society or a society's immediate perimeter. The impact refers to both positive and negative influences produced by the event on the environment. The degree of damage produced by the energy impacting the environment is dependent upon the vulnerability and preparedness of the environment and society for the specific event. The impact is the precipitating cause of the damage that may result from an event. The damage that results from the impact not only is a function of the magnitude of the event but also depends on the resilience of the society and environment towards the impact including the preparedness of the society for such an event. Examples include the landfall of a tropical cyclone, drought extending to an expanded area, and refugees arriving in a new area (p.35).

This event is one of the most important causes to precede the disasters. When an event occurs the hazard is realized or becomes manifest. It means an occurrence that has the potential to negatively affect living beings and/or their environment has a characteristic type of onset, intensity, duration, scale, and magnitude. Temporally, events may be sudden, gradual, slow, or delayed in onset- last for seconds to hours (e.g. earthquakes, tsunamis, cyclones, fire, etc.), Gradual-onset events have an onset over days to weeks (e.g. floods, climate changes, epidemics, armed conflict), and may or may not present with warning of several days to weeks. Slow-onset events have a prolonged and gradual onset (famine, drought, epidemics, nuclear contamination, etc.), such events usually allow for warnings to the population that potentially will be impacted by the event (cyclones, tsunamis, burst of weakened dams, famine).

4.5.4 Disaster

There are many definitions of a disaster. These definitions are apparently dependent upon the discipline using the term. No definition of "disaster" is accepted universally; however, in Disaster Management published in Pre-hospital and Disaster Medicine, Cuny (1992) defined a disaster as, "a situation resulting from an environmental phenomenon or armed conflict that produced stress, personal injury, physical damage, and economic disruption of great magnitude." Perez and Thompson (1994), in their series of publications on Natural Disasters, defined a disaster as, "the occurrence of widespread, severe damage, injury, or loss of life or property, with which the community cannot cope, and during which the affected society undergoes severe disruption."

In all definitions, it is noted that a disaster disrupts the society stricken by the event. Furthermore, Cuny stresses that the events involved in a disaster do not comprise the disaster. It is what results from the event that comprised the disaster, not precipitating event itself.

The definition of a disaster adopted by the World Health Organization and the United Nations as established by Gunn (na) is:

> the result of a vast ecological breakdown in the relationships between man and his environment, a serious and sudden (or slow, as in drought) disruption on such a scale that the stricken community needs extraordinary efforts to cope with it, often with outside help or international aid.

This definition also indicates that it is the damage that results from the impact on society that constitutes the disaster, not the event that is the disaster.

The occurrence of an event results in the destruction of resources and the death of human beings and other domestic animals that are kept along with human families, along with injuries of vulnerable populations such as children, the elderly, the disabled, and mothers who are with children. Resources affected by the event may include consumable supplies stored especially in remote and scarcity of food for certain days, especially in the mountain. Disaster may damage the infrastructure that

stops the functions of the organization, especially children's schools, health care centers, and cultural and social institutions. Damage to the infrastructure may contribute further to the impairment of the function of the organizational structure (process) of the affected society. The infrastructure encompasses all societal structures including buildings, roads, bridges, sanitary facilities, railroads, waterways, water facilities, and other essential societal structures and functions. An important example of increased consumption is the use of medical supplies and equipment in the treatment of those injured as a result of the event.

A disaster happens when the damage rendered by an event becomes so great that the local mechanisms for response become overwhelmed and outside assistance is required to cope with the damage. The ability of a society to absorb the impact and to suffer the consequences of the damage created is determined by many factors described above. These factors are influenced by the stage of development and culture of the society, the economics of the region, the natural and built environments, the preparedness for the event, and the ability of the society to manage the damage. What constitutes a disaster in one setting may not generate one in another.

4.5.5 Recovery

According to Fothergill (1994), recovery is the long term – or about one year after the disaster – a time frame during which life will return to normal or to an improved level to some extent. It looks into issues of relief assistance, family relocation, and relationships. Caste/ethnic groups along with age group, educational status, place of residence, and head of household with gender are variables within them how rescue, relief, up to the rebuilding of the physical residence, etc. are taken into account.

As far as variables involved in the studies, there are mainly two variables-dependent and independent variables tend to deal with the impact of the earthquake upon vulnerable populations. Thus what they are and how they would be acting upon is underpinned here.

4.6 Dependent Variables

Independent variables' major three aspects are taken into account. The impact is firstly taken the 'Physical Lost;' secondly, secondly, the 'Social, Economical, and Health,' and thirdly, the 'Recovery' after four years of earthquakes the study attempted to measure under the broader study of community resilience in 2019. The recovery is ultimately measured into well builtup a house building that prior to the earthquake was found no matter what physically it was set up that the earthquake hit very badly.

The first, dependent variable Physical Lost comprises Death Toll and Injuries, followed by Houses (ghar) Damage, Cattle-shed (Goth, gala) Damage, Loss of Four-legs (chaupaya) Live stocks, Loss of two-legs Live Stocks (Panchhi), Crops (bali) Damage, Loss of Cash and Jewelry, and Loss of Household (gharka saman) facilities. Similarly, the second variable, 'Social, Economical, and Health,' comprises Living Conditions, Seasonal Crop Plantation, Livelihood Conditions, Security of Girl Children, Psychosocial Problems, Disability, and Elderly Citizens. And lastly, the third variable comprises: 'Recovery,' which is plainly understood the damage from an event has been repaired or replaced. Thus, in the context of a disaster, recovery means bringing all of the societal components back to their pre-event or earlier disaster status.

As the explaining or independent variables that act upon the dependent variables on the one hand and that have also been affected in disasters are generally taken as earthquake domain, place of residence, gender, the highest level of education, occupation, religion, and caste/ ethnicity.

All disasters are related to a specific hazard or combinations of hazards whether of a natural phenomenon or a result of human actions. A hazard is a natural or manmade phenomenon or a mixture of both that has the potential to adversely affect human health, property, activity, and/or the environment. The Asian continent accounts for more susceptible to natural disasters. Asia shares a sheer scale of the global population (4.5 billion), characterized by limited and unequal socio-economic development that increases full-fledged disasters due to the risk of natural hazards (Bruun & Rubin, 2015). In the last 20 years (1995-2014), approximately 1.5 million

people succumbed to natural disasters worldwide, more than half of whom Asia accounts for, no matter how disasters are measured (in terms of injuries, homelessness, or economic damage), the most affected continent in the world in absolute terms.

In the previous days the interventions made from humanitarian interventions were considered as socially-neutral response to human and societal changes posed by disasters. Yet, regardless of their declared good intentions, interventions (whether NGO- or state –driven) potentially alter power relations, undermine traditional livelihoods, and entitlements, strengthen formal authority, marginalize institutions, and replace existing cultural practices. Thus not only disaster impacts but also external responses might become stresses or vulnerable groups. Based on several studies, it is found that disaster-related interventions and associated political processes might have just as serious repercussions for vulnerable groups as the impact of the disasters they seek to mitigate. For example in the 2006 evaluation of Word Band-assisted natural disaster projects, they tend to rely on command-and-control systems like military operations, which exclude local participation; that sideline local power structure and leave local people and institutions out of the community rebuilding process, making recovery more difficult, and they ignore local people's social and livelihood needs with the result that vulnerable groups may be left even more disadvantaged (Ibid, 672).

What is the major source of information or knowledge to know about the earthquake hazard? We heard the narratives of many elders who referred to the mega-earthquake Nepal grappled with in 1934 (*Nabbesalko Bhukampa*). So, local narratives experienced people shared with relatives, community members become the major sources of information about these hazards. Knowing about the earthquake hazards and their impact on people who lost their beloved family members, property, and resources makes us or educate us on how to protect ourselves from such an event. What sort of measures do we need to adopt from building a safe house to any structure newly evolving engineering to education can impart to us?

It is a disputable matter whether mankind is able to use its knowledge appropriately during the stress. Epistemologically how much we have made an inquiry regarding this matter, since if one cannot use his knowledge during the critical

hour or moment, what is the significance of imparting knowledge? In a tense situation, one can pursue the job in the opposite way, which may create mistrust in the performer, but the information or knowledge one gets to avoid the disaster during the hazard, one has to use it to the full extent.

There are some important contexts to be defined or discussed and how they need to be taken. For example, the earthquake is taken as the event that took place on 25 April 2015 in Barpak as the epicenter, its impact, turned out to be a disaster and is expected to get recovery even at this moment. So, we have to look at these terms relating to the broader aim of studying the vulnerable populations.

4.7 Independent Variables

4.7.1 Earthquake Domains

Gorkha Earthquake in 2015 wrapped up altogether 35 districts. Of them, 14 districts comprise- 7 districts characterized by severely hit, and another 7 districts characterized by Crisis hit. Of the crisis-hit districts, three districts of Kathmandu Valley were taken out as the one explaining variable, since they are different in geographical as well as political proximity, and the rest the crisis-hit category. So, the entire selected sample population is drawn from three categories- Severely hit (7 Districts), Crisis hit (4 districts), and Kathmandu Valley (3 districts).

4.7.2 Gender

It is an analytical category since disasters' impact can be felt through different race, class, and gender parameters in specific historical contexts (Enarson & Fordham, 2001). Women's invisibility causes them to become more vulnerable before and after the disaster. Since vulnerability, an analytical category is needed to understand through women's eyes, it is taken as an explaining variable.

Women across the world to varying degrees have triple roles of reproduction, production, and community work. The unequal opportunities lead them to be less power and freedom, making them more vulnerable in particular locations and times. Further, if disaster vulnerability cannot be separated from everyday reality, gender differentials are bound to affect the disaster outcomes. Gender-blind decisions can

impact their workload and increase violence after a disaster and women may be marginalized from women's eyes in a disaster context. So it is taken as an important explaining variable.

4.7.3 Place of Residence

Vulnerability from and through the voices of urban and rural inhabitants is important to analyze. People are affected by repeated disasters such as floods or multiple disasters such as drought and floods as well as riots which had taken place. The characteristic of vulnerability is voiced by the residents in different forms by urban and rural people. Rural women, irrespective of the regional variations, culture and morphology, and climatic conditions, identified their vulnerability due to lack of resource base, poor resource quality such as degraded land, - lack of productive assets such as wells, bullocks, and poultry; lack of access to better seeds, marketing; lack of absence in the nonfarm sector, high indebtedness to meet various relief, rehabilitation, and consumption needs, - irregular and seasonal work available before and after the disaster and low wages (Bhatta, 1998).

4.7.4 Highest Level of Education

Inhabitants who are badly affected by the earthquake disaster is compounded by illiteracy, lack of education and information about disasters (beyond direct experience); lack of awareness about government program for relief and rehabilitation, rigidity in government relief distribution programs; malpractices and role of middlemen in rehabilitation efforts, and Patriarchy prevalent in the relief to rehabilitation cycle.

A survey was conducted of 500 male and female survivors (aged 19-80 yrs) of the 1999 earthquake in Turkey to investigate their levels of alienation and forms of preparedness for future disasters (Ecevit & Kaspoglu, 2002). It was found that the level of alienation in general is not very significant and that level of education is the most important influential independent variable. The only alienation component found to have a negative impact on the responsible behavior related to preparedness for earthquakes was the social isolation variable. As the level of education increases and social isolation decreases, responsible behavior increases. The existence of little such

research in developing societies like Turkey increases the importance of this work and it is expected that it will have a positive impact on similar future studies.

The definition of literacy in Nepal has changed over the years. Earlier censuses defined literacy as the ability to read and write, but the most recent census of 2011, adopted a definition that includes three distinctions: 1) can read only, 2) can read and write only, and 3) cannot read or write. And respondents were asked about the highest level of education completed, based on them different categories of education can be calculated as required in the analysis.

4.7.5 Occupation

It is obvious that people suffer from psychosomatic trauma after disasters. Anxieties concerning the future are common and effective treatment lies in the alleviation of the situations which produced them. Rapid reuniting of families, restoration of familial and occupational routines, and rapid and efficient efforts of reconstruction and rehab can alter these effects (Rao, Dec. 2006). Among the Key variables explaining the impact on vulnerable populations are occupation, caste, ethnicity, gender, disability, health status, age, and immigrations status – both legal and illegal and the social networks of the affected people (Wisner, Blackie, Cannon, & Davis, 2004).

In defining the occupation in Nepal, how the census of 2011 uses the International Labour Organization's definition was adapted as populations aged 10 years and above are economically active population. And were economically active at some time during the last year preceding the enumeration (ILO, 1990) was taken as economically active population. Employed persons are the populations aged 10 years and above who were employed for more than six months during the last year preceding the enumeration. Occupation is the sector in which those who were usually economically active for six months or more were involved.

4.7.6 Religion

A study conducted by Gillard and Paton (1997) reveal that religious denominations exercised a differential impact on vulnerability, although differences

were partially dependent on the measures of vulnerability used. In Nepal, it is a bit difficult to define the religion. However, formally there are 10 different religious groups recorded in every national census. Every household member was asked what religion she/he belongs to. However, most of the families collectively report their religion. So, religion in the context of Nepal connotes not the individual faith, but rather the collective costume of a family or a community.

4.7.7 Caste/ Ethnicity

With the collection of demographic and socioeconomic information on caste/ethnic group, age, sex, education, caste, and place of residence, loss of life and property can be measured to identify the impact of the disaster. In Third World contexts, dealing with peoples' livelihood resilience (their strength pre-hazard and their recovery capacity post-hazard impact) is not regarded as susceptible to technical interventions and so is 'defined out' of the problem (Cannon, 2000). In this study, the hazard impact and recovery are measured with caste/ ethnic groups. The reason to emphasize caste/ ethnicity is that Nepal, like many developing countries, holds numerous social or ethnic groups that govern social and political matters. Many impacted populations are defined with the clusters massively hit by the earthquake.

Since the study is a Household-level survey, it was imperative to define the household populations. The household was considered to have the members of any given unit share a common kitchen and usually live as a family. Members who do not live with the rest of the family include members who send remittances (or are looking for work with the intent of doing so) as well as those, like students, who get economic support from the household. All household members might not have been home at the time of the survey as they may have gone to visit relatives or been on a business trip, but the expectation is that an absent member of a household will return. Under this definition, a domestic worker who shares a common kitchen is also a member of the household, as is a married woman who is living in her maternal home and does not intend to return to her husband’s home.

4.8 Type of Analysis

Using an established method, a research study can be carried out to investigate an issue in detail aiming to generate new knowledge about it. Knowing the types of research allow us to better plan to study and analyze using appropriate tools and techniques and better communicate the findings to audiences. There are various types of research analysis tools and techniques devolved as stating the problems met with appropriate objectives, depth of studies, time availabilities, and researchers' capabilities.

Of various techniques, a descriptive research analysis is taken as the type of research analytical tool in this study. The primary objective of descriptive research analysis is to measure the impact of earthquake events on vulnerable populations who are weaker sections of the population phenomenally unable to cope, resist, and recover in comparison to their counterparts when a natural disaster hits the population.

Descriptive data analysis is usually applied to the volumes of data such as census data, or survey data generated from a purposive study. It has different steps for description, procession, and interpretation. There are two methods of statistical descriptive analysis: univariate and bivariate and multivariate. Univariate descriptive data analysis comprises the distribution of a single variable whereas bivariate and multivariate analysis comprises a description of more than one variable. Descriptive statistics, in such cases, may be used to describe the relationship between the pair of variables.

Descriptive data analysis simply aims to describe and summarize data by using a variety of statistical techniques, including measures of frequency, central tendency, dispersion, and position. In order to look at the distribution of cases in bivariate and multivariate situations, cross tabulations are made, followed by statistical tests carried out by using various packages. In this study, SPSS/PC, version 16 will be used.

In the measurement of responses or data, both nominal and ordinal variables represent the complex socio-economic and demographic factors that interact as events

and activities that are unfolding in a dynamic and potentially hazardous environment. A goal, this type of research set, and the results and findings intend to help improve future disaster response for such events. The purpose may vary, whether it is intended to be exploratory, descriptive, or explanatory, to more appropriately explain these dynamics and interactions, this discussion draws primarily examples in previous research, writings, observations, and personal correspondences related to field research an attempt to illuminate many of these examples (Bevc, Sept. 2010).

In order to find the association between variables, a Chi-square test, and Multivariate Linear Regression analysis is applied. In multivariate regression how many independent variables account for the association to criterion or dependent variable would be observed in a given significant level of coefficient.

CHAPTER V

SOCIOECONOMIC, DEMOGRAPHIC, AND CULTURAL CHARACTERISTICS

5.1 Introduction

This chapter deals with the socioeconomic, demographic, and cultural characteristics of the surveyed household population. Socioeconomic characteristic comprises the occupational, literacy status, educational, and economically active population whereas demographic characteristic comprises the household population for the selected sample domain, age-sex structure, types of family, marital status, and the cultural characteristic comprises caste/ ethnic and religious composition of the survey population. It also consists of household members who possess the citizenship card.

5.2 Age-sex Composition

The age-sex composition of a population is considered an important indicator of demographic characteristics. It was asked each and every family member to report their completed age.

When people report their age, generally they report either running or going to attend age, so inconsistencies in the age reporting occur very often. Moreover, respondents also report preferring certain numbers ending with ‘0’ or ‘5’ or even numbers that heap the numbers of the population at those digits. So, there would be a problem with the age distribution of a population.

There are 3000 households surveyed, accounting for 14,987 sample populations; with 7,419 male and 7,568 female. So, the sex ratio is the number of males in every 100 female populations (Table- 5.1). It is estimated at 98.0 which shows a slight deficit of the male population. The sex ratio for the entire world population is approximately 101 males to 100 males.

Table 5.1

Population Distribution of Households with Five Years Age Groups and Sex, 2015

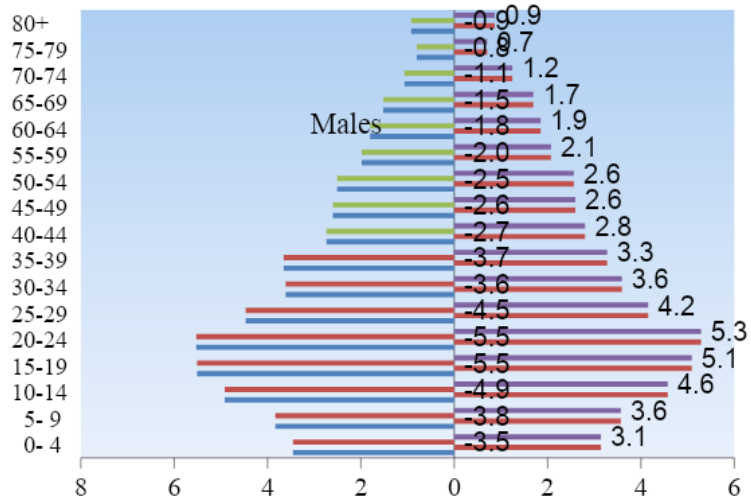
Age group	Male	Female	Total	Sex ratio
0-4	7.3	5.9	6.6	122.5
5-9	8.1	7.0	7.5	112.6
10-14	10.1	10.6	10.3	92.7
Below 15	**25.4**	**23.5**	**24.5**	**106.1**
15-19	11.8	12.3	12.0	93.5
20-24	11.6	11.8	11.7	96.2
25-29	8.6	7.9	8.3	106.5
30-34	6.2	6.2	6.2	97.4
35-39	5.5	6.8	6.1	79.3
40-44	5.8	6.1	5.9	93.1
45-49	5.0	5.2	5.1	93.9
50-54	5.3	5.5	5.4	94.3
55-59	4.3	4.1	4.2	101.9
15-59	**63.9**	**65.9**	**64.9**	**95.1**
60-64	3.2	2.9	3.0	109.6
65-69	2.4	2.5	2.4	92.6
70-74	2.3	2.3	2.3	101.2
75-79	1.2	1.2	1.2	97.8
80+	1.5	1.7	1.6	84.6
60+	**10.6**	**10.6**	**10.6**	**98.4**
Total	100.0	100.0	100.0	98.0
N	7419	7568	14987	

Source: CDPS, 2015

The number of women slightly exceeds the number of men in earthquake-affected areas. We don't know the reasons. But in the below-15 age groups, the male population exceeds the female population. The sex ratio for the under-15 years age group population is 106.1 males to 100 females. Following this, the sex ratio for the economically active population (15 to 59 years) is 95.1 males to 100 females, and that of the economically inactive population (60 years and above) is 98.4 males to 100 females. It indicates that except for those under 15 years, the number of females exceeds in both economically active and inactive populations may imply that the absence of the male population against their female counterparts in earthquake-affected districts is prevalent due to out-migration.

In the broad age group, the younger age population, below 15 years accounts for 24.5 percent. Which, male population (25.4 %) exceeds the female population (23.5%) with less than 2 percent. Similarly, the economically active population (15-59 years) accounts for 64.9 percent. In, the female population (65.9%) exceeds the male population (63.9%), with slightly over 2 percent. And for the older dependent population (60+ Years), the male and female population accounts for 10.6 percent each.

Fig. 5.1:Pyramid of Earthquake Impacted Population, 2015



If we look at the population pyramid, the base of the pyramid is gradually shrinking and the mid of the pyramid is also becoming dumb size male population above and equal 40-44 years is decreasing (Fig. 5.1). However, the pyramid doesn't depict a large number of male population absentee in earthquake affected districts.

5.3 Types of Family

A nuclear family was defined if a couple along with their siblings live together using a single kitchen. Similarly, a joint family was defined as a couple living with their siblings as well as their parents together using a single kitchen. And an extended family was defined as a couple living with their siblings, parents and grandparents, and other members of a family using a single kitchen.

In a very simple question, what type of family is yours? About 61 percent reported the nuclear family, followed by joint family (36.0%), and extended family (3.0%).

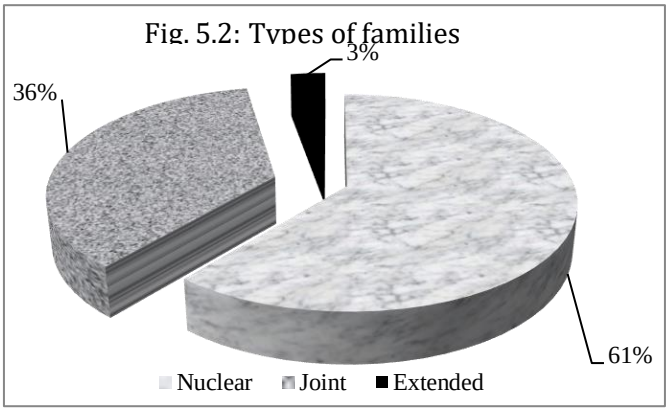
Table 5.2

Types of the Family by Sex of Head of the Households

	Male		Female		Total	
	N	**%**	**N**	**%**	**N**	**%**
Nuclear	1442	60.5	389	62.8	1830	61.0
Joint	870	36.5	213	34.5	1083	36.1
Extended	70	2.9	17	2.7	87	2.9
Total	2381	100.0	619	100.0	3000	100.0

Source: CDPS, 2015

We can understand the situation that many joint and extended families tend to be nuclear when the quake hit houses. When fatalities and house buildings had to be reported to concerned authorities, the family head was imperative to be identified, so that number of nuclear families might be increased than how previously existed ad an extended family. One of the respondents from Sankhu, Bhaktapur:



> We had a single house (Ghar) built by our grandfather, where 6 families were accommodated in different flats and rooms. We didn't care to register them as different families, because needn't until the quake turned to debris. The government's attendant recorded the demolished house in the name of our fathers since everybody knows it is his house. In fact, we were 6 families under a single roof. And in the first list, only fathers got support from the government. And as we complained to authorities, we were listed as complaints, followed by giving support later.

The survey also found that female-headed households (62.8%) slightly exceed the male-headed households (60.5%) in a nuclear family. But, male-headed households (36.5%) exceed slightly the female-headed households (34.5%) in an extended family. The male-headed family also exceeds their female-headed

counterparts in the extended family. We don't know the reasons, but female-headed households are less likely in extended and joint families than the nuclear family.

How is the number of nuclear families increasing? There are many arguments. Of course, social, economic, and political, factors may cause this. A young lady, head of the household of 26 years of Magar ethnic group in Deurali Municipality, Gorkha opined:

> A woman comes to her husband's house after marriage, doesn't she? It is like a maternal family to the bridegroom. The bride becomes the groom's family member strangely. Since by all means, she is of the groom but remains the family member in a joint or extended family. The rest of the family members says, 'we' including the husband. If a newly married bride is taken as 'other,' one, then the formation of a nuclear family would be possible soon.

It is interesting to know about the formation of the nuclear family in a society where the extended family used to be the tradition. Further inquiry is needed.

5.4 Deaths

The District Disaster Rescue Committee (DDRC) gets a meeting every month. If needed, held meetings as needed. DDRC has maintained the primary data, collected in the aftermath of the earthquake by deploying government officials and supporting staff from the central authority, Ministry of Home Affairs (MoHA). In the screening survey, the database of DDRC from 14 districts pulled and analyzed the casualties and damages of the households (CDPS, 2015). Of 14 districts, there are 10,426 deaths tolled, followed by injured (12,662) and missing (136). In total 794,921 households were found to be affected, but it doesn't say anything about the cattle sheds.

In affected districts, the death toll in severely hit districts accounts for over 61 percent, followed by Crisis hit (23.4%), and Kathmandu Valley (15.2%). Regarding the missing persons, severely hit districts account for over 71 percent, followed by crisis hit (28.7%), and Kathmandu Valley nil. Meanwhile among the injured persons, severely hit districts account for 68.7 percent, followed by Kathmandu Valley (23.0%), and crisis hit (8.3%) (Table- 5.3).

Table 5.3

Death Toll, Missing and Injuries by Earthquake-Affected Domains

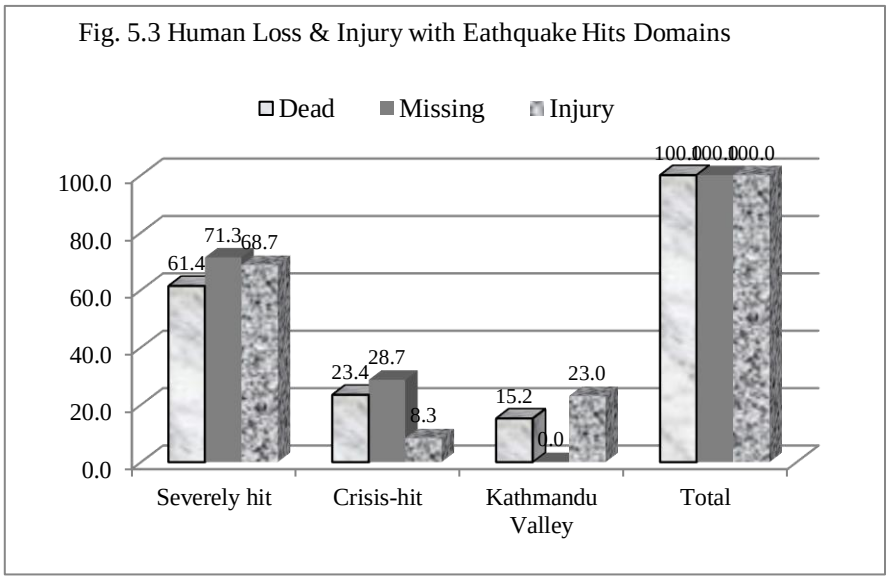
Loss	Severely hit	Crisis hit	Kathmandu Valley	Total	
				N.	%
Dead	61.4	23.4	15.2	10,426	100.0
Missing	71.3	28.7	0.0	136	100.0
Injured	68.7	8.3	23.0	12,662	100.0
Damaged houses	53.4	26.4	20.2	794,921	100.0

Source: Data pulled from DDRC and analyzed, 2015

There are 7 districts under the severely hit category that are all in the mountain region. The earthquake very badly hit mountain settlements including the epicenter *Barpak*. The proportion of missing accounts for the largest 71.3 percent in severely hit districts against nil in Kathmandu valleys. Kathmandu Valley was also badly hit by the earthquake, so the injured person accounts for 23 percent, which is more than the crisis-hit districts.

If we look at the damaged houses, severely hit districts account for 53.4 percent, followed by crisis hit (26.4%), and Kathmandu Valley (20.2%).

Fig. 5.3 Human Loss & Injury with Eathquake Hits Domains

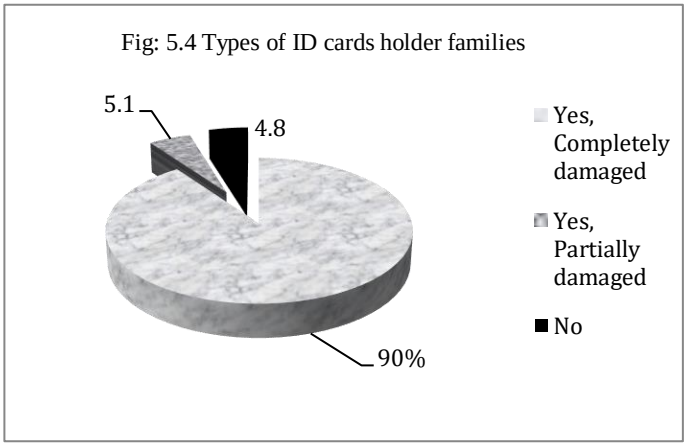


A single woman of *Dalit* (Mijhar) community, of age 61 years from Thansingh, Nuwakot district, shared her apprehension:

I built this house with my entire effort and assets that I earned in my whole life. I cannot share with you what sort of difficulties I got in those days, as a single woman. I have two sons but uneducated and agricultural laborers. What they earn in the noon that we spent for the meal of the evening. We had to see the next morning who would hire us….The earthquake had very badly cracked my house. Security personnel visited us and look at it from a distance, but they didn't touch it. I requested them and prayed for them but the team leader replied that they were for cleaning the debris but not to demolish the cracked one. But my house was not fallen/ demolished but completely cracked where we cannot live. I don't know what to do with this cracked building, another plight (dasha) for me.

5.5 ID Cards for Damage

Fig: 5.4 Types of ID cards holder families



In the aftermath of the earthquake, GoN has distributed two types of Identity Cards: first, characterize as complete damage, and second as partial damage. In some districts, residents opine that they also got a category of slight damage too. In order to identify the affected family or household, they distributed different cards. On the basis of these criteria, the affected households would get relief and support from the GOs and NGOs. It would be easier to figure out the households and what sort of support they deserved when assistance reached out to the community level. In a question, what kind of card did she/he have, if any card was given to them? Nine respondents out of ten households reported that they have an ID card completely damaged, followed by an ID card partially damaged (5.1%), and no ID card (4.8%) (Fig. 5.4).

Among households holding ID Cards, characterizing with completely damage houses, male-headed accounts for 80 percent, against the female-headed (20.0%). Among partially damaged households, male accounts for 75.5 percent against female-

headed houses (24.5%), and household with no identity card, male account for 72.7 percent and female accounts for 27.3 percent (Table- 5.4).

Table 5.4

ID Card Distributed by Type of Houses Damage and Gender

			Total	
	Male (%)	**Female (%)**	**N.**	**%**
Completely Damaged	80.0	20.0	2,704	100.0
Partially Damaged	75.5	24.5	153	100.0
Not at all	72.7	27.3	143	100.0
Total	75.5	24.5	3000	

Source: CDPS, 2015

During the survey, investigators very commonly heard of apprehensions, local peoples expressed that they don't have names on the list of the local authority.

A woman of age about 30 plus had expressed her feelings by crying when she was not selected as the sample household for the study. She thought that the survey team was the authority of the government discharging the relief and other assistance. She cries:

> I know this is my fortune that hindrances me. In the last survey too, my house was left out, while all the houses of my neighbors were enlisted. Everybody knows about my complete damage house, but even this time too, you guys are not taking care of me, and my house. I know my fortune is empty, so no support I am getting (crying….). On which day, did I born? So, that my fortune circumvents my achievements.

5.6 Marital Status of Household Population

Marriage has been defined as a union between a man and a woman such that children born to the woman are recognized as legitimate offspring of both parents. However, the definition of marriage itself varies across societies. Anthropologists generally agree that marriage is an institution or process that legitimizes the rights of mutual sexual access, rights of access to spousal labor, rights of paternity, and forms

of support. Demographers, however, take a functionalist view of marriage and have often treated all 'regular sexual unions' as marriages (Bongarrts & Potter, 1983).

Marriage is an important institution across the large majority of societies around the world. Studies have marital quality directly correlates with physical, mental, and spiritual well-being (Bowman & Dollahite, March-April 2013). In the survey study, the household population who are 10 years and above aged were asked about their marital status. There were 12,870 sample population were interviewed whether they are unmarried, married, single (widow/ widower), or divorced/ eparated.

Table 5.5

Marital Status and Head of the Households

Marital	**Male**		**Female**		**Total**	
Status	**N**	**%**	**N**	**%**	**N**	**%**
Unmarried	2443	38.9	2193	33.3	4636	36.0
Married	3615	57.6	3852	58.4	7466	58.0
Single (widow/widower)	181	2.9	500	7.6	680	5.3
Divorced/separated	38	0.6	50	0.8	88	0.7
Total	6277	100	6594	100	12870	100

Source: CDPS, 2015

The data shows that about three out of five were found to be married (58.0 %), where female (58.4%) shows bit more than married male (57.6%). On the other hand, the unmarried sample population accounts for just over one-third whereas the male population (38.9%) is slightly more than the female population (33.3%) (Table- 5.5). Single in terms of both male (widower), and female (widow) accounts for 5.3 percent. Following this, widows (7.6%) are much higher than widowers (2.9%), more than double.

Divorced/ separated accounts for about 0.7 percent, of which the divorced/ separated male population accounts for 0.6 percent against the female divorced population is 0.8 percent. So, slightly female exceeds male.

A family member of a household with married status was found to be instrumental when that family fell into disaster. A story of about 27 years, from the Gurung ethnic group of Barpak says:

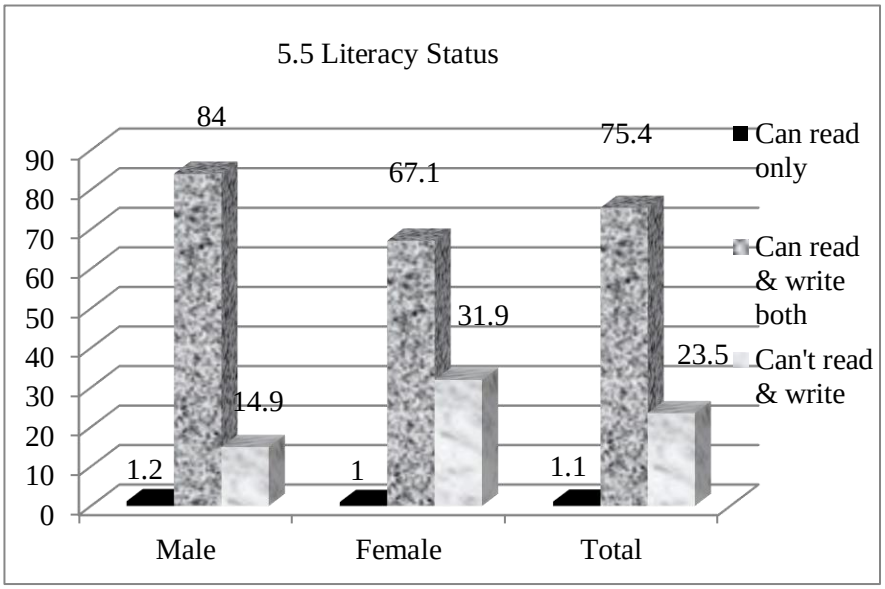
I am at my maternal home now, since the earthquake hit the maternal house where my mother and her daughter-in-law were staying with grandchildren. My elder brother went to Malaysia for labor work, but he had been out of contact for the last 7, years. We don't know where about him, living or dead. My sister-in-law was in her neighbor's house for self-help (parma) to scrub and clean the newly built house. When the earthquake came, the newly built house fell- down, and the debris covered all seven women. None of them survived. So, my maternal mom lost her daughter-in-law, and she is the old one, and cannot look after the grandchildren, and became helpless. To help my maternal family I am here; you know, leaving my day-to-day jobs in my house. I don't have any idea, what I do.

5.7 Literacy Status

In order to measure the literacy status each and every family member above the age of 5 years and above were asked if [name] of person, in any language, was able to read and write. There were three categories: only able to read, able to both read and write and unable to both read and write. So, if she/he is able to both read and write in any language, entitled to be literate against she/ he is unable, then they are illiterate. There would be very less likely to read or write only, but somebody might learn reading only or writing only and be able to do either one, but not entitle them literate.

Nepal is a country with more than a hundred Caste/ ethnic groups each is different from others with social origin, inhabited in different areas, physical appearance (race), and speaking different languages. They speak differently than the Nepali language, which may be found their vulnerable populations. When we talk about literacy, usually people are asked able to read, write, or both in any language. Whatever the intuition is, only one language is an official language, so respondents might get if she/ he was literate in the Nepali language or not.

Among the 13,999 household population aged 5 years and above, about round 75 percent population can read and write whereas about 23.5 percent can't read and write and only 1 percent can only read (Fig. 4.5). By disaggregation, male accounts for 84 percent literate, against female (67.1%). And just reverse female accounts for 31.9 percent illiterate against male (14.9%). But interestingly one percent each (male and female) are only able to read any language.



This is a big ambiguity when we talk about the literacy- able to read and write in any language. Since less than 50 percent population reports Nepali as a mother tongue. Rest of the population reports different languages. A respondent of Tamang community, aged 56 opine:

> What do you mean by literacy? Since I do speak Nepali language and able to read and write to some extent. But if mass populations do not and if any official work they need to attain, they need to contact me. Because I know how official business can be dealt and happened in reality. There are educated youngsters, but even they don't know. Better they know about foreign (Bideshi) language, songs, and other matters. For example, when official personnel come to village no youngsters interact with them. So, many Tamang people are in dilemma what they speak as communal language, they are well literate on it, but government official do not or vice versa. There are many Tamang fellows able to write and read in Nepali, but unlikely to comprehend.

5.8 Educational Status

Each and every family or household member who was 5 years and above the age were asked the highest level of education ever they had attended. There were 13,999 respondents eligible to response the question. Of them, primary level (grade 0 to 5) accounted for 29.1 percent, followed by Secondary (25.4%), no education (24.2%), and secondary and highest (21.2 %). It is striking, when we set 4 categories for highest level of education from no education to higher than secondary, each category account for more or less 20 to 29 percent (Table- 5.7).

Table 5.7

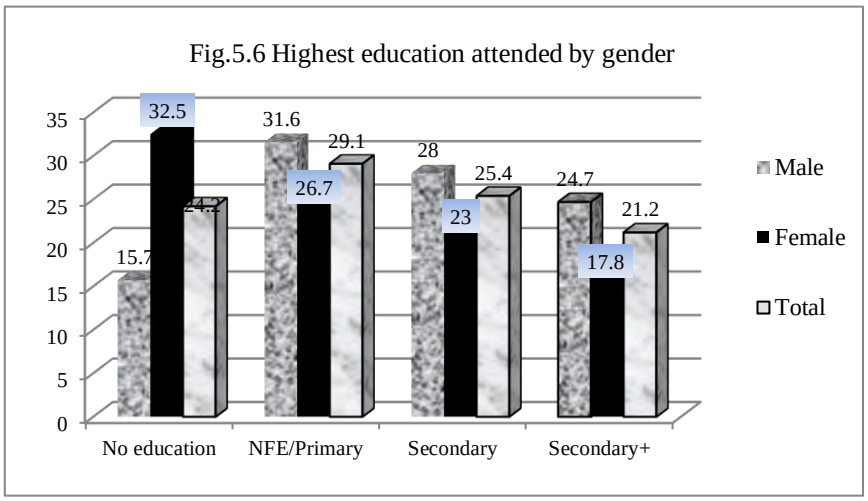
Highest Educational Level Attended by Gender

Highest Educational Status	Male %	Female %	Total %
No education	15.7	32.5	24.2
NFE/Primary	31.6	26.7	29.1
Secondary	28.0	23.0	25.4
Secondary +	24.7	17.8	21.2
Total (%)	100	100	100.
(N.)	6875	7124	13999

Source: CDPS, 2015

When we disaggregate with gender the variation goes the minimum down to 18 percent, and maximum up to 32.5 percent with female population.

When we compare the no education in gender disparity, it is amazingly high. Male population without education accounts for only 15.7 percent against that of female population (32.5%), more than double. Just



reverse when we compare it in higher than secondary level, female population (17.8%) higher than male population (24.7%) (Table- 5.7).

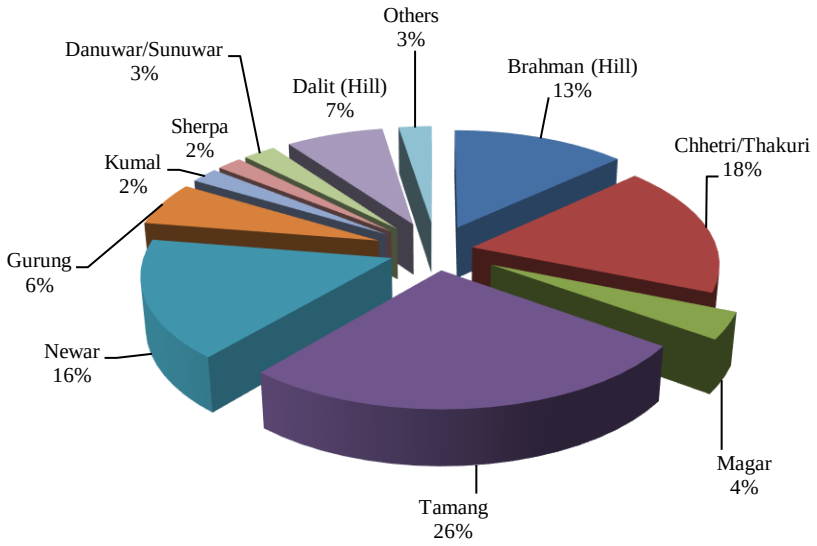
5.9 Caste and Ethnic Composition

In Nepal, the term caste basically refers to Dumont's model (1970) of those groups whose social structure is hierarchical and strongly embedded in the Hindu religious values of purity and impurity; and a particular person is also placed at the top in the hierarchical structure whereas another person is placed at the bottom in hierarchical system (Dahal, 2014). The term "ethnicity" encompasses certain kinds of cultural attributes such as a collective name, a common myth of descent, a shared history and association with a specific territory (Smith, 1986).

Nepal is diverse in terms of both caste and ethnic (Adibasi Janajati) composition. None of the group reveals numerical majority position; the largest group is Chhetri with about 17 percent of national population (26.5 million) as PHC reported in 2011. However, it is quite different than the other nations, because different caste and ethnic groups have a densely concentration in a specific geographic point and that spreads across the country in different proportion by caste and ethnic groups. For example, the earthquake hit the central mountain and the hill, largely a traditional hut for Tamang, and Newar ethnic groups, and Gurung in the Western Mountain and hill. Hill caste groups such as Brahman, Chhetri, Sanyashi, and Dalit spread from west to east, so they are also populated the hill region. Of the studied household population composition, Tamang accounts for the largest (26.3%) group, followed by Chhetri/ Thakuri (18.0%), Newar (16.3%), Other Hill Janajatis[9] (16.3%), Brahmin (13.1%), Hill Dalit (7.4%) and others[10] (2.5%)(Fig.- 5.8).

National Foundation of Development of Indigenous Nationalities (NFDIN) (2003) recognizes 59 ethnic groups as the Indigenous Nationalities (INs). Largely rural villages of hill and mountain of central region is largely inhabited by Tamang and Kathmandu valley is densely inhabited by Newar, among others. Proportion of Chhetri and Brahmin population each, which was affected by the earthquake account for more or less as equal as nationally they account and this is because of their spread across the hill region of Nepal.

Fig. 5.8 Social composition of household population



Since Nepal is predominantly governed in terms of civil servants by high caste groups such as Brahmin, Chhetri, and Newar; ethnically and linguistically diverse groups are often biased to get the proper care and services of the state. The damage assessment was carried out right aftermath of the earthquake. But there were many fallacies appeared when the service distribution was made in the rural villages. One of the instances, a gentle man of Sherpa community, from Khiji Phalate VDC of Okhaldhunga districts shares:

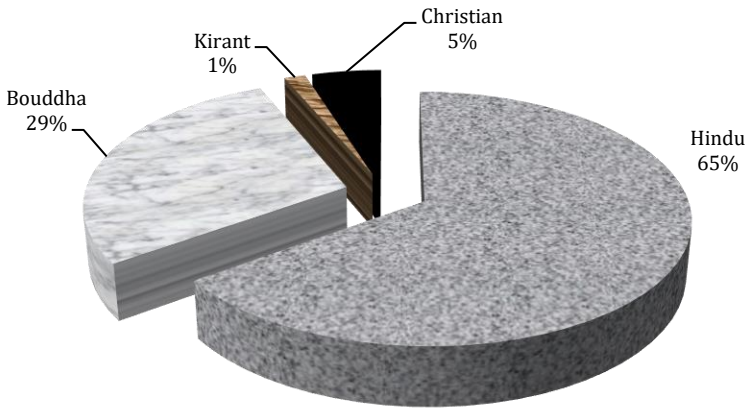
> When government officers came to collect the information related to damage the landowner was out of the country, Japan. The house was looked after by a second person, he didn't know either name of the owner. So, in a question of who was the owner? Local people said the name in terms of Maila Sherpa, Sainla Sherpa, etc. or name of the gentleman who look after the house. That was a mistake. And when owner returned from abroad and saw the name list, he didn't get his name. And there are many mistakes in pronouncing of name of my (Sherpa) community. For example Angdorje is listed as the Ang Bahadur, Furba is noted Phul Kumar, etc. This kind of mistakes we found especially in Sherpa community.

The vulnerability was socially, culturally, or politically in practice from years and years; but when earthquake disproportionately hit the land, the affect of disasters to inhabitants who were already in vulnerability triggered, so very difficult to resist the disaster and able to cope its impact.

5.10 Religious Composition

Todd Lewis[11], an expert on Asian religions at College of the Holy Cross in Massachusetts, says that Nepal's religious history has been shaped by its geographic isolation, its cultural diversity and its many ethnic groups. As news of the earthquake spread, religious leaders from Pope Francis to the Dalai Lama offered their prayers and condolences along with many institutions and faith organizations. In the United States, several Nepalese-American groups held candlelight vigils on Sunday night, and a number of Hindu temples will be offering special services for the earthquake's victims.

Fig. 5.9 Religions Composition



Among the household population, the majority (65.0%) reported Hindu religion, followed by Buddhist (28.5%), Christianity (4.9%) and Kirat (1.5). Religion in the real sense difficult to mean in the context of Nepal; however, the national population accounts for 81.3 percent Hindus, followed by Bouddha (9.04%), Islam (4.38%), Kirat (3.04 %), Christianity (1.41%), Prakriti (nature) and Bon.

Religion, culture or customs are such a belief systems that determine even how the hazards took place, and how to get rid from them. Since Nepal been Hindu kingdom for long years implies that the institutions, politicians, bureaucracy, and social functions are pretty much influence by Hindu religious practices. However, Hindus are by birth practicing ‘dos’ and don’t ‘dos’ in day to day life rather than individually preaching or believing any faith. Many common people believe that why the ‘God’ made a punishment to them? So, natural hazard is believed to be occurred when common people do mistakes or the god takes revenge against the commoners.

5.11 Occupational Status

What exactly occupation means in the context of many developing countries including Nepal where substantive economy prevails. However, people have had a binary concept either you do meet your day to day subsistence from traditional agricultural production or from the job (jagire). Apart from them there is another important sector that is agricultural labor (khetala). In the end of the last century, when Nepal formally adopted the liberal market economic policy, the trade and commerce become important sector. But still less amount of people are engaged with trade and commerce.

A man, age of 48, from Dalit community of Barpak, Gorkha; epicenter of earthquake said:

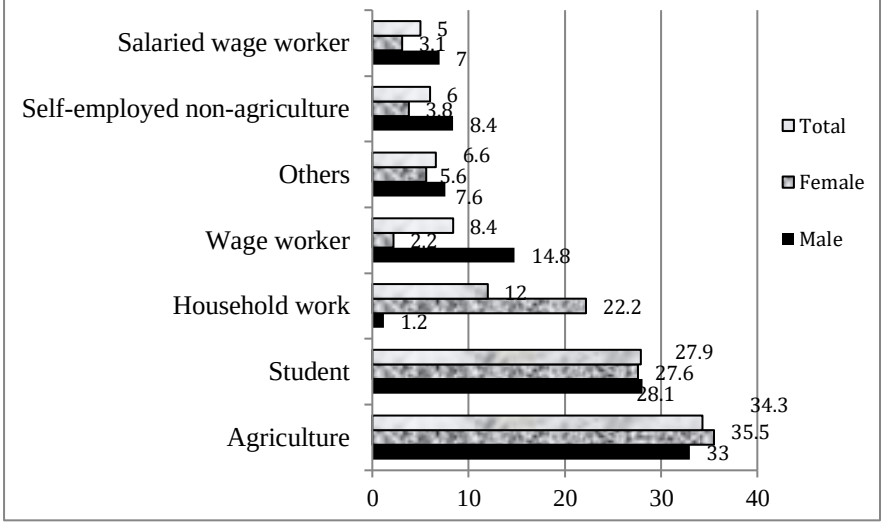
> We people from talllo-jatko (Dalit), didn't have any alternative than to go to the day to day khetala (agricultural labor) in land owner's field (Sahukoma) prior or in aftermath of to earthquake. Our forefathers also deed and, so as we are doing now.

Information on occupation was collected through structured questionnaire interviewing household population of age 10 years and above. Out of 14987 household populations, 10 years and above accounts for 12,870 whereas female and male population comprised 6277, and 6570 respectively. In order to measure the occupational status of earthquake affected household population, a standard instrument or questionnaire was devised which is compatible with other sources of data such as census, survey, etc.

Among surveyed household population, 10 years and above, over 34.0 percent reported that they were involving in agricultural occupation, followed by population who are studying (27.9%), engaged in different kind of activities or say household chores (12 %), Wageworkers (8.4%), and self-employed non agriculture sector (6 %).

Amoong the employed population 27% were employees, 2% were an employer and 66% were own account workers, while 4% of the employed population reported that they had only worked for less than 3 months.

Fig. 5.10 Occupational status of household population



If we see the household population involved in agricultural activities by three sample domain, larger proportion (38.4%) found in severely hit, followed by crisis hit (36.4%), and Kathmandu valley. But in all three domain household work plus students and other category account for the largest proportion. The largest 53.2 percent household population of Kathmandu valley found to be engaged in so-called non agricultural sector such as household work/ student/ other category. Following this, 45.1 percent of household population of severely hit were found to be engaged in household work/ student/ other category.

It is clearly observed that the household work/ student/ other category compliments to agriculture occupation. Generally female population is involved in household work in Nepal, but in this study male population is also found equally involved in household work/ student/ others (Table 4.13). So, irrespective of all background characteristics, household population found to be involved in household work implies that disaster made damages and loss might tend to bring all family members in household work rather than in agricultural activities.

Change in occupation is a general phenomenon to measure the impact of disaster in a society. Household populations were asked if any occupational status has been changed after the earthquake. Out of 12,870 eligible respondents, 342 respondents reported that their occupation was changed. If we compare the current occupation after the earthquake and the previous occupation before earthquake, the population involving in agricultural activities appeared to be significantly changed.

Among changed occupation, household populations involved in agriculture was about 43.6 percent before the earthquake, that was found to be declined to 16.7 percent at the time of survey which is about 62 percent. Similarly, even in self-employed in non-agriculture sector, there were about 11.4 percent household population involved in agriculture is also declined to 7.6 percent after the earthquake which is about 8.7 percent. Household population got out from agriculture is found to be inundated in Wageworkers (49.0 percent), followed by household work/ student/ other (17.4 %), and Salaried-Wage(4.0%).

Fig. 5.11 Household population by psychosocial problems

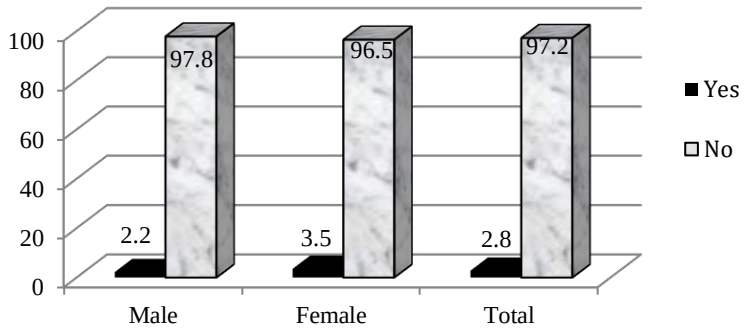


Table 5.8

Change in Occupational Status of Population After the Earthquake

Occupations	**Before**		**After**		**Change**	
	No.	**%**	**No**	**%**	**No**	**%**
Agriculture	149	43.6	57	16.7	92	61.7
Self-employed	39	11.4	26	7.6	13	8.7
Wageworkers	69	20.2	142	41.5	73	49.0
Salaried wage	9	2.6	15	4.4	6	4.0
Household chore	76	22.2	102	29.8	26	17.4
Total	342	100.0	342	100.0	0	0.0

Source: CDPS, 2015

Due to disaster, the occupational status of the affected population is assumed to be changed, so the inquiry was made the occupation of household member before and after the earthquake. Of total households, 342 said that their occupation changed in aftermath of earthquake.

Before earthquake, households with agriculture account for 43.6 percent, followed by household work (22.2%), and Wageworkers (20.2), and the least

Salaried-Wage(2.6%). After earthquake occupation of Wageworkerss increased, so account for 41. (Table-5.8).

5.12 Psycho-Social Problem

The psychosocial health problems generally appear among the affected population in disaster afflicted areas. The magnitude of psychosocial problems varies with the intensity of the disaster and capability of a society to cope with. A general believe is that the degree of coherent social tie, means a homogenous society can cope psychological problems than the heterogeneous society.

The survey collected information about psychosocial problem of household population. Out of 14987 household populations, 426 (2.8%) had reported that they have experienced some psychosocial symptoms after the earthquake.

Among household populations who are afflicted with some psychosocial problems, female (3.5%) exceeds the male (2.2%) population. As disaster literature reveals that women are at high risk of exposure to the vulnerability, in terms of psychosocial problem woman's number is higher than their male counterparts .

5.13 Citizenship Card

Having a citizenship card to an adult person characterizes that s/he entitles a full-fledged membership of a state. For example, an adult member can exercise the right of adult franchise to determine his or her future, if she/he possesses the citizenship card. In Nepal, when an adult person (both sexes) completes 16 years, she/ he is entitled to get the citizenship card.

Table 5.9

Population (16 Years & Above) by Possessing of Citizenship Certificate

	Male		Female		Total	
	Number	**%**	**Number**	**%**	**Number**	**%**
Yes	4928	91.8	4795	85.3	9723	88.5
No	432	8.1	808	14.4	1240	11.3
Don't know	5	0.1	20	0.4	26	0.2
Total	5365	100.0	5624	100.0	10989	100.0

Source: CDPS, 2015

So, every household population, 16 years and above, were asked whether she had a citizenship card or not.

Household population, 16 years and above accounts for 10,989; of them 9723 (88.5%) had reported that they did possessed citizenship card during the survey against 1240 (11.3%) do not (Table-5.9). Female population (14.4 %) is found comparatively deprived of citizenship card than male population (8.1%).

The household population without citizenship card is further analyzed to figure out the population who do not have accessibility towards the state's benefits and opportunities. Indeed, states' benefit primarily required the citizenship card, if any relief materials and facilities giving or claimed by an affected population, essentially need to show that he is the citizen of Nepal.

5.14 Discussions and Conclusion

The secondary data produced by PDNA (2015) is of 31 districts, but the inconsistencies are apparently found between the data DDRC has PDNA. The total death and injured population and affected households and population are greater than the estimation the PDNA made. Thus the data pulled from DDRC exceeds the estimated number of PDNA by three thousand, six hundred and thirty six.

Amid such an environment Nepal government has officially announced that there were 8,790 casualties and 22,300 injuries, and daily lives of 8.0 million people affected which is one-third of the population of Nepal (PDNA, 2015). Report reveals that 31 districts are affected out of 75 districts, and of them 7 districts are severely hit and 7 districts are crisis hit.

Surveyed population shows sex ratio (98.0) more than the national account (94.1) reported in 2011 PHC (Adhikari, 2014). But the sex ratio of survey population is only for 14 districts, the earthquake very badly hit, and it is of mountain and hill including Kathmandu valley. National level sex ratio is calculated in national census, 2011; four years earlier. So, it might be ambiguous from temporal perspective to compare with the national account. On the other hand sex ratio (number of males per 100 females) at the national level has decreased from 99.8 in 2001 to 94 in 2011. One guess we can argue is that in aftermath of earthquake, most of the absentee might

return to house to share the plight of family and to reconstruct or take care of family in the crisis. A large share of Nepal's most skilled labor works abroad temporarily,

and is the source of most remittances. In the aftermath of the disaster, many attempted to return home to help family members and relatives – their skilled labor highly valuable to the country – but most were unable to do so (European Institute of Asian Study)(EIAS, May 2016), in the case of Nepal.

For the first time ever since the demographic enquiries are made in Nepal, the types of family have been asked apart from total number of household members which is usually asked through a roster. Very surprisingly 3 out of 5 families were found nuclear, slightly over one third families are found as joint families, and remaining 3 percent as extended families. In the context of Kathmandu valley, there are still very traditional types of households where multiple nuclear families live, and if they are not recognized as the families yet, and when they need to show that they are families, there would be many problems. That earthquake affected families encountered such problems when they claim the assistance as they got as subsidies from the government. It became a problem from the very beginning of relief distribution to till now there are still many problems.

We don't exactly know about the proportion of each nuclear family, joint family, and extended family in earthquake hit regions. They are disproportionately hit by the hazard, and very few can stand if they are economically, politically able to stand. Super (November, 2013:1821-22) argues that Katrina wiped out a substantial number of low-income communities across the Gulf region and long after the disaster, officials reported that only one-eighth of the residents of lower Plaquemines Parish and the East Bank had recovered their condition. He further argues that the elimination of low-income communities in the Gulf Katrina bears some striking resemblances to the dispossession Americans from their lands.

When earthquake disaster took place, a chaotic situation cropped up, since first and foremost efforts would be rescue work of live bodies who were in the trap of damage buildings; taking injuries to hospital for emergency treatment, and protection of properties including food, clothes and other important things. To manage relief in crisis hour and how to distribute foods for survivors particularly children, and elderly

persons and vulnerable population was the tremendous job. In an emergency situation, seeking the medical treatment and burial of dead bodies becomes the most essential task, so to maintain the data often fall in less priority. Moreover, the society, the authorities who are often not prepare for possible disaster and its consequences, the situation even becomes worse. Generally, when a patient is entered in a medical hospital for seeking treatment, an admission record file is developed and that will be maintained along with the treatment. But what about in an emergency hour even in a hospital usually the record keeping is done?

After a week, fortnight, a month, two month, the authorities reached to affected areas, households and collected the data of death toll, physical loss, distributed the identity cards, and so on. Earthquake hit districts, villages, and communities are in remote areas where authorities need to walk for an hour to a week. However, they maintained about 90 percent houses are completely damaged.

Available disaster risk information and assessment, and access to multi-hazard, and early warning system is highlighted by the Sendai Framework on Disaster Risk Reduction in 2015 as the one of the seven targets set (Mysiak, Surminski, Thieken, Mechler, & Aerts, 2015). The information or data is so important to know primarily about the effect of an event, such as earthquake. As far as information or data related to disasters is concerned, without a reliable information or data, no one can estimate the impact of the event, and without it recovery would be unattainable. People requiring immediate assistance during a period of emergency, i.e. require basic survival needs such as food, water, shelter, sanitation and immediate medical assistance may include displaced or evacuated people (Guha-Sapir et al., 2006). Like in Nepal, the data or information to be collected or updated is very challenging, since it gets less priority. According to Integrated research and disaster reduction (IRDR, 2014):

Understanding and documenting impacts from natural hazards is the foundation for decision making and policy-setting in disaster risk reduction. The impacts range from human effects such as displacement, homelessness and fatalities, to environmental (wetland loss, desertification) and economic losses (damage to property and crops). Documenting impacts in a standardized and comprehensive way is challenging largely due to the lack of common terminologies for perils,

measurement methodologies, and human loss indicators. The inability to compare losses across hazards, space, and time hampers the assessment of the burden of disasters at global to local levels.

The study found that unmarried household population accounts for 36 percent, against the married population (58.0%), whereas unmarried male population accounts for almost 40 percent against the unmarried female counterparts about to one third. If we look at national account, 2011 census shows that married female population is significantly higher (63.9%) than the male married population which is 57.6 percent across the country (Bajracharya & Bhandari, 2012). Proportion of never married or unmarried male population is 40.6 percent against 31.1 percent female unmarried population. And male single or widower accounts for 1.6 percent against the female single or widow (4.6%) in 2011. In regards to the divorced or separated male and female population, it is 0.3 per cent and 0.4 percent respectively which is less than the study population.

Suwal and Dahal (2014) argued that the proportion of the employed population in the primary sector, mainly in agriculture, is gradually declining. This has been observed in earthquake disaster affected districts as well. However, it is too sharp decline that about halves population seems to get rid of agriculture occupation. But the situation might not be so, since the date of enumeration and environment for census enumeration and this study is totally different. In census, household population were self motivated to enumerate their socio-economic, and demographic surroundings but in this study, household population did not have their house, and mostly were found in their temporary shelters in pathetic situation due to the earthquake and its subsequent tremors. Household population might be less motivated to give their socio-demographic information, rather they had a question that what they would get from reporting their household information.

Another plausible reason for under enumeration might be the post-earthquake hit situation where household members are not fully involved in agriculture as they involved in normal situation. The situation of land itself where agricultural activities are traditionally carried out, the farm land and the place of temporary residence due to displacement, and the relief materials supplied for affected communities for day to

day feeding, all might bring a change in involvement of household population in agricultural activities as an occupation.

In regards to the marital status, a striking feature observed was the divorce/ separated status. Male family members are more likely to divorced/ separated than female members in aftermath of disaster.

As far as the occupation of a house hold is concerned, it is very difficult to define what occupation is, since very few household members has a particular occupation. A household or a member could have a multiple occupation. It is so, because of the tradition posed one occupation, and modernization posed another occupation, it is like a juxtaposition of modern over tradition. Since Nepal is a hybridization of these two put the difficulties in identifying many issues. Nepal is an agrarian economy, where more than 74% of populations are engaged in traditional agricultural occupations. But the study shows that about one third population who are residing in 14 districts, very badly hit by earthquake, are engage in agriculture. The variation seems to be high in two data sources, but it is so because of the problem what the occupation stands for, in the context of Nepal. The PHC, 2011 reported that sixty per cent of the employed population reported agriculture as their main occupation, which is two times more than the surveyed population. Since Kathmandu largely non-agricultural population reside might skewed the proportion of agricultural less than the national account.

Another important aspect to be discussed here is caste/ ethnic category as the background variable. Since Nepal was called a 'common garden of four caste and thirty six colors,' king Prithivi Narayan' crafted amid of 18th century, it constituted diverse social groups from the very beginning. Now, there are more than hundred groups. But Hindus are predominantly in the realm. So, virtually every aspect of the society to polity the state perceive from Hindus world view. The most difficult conundrum regarding to understand the role and responsibility is very much messed up, so the caste/ ethnic group, a social variable could be an identifier to understand much. The lowest folder of Hindus are known as Dalit, from social nomenclature point of view, as Tailors, Blacksmith, Shoemaker, or so on from occupational point of view, and they have been untouchables from the social discrimination point of view.

So, this will give us some ideas how we perceive the vulnerable population the earthquake has hit us.

According to Bennett et al. (2008), different social groups are socially excluded from very beginning the state formation. They said:

> In the 2001 Census around 81 percent of Nepalese reported their religion as Hindu, thus locating them within the caste system. For the most part over the last several years and even earlier in some areas, whether they were Hindu or not, all Nepalis were socially defined by the caste system as the Nation State was defined with Hindu religious king and kingdom. Some in high mountain areas may have been more influenced by Tibetan Buddhism and others in remote valleys and hills, they were known with the practices of Shamanism or Animism. They had a contact with the Hindu world view might have been minimal, but for most people living in the territorial boundaries of the modern Nepali state – especially after the promulgation of the *Muluki Ain (*National Code) in 1854 – the caste system has been a major determinant of their identity, social status and life chances (p. 3).

Dahal (2014) reported that there are 126 caste/ethnic groups in 2011 whereas Chhetri is the largest caste group (16.6 %), followed by Brahman-Hill (12.2%), Kami (4.8%), so on. Similarly, among Janajati (indigenous nationality), Tamang accounts for 5.8 per cent, followed by Newar (5%), and Rai (2.3 %). In 16 districts, central and partially western region, population residing in 2011 census is as Mabuhang (2015) estimated, Janajati population accounts for more than 54 percent, followed by hill caste (33.4%), Dalit (6.4 %), and so on. Among Janajati, Tamang accounts for the 19.3 percent, followed by Newar (16.6%), Magar (6.5%), Gurung (3.9 %), and so on. Similarly, among caste groups, Chhetri accounts for 16.4 percent, followed by hill Brahmin (15. %), Kami (2.9%), Sarki (1.9%), Damai (1.4%) and so on.

Christianity has seen a substantial increase in the number of its followers in the last ten years, although the number is still small compared to other religions (Dahal, 2014). Since affected region is predominantly resided by Tamang population and by practice largely they are Buddhist, the percentage of Hindu is less than the national account and Buddhist population is about 3 times more than the national

account. In national account Christian religion is about 1.41 percent which is about 1 percent in round figure, is reported to be 5 percent in affected regions.

CHAPTER VI

KNOWLEDGE OF EARTHQUAKE EVENT, RESCUE AND RELIEVE AND IMPACT

6.1 Introduction

This chapter primarily deals with the knowledge- sources of information, and usefulness of the information to mitigate earthquake disaster and Safety Measures, Rescue, and Relief Materials (SMRR); followed by the impact of the disaster on houses, cattle sheds, four-legs live stock, two-legs livestock, food grain, household facilities, cash and jewelry, and perceived cost of all properties. The impact would be measured by cross-tabulating background variables: earthquake domains, place of residence, occupation, the highest level of education (qualification), religion, and caste/ ethnic characteristics of the head of the households. In order to understand the significant relationship between dependent and independent variables Chi-square test would be applied. Last but not least the chapter would be wrapped up with the discussions and conclusions of this chapter.

6.2 Knowledge of Earthquakes

Surveyed heads of households were asked if they were informed about the earthquake hazard, safety measures, rescue, and relief (SMRR) management during the survey, in 2015. Slightly over two-fifths (43.1%) of respondents said they were informed.

Table 6.1

Distribution of Head of the HHS by Information on Earthquake Disaster Impacts

Background Characteristics	**Categories**	**Have you heard of Safety, Rescue, and Reliefs Measures (SRRM)?**			
		Yes.	**No.**	**Number**	**%**
Domain	Severely hit	34.9	65.1	1,601	100
	Crisis-hit	52.2	47.8	791	100
	Kathmandu	53.0		607	100
	Valley		47.0		
Residence	Rural	38.9	61.1	2,004	100
	Urban	51.7	48.3	996	100
Gender	Male	44.4	55.6	2,382	100
	Female	38.3	61.7	619	100
Occupation	Agriculture	38.0	62.0	1,786	100
	Self-employed	54.2	45.8	299	100
	Wageworkers	42.2	57.8	294	100
	Salaried-Wageworker	73.3	26.7	202	100
	Other	43.4	56.6	419	100
H. Edu.	None	23.1	76.9	173	100
	Primary	25.5	74.5	329	100
	Secondary	33.7	66.3	976	100
	Higher Secondary	51.2	48.8	1,106	100
	Tertiary	66.2	33.8	417	100
Religion	Hindu	47.4	52.6	1,968	100
	Buddhist	34.3	65.7	828	100
	Kirant	16.3	83.7	49	100
	Christian	45.2	54.8	155	100
Caste\ethnic Grs.	Brahmin	58.8	41.2	396	100
	Chhetri/Thakuri	50.0	50.0	566	100
	Tamang	37.1	62.9	781	100
	Newar	50.7	49.3	487	100
	Other Hill Janajatis	31.4	68.6	446	100
	Hill Dalit	33.2	66.8	235	100
	Other	25.3	74.7	87	100
	Total	**43.1**	56.9	**3,000**	100

Source: CDPS, 2015

The informed respondents were found to be large variations. Almost 8 out of 10 heads of the households of Kirat, the highest number of respondents, reported that they have never been informed about the safety, rescue, and relief measures to be taken in earthquake hazards. It clearly indicates that Kirat religious households were at the highest risk of exposure to earthquake hazards.

Following the religious background of the respondents, no education (76.9%) reported that they never knew about it. Education as an explaining variable rightly hinted that heads of households with no education are much more vulnerable than their other counterparts. Caste/ Ethnic characteristics are also taken as the prominent explaining variables. Among various groups, heads of the households of other minority groups account for 74.7 percent against the larger groups and dominant hill Brahmin, Newar, Chhetri, and so on. Chepang is the one

In regards to the knowledge about the earthquake, an elderly of age 80 years, Chepang INs, opined:

> I didn't encounter the earthquake of nabbe sal (1990) but heard about that. As I heard, many people died in Kathmandu. Durbar bhanchchiyo (palace broken), but nothing happened here in Wasabang. But this time nothing was left, everything matoma milyo (messed into the soil). It came very badly. I was outside the house, sitting in the courtyard. It sounded like a storm. I thought a chopper might come above us. And I cried saying 'What happened?' by that time all 150 houses were already collapsed. And stones brought down from the cliffs, like landslides and we all were shocked, didn't have any idea. What to do and not to do?

By domain, over half of the households in Kathmandu Valley and crisis-hit districts (52.2%) were informed against severely hit districts where just over one-third of respondents (34.9%). Slightly over one-third of the respondents from severely hit districts, mostly Mountain districts, were aware of earthquakes and other measures imply that they were prone to bear the impact of earthquakes (Table- 6.1). Kathmandu Valley and crisis-hit districts were fairly well known about the earthquake and related other measures since more than fifty percent head of the households knew about it.

There is a significant variation when we look at the place of respondents- rural and urban. However, there is a blunt feature to define the urban and rural places in Nepal. Although population, annual income, and level of infrastructure development are set as the basic criteria to declare a municipality, the political decision and the population criteria have been adopted in practice (Chapagain, 2018). Mainly a number of people are taken to measure the place of urban. Head of the households of urban

places accounts for almost 51 percent knew about SMRR against the rural place (38.9 %). And respondents from urban places account for 52 percent who knew about the earthquake and related other measures.

There is also a larger variation in knowledge about the earthquake by the occupational characteristics of respondents. Salaried- Wageworkers accounts for the largest percentage (73.3%) known about SMRR, followed by self-employed (54.2%). Head of households who are mostly engaged in agriculture occupation accounts for the least (38.0%) knew about the earthquake event and the ways to avoid the negative effects.

Education is considered to be the best means to communicate knowledge. As we know an earthquake is a natural event, but how it has impacted the population and ways to mitigate is an important issue to know. As we assumed, heads of households with no education accounted for the least (23.1%) on knowledge about the earthquake, whereas those with tertiary level education accounted for the highest (66.2%) who knew about the earthquake and other measures. The difference in knowledge of earthquakes and their impact in those with no education to the tertiary level of education ranges almost 3 times more.

As far as religion is concerned, especially in Nepal, largely it is taken as the customary practice of a community rather than an individual's faith; however, Hindu religious respondents (47.4%) knew more about the earthquake and other measures, followed by Christian (45.2%), Buddhist (34.3%), and Kirat the least (16.3%).

Among different domains the earthquake hit, heads of the households from Kathmandu Valley accounted for 79.3 percent who knew about SMRR, followed by Crisis-hit (73.7 %), and Severely Hit (53.9%) (Table-6.1).

In Nepal, people classified with Caste\ ethnic background are still prominent socially and culturally able to explain many issues. Among broader Caste\ ethnic groups Brahmin accounts for the most 58.8 percent who are known to SMRR, followed by Newar (50.7%), Chhetri (50.0%), against the Other Hill *Janajati*s, the least (31.4%).

In the Chepang language earthquake is called 'Leyang.' Elderly opined:

> Elderly shared with us about the Leyang, as they said in the earth, jamin mata (motherland), koi (somebody) bears this land, as we bear the beam of the roof of the house on our shoulder (during construction) and when it gets tired and need to change the shoulder, how it badly 'shakes' the land does so. An earthquake comes like this. Another story is that in the entire earth amount of water is greater, and the level of water exceeds. It is believed that there is a huge fish with big eyes that can accommodate an elephant. When that fish shakes its tail, the tremors come in the earth.

As far as the association between dependent and independent variables is concerned, there is a significant relationship at a 95 % confidence level.

Compared to other explaining variables gender seems to be statistically less significant than the others.

Table 6.1.1

Pearson Chi-square Test between the Background Characteristics and Knowledge of Earthquake

Dependent Variable: Knowledge of Earthquake

Explaining Variables	X^2	df	P-value
Domain	95.0	2.0	0.000*,b
Place of residence	44.7	1.0	0.000*,b
Sex of HH head	7.5	1.0	0.006*,b
Occupation of HH head	109.3	4.0	0.000*,b
Highest level of education	224.6	4.0	0.000*,b
Religion	55.3	3.0	0.000*,b
Caste/Ethnicity	119.4	6.0	0.000*,b

Note: Results are based on nonempty rows and columns in each innermost sub table.

* The Chi-square statistic is significant at the .05 level.

b. Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.

In Palapu, Okhaldhunga, how *Dalit* Community experienced the earthquake hit, they shared:

> This place is known as BK tol (Black Smiths's) settlement. This is the third time the earthquake hit us: first, in 1934; second, in 1989; and third, in 2015. No death toll, but everything we lost. One ox, chickens, stored foods, everything went under the debris. The maize, millet, and rice all messed in the soil, germinated in the last summer, and fruited and reaped. I was sitting and making sickles at Aran (Black Smith's workshop). Goats were crying ulkai garyo (extremely cried), and a pig also karaera udhinera banchna khana diena (cried and tilled extremely), so just let free them and came inside the house and just trying to sit to take my meal, the tremors started. Wao earthquake! As the elderly told us we ought to get out when the earthquake came. So, went out. Tremor slowed down. There were 3 buffalos were tied up there, and a cow was tied- up under the cattle shed. I thought! should I let them free? Or not. I couldn't decide. Tremor strongly came. Just I looked at the cattle shed first fell down. Everything was full of smoke. I was in a dam crisis about how to protect myself. The buffalo and a pair of oxen were totally covered by the debris. No way, or any equipment to get out of them. Immediately family members and community members got together, and somehow we were able to take out the oxen and a buffalo.

In summary, respondents with Salaried-Wageworkers rated the largest percent who knew about the earthquake disaster and ways to get rid of, it prior to the earthquake took place, followed by Brahmin respondents, respondents with tertiary level education, and respondents from Kathmandu Valley. In regards to the association between dependent and independent variables examined, except gender, all explaining variables have shown a high-level association with respondents' knowledge about the disaster and its consequences people have to face.

6.3 Sources of Knowledge

Respondents, who have had knowledge of SRRM, were also asked about the main sources of knowledge. Over two-thirds (66.6%) named the media, both print and electronic; followed by the narratives of the elderly who experienced the previous

quakes including the mega earthquake of 1935, well known with Nabbe Salko Bhukamp (earthquake of B.S. 1990)(19.2%), and awareness program (8.2%), etc. (Table-6.2).

About 79 percent head of the households of Kathmandu Valley reported that the source of knowledge was media, followed by crisis hit (73.7%), and severely hit districts (53.9%). And the second source of knowledge is the narrative of the elderly about the experiences of earthquakes, the severely hit districts account for the most, 30.1 percent, followed by crisis hit (14.2), and Kathmandu Valley (6.8%). It clearly shows the media in the first account, and access to Kathmandu valley. The narratives of the elderly account for the second priority, and the severely hit districts account for more than others.

Similarly, awareness, as well as training, are the source of SMRR, and severely hit districts account for 10.5 percent, followed by Kathmandu Valley (4.6%), and the awareness program is the third account on which severely hit districts account for the most, 10.5 percent. So, it can be understood that awareness is much higher at severely hit districts than in crisis hit and Kathmandu Valley.

It is also true that urban dwellers have more access to media so, they account for 77.4 percent against the rural residents (59.6%). By gender, of male respondents, about two thirds (67.2) respondents said that media is the main source of information on SMRR, whereas 23.2 percent of the female heads of the households found the narrative more informative on SMRR. The narratives as the sources of information female respondents hit much better compared to their male counterparts.

Occupationally, among the head of the households, waged workers account for 73.4 percent said the media is the main source of information related to SMRR, followed by self-employed (non-agriculture) (71.0%), and salaried workers (66.9%). Head of the households engaged in agriculture occupation account for 65 percent only, and it is true since agriculturists have less access to media compared to others. And it is interesting to know the head of household of the agricultural sector who accounts for the greatest 22.3 percent said the narratives of the elderly were the main source of SMRR. The Salaried-Wageworker account for the least, 10.8 percent who noted that the narrative of the elderly was the main source of SMRR. Awareness

programs were found the most effective source of SMRR for Christians (27.2%), and Kirat (22.2%), in comparison to Hindus (7.5%) and Buddhists (5.7%). Among caste\ ethnic groups, of Brahman respondents account for the highest percentage (77.4%) said the media is the main source of SMRR against the other hill *Janajati* (50.0%).

Table 6.2

Distribution of Head of the HHS by Sources of Information

Background Characteristics	Characteristics	Media	Social Narratives	Training	Awareness	Total	
						N.	%
Domain	Severely Hit	53.9	30.1	5.4	10.5	558	100
	Crisis-hit	73.7	14.2	4.1	7.9	415	100
	K. Valley	79.3	6.8	9.3	4.6	323	100
Residence	Rural	59.6	24.6	5.6	10.2	779	100
	Urban	77.4	10.9	6.4	5.3	514	100
Gender	Male	67.2	18.3	5.9	8.6	1,058	100
	Female	63.7	23.2	6.3	6.8	237	100
Occupation	Agriculture	65	22.3	4.9	7.8	677	100
	Self-employ	71	15.4	6.2	7.4	162	100
	Wageworkers	73.4	12.1	4.8	9.7	124	100
	Salaried Wageworkers	66.9	10.8	10.8	11.5	148	100
	Other	63.9	22.4	6.6	7.1	183	100
Highest Education	None	35.0	62.5	0	2.5	40	100
	Primary	61.9	31.0	4.8	2.4	84	100
	Secondary	64.4	22.8	4	8.8	329	100
	H. secondary	69.4	15.9	5.7	9.0	566	100
	Tertiary	69.2	12.0	10.1	8.7	276	100
Religion	Hindu	71.0	15.9	5.6	7.5	931	100
	Buddhist	58.1	28.5	7.7	5.7	284	100
	Kirant	55.6	11.1	11.1	22.2	9	100
	Christian	44.3	25.7	2.9	27.2	70	100
Caste\ethnic	Brahmin	77.4	9.0	4.3	9.4	234	100
	Chhetri/ Thakuri	66.5	21.5	5.6	6.3	284	100
	Tamang	58.6	24.5	7.6	9.3	290	100
	Newar	76.5	11.7	6.5	5.2	247	100
	H. Janajatis	50.0	32.9	6.4	10.7	140	100
	Hill Dalit	57.7	25.6	3.8	12.9	78	100
	Other	81.8	4.5	4.5	9.2	22	100
	Total	66.6	19.2	5.9	8.2	1,294	100

Source: CDPS, 2015

About one-third of other hill Janajatis reported that the narratives are the main sources of SMRR against the Brahmin caste group, the least (9.0%).

Respondents said that they got knowledge on SRRM from media accounts for almost two-thirds (66.6%), followed by social narratives (19.2%), awareness programs (8.2%), and trainings (5.9%), Interesting remarks is that head of the households from both Kathmandu domain (71.9%) and other minor groups (81.8%)

respectively account for media as the main sources of knowledge. As far as the social narratives as the source of knowledge on SRRM is concerned, no education accounts for 62.4 percent. This is very true, since the older age group less likely to be no education than their younger counterparts learned about the earthquake in 1935, and shared SRRM responsibility.

Dependent Variable: Main sources of Safety Measure, Rescue and Relief Management (SMRR)

Table 6.2.1

Pearson Chi-square test Between Background Variables and Sources of SMRR

Independent Variables	**□2**	**df**	**P-value**
The domain of earthquake affected districts	113.66	8	.000*,b,c
Place of residence	59.655	4	.000*,b,c
Sex of HH head	4.91	4	.297c
Occupation of HH head	29.637	16	.020*,b,c,d
Highest level of education of HH member	88.231	16	.000*,b,c,d
Religion	71.091	12	.000*,b,c,d
Caste/Ethnicity	88.05	24	.000*,b,c,d

Note: Results are based on nonempty rows and columns in each innermost sub table.
The Chi-square statistic is significant at the .05 level.
. More than 20% of cells in this sub-table have expected cell counts of less than 5. Chi-square results may be invalid.
Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.
. The minimum expected cell count in this sub-table is less than one. Chi-square results may be invalid.

The Pearson Chi-square test was applied to show the relationship between the dependent and independent variables. Except for the gender or head of households with sex, all categories show a significant relationship at a 95 % confidence level. So, the distribution is not only by chance, but it is meaningful as far as the measurement of the impact is concerned.

In summary, the data analysis reveals some important features. Some dominant groups go with the dominant source of information on SMRR. For example, Kathmandu Valley out of earthquake-hit domains, urban residents out of their place of residence, male in gender, salaried workers out of different occupations, tertiary level of education out of higher education, Hindu out of the religious group, and Brahmin out of caste/ ethnic groups account for the median main source of information on

SMRR. On the other hand, the narratives of the elderly though account for the second largest by respondents just goes opposite of the dominant groups.

6.4 Usefulness of Information

Prior to any natural or manmade hazards, different agencies worked on the potential hazards and their consequences. Since Nepal lies in a very seismic zone, different types of academic and public awareness programs ought to be done from time to time. But except for the media, virtually no agencies are found to be working for building knowledge by imparting the knowledge to different age groups, professions, institutions, and its impact on disasters. Apart from media, the narratives of the elderly got or heard about earthquakes including the mega earthquake of 1934, made them aware of the earthquake and its socks, disaster, and so on. Following this, there were different agencies that organized workshops or awareness programs, making people aware of the earthquake, but whether they applied them or not when the earthquake was gone. So, a simple question was asked whether they did apply the knowledge or not.

An elderly of age 92 and his colleague at Mirkot, Gorkha shared their experienced

> I was a small boy, and I didn't know what was happening, but came to a storm like initially and tremor. We fell down on the ground. And we never got such a big event, but this year encountered even bigger alike. I didn't think that we would save our lives, so I cried for my grandchildren where they were. But god! Nothing happened to us and this village. Many houses and cattle sheds fell down. As I remembered from the elderly, when an earthquake comes you ought to be out of the house or room. So, I tried to run out of the house. And when I came out everything was collapsed. If it would be at night, nobody would alive in this village.

There are some contradicting responses found among respondents. Apparently, very vulnerable groups knew about SRRM, they got information less than the affluent groups.

Table 6.3

Distribution of Head of HHS by the Usefulness of Information During the Quake

Background Characteristics	Background Characteristics	Was the information useful during the quake?			
		Useful	Not Useful	Total	
				Number	%
Domain	Severely hit	47.8	52.2	558	100
	Crisis-hit	41.6	58.4	415	100
	Ktm.Valley	40.1	59.4	323	100
Residence	Rural	44.1	55.9	779	100
	Urban	43.7	56.3	514	100
Gender	Male	43.0	57.0	1,058	100
	Female	47.9	52.1	237	100
Occupation	Agriculture	46.0	54.0	677	100
	Self- employed	45.3	54.7	162	100
	Wageworkers	39.5	60.5	124	100
	Salaried-Wageworkers	39.2	60.8	148	100
	Other	41.8	58.2	183	100
Highest Education	None	55.0	45.0	40	100
	Primary	50.6	49.4	84	100
	Secondary	44.7	55.3	329	100
	H. secondary	43.2	56.8	566	100
	Tertiary	40.9	59,1	276	100
Religion	Hindu	42.7	57.3	931	100
	Buddhist	47.2	52.8	284	100
	Kirant	12.5	87.5	9	100
	Christian	50.7	49.3	70	100
Caste\ethnic	Brahmin	39.3	60.7	234	100
	Chhetri/Thakuri	43.1	56.9	284	100
	Tamang	45.5	54.5	290	100
	Newar	36.3	63.7	247	100
	Hill Janajati	62.1	37.9	140	100
	Hill Dalit	46.8	53.2	78	100
	Other	40.9	59.1	22	100
	Total	43.9	56.1	1,294	100

Source: CDPS, 2015

As far as the usefulness of the information or knowledge whatever respondents got, the weaker section say vulnerable groups are more likely to use the knowledge than their counterparts, except the Kirat in religion. And the dominant groups who are from Kathmandu Valley, Urban dwellers, Males, Salary Wager-workers, Tertiary education level, Newar, and Brahmin respondents found the acquired knowledge was not useful (Table-6.3). If we look at the response got with different occupational background characteristics, respondents from the agricultural sector account for the highest, 46.0 percent found the information useful; followed by self-employed (non-agriculture)(45.3%), and other categories (41.8%) .

In contrast, the head of the respondents with no educational status account for 55.0 percent found the information useful against the respondents with tertiary level education accounts for the least 40.9 percent. Similarly, Christians by religion account for the highest, 50.7 percent, found the information useful, followed by Buddhists (47.2 %), Hindus (42.7%), and Kirat (12.9%). About 62.1 percent Other Hill *Janajati*s found the information useful, followed by Hill *Dalit* (46.8%), Tamang (45.5%), Chhetri/ Thakuri (43.1%), and Brahmin (39.3%), against the Newar accounts for the leas, 36.3 percent.

For example, by domain, the head of the households severely hit used the information more than the Kathmandu valley, rural residents used more than the urbanites, females than males, etc. It shows some surprisingly different patterns. But the statistical test, the Chi-square test shows, out of seven explaining variables, except the earthquake-hit domains, and the caste/ ethnic group, the rest of all categories are insignificant in the given level (Table- 6.3.1).

Table 6.3.1
Pearson Chi-square Test
Dependent Variable: Whether knowledge was useful during the earthquake?

Independent Variables	**□2**	**df.**	**P-value**
The domain of earthquake-affected districts	6.310	2	.043[*,b]
Place of residence	.022	1	.883[b]
Sex of HH head	1.831	1	.176[b]
Occupation of HH head	4.010	4	.405[b]
Highest level of education of HH member	4.722	4	.317[b]
Religion	6.365	3	.095[b,c]
Caste/Ethnicity	27.481	6	.000[*,b]

Note: Results are based on nonempty rows and columns in each innermost sub table.
*. The Chi-square statistic is significant at the .05 level.
b.Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.
c. More than 20% of cells in this sub-table have expected cell counts of less than 5. Chi-square results may be invalid.

The association between dependent and independent variables is examined using Chi-square distribution. Except for respondents of caste/ ethnicity and domain to some extent, there is no likely to be a statistically significant association with others explaining variables.

In summary, information, knowledge acquired through the workshops, awareness regarding mitigation, and risk reduction in earthquake seems to be less

useful; however, less prominent categories are found champion to the use of those information. But Chi-square statistical test does not show any significant association as far as the relationship between dependent and independent variables. And it is also true since the use of knowledge in commotion is less likely to be.

6.5 Impact on Houses

House is not merely a physical asset; it is a cultural, economic, social, or let's say a holistic entity. When a hazard hits a house, for example, an earthquake hits the house it affects multiple aspects of a family with which they are currently living.

It was about midday on 25 April 2015. Since the epicenter was in the mountain, waves that came out were skewed from the epicenter towards the east. The eastern mountain and hill regions were very badly hit. Most of house buildings are made of stone molded with mud and even roofs were of stone slate in rural settlements that have a high chance of collapsing with the intensity of earthquakes. An owner may have more than one abode, depending on the family, land, and economy of the owner. A gentleman, age of 41 years from Mandre, Barpak, Gorkha experienced the quake:

> It was 12 o'clock noon on 25 April 2015. We were, here, planting the maize seeds. At that point, from where the smoke came out, '..putututu……' The land was 'phatyo' (ruptured). It could not be filled up with 12 dead goats, such a big gap was created. People guessed a kind of explosion occurred. And that was said to be an earthquake, but in the early day, earthquakes used to shake the land, rather to explode. It was a huge explosion that made us a great shock. Family members were just thrown up. I thought somebody is bombing us, but why? Just it came to my mind. A chopper came over us, after an hour but didn't land. The land, road, and everything was shaking. Stones fallen down, as in Landslide. The motor road to and from Barpak was disturbed in many places. So, went down to the Baluwa, and brought rice and other foodstuff, to feed family members and children. I have never seen such a quake before. The rupture is gone along the edge of the hill from down to Barpak village and beyond. There were 8 goats and 2 sheep of mine killed by the quake. Eight

people were dead in our village. All the houses with a stone roofs and wall were collapsed.

In Nepal, mostly agricultural families with joint family structure, have more than one house buildings for both accommodation of family members and storage of food grains. The extent of damage was categorized as completely damage, partially damage, and slightly damage. The survey collected the data of house building damage a head of household possessed: one, two and three or more buildings.

Table 6.4

Distribution of Head of HHS by a Number of Houses Damaged

Number of House Building	**Damage Status**	**Percent**
One	Completely	84.1
	Partially	13.7
	Slightly	2.2
	Total	100 (2,500)
Two	Both completely	72.1
	One Completely	22.4
	Both partially	4.6
	One Partially	0.9
	Total	100(438)
Three	Three completely	77.8
	Two completely	9.5
	One completely	7.9
	All partially	4.8
	Total	100(62)

Source: CDPS, 2015

In terms of number of houses destroyed, head of the HHs with a single house completely destroyed account for over 84.0 percent completely destroyed out of 2500 houses, followed by partially destroyed (13.7%), and slightly hit (2.2%). Among head of the HHs who owned two house buildings and both were completely destroyed accounts for 72.1 percent out of 438 houses, followed by one completely destroyed (22.4%), both partially destroyed (4.6%), and one partially destroyed (0.9%).

In a question of how did all houses fall down? Participants of the Focus Groups Discussion argued:

This is ward number 3, Chyanglitar, VDC. There are 56 houses collapsed from the Jaraisita (Foundation) in a single hit. We were surprised when all houses

collapsed. Some were built with stone with cement mortar. But later we came to know that the stones were simply collected from the bank of the Marshyandi River, not broken ones. So, most of the stones were fine oval shapes that were not joined by the cement as the rough stones do. The outside of walls was plastered with cement, even though they could not withstand, all collapsed.

The study found that 78 percent of completely destroyed out of 62 households that have three houses, followed by two completely destroyed (9.5%), one completely destroyed out of three (7.9%), and all three houses partially damaged (4.8%)(Table-6.4).

Of heads of the households who possessed a single house, about 84.1 percent were completely destroyed, followed by partial damage (13.7%) and slight damage (2.2%). Among earthquake-affected households of the Kathmandu Valley domain, about 90 percent completely destroyed, followed by partially destroyed (8.3%), and slightly destroyed (1.8%) (Table-6.5). Of the total respondents of severely hit districts, about 94 percent of houses were completely destroyed, followed by partially destroyed (5.8%), and slightly destroyed (0.2%). In crisis-hit districts, about 60 percent of houses were completely destroyed, followed by partially destroyed (33.4%), and slightly destroyed (6.6%). The house buildings damage in crisis-hit districts sound unlikely compare to two domains: Kathmandu Valley and severely hit districts

The damage of house buildings reported by different gender, and place of residence (urban and rural) doesn't seem to be any variation. Among respondents with agriculture occupation, about 85.7 percent head of the households said their houses were completely destroyed, followed by partially damaged (12.5%), against slightly damaged (1.8%).

The least number of respondents by occupation was the self-employed (non-agricultural), account for only 74.5 percent said their houses were completely destroyed. So, completely destroyed houses of agricultural occupation of the head of households may be compared with that of the self-employed (non-agricultural) head of the households. And heads of the households with self-employed occupations also

reported that their houses were partially damaged in greatest number (20.8 %) compare to others (12.5-14.6 %).

Table 6.5

Distribution of Head of HHS with Single House Destroyed

Background Characteristics		**One house damaged**			**Total**	
		Completely	**Partial**	**Slightly**	**%**	**(n)**
Domain	Severely hit	94.1	5.8	0.2	100	1,283
	Crisis-hit	59.9	33.4	6.6	100	664
	Kathmandu Valley	89.9	8.3	1.8	100	553
Residence	Rural	85.5	12.5	2.0	100	1,615
	Urban	81.5	15.7	2.8	100	885
Gender	Male	83.8	13.7	2.5	100	1,959
	Female	85.0	13.5	1.5	100	541
Occupation	Agriculture	85.7	12.5	1.8	100	1,471
	Self-employed	75.4	20.8	3.8	100	240
	Wageworkers	84.6	12.4	3.0	100	267
	Salaried-Wageworkers	85.0	13.2	1.8	100	167
	Other	82.6	14.6	2.8	100	356
H. Education	None	85.9	13.5	0.6	100	163
	Primary	84.9	13.5	1.6	100	304
	Secondary	84.6	13.3	2.1	100	812
	Higher Secondary	84.6	13.5	1.9	100	898
	Tertiary	79.8	15.2	5.0	100	322
Religion	Hindu	83.5	14.1	2.3	100	1,661
	Buddhist	83.7	13.9	2.4	100	663
	Kirant	86.0	11.6	2.3	100	43
	Christian	92.5	7.5	0.0	100	133
Caste/	Brahmin	84.2	13.7	2.1	100	329
	Chhetri/Thakuri	85.0	12.9	2.1	100	466
ethnic gr.	Tamang	82.3	15.2	2.5	100	645
	Newar	81.9	16.2	1.9	100	425
	Other Hill Janajatis	90.9	6.7	2.3	100	342
	Hill Dalit	82.9	14.8	2.3	100	216
	Other	81.1	17.6	1.4	100	74
Total		84.1	13.7	2.2	100	2,500

Source: CDPS, 2015

From an educational point of view, almost 80 percent of respondents reported that their house buildings were completely destroyed ranging about 79.8 percent with tertiary education to 86 percent with no education. So, it shows that the head of households with less education is more likely to be destroyed by the quake than the head of households with more education.

With religious background variables, Christians' house buildings were destroyed the most (92.5%), followed by Kirat (86.%), Buddhists (83.7%), and Hindus (83.5%). Among different caste/ ethnic groups, of other hill *Janajati*s, over 90.9 percent said that their house buildings were completely destroyed, followed by partially destroyed (16.2%), and slightly destroyed (1.8%).

In summary, it is apparently observed that 8 houses completely destroyed out of 10 houses. The vulnerable households in terms of domain, Severely hit account for the highest 94.1 percent completely destroyed, followed by Christian head of the households accounting for 92.5, and other minorities account for 90.9 percent.

House building damage is estimated in the perceived value of the house building the head of the household made. Of heads of the households, from one lakh one NRs to 500,000 account for 41.3 percent, followed by 500,001 to 1000,000 (31.1%), and 1000001 to highest (21.1%) (Table- 6.6). There is an interesting feature phenomenally found that households of crisis-hit districts are relatively less likely to damage than the severely hit, and Kathmandu Valley. And also damage of houses in occupation shows typical evidence.

Table 6.6

Distribution of Head of HHS with Estimated Cost of Damaged Houses

Rupees	**Number**	**%**	**Cumulative**
Up to 100000	195	6.5	6.5
100001 to 500000	1238	41.3	47.8
500001 to 1000000	934	31.1	78.9
1000001 to highest	634	21.1	99.9
Total	3000	100	

Source: CDPS, 2015

The head of the households from agriculture shows the highest number of houses that are completely damage against the head of the households from self-employed (non-agriculture) (75.4%). On the other hand the former, respondents from agriculture account for the least in partial damage against the respondents from the self-employed account for the highest in partial damage of houses.

Respondents, with no education, had houses completely destroyed than the best (tertiary) education; Christians' houses are completely destroyed than Hindus'; and other hills Janajati's houses are completely destroyed than Newar. Thus it can be inferred from this analysis that who are badly impacted in comparison to other reference variables.

However, the chi-square test shows some interesting results. The data analysis yielded that the earthquake-hit domains, place of residence, and occupation are significantly associated with the houses hit completely turned into debris, but other variables do not show a significant association with the damage in April 2.15 earthquake (Table- 6.6.1).

Table 6.6.1

Pearson Chi-Square Test with the First House Damaged and Explaining Variables

Explaining Variables	**□2**	**df**	**P-values**
The domain of earthquake-affected districts	447.506	4	.000*,b
Place of residence	9.605	2	.008*,b
Sex of HH head	1.738	2	.419b
Occupation of HH head	15.674	8	.047*,b
Highest level of education of HH member	10.141	8	.255b
Religion	9.638	6	.141b,c
Caste/Ethnicity	20.024	12	.067b

Note: Results are based on nonempty rows and columns in each innermost sub table.

* The Chi-square statistic is significant at the .05 level.

b. Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.

c. The minimum expected cell count in this sub-table is less than one. Chi-square results may be invalid.

In summary, as head of the households reported, there are at least three types of them; the first type of head of the household had only one house accounting for 2500, the second type of household had two houses accounting for 438, and the third type of households who had more than three houses accounted for 62. However, the

study shows that more than 80 percent of respondents said that their one-house building was completely damaged. Houses are damaged irrespective of which caste\ ethnic groups are possessed, but hill Janajati accounts for almost 90 percent who do not have a residence in the aftermath of an earthquake.

6.6 Cattle-shed

Along with a house building, Nepalese family needs, accompanied by a cowshed, an essential structure. House buildings are obviously more cared for than cattle sheds. When earthquake hazards destroyed the houses, most of the cowsheds were also destroyed impacting both the social and economic conditions of a household.

Of all heads of the households, 1300 reported that they had cattle-sheds: one or more two; 91.5 percent reported that their one cattle shed completely destroyed, and 8.5 percent reported that their two or more cattle sheds were completely destroyed by the earthquake in 2015.

There is no significant variation with respect to a place of residence and gender, as far as the cattle sheds destroyed by the earthquake were concerned. But in the occupation of the households, obviously, the head of the households characterized with agriculture was expected to have more cattle sheds and impact on it by the earthquake.

Table 6.7

Distribution of Head of HHS with Cattle-Shed Damage

Background Characteristics	Categories	Cattle-sheds		Total	
		One	Two+	%	N.
Domain	Severely hit	88.6	11.4	100	871
	Crisis hit	97.4	2.6	100	304
	Kathmandu Valley	97.6	2.4	100	125
Residence	Rural	90.4	9.6	100	1010
	Urban	95.4	4.6	100	289
Sex	Male	91.0	9.0	100	1071
	Female	93.9	6.1	100	229
Occupation	Agriculture	91.7	8.3	100	866
	Self-employed	91.1	8.9	100	72
	Wageworkers	92.4	7.6	100	84
	Salaried-Wageworker	89.7	10.3	100	86
	Others	91.5	8.5	100	192
Highest Education	No education	98.7	1.3	100	61
	NFE & Primary	95.0	5.0	100	128
	Secondary	92.8	7.2	100	435
	Higher secondary	90.1	9.9	100	494
	Bachelor & above	87.5	12.5	100	183
Religion	Hindu	92.8	7.2	100	814
	Bouddha	89.1	10.9	100	388
	Kirant	100.0	0	100	13
	Christian	88.7	11.3	100	86
Caste/Ethnicity	Brahman (Hill)	95.8	4.2	100	248
	Chhetri/Thakuri	92.3	7.7	100	260
	Tamang	87.8	12.2	100	395
	Newar	93.4	6.6	100	85
	Other Hill Janajatis	89.7	10.3	100	194
	Dalit (Hill)	93.4	6.6	100	94
	Others	100.0	0	100	23
Total		91.5	8.5	100	1300

Source: CDPS, 2015

However, we didn't see any significance difference, except the Salaried-Wageworker. The head of the households must be a non-agriculture population, but they noted that their two cattle sheds were destroyed by 10.3 percent. There is a contrasting scenario we got when we see the earthquake hit domains. In severely hit

districts, heads of households account for 88.6 percent said that their only one cattle shed was completely destroyed against two or more cattle-shed with 11.4 percent. Whereas either in Kathmandu Valley or crisis-hit districts, over 97 percent of households said that they had a cattle shed that was completely destroyed, against the households who had two or more cattle sheds (Table-6.7).

Households with education revealed some correlated results. For example, the head of the households characterized with no education reported that they had a cattle shed destroyed accounting for the largest percent (98.7%) against the head of the households with tertiary level education had a cattle shed which was destroyed accounting for 87.5 percent. From households with religion, the Kirat population noted that they had only a cattle shed that was destroyed by the quake accounting for (100.0%), against the Christians whose single cattle sheds were destroyed by the quake accounting for 88.7 percent.

From the caste/ ethnic group's point of view, heads of the households characterized with Other groups only had a cattle shed that the earthquake destroyed cent percent. Tamang, hill ethnic group reported that about 87.8 percent lost their cattle shed, and the rest 12.2 percent lost their two or more cattle sheds. As far as the loss of the cost of cattle-shed in terms of Nepalese Rupee is concerned head of households who lost up to 50 thousand accounts for 35.5 percent, followed by 50001 to 150,000 (30.2%), 150,001 to 300,000 (21.3%), 300001 to 600000 (10.0%), and 600001 up to highest (3.0%) (Table- 6.8).

Table 6.8

Distribution of Head of HHS with the Perceived Cost of Cattle-Shed Damage (in NRs.)

Perceived Cost (in NRs.)	**No.**	**%**	**Cumulative (%)**
Up to 50,000	461	35.5	35.5
50001 to 150000	393	30.2	65.7
150001 to300000	277	21.3	87.0
300001 to 600000	130	10.0	97.0
600001 up to high	39	3.0	100
Total	1300	100.0	

Source: CDPS, 2015

Table 6.8.1

Pearson Chi-square Test Between the Cattle-Shed Destroyed with Background Variables

Explaining Variables	**□2**	**df**	**P-value**
The domain of earthquake-affected districts	28.757	2	.000*,b
Place of residence	7.557	1	.006*,b
Sex of HH head	1.978	1	.160b
Occupation of HH head	0.66	4	.956b
Highest level of education	12.368	4	.015*,b
Religion	6.994	3	.072b
Caste/Ethnicity	17.135	6	.009*,b

Note: Results are based on nonempty rows and columns in each innermost sub table.

* The Chi-square statistic is significant at the .05 level.

b. Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.

In summary, it can be inferred from the analysis that households with cattle-sheds too, the earthquake affected lost cattle-sheds that are phenomenal agricultural background, in comparison to households with a nonagricultural background.

6.7 Live Stock

Domestic animals have an economic, cultural, and emotional relationship with human being since they are primarily the possession of human beings. When a hazard hits the household, a loss of domestic animals along with the death toll of mankind, damage to cattle- sheds, and damage to houses generally occurs.

Loss of animals especially four-legs are economically valuable assets. Heads of the households were asked if any cattle or domestic animals were lost due to the earthquake. Of the total head of households, 3000; over 11 percent agreed that they have lost the four-legs-live stocks; against about 89 percent said they didn't lose any four-legs-live stocks.

Among heads of the households from severely hit districts, about 18.2 percent reported that 'yes' they had lost four-legs-live stocks. In contrast severely hit districts, Kathmandu Valley and Crisis hit districts the head of the households who

lost four-legs-live stock accounted for 4.6 percent and 3.2 percent respectively (Table-6.9).

Table 6.9: *Distribution of Head of HHS with Hoss of Hour- Leg Live Stocks*

Background Characteristics	Categories	Loss of Livestocks		Total	
		Yes	No	Number	%
	Severely hit	18.2	81.8	1601	100
	Crisis hit	4.6	95.4	792	100
Domain	Kathmandu Valley	3.2	96.8	607	100
	Rural	15.3	84.7	2004	100
Residence	Urban	4.1	95.9	996	100
	Male	11.8	88.2	2381	100
Sex	Female	10.6	89.4	619	100
	Agriculture	12.8	87.2	1786	100
	Self-employed	7.2	92.8	298	100
	Wageworkers	12.6	87.4	294	100
	Salaried worker	7.4	92.6	202	100
Occupation	Others	10.8	89.2	420	100
	No education	7.0	93	173	100
Highest	NFE & Primary	13.8	86.2	329	100
Education	Secondary	12.8	87.2	976	100
	Higher secondary	11.3	88.7	1106	100
	Bachelor & above	9.7	90.3	417	100
	Hindu	8.5	91.5	1969	100
	Bouddha	13.7	86.3	828	100
	Kirant	21.4	78.6	49	100
Religion	Christian	36.7	63.3	155	100
	Brahman (Hill)	11.8	88.2	396	100
	Chhetri/Thakuri	9.6	90.4	567	100
	Tamang	15.7	84.3	781	100
	Newar	3.0	97.0	488	100
	Other Hill *Janajati*s	15.4	84.6	445	100
	Dalit (Hill)	9.7	90.3	235	100
Caste/ethnicity	Others	19.2	80.8	87	100
	Total	11.6	88.4	3000	100

Source: CDPS, 2015

By place of residence, rural residents accounted for 15.3 percent of their urban counterparts (4.1%). From the occupational background, heads of households with agriculture account for 12.8 percent, followed by Wageworkers (12.6), others (10.8%), and so on.

Head of households with primary level education accounted for 13.8 percent who lost their four-legs live stocks in aftermath of the earthquake, followed by secondary (12.8%), and higher secondary (11.3%).

Tertiary-level educated households account for only 9.7 percent meanwhile religion Christians (36.7%) reported more four-leg animals lost in earthquakes against the Hindus (8.5), almost 4 times less. From a caste/ ethnic group's point of view, Tamang (15.7%) and other hill Janajatis (15.4%) reported that they lost four legs- live stocks lost in the earthquake more than others. The lost in perceived cost the respondents estimated, up to 100000 (NRs.), account for 90.7 percent (Table- 6.9).

Table 6.10

Distribution of Head of hhs with Perceived Cost of Four-Legs Live Stocks

	Number	**Percent**	**Cumulative Percentage**
Up to 50,000	268	77.2	77.2
50001 to 100000	47	13.5	90.7
100001 to highest	32	9.3	100
Total	347	100	

Source: CDPS, 2015

As far as the lost of four-legs live stocks are concerned, about 77.2 percent head of the households said the estimated cost of lost was up to fifty thousand, followed by 50001 to 100000 (13.5%), and 100001and highest (9.3%). It shows that 3 out of 4 heads of the households lost their four legs animal costing up to 50 thousand in the aftermath of the Gorkha Earthquake(Table-6.10).

The Chi-square statistical test shows that except sex and educational background of the head of the households, all the variables suit the relationship between dependent and independent variables (Table- 6.10.1).

Table 6.10.1

Pearson's Chi-square Test Between the Loss of Four-Legs-Live Stocks and Explaining Variables

Explaining Variables	**□2**	**df**	**P-value**
The domain of earthquake-affected districts	149	2	.000*,b
Place of residence	81.43	1	.000*,b
Sex of HH head	0.624	1	.430b
Occupation of HH head	11.679	4	.020*,b
Highest level of education of HH member	7.664	4	.105b
Religion	123.074	3	.000*,b
Caste/Ethnicity	61.882	6	.000*,b

Note: Results are based on nonempty rows and columns in each innermost sub table.

* The Chi-square statistic is significant at the .05 level.

b. Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.

In summary, severely hit districts are more likely to lose the four-legs-live stock than the others, especially Kathmandu Valley. And rural places of residence obviously account for more loss of live stocks. Heads of households with primary level education reported more loss than those with tertiary level education. On the one hand, Christians are profoundly in loss of four-legs-live stock than their Hindu counterparts. From the caste/ ethnic group background variable, others lost a lot more than the Newar ethnic group.

6.8 Poultry

Two legs live stocks- especially chicken, ducks, and even pigeons are also taken as economically significant in both the decent profession and traditional livelihood in Nepal. When a large number of chickens began to raise focus on the demands of meat, two legs livestock production is very a flourishing profession in Nepal.

As far as the impact of the earthquake on two-leg livestock is concerned, whether two-leg animals were lost or not, a question was asked to the head of households. In total about 10.9 percent ahead of the households said they lost two-legs or livestock in the aftermath of the earthquake.

In earthquake-affected domains, respondents from severely hit account for 17 percent lost two-legs live stocks, followed by Kathmandu Valley (4.4%), and crisis hit

(3.3%). It is also revealed in rural places of residence, where 13.2 percent of respondents lost their two- legs live stocks, followed by male respondents (11.0%).

As far as the occupational background of respondents is concerned, self-employed (6.4%) and Salaried-Wageworkers (7.9%) account for the least number they lost their two legs live stocks, in compared to Others (12.9%), Agriculture (11.5%), and Wageworkerss (11.2%).

Table 6.11

Distribution of Head of HHS with Loss of Two-Leg Live-Stock

Background Characteristics	**Categories**	**Lost**	**Not Lost**	**Total**	
		%	**%**	**N**	**%**
	Severely hit	17.0	83.0	1601	100.0
	Crisis hit	3.3	96.7	792	100.0
Domain	Kathmandu Valley	4.4	95.6	607	100.0
	Rural	13.2	86.8	2004	100.0
Residence	Urban	6.0	94.0	996	100.0
	Male	11.0	89.0	2381	100.0
Sex	Female	10.3	89.7	619	100.0
	Agriculture	11.5	88.5	1786	100.0
	Self-employed .	6.4	93.6	298	100.0
	Wageworkers	12.9	87.1	294	100.0
	Salaried-Wageworker	7.9	92.6	202	100.0
Occupation	Others	11.2	88.8	420	100.0
	No education/illiterate	6.4	93.1	173	100.0
Higher	NFE & Primary	13.7	86.3	329	100.0
Education	Secondary	12.1	87.9	976	100.0
	Higher Secondary	10.8	89.2	1106	100.0
	Bachelor & above	7.7	92.3	417	100.0
	Hindu	8.1	91.9	1969	100.0
	Bouddha	12.2	87.8	828	100.0
	Kirant	28.6	71.4	49	100.0
Religion	Christian	33.5	66.5	155	100.0
	Brahman (Hill)	3.0	97.2	396	100.0
	Chhetri/Thakuri	10.6	89.4	567	100.0
	Tamang	11.5	88.5	781	100.0
	Newar	6.6	93.2	488	100.0
	Other Hill Janajatis	21.3	78.7	445	100.0
Caste/ethnicity	Dalit (Hill)	7.2	93.2	235	100.0
	Others	23.0	77.0	87	100.0

Source: CDPS, 2015

From educational background, it is very contrasting; the respondents with tertiary level (7.7%), and no education (6.4%) are less likely to lose the two- legs live stocks than primary level (13.7%), secondary (12.1%), and higher secondary education (10.8%).

From the religious background, the respondents with Christian religion account for 33.5 percent lost their two- legs live stocks, followed by Kirat (28.6%), Buddha (12.2%), and Hindu (8.1). And from Caste/ Ethnic background, the respondents with others (23.0%) and others hill Janajati (21.3%) lost two- legs live stocks, compare to Dalit (7.2%), Newar (6.6%), and Brahmin (3.0%) (Table- 6.11).

Table 6.12

Distribution of Head of HHS with the Perceived Cost of Poultry

Perceived Cost	Number	%
Up to 25000	295	90.5
25001 to 50,000	11	3.4
50,001 to highest	20	6
Total	326	100

Source: CDPS, 2015

As the perceived value of heads of households who lost the two legs lives stocks, about 90.5 percent reported that they lost estimated to cost up to 25 thousand, followed by 25 to 50 thousand (3.4%), and 50 thousand and above (6.0%) (Table- 6.12).

In the chi-square statistical test, except the gender, all independent variables significantly explain the relationship with the loss of two-legs lives stock in the aftermath of the earthquake (Table- 6.12.1).

Table 6.12.1

Pearson Chi-Square Test Between Loss of Two- Legs Livestock and Explaining Variables

Explaining Variables	**□2**	**df**	**P-value**
The domain of earthquake-affected districts	135.173	2	.000*,b
Place of residence	35.7	1	.000*,b
Sex of HH head	0.221	1	.638b
Occupation of HH head	10.131	4	.038*,b
Highest level of education of HH member	12.132	4	.016*,b
Religion	114.693	3	.000*,b
Caste/ethnicity	101.837	6	.000*,b

Note: Results are based on nonempty rows and columns in each innermost sub table.

* The Chi-square statistic is significant at the .05 level.

b Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.

In summary, it is found that the head of the households from severely hit domains, rural places of residence, male-headed households, and agriculture and Wageworkers along with other professionals lost the two- legs live stocks more than the other categories. Similarly, respondents with medium educational status, Christians and Kirats religious, and minor groups in caste/ ethnic groups lost the two-legs live stocks compare to other groups. It seems to be quite positive since two-legs live stocks are a major way to earn cash in minor groups.

6.9 Food Grain

Cereal crops are taken as the main sources of food intake in Nepal. Nepalese people do cultivate cereal crops and harvest them in different seasons. People's livelihood is dependent largely on cereal crops. Usually, they harvest most of the cereal crops during the late autumn and they keep their food grain in stores of their own huts. People who don't have enough land, produce and consume it; but if they have sizable paddy fields (Khet), or dry land (Bari), they can harvest their crops and subsidize them for the rest of the months or to sell them for cash income.

Table 6.13

Distributions of Head of HHS with Food Damage

Background Characteristics	Categories	Yes	No	Total	
		%	%	No.	%
	Severely hit	71.3	28.7	1601	100
	Crisis hit	23.4	76.6	792	100
Domain	Kathmandu Valley	33.6	66.4	607	100
	Rural	59.3	40.7	2004	100
Residence	Urban	34.4	65.6	996	100
	Male	52.2	47.8	2381	100
Sex	Female	46.6	53.4	619	100
	Agriculture	56.5	43.5	1786	100
	Self-employed	39.7	60.3	298	100
	Wageworkers	45.6	54.4	294	100
	Salaried-Wageworker	43.7	56.3	202	100
Occupation	Others	43.1	56.9	420	100
	No education	52.4	47.6	173	100
	NFE & Primary	53.9	46.1	329	100
	Secondary	54.0	46.0	976	100
Highest	Higher secondary	50.8	49.2	1106	100
Education	Bachelor & above	41.9	58.1	417	100
	Brahman (Hill)	51.6	48.4	396	100
	Chhetri/Thakuri	48.8	51.2	567	100
	Tamang	55.1	44.9	781	100
	Newar	38.7	61.3	488	100
Caste/	Other Hill Janajatis	60.2	39.8	445	100
	Dalit (Hill)	48.8	51.2	235	100
ethnicity	Others	54.0	46.0	87	100
	Hindu	47.1	52.9	1969	100
	Bouddha	54.9	45.1	828	100
	Kirant	64.1	35.9	49	100
Religion	Christian	75.8	24.2	155	100
Total		51.0	49.0	3000	100

Source: CDPS, 2015

When the Gorkha Earthquakevery badly hit 14 districts most of the affected households were in hill and mountain regions, so one can hardly imagine what happened to farmers' stored food. During the survey, heads of households were asked if any food grain was lost in the aftermath of the earthquake hit in April 2015. It is

interesting about 51 percent just the majority of the respondents said they lost their food grain, again 49.0 didn't lose the food grain.

By domain, heads of the households from severely hit districts accounted for 71.3 percent who lost the entire food grain they stored, against the 28.7 percent who said 'no' they didn't lose. In contrast, respondents from Kathmandu Valley and Crisis hit district with 33.6 percent and 23.4 percent respectively said lost their stored food. So, in comparison to severely hit districts, the two domains were very badly hit in terms of loss of food grain.

Male, respondents accounted for 52.2 percent lost their food against 47.8 percent who did not. Similarly, female respondents accounted for 46.6 percent who lost their food against 53.4 percent who did not (Table- 6.13).

By occupation, it is obvious that the head of households who are characterized with agriculture account for 56.5 percent lost their stored food, against 43.5 percent who didn't. It is interesting to observe that the respondents with medium level education lost the stored food than the respondents with lower as well as higher level educational background.

The respondents with non-formal or primary education and tertiary level account for 52.4 percent and 41.9 percent respectively, lost the food grain, then primary and secondary each 54 percent.. Head of the households with other hill *Janajati* accounted for, the highest, 60.2 percent who lost the food grains against Newar lost the stored food grain, the least, 38.7 percent. It shows that the other hill *Janajati* who are minor groups lost their amount of food grain on which they might depend for a whole year.

Among larger groups, 39.8 percent of that group don't store food. Among the larger caste/ ethnic groups, respondents from Tamang ethnic group account for 55.1 percent lost the food grain, followed by Brahmin (51.6%), and Chhetri (48.8%). The *Dalit* is one of the minor groups, also accounted for 48.8 percent of lost the food grain in the earthquake.

From a religious point of view, respondents from the Christian religion accounted for 75.8 percent those lost the food grain in the earthquake, followed by Kirat (64.1%), Buddha (54.9%), and Hindu (47.1%)(Table- 6.13).

As far as the cost of loss of food damage is concerned, 50.6 percent head of the households reported that they lost up to 10,000, followed by ten thousand one rupees up to 25,000 (27.0%), 25 thousand to 50 thousand (17.0 %), fifty thousand to one lakh (3.9%), and one lakh and above (1.5%)(Table- 6.14).

Table 6.14

Distribution of Head of HHS with Perceived Cost of Food Damage

Estimated Cost	**No.**	**%**	**Cumulative (%)**
Lowest to 10000	774	50.6	50.6
10001 to 25000	414	27.0	77.6
25001 to 50000	260	17.0	94.6
50001 to 100000	59	3.9	98.5
100001 to highest	23	1.5	100
Total	1531	100	

Source: CDPS, 2015

Table 6.14.1

Pearson Chi-square Statistical Test Between Food Damage and Explaining Variables

Explaining Variables	**□2**	**df.**	**P-value**
The domain of earthquake affected districts	578.618	2	.000*,b
Place of residence	164.329	1	.000*,b
Sex of hh head	6.116	1	.013*,b
Occupation of hh head	54.712	4	.000*,b
Highest level of education of hh member	18.29	4	.001*,b
Religion	57.549	3	.000*,b
Caste/ethnicity	51.769	6	.000*,b

Note: Results are based on nonempty rows and columns in each innermost sub table.
* The Chi-square statistic is significant at the .05 level.
b. Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.

As far as the statistical text, chi-square is applied to show the significance of the relationship between dependent and independent variables. All the independent explaining variables are found to be significantly related to the dependent variable (Table- 6.14.1).

In summary, a slight majority of the respondents, heads of households, reported that they lost their stored food. And most of the respondents from the severely hit districts lost their food more than others. Similarly the rural and the male head of the households lost much more than their counterparts and occupationally largely heads of the households with agriculture lost the food grain. Respondents with caste/ ethnic groups show that other hill Janajatis were found largely lost the food grains in the earthquake.

6.10 Households Facilities

When a disaster hits the house, the facilities for example utensils, furniture, electricity, water tape, clothes, Radio-TV Sets, store room (Bhakari), etc. are either buried or destroyed mostly in an irreparable way. It is very difficult to measure the cost of them. One way to measure is simply to ask the head of the household and calculate as they report in perceived value.

Of the three domains, Kathmandu Valley accounts for 136.6 thousand the perceived cost in the mean lost in earthquake disaster, followed by severely hit districts (35.6 (K=thousand)), and Crisis hit districts (34.3K). It is obvious that Kathmandu Valley accounts for almost 4 times more than the two counterparts-severely hit and crisis hit. From a place of residence point of view, rural residents lost physical facilities almost below one-third (36.4k), against their urban counterparts (99.6k) (Table- 6.15).

When we measure the loss of perceived cost for physical facilities, Hindus account for the highest (65.6k) in average, followed by Boudhha (40.2k), Christians (34.1k), and Kirat (23.3k). And by caste/ ethnic groups, Newar accounts for the highest (116.8k), followed by Chhetri\ Thakuri (73.0k), Brahmin (38.4k), Dalit (35.4k), and other hills Janajati, the least (26.3k). From the educational background, of the head of the HHs with tertiary level accounts for 122 thousand, they lost as physical facilities, followed by higher secondary (122.0k), secondary (32.3k), and primary (25.6k), against the least lost by no. education or illiterate (20.0k) (Table-6.15).

Table 6.15

Distributions of Head of the HHS with Loss of Physical Facilities in NRs

Background Characteristic	Categories	No. of Respondents	Mean of the Perceived Cost (in '000')
	Severely hit	1601	35.626
	Crisis hit	792	34.27
Domain	Kathmandu Valley	607	136.564
	Rural	2004	36.393
Residence	Urban	996	99.591
	Male	2381	58.784
Sex	Female	619	44.043
	Agriculture	1786	44.474
	Self-employed in .	298	141.12
	Wageworkers	294	41.128
	Salaried-Wageworker	202	45.953
Occupation	Others	420	54.052
	Illiterate	173	19.983
	NFE & Primary	329	25.563
	Secondary	976	32.276
	H. Secondary	1106	65.448
Highest Education	Tertiary	417	122.037
	Hindu	1969	65.583
	Bouddha	828	40.23
	Kirant	49	23.295
Religion	Christian	155	34.121
	Brahman (Hill)	396	38.394
	Chhetri/Thakuri	567	73.024
	Tamang	781	36.076
	Newar	488	116.769
	Other Hill Janajatis	445	26.255
	Dalit (Hill)	235	35.44
Caste/ethnicity	Others	87	22.404

Source: CDPS, 2015

6.11 Perceived Cost of All Properties

By making the inquiry to the head of the household about the perceptive value of lost in terms of the estimated cost in NRs. About 57.7 percent of respondents said the total loss from the earthquake was 5 lakh to 25 *lakhs* (approximately 4000- 20,500 USD, (1$=122. NRs)), followed by 4000 USD (35.6%), 20,500-41000 USD (5.3%), and 41,000 USD and above (1.3%).

In earthquake-hit domains, the respondents from severely hit domains accounted for the greatest lost of 4000- 20,500 USD (64.4%), followed by respondents from Kathmandu Valley (52.8 %), and Crisis hit (48.0%). The respondents from crisis-hit domains lost up to 4000 USD, the largest percent (49.3%).

There is a significant variation in the total loss noted by the head of the households with gender. Female-headed respondents account for 51.9 percent who lost 4000 to 20500 USD, followed by 4000 USD (43.1%), and so on. On the other hand, male counterparts lost that of 59.2% and 33.7 percents. Females were found much larger to have lost 4000 USD than their male counterparts and vice versa in 4000-20,500 USD lost in the aftermath of the earthquake.

Table 6.16
Distribution of Head of Hhs with the Perceived Cost of Loss of Total Property

Background Characteristics		**Estimated Cost of all properties in '00000'**				**Total**	
		Up to 5	**5-25**	**25-50**	**50+**	**No.**	**%**
	Severely hit	31.2	64.4	3.7	0.7	1601	100
	Crisis hit	49.3	48.0	2.3	0.4	787	100
Domain	KTM Valley	29.5	52.8	13.5	4.2	607	100
	Rural	35.3	60.5	3.5	0.7	2002	100
Residence	Urban	36.2	52.1	9.0	2.7	993	100
	Male	33.7	59.2	5.6	1.4	2379	100
Sex	Female	43.1	51.9	4.1	0.9	616	100
	Agriculture	35.7	59.8	3.8	0.7	1783	100
	Self-employed	34.1	54.3	8.9	2.8	298	100
	Wageworkers	36.8	53.5	7.9	1.8	293	100
	Salaried worker	31.3	58.0	7.4	3.2	202	100
Occupation	Others	37.4	54.3	6.5	1.9	419	100
	Illiterate	55.1	42.9	2.0	0	173	100
	Primary	48.4	48.9	2.6	0	329	100
	Secondary	36.2	59.7	3.5	0.5	974	100
	H. Secondary	31.1	61.5	5.9	1.5	1104	100
H.Education	Tertiary	28.0	56.1	11.6	4.3	416	100
	Hindu	36.3	56.0	6.2	1.5	1965	100
	Bouddha	32.7	61.7	4.4	1.1	827	100
	Kirant	67.1	29.6	0	3.3	49	100
Religion	Christian	32.0	67.3	0.8	0.0	155	100
	Brahman (Hill)	29.8	65.0	4.7	0.5	396	100
	Chhetri/Thakuri	32.3	60.7	5.6	1.4	566	100
	Tamang	34.2	61.7	3.4	0.7	781	100
	Newar	31.4	49.7	14.8	4.1	487	100
Caste/	Other H. Jana	40.8	56.8	1.8	0.7	445	100
	Dalit (Hill)	50.9	47.8	1.3	-	235	100
Ethnicity	Others	51.3	46.8	0	1.8	87	100
Total		35.6	57.7	5.3	1.3	3000	100

Source: CDPS, 2015

Respondents from religion shows that about 67.1 percent Kirat religious lost up to 4000 USD, but other religious respondents lost much less than half, Hindu (36.3%), Buddha (32.7%), and Christian (32.0%). On the other hand, in the loss from 4000-20,500 USD, Christians accounted for 67.3%, Buddha (67.1%), and Hindus (56.0%). Respondents from caste/ ethnic groups show that the loss up to 4000 USD, *Dalit,* and other groups accounted for 51.0 percent each, followed by other hills *Janajati* (41.0%), Tamang (32.4%), Chhetri (32.3%), Newar (31.2%), and Brahmin (29.8%). The loss from 4000 to 20,500 USD; Brahmin accounts for 65.0 percent, against Others (46.8 %), the least.

Table 6.16.1

Pearson Chi-square Test between the Total Lost Estimated and Independent Variables

	□2	**df.**	**P-value**
Earthquake-affected districts	232.159	6	.000*,b
Place of residence	66.679	3	.000*,b
Sex of HH head	19.6	3	.000*,b
Occupation of HH head	41.408	12	.000*,b
Highest level of education of HH member	145.939	12	.000*,b
Religion	48.358	9	.000*,b,c
Caste/ethnicity	196.222	18	.000*,b

Note: Results are based on nonempty rows and columns in each innermost sub-table.

* The Chi-square statistic is significant at the .05 level.

b Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.

c The minimum expected cell count in this sub-table is less than one. Chi-square results may be invalid.

The Newar ethnic groups account for the highest 14.8 percent who lost 20,500- 41,000 USD, followed by Chhetri (5.6%), Brahmin (4.7%), Tamang (3.4%),

and so on. So, the total loss in earthquake varies with the social, cultural, and educational status of respondents. The statistical test applied, the Pearson Chi-square test also distinctly and significantly shows the relationship between dependent and explaining variables (Table- 6.16.1)

In summary, it is found that respondents from Crisis hit account for the largest number who lost up to 4000 USD, and severely hit account for 64.4 percent lost from 4000- 20500 USD, and Kathmandu valley account for 13.5 percent largest amount in 41,000 USD. Respondents with religion show quite an interesting dichotomy, the largest 67 percent of respondents of Kirat lost up to 4000 USD, whereas Christians only account for 32 percent of that lost.

6.12 Discussions and Conclusions

As knowledge on disaster is concerned, F.A. Hayek's critical insight called "the knowledge problem," highlighted two central features of social organization- first, every society confronts a "division of knowledge" analogous in many respects to the "division of labor." Information is fragmented, diverse, and often contained in inarticulate forms, held separately and locally by the many individuals who compose society; second, the foremost obstacle that every effort at social coordination must overcome is somehow tapping into this dispersed information and processing it in forms that individuals can use to achieve ends mutually (Sobel & Leeson, Spring, 2007). Nepal Government has control of the information related to rescue, and relief work is effectively run while NGOs and INGOs felt very sluggish as far as relief reached out was concerned.

To the extent of information or knowledge related to earthquake people holds prior to an earthquake, the head of households in Kathmandu Valley, the capital city of Nepal shows much better (53.0%) than severely hit and crisis-hit domains. It is obvious, Kathmandu Valley is producing the information and also manipulating it for the benefit of elite groups skewed in Kathmandu city.

It is corroborated by the study British Red Cross and Nepal Red Cross Society (March 2013), which found that over 73 percent out of 3615 respondents of Kathmandu Valley (Kathmandu, Lalitpur, and Bhaktapur districts) have received

some sort of message or information related to earthquake against about one quarter (26.3%) of the respondents who have not received any information). About 64 percent of respondents out of 2664 noted that they got the information from the media (TV, radio, and newspapers).

It indicates that about 20 percent more respondents were known about the earthquake in Kathmandu Valley two years ago. About 52 percent ahead of the households were informed about the earthquake and related information in urban places of respondents. Instead, about 73.3 percent Salaried-Wageworker were informed about it, followed by Tertiary level education (66.2%). As the social-cultural variables, Hindu religious heads of the households know about the earthquake, and among caste/ ethnic groups, e.g. Brahmin accounts for 58.8 percent against the *Dalit* and *Janajati*.

In regards to the sources of information, all the background variables noted that the media (newspaper, TV, & Radio) is the main source of information rated by Kathmandu Valley 79.3%), as the of domain; urban (77.4%), as the place of residence; male head of households (67.2%), as the gender; waged worker (73.4%), as the occupational background, and higher secondary (69.4%). Buddhist (58.1%), as the religion among others, and Brahmin (77.4%), were the caste/ ethnic groups accounted for. Buddhist religious heads of the households accounted for 28.5 percent of noted narratives of earthquakes the sources of information or knowledge.

In the application of information or knowledge about the earthquake and ways to mitigate potential effects, very few people are prepared to whistle in a disaster. Only about 3.9 percent had Go Bags, indicating a lack of preparedness (ibid, March 2013). In a query if information or knowledge about mitigation from earthquakes was useful during the hazard. About 43.9 percent reported that the knowledge was useful. Halvorson and Hamilton (2007) argue that a large body of literature on 'Seismic culture', a broad concept that encompasses a range of cultural adaptations to seismic risk and hazard exists that highlights the deteriorating local knowledge of hazards, the demographic dynamics, the livelihood transformations, and the concentration of knowledge in internationally well-connected urban agglomerations. A seismic culture is one in which adaptations to seismic hazards become ingrained in society through knowledge sharing, indigenous building practices, vernacular architecture, and so

forth (EUCCH, 1993; Degg & Homan, 2005). But in the context of Nepal, an earthquake with a 7.8 Richter scale came after almost a century. It doesn't give a live seismic culture in Nepal. The first generation that experienced the mega quake in 1934 almost passed away. The institutions working on Disaster Risk Reduction at the district headquarter level are ad hoc structures led by the local administrative officer.

The hypocenters for both the main quake and aftershock were at depths of 8.2 km and 18 km respectively (Manandhar et al., 2016). They argue that because hypocenters are shallow-type, the consequences of such tremors produce strong shaking at the ground surface causing more damage across the affected area. So, traditional cities/towns, rural villages, new reinforced concrete buildings, world heritage sites, and historic temples together with landslides and slope failures along the highways cause great loss of life. Head of the households reported that over 84.0 percent of houses were completely destroyed, followed by partially destroyed (13.7%), and slightly destroyed (2.2%). Buildings generally built prior to 1934 (older than 82 years) were severely damaged/ collapsed, since many renovations on these old buildings were performed without considering any engineering designs (ibid, 2016). Contrasting with this argument, Manandhar, Soralump, Hino, & Kitagawa (2015) pointed out that newly built buildings were also damaged because they were poor design and improper construction. In perceived cost, estimated by the affected head of the household about 48.0 percent of house buildings were of cost up to NRS 5,00,000 (USD $ 4000.00), followed by up to 10 lakh cost (USD $ 8000.00) covering almost 80 percent of house buildings.

In the rural area of South Asia, most of the house buildings are accompanied by cattle-shed, since they keep cattle along with them. When disaster event occurs, cattle sheds also fell down with the house buildings. Above 90 percent head of households reported that at least one cattle shed they possessed was destroyed in the earthquake. In perceived cost, the head of the HHs estimated, damage cattle-shed costs up to NRS. 1,50,000 (USD $ 1230.00) accounts for almost 65.7 percent. Almost two-thirds of cattle sheds were destroyed perceived cost estimated by the head of HHs. There is an interesting experience of earthquake impact on cattle sheds.

On 23 November 2014; about 6.3 Richter scale magnitude of earthquake hit Tagong town of Kangding country, Ganzi Tibetan Autonomous Prefecture, Sichuan

province. Reporters[12] at the site said dozens of village huts and cattle sheds collapsed in the rural areas, but no building collapsed in the county seat. Cattle sheds are more poorly constructed than buildings or houses, so they have much more potential to damage when an earthquake goes.

With respect to religion, Christians lost four-legs live stocks in an earthquake disaster. Followed by other hills Janajati head of the households also lost their 4-legged livestock in disaster than the others. From the caste/ ethnic group's point of view, Tamang and other hill Janajatis lost four legs live stocks in the earthquake. The loss in perceived cost the respondents estimated, up to NRs. 100000 (USD $ 800.00), accounting for 90.7 percent. GoN, Home Affairs (2013) noted that about 40 percent of animals were killed by fire followed by thunderbolts (36%), landslides (10%), floods (9%), heavy rainfall (4%), and avalanche (2%). In numbers, fire killed 613, thunderbolt killed 547, landslide killed 148, flood killed 131, heavy rainfall killed 66 and avalanche killed 30 animals in the year 2013. Along with animals, a fire destroyed 2689 houses and cattle sheds, a flood destroyed 378, a landslide destroyed 209, a thunderbolt destroyed 68, an earthquake destroyed 43, and a windstorm destroyed 4 houses and cattle sheds.

Farmers usually stored the food grain after harvesting. Large farmers consume their products over the years, but few may have sold if they have surplus production. Respondents from severely hit domain account for 71.3 percent who reported that their food grain was damaged in the earthquake. Earthquakes, landslides, floods, drought, fires, and hailstorms are some of the natural calamities that occur every year, at any point, and anywhere, causing threats to the livelihoods of smallholder farmers and their food security (Chapagain, 2017). Disasters can cause loss of human and animal life, field crops, stored seeds, agricultural equipment/ materials, and their supply systems (e.g. infrastructure) as well as associated indigenous knowledge, thus disrupting not only the immediate growing season but also future seasons (Sperling, 2008; McGuire & Sperling, 2013). In Barpak, the epicenter of the earthquake, millet a stable food grain small farm holders stored was lost when the house collapsed. People could not restore it, so it simply germinated in the monsoon season on the street. An adult of the Gurung ethnic group opined:

> Look at kodo (millet) is a strong (nutritious) food grain. We do restore our house for years and years because it does not damage no matter how long you keep it. But when an earthquake shook houses, they fell down, and all stored millet food grain is wastage with the mud or soil. (In September, it was grown on the field.

The extent of the loss of food grain in an earthquake, about 77.6 percent ahead of the households estimated their perceived value up to only 25,000. About 94 percent head of the households estimated the cost of food grain an earthquake was about 50,000. It means the small farm holders' stored food, in perceived value, costs not much than 50,000.

The estimated cost of the perceived value of all assets damaged in the earthquake, of the severely hit domain, over 64.4 percent, the largest percentage, noted that it was between 5-25 hundred thousand, followed by up to 5 hundred thousand (31.2%), 25 to 50 hundred thousand (3.7%) and 50 hundred thousand and more (0.7%).

CHAPTER VII

IMPACT ON LIVING CONDITIONS AND HEALTH

7.1 Introduction

This chapter deals with the earthquake's impact on the current living condition, agricultural cultivation, and food production, livelihood condition, security of girls-child, psychosocial problems, disability or people with different capacities, and elderly citizens. The impact will be measured by cross-tabulating the data with earthquake-hit domains, place of residence, gender, occupation, educational status, religion, caste, and ethnic groups. In order to show the relationship between independent and dependent variables, the Pearson Chi-Square Statistical test is applied, so that the statistical significance on the relationship will be interpreted. The chapter will be wrapped up with discussion, and conclusions.

7.2 Current Residence

Earthquake disasters hit very badly to traditional settlements. According to the Government of Nepal (GoN), home affairs (PDNA, 2015), a large-scale survey made, a month following the earthquake revealed that a total of 498,852 houses collapsed completely or were damaged beyond repair, and 256,697 houses were damaged partially.

When a family is displaced from the place where they used to live, many groups don't know when they have been there, it is not merely a transfer of a physical building from one place to another but there are many aspects to be related to residence.

In Palapu VDC, Okhaldhunga; head of the households of the *Dalit* community, opined:

> We don't know when our ancestors set up here, everything is lost in an earthquake disaster. We are living in this Tankar (curvature type of shelter made from galvanized sheets). One of our neighbors is in the USA. When he came to know that we were badly hit by the quake, living without anything

> left to cover our heads, and deadly needed shelters, then his organization asked others and helped us. There were 9 houses along with cattle-sheds were completely collapsed.

Further he added,

> As far as the building of a house in earthquake resistance is concerned, we don't have that kind of knowledge, and practice. Rather we have an unhealthy competition to build houses. For example, if somebody builds a house of three stairs, then I also think to build at least up to that number of stairs; so that I would get my prestige.

He opined,

> In a land survey, for the first time happened in 1987, the surveyors suggested we take the land as we need to build the safe houses, there. But we didn't agree. The trial is also used for funeral processions if any member of Brahmin or Chhetri died in the village up, they bring along this trial. So, we had a fear of 'witchcraft' walk down, and up in the night. So, didn't agree to build the houses here. If we agreed which would be much safe? Rather we liked to build our houses where the earthquake hit houses in 1934, and 1987, and this time again the quake hit us in a very bad way. Now, we don't have many options, because we cannot build houses on government's l, and. The dhanjo (fault line) went on the same line as it did in 1934, 1987, etc. Our elderly decided on this place for the access trail and the water. Building the house is out of our imagination now, we may think about it in the future, later; but at this moment it is our out of mind. How we built those houses even we cannot recall back now. Because prior to getting our children we built the house, now we married our children, got gr, and have children in those houses. Now houses are fallen down, we don't know how to reconstruct or rebuilt them.

Respondents were asked about their current living and residential status during the field survey. About 96 percent ahead of the households from Crisis hit domains

said that they are currently residing where they used to stay prior to the earthquake, followed by transferring to a different place in terms of ward or VDC (3.6%), and different place in terms of the district (0.5%). So, very few families in the Crisis-hit domain were displaced from their original place of residence (Table- 7.1).

Table 7.1

Distribution of Heads of Households by Current Place of Living

Background Characteristics	Categories	Same Place- VDC & Ward	Different Place- VDC & ward	Different Place, by District	Total %	Total Number
Domain	Severely hit	84.9	15.0	0.1	100	1601
	Crisis hit	95.9	3.6	0.5	100	792
	Kathmandu Valley	82.6	17.2	0.2	100	607
Residence	Rural	85.2	14.7	0.2	100	2004
	Urban	91.7	8.2	0.2	100	996
Sex	Male	88.0	11.9	0.2	100	2381
	Female	84.8	14.8	0.3	100	619
Occupation	Agriculture	90.0	9.8	0.2	100	1786
	Self-employed	86.8	13.0	0.3	100	298
	Wage-workers	80.9	18.5	0.5	100	294
	S. wage-worker	89.6	10.4	0	100	202
	Others	79.8	20.0	0.1	100	420
Highest Education	No education	90.1	9.4	0.5	100	173
	NFE & Primary	80.6	18.9	0.5	100	329
	Secondary	86.0	14.0	0.1	100	976
	Higher secondary	88.9	11.0	0.2	100	1106
	Tertiary	90.7	9.2	0.2	100	417
Religion	Hindu	91.2	8.7	0.1	100	1969
	Bouddha	85.2	14.3	0.6	100	828
	Kirant	72.1	27.9	0	100	49
	Christian	53.8	45.7	0.5	100	155
Caste/ Ethnic Group	Brahman (Hill)	91.4	8.7	0	100	396
	Chhetri/Thakuri	94.3	5.7	0	100	567
	Tamang	81.2	18.1	0.7	100	781
	Newar	84.5	15.4	0.2	100	488
	Other H.Janajatis	87.7	12.2	0.1	100	445
	Dalit (Hill)	92.6	7.5	0	100	235
	Others	79.0	21.1	0	100	87

Source: CDPS, 2015

About 85 percent of respondents from severely hit districts said that they were living in the same place, followed by respondents from Kathmandu Valley (83%).

Respondents from Kathmandu valley accounted for 17.2 percent, followed by severely hit (15.0%), and crisis hit (3.6%), who changed their place of residence in the aftermath of the earthquake in terms of the different ward, and VDC. If any migrated from a previous place in terms of the district to another district is so tiny number.

From a place of residence point of view, urban residents are found to be living in the same place (91.7%), as their rural counterparts (85.2%). It means rural households are more likely to displace in terms of VDC, and wards (14.7%) than the urbanites (8.2%).

Male-headed households account for 88.0 percent remaining at the same place where more than 84 percent of female-headed households are. Head of the households (90.0%) with agricultural background were more likely to stay in the same place than wage-workers (81.0%), and others (80.0%). Respondents with wage- worker-occupational background accounted for 18.5 percent, the largest number, living in different wards or VDC currently. Wageworkers might look at the availability of day-to-day jobs, which would determine their place of current living residence, so they are less likely to stay in the place where they were before the quake (Table-7.1).

It is interesting to know that the head of households with Tertiary education is more likely to stay in the same place prior to earthquake hazard (90.7%), followed by no education (90.1%), higher secondary level (88.9%), and so on. Respondents with primary education account for about 19.0 percent who were displaced from their earlier residence, followed by respondents with secondary education (14.0 %), higher secondary (11.0%), and no education (9.4%).

Head of the households with Hindu religion account for 91.2 percent, who are currently residing in the place prior to the earthquake, followed by respondents with Buddhist (85.2%), respondents with Kirat (72.1%), and respondents with Christian religion (53.%). The interesting phenomenon of religion is that Hindus are more static, and Christians are more dynamic as far as the change in their current place of living is concerned. Christians (45.7%) are found to be the largest number who changed their place of residence in terms of different wards, and VDC at the time of the survey.

Caste/ ethnic background is the strongest cohesive factor to tie up families with the society or community. Respondents from Chhetri, and Thakuri accounts for 94.3 percent who are currently living in the same place as they used to stay before the earthquake, followed by hill Dalit (92.6%), Brahmin (91.4%), and so on. Presumably, Janjatis such as Tamang (81.2%), Newar (84.5%), and other hills Janjatis (87.7%) are supposed to be more static than the others but they account for less number to be in the place prior to the earthquake. We don't know the reason but the head of the household might have a compulsion to change the current place of residence as the earthquake badly hit the place of residence. For example, heads of the households from Tamang indigenous group account for 18. 1 percent who changed the current place of residence in terms of different ward or VDC, followed by Newar (15.4%), and other hill Janajati (12.2%) in larger number.

In summary, it can be inferred from the analysis that heads of the households from Crisis hit domains are currently predominantly staying in their previous places. As far as the change in residence of place in terms of up to ward or VDC, respondents from Kathmandu Valley were more than the others. By the place of residence, respondents from rural areas were more likely to change their current living conditions than the urban ones. Obviously, male-headed respondents were more likely to change their living places. It is very clearly shown that Hindus are residing in the previous place more likely, and Christians are more likely to change their current living place. Largely Chhetri, Brahmin, and hill Dalit show a more static condition than the Janjatis (Tamang, Newar, and hill Janajatis).

Table 7.1.1

Pearson Chi-square Test Between the Current Place of Living, and Explaining Variables

Explaining Variables	**□2**	**df.**	**P-value**
The domain of earthquake affected districts	154.648	4	.000*,b
Place of residence	49.583	2	.000*,b
Sex of hh head	4.476	2	.107b
Occupation of hh head	63.905	8	.000*,b
Highest level of education of hh member	49.466	8	.000*,b
Religion	507.042	6	.000*,b
Caste/ethnicity	172.509	12	.000*,b

Note: Results are based on nonempty rows, and columns in each innermost sub table.

* The Chi-square statistic is significant at the .05 level.

b Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.

Table 7.2

Distribution of Head of the HHS with Belonging Status of l, and

	Number	**Percent**
Temporary shelter in own l, and	1827	60.9
Permanent house in own l, and	661	22.0
Temporary shelters in other's house	95	3.2
Temporary shelters in other's l, and	286	9.5
Temporary shelters in occupied (government) land	89	3.0
Residing in own (cracked) house by repairing little	42	1.4
Total	3000	100

In relation to the distribution of respondents in cross-tabulation between the current place of living, and other explaining variables, the Pearson Chi-square test was applied. Except for the sex of the head of the households, all explaining variables show a significant relationship.

In the aftermath of the earthquake disaster, households with temporary shelter on their own land account for 60.9 percent, followed by the permanent house (22.0%),

temporary shelter on others' l, and (9.5%), Others' houses (3.2%), shelter in a public place (3.0%), and own cracked house (1.4%).

Table 7.3

Distribution of Head of the HHS with Living Conditions in Own l, and

Background Characteristics	Categories	Current Living in Own		Total	
		Shelter	House	No.	%
Domain	Severely hit	81.2	18.8	1340	100
	Crisis hit	63.6	36.4	702	100
	Kathmandu Valley	65.5	34.5	446	100
Residence	Rural	78.5	21.5	1712	100
	Urban	62.2	37.8	776	100
Sex	Male	74.7	25.3	1982	100
	Female	68.4	31.6	506	100
Occupation	Agriculture	77.9	22.1	1554	100
	Self-employed	64.3	35.7	236	100
	Wageworkers	73.2	26.8	209	100
	Salaried Worker	64.2	35.8	170	100
	Others	63.4	36.6	319	100
Highest education	No education	83.0	17.0	149	100
	NFE & Primary	76.4	23.6	255	100
	Secondary	73.8	26.2	821	100
	Higher Secondary	75.0	25.0	910	100
	Bachelor & above	62.3	37.7	353	100
Religion	Hindu	70.3	29.7	1659	100
	Bouddha	80.9	19.1	711	100
	Kirant	81.2	18.8	42	100
	Christian	68.2	31.8	75	100
Caste/ethnicity	Hill Brahman	73.2	26.8	355	100
	Chhetri/Thakuri	70.6	29.4	509	100
	Tamang	78.8	21.2	644	100
	Newar	62.4	37.6	341	100
	Other Hill Janajatis	75.4	24.6	351	100
	Hill Dalit	78.1	21.9	210	100
	Others	76.4	23.6	77	100
Total		72.2	27.8	2530	100

Source: CDPS, 2015

Head of the households from severely hit domains accounts for 81.2 percent who were living in shelters at own lands, followed by that of Kathmandu valley (65.5%), and crisis hit (63.6%). Respondents who are living in houses from severely hit districts live in their l, and accounts for 18.8 percent, followed by that of Kathmandu Valley (36.4%), and crisis hit (34.5%) (Table-7.3). It clearly shows that

households are very badly hit by quakes in severely hit districts compare to the Crisis-hit, and Kathmandu Valley. In comparison to urban residents, their rural counterparts are living more on their own land. Of five households, living on their own land accounts for four rural residences they are in shelter. Similarly, three households of the urban places of residence are in shelters.

Head of the households by agriculture occupation accounts for almost about 78 percent stayed in a shelter during a survey in the same place prior to the earthquake occurred, followed by Wageworkers (73.2%), self-employed (nonagricultural), salaried workers each 64.0 percent, and others (63.4%).

Head of the households with no education are currently living in shelters, the largest percentage, accounting for 83 percent, followed by primary education (76.0%), higher secondary education (75.0 %), and secondary (74.0%).

Table 7.3.1

Pearson Chie-square Test in Between Belonging of l, and, and Residence, and Explaining Variable

Explaining Variables	**□2**	**df.**	**P-value**
Domain of earthquake affected districts	128.212	4	.000*,b
Place of residence	92.586	2	.000*,b
Sex of hh head	8.676	2	.013*,b
Occupation of hh head	56.995	8	.000*,b,c
Highest level of education of hh member	34.117	8	.000*,b
Religion	36.191	6	.000*,b,d
Caste/ethnicity	54.823	12	.000*,b

Note:
Results are based on nonempty rows and columns in each innermost sub table.
* The Chi-square statistic is significant at the .05 level.
b. Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.
c. More than 20% of cells in this sub-table have expected cell counts of less than 5. Chi-square results may be invalid.
d. The minimum expected cell count in this sub-table is less than one. Chi-square results may be invalid.

Respondents with religion show that Hindus (70.3%), and Christians (68.8%) are less likely to stay in a shelter compare to Buddhists (80.9%), and Kirat (81.2%). From a caste/ ethnic groups point of view, respondents from Tamang ethnic group accounts for 78.8 percent who live in shelter, followed by Hill *Dalit* (78.1%). Newar

(62.4%), Chhetri/ Thakuri (70.6%), and Brahmin (73.2%) are less likely to stay in shelters (Table-7.3).

The cross-tabulation between dependent, and independent variables phenomenally shows the relationship, and to make sure that relationship is not by chance, but rather significantly inter-related, Pearson Chi-square test is applied. Except for the response from the gender or sex of the head of households, other variables show a statistical significance at 95 percent. Therefore, the inferences drawn from the analysis is most reliable, than to be mathematical manipulation or chance.

In summary, there are over 72 percent head of households are currently staying on their own land but in shelter against the home (27.8%). By earthquake-hit domains, they were currently living at their house the least (18.8 %), and the most in shelter (81.2%). Respondents from agricultural occupation accounts for the least (22.1%) currently they are living in their home. Similarly, from an educational background, no education accounts for the least (17.0 %) living in their home at the time of the survey., and respondents with religious backgrounds, Kirat, and Buddha each account for the least (19.0 %) living in their home., and from the caste/ethnic variable, Tamang accounts for the least (21.2%) who are currently living in their home.

Earthquake Affected households were still living largely in shelters on both other and Public land (Table-7.4). Head of the households who are currently living at others' houses accounted for 20.3 percent, followed by shelter in others' land (60.8%), and shelter in public land (18.9).

Among respondents who are currently living in shelters on others' land in severely hit accounts for 70 percent, the largest number, followed by public land (17.5%), and others' houses (11.9%). Head of the households of Kathmandu valley accounted for 33.7 percent are living in others houses, followed by living in shelters in public l, and, the largest number (22.7 %). percent who are residing in public places.

Social Worker of Mandre, of Gurung ethnic group, from Barpak argues:

> Geologist or technical person didn't make any suggestion for the place appropriate to stay or transfer us to a new place. About 2/3 percent are staying in their own l, and. Otherwise, many are staying in others' l, and. Most of them had an adhiya (Tenant, and tenancy both get 50/50) from the early days., and some are newly stayed for some time. 6-7 months they have given the advance payments. Now onwards, you must pay back or after Magh you have to pay.

Urban residents who are currently residing in the shelter on public land accounted for 22.1 percent compared to rural residents (16.7%). As far as residing in others' houses in both Kathmandu Valley and Urban Place is concerned, about one out of 5 residents were found.

Among the respondents from Wageworkers, and other occupations, almost two third each are living in shelters in others' land. Meanwhile, respondents from agriculture occupation account for about 25 percent living in a shelter on public land.

Head of households from educational background, tertiary level accounted for the largest number who are living in others house. But with primary level education respondents accounted for 75 percent who are living in shelters on other land, followed by 24 percent head of the households living in shelters on public land.

Respondents with Christian religion living in the shelter of others' land account for 95.6 percent against the others' house (2.6%). The striking issue is that Buddha and Hindu religious residents occupied the public land by 22.2 percent, and 24.0 percent respective but unlikely Kirat, and Christians (1.8%) have occupied the public l, and almost negligible.

Table 7.4

Distribution of Head of HHS with Current Living Condition

Background Characteristics	Categories	Current Living Condition in			Total	
		Others' House	Others 'Land (shelter)	Public L, and (shelter)	No.	%
Domain	Severely hit	11.9	70.6	17.5	256	100
	Crisis hit	22.1	62.3	15.6	61	100
	Kathmandu Valley	33.7	43.7	22.6	153	100
Residence	Rural	11.4	71.9	16.7	277	100
	Urban	33.1	44.8	22.1	193	100
Sex	Male	21.1	60.0	18.9	364	100
	Female	17.7	63.4	18.9	106	100
Occupation	Agriculture	14.7	60.7	24.6	213	100
	Self-employed	27.7	58.4	13.9	55	100
	Wage-workers	24.0	66.3	9.7	79	100
	S. wage-workers	49.2	35.9	14.9	30	100
	Others	16.5	65.6	17.9	93	100
Highest education	No education	15.3	62.5	22.3	22	100
	NFE & Primary	10.1	74.1	15.8	70	100
	Secondary	13.6	62.8	23.7	143	100
	Higher secondary	24.5	58.0	17.5	178	100
	Tertiary	38.7	47.5	13.8	57	100
Religion	Hindu	29.0	48.8	22.2	276	100
	Bouddha	11.5	64.5	24.0	110	100
	Kirant	12.5	87.5	0	6	100
	Christian	2.6	95.6	1.8	78	100
Caste/ ethnicity	Hill Brahman	30.3	63.4	6.4	34	100
	Chhetri/Thakuri	30.5	57.1	12.4	53	100
	Tamang	8.3	87.4	4.3	129	100
	Newar	33.2	36.4	30.4	131	100
	Other H. Janajatis	11.1	56.4	32.5	90	100
	Hill Dalit)	16.9	65.5	17.6	23	100
	Others	8.3	75.1	16.6	10	100
Total		20.3	60.8	18.9	470	100

Source: CDPS, 2015

Respondents from Caste/ ethnic groups, Newar, Brahmin, and Chhetri/Thakuri, who are residing in others' house 1 out of threebut Tamang, and others were residing by 8.3 percent each. Instead, other hills *Janajati* and Newar occupied the public land 32.5 percent, and 30.4 percent respectively (Table-7.4).

Land from caste/ ethnic group background, Tamang are the most likely to stay in a shelter in others' land and Newar are the least living in a shelter in others' land. So, the cross-tabulating data reveals very interesting results. In order to look at the significance of interrelationship, Pearson Chi-square is applied, except for the sex of the head of the households; all independent variables are found to be significant at a 95 percent significance level.

Table 7.4.1

Pearson Chi-square Test Between the Belongingness of Place of Current Living Residence, and Independent Variables

Explaining Variables	**□2**	**df.**	**P-value**
Domain of earthquake-affected districts	263.154	10	.000*,b
Place of residence	151.707	5	.000*,b
Sex of hh head	10.351	5	.066b
Occupation of hh head	150.374	20	.000*,b
Highest level of education of hh member	72.376	20	.000*,b
Religion	342.163	15	.000*,b,c,d
Caste/ethnicity	259.403	30	.000*,b

Note: Results are based on nonempty rows and columns in each innermost subtable.
* The Chi-square statistic is significant at the .05 level.
b. Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.
c. More than 20% of cells in this sub-table have expected cell counts of less than 5. Chi-square results may be invalid.
d. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

In summary, 3 out of 5 heads of the households are living a shelter, and 1 out of 5 are living in each other's house, and shelter in public land. Respondents, who are from severely hit districts, seemed to be living in shelters on others' land, and respondents from Kathmandu Valley accounted for larger numbers who are living in others' houses, and shelters in public land. Education is taken as an independent variable since it empowers a head of the household to decide his or her needs. Indeed, with tertiary-level educational backgrounds, the head of households are found to be residing at others' houses. But that of primary level education were found more in the shelters of others' land. Hindus are most likely to stay in others' houses against the Christians the least likely to stay in others' houses, and the most in the shelter of others' land.

7.3 Seasonal Crop Plantation

Since Nepal is still relied on agriculture by 83 percent, usually people cultivate their or others' land for food production. After 4-5 months after the earthquake occurred, respondents were asked about their seasonal agricultural cultivation. Among earthquake-affected households in different domains, crisis-hit districts accounted for 91.9 percent noted that they had cultivated the seasonal crops, followed by severely hit (88.7%), and Kathmandu Valley (69.0%). Rural heads of households accounted for 90.4 percent who cultivated seasonal crops against their urban counterparts who accounted for 76.0 percent who cultivated seasonal crops in 2015 (Table-7.5).

Table 7.5

Distribution of Head of HHS by Seasonal Cultivation of the Crop

Background Characteristics	Categories	Seasonal Cultivation		Total	
		Yes (%)	No (%)	No.	%
Domain	Severely hit	88.7	11.3	1579	100
	Crisis hit	91.9	8.1	765	100
	Kathmandu Valley	69.0	31.0	556	100
Residence	Rural	90.4	9.6	1971	100
	Urban	76.0	24	928	100
Sex	Male	86.8	13.2	2307	100
	Female	82.0	18	592	100
Occupation	Agriculture	94.8	5.2	1759	100
	Self-employed	69.0	31	268	100
	Wageworkers	71.9	28.1	275	100
	S. wage-workers	81.8	18.2	194	100
	Others	69.0	31	403	100
Highest education	No education	85.5	14.5	164	100
	NFE & Primary	81.5	18.5	321	100
	Secondary	88.3	11.7	948	100
	Higher secondary	84.8	15.2	1061	100
	Bachelor & above	85.8	14.2	405	100
Religion	Hindu	86.4	13.6	1890	100
	Bouddha	90.1	9.9	812	100
	Kirant	93.3	6.7	48	100
	Christian	51.5	48.5	149	100
Caste/ ethnicity	Brahman (Hill)	92.0	8.0	393	100
	Chhetri/Thakuri	89.1	10.9	550	100
	Tamang	84.2	15.8	766	100
	Newar	76.4	23.6	445	100
	Other H. *Janajatis*	89.9	10.1	437	100
	Dalit (Hill)	83.5	16.5	222	100
	Others	84.7	15.3	87	100

Respondents with agricultural occupation accounted for 94.8 percent noted that they had cultivated seasonal crops, followed by Salaried-Wageworker (81.8%), and Wageworkers (71.9%) against the self-employed in the non-agriculture sector, and others by 69 percent each. It clearly shows that households who are severely affected by April 2015; are actively engaged in agricultural activities along with seasons as they used to work prior to the earthquake.

Respondents from educational backgrounds with secondary education accounted for 88.3 percent cultivated seasonal agriculture crops, followed by tertiary education (85.8%), and no education (85.5).

t clearly shows that earthquake affected households are obliged to pursue their usual way of livelihood. The disaster didn't impact the usual way of agricultural cultivation, despite their living condition being very badly hit by the earthquake. Among heads of households with religion, above 90.0 percent Kirat, and Buddhist religious respondents each noted that they are engaged in seasonal agricultural cultivation. Christians accounted for the least 51.5 percent who were also cultivating seasonal agricultural crops.

About 92.0 percent Brahmin reported that they had cultivated their l, and for agricultural food production as usually they cultivate, followed by other hills *Janajati* (89.9%), Chhetri/Thakur (89.1%), Tamang (84.2%), and hill *Dalit* (83.5%). Newar, mostly living in Kathmandu Valley accounts for the least (76.4%) in agricultural cultivation (Table-7.5).

In summary, earthquake-affected households didn't give the usual way of life how traditionally pursued. In earthquake-hit domains, Crises-hit districts were found more engaged with agricultural cultivation than the severely-hit, and Kathmandu Valley. Rural respondents were found more likely to involve in agricultural activities than their urban counterparts. Respondents with agriculture occupations must have been found more actively engaged in seasonal agricultural cultivation than the head of households in other occupations. From educational background, respondents with secondary education were found more actively involved in seasonal agricultural cultivation. The Kirat religious head of the households was found much involved in

agricultural activities. Similarly, Hindu religious heads of the households were found much more involved in the cultivation than the other caste/ ethnic groups.

Table 7.5.1

Pearson Chi-square test Between Seasonal Agricultural Cultivation and Independent Explaining Variables

Explaining Variables	**□2**	**df.**	**P-value**
Domain of earthquake affected districts	162.75	2	.000*,b
Place of residence	107.923	1	.000*,b
Sex of hh head	8.474	1	.004*,b
Occupation of hh head	316.687	4	.000*,b
Highest level of education of hh member	10.715	4	.030*,b
Religion	157.992	3	.000*,b
Caste/ethnicity	58.722	6	.000*,b

Note: Results are based on nonempty rows and columns in each innermost sub table.

* The Chi-square statistic is significant at the .05 level.

b. Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of Chi-square test.

The Pearson Chi-square statistical test is applied to show the interrelationship between the dependent, and independent variables. As the test results reveal all the categories of independent variables are significantly related with the dependent variables.

7.4 Livelihood Condition

Traditionally, people relied on agriculture food, and animal husbandry. People still produce to meet their annual food needs. When they produce more amount food grains, they may bring them into hat bazzar (marketplace) every month, fortnight, week, or day-to-day event take place in the local areas. So, the main food dependence was own production in khets (irrigable or rainwater dependent paddy land for paddy, wheat, mustard, potato, etc.), and bari (non-irrigable land for maize, millet, lentils, potato, etc.).

A Dalit family of Palapu, Okhaldhunga shared their food production, and unmet needs:

> We afford for six months from our own agricultural production., and for about 3-4 months we subsidize our needs from the food we get from the barista's (cliental) work (Black Smiths craft iron sickles or knives for agricultural purposes, exchange it with the food grain in harvesting season)., and we also work as agricultural labor in our free time.

Head of the households, characterized by severely hit domains, about one of them said they produce food enough for 12 months, followed by 6 to 11 months (45.0%), and up to 5 months (21.7%). It shows that usually, 45 percent of households of severely hit districts produce their food for six to 11 months.

In crisis-hit districts, there is less number of households who were able to feed from their agricultural production for a whole year. However, over 50 percent of respondents said that they produce their food for 6 to 11 months. Kathmandu Valley accounts for only 15.1 percent who can feed their family from their own production (Table- 7.6).

By place of residence, about one-third of rural household heads can feed on their own food production for 12 months. Head of the households with agriculture occupation accounts for over 31.1 percent feed their family for 12 months from their own production, followed by Salaried-Wageworker (30.0%), Wageworkers (20.6%), self-employed in non-agriculture (20.9%). Head of the households with a bachelor, and above reported that over 39.5 percent meet their annual need of food from their own production, followed by higher secondary (31.6%), no education (28.9%) against the least primary (22.8%).

Respondents from religious households, Hindu feed their family from their production annually by 30 percent followed by Buddha (28.5%), and Christians (22.8%). Kirat religious households account for only 8.3 percent being able to feed their family annually from their agricultural production (Table-7.6).

Table 7.6

Distribution of Head of the Hhs by Months of Food Sufficiency

Background Characteristics		**Up to 5 %**	**6 to 11 %**	**12+ %**	**No.**	**Total %**
Domains	Severely hit	21.7	45.0	33.4	1559	100
	Crisis hit	22.4	50.7	26.8	720	100
	Kathmandu Valley	55.2	29.7	15.1	417	100
Residence	Rural	21.7	45.8	32.4	1946	100
	Urban	40.8	39.8	19.4	750	100
Sex	Male	25.4	44.1	30.5	2167	100
	Female	33.8	44.3	21.9	529	100
Occupations	Agriculture	22.0	46.8	31.1	1737	100
	Self-employed	41.6	37.5	20.9	210	100
	Wage-workers	41.7	37.7	20.6	231	100
	S. wage-workers	26.7	43.2	30.0	173	100
	Others	33.8	39.4	26.9	344	100
Highest Education	No education	26.0	45.2	28.9	154	100
	NFE & Primary	36.6	40.6	22.8	306	100
	Secondary	29.1	47.3	23.6	906	100
	Higher secondary	24.1	44.3	31.6	969	100
	Bachelor & above	22.4	38.2	39.5	362	100
Religion	Hindu	28.5	41.5	30.0	1725	100
	Bouddha	23.2	48.3	28.5	777	100
	Kirant	33.5	58.3	8.3	48	100
	Christian	28.1	49.1	22.8	146	100
Caste/ethnicity	Brahman	14.0	39.3	46.7	374	100
	Chhetri/Thakuri	23.7	41.3	35.0	513	100
	Tamang	23.9	44.9	31.2	732	100
	Newar	40.8	34.7	24.5	370	100
	Other H. Janajatis	22.8	59.0	18.2	424	100
	Dalit (Hill)	45.4	45.2	9.4	202	100
	Others	51.0	40.2	8.8	81	100

Source: CDPS, 2015

Households with caste/ ethnic groups, Brahmin accounts for 46.7 percent annually meet their food need sufficiently, followed by Chhetri/ Thakuri (35.0%), Tamang (31.0%), Newar (24.5%), other hill Janajati (18.2%), against hill *Dalit* (9.4%).

It is very unlikely that study shows the unmet food of own production accounts for food scarcity in all 12 months., and it is alarming from Bhadra (62.9%) to Chaitra (57.1%), 8 months. Since 7 districts out of 14 are of mountain districts (Table- 7.7).

In summary, it is inferred from the analysis that phenomenally respondents from severely-hit, and crisis domains reported largely that they meet their subsistence food for 6 to 11 months against Kathmandu Valley (up to 5 months). About one-third head of the households in severely hit districts meet noted that they meet their subsistence food for the whole year, followed by crisis hit one out of 4, and Kathmandu Valley over one out of ten households. By place of residence, urbanites are tended to meet their food needs for up to 5 months largely, and rural residents are tended to meet the whole year from their own production. A similar phenomenon apparently observed among the head of the household with agricultural occupation, and others. A large proportion, about 31 percent head of the households with agriculture meet their annual food subsistence against the Wageworkers (20.6%).

Table 7.7

Distribution of Head of Hhs Meets the Needs of Food in Months from Own Production

Months	**Usual food production**		**Total**	
	Meets (%)	**Unmeet (%)**	**N.**	**%**
1. Baisakh	48.0	52.0	3000	100
2. Jeth	53.2	46.8	3000	100
3. Ashad	53.3	46.7	3000	100
4. Srawan	50.0	50.0	3000	100
5. Bhadra	37.1	62.9	3000	100
6. Ashoj	29.5	70.5	3000	100
7. Kartik	25.5	74.5	3000	100
8. Mangshir	10.3	89.7	3000	100
9. Push	10.9	89.1	3000	100
10. Magh	18.3	81.7	3000	100
11. Phagun	32.5	67.5	3000	100
12. Chaitra	42.9	57.1	3000	100

Source: CDPS, 2015

The Pearson Chi-square test is applied to see the level of significance between dependent, and independent variables. All the explaining variables were found to be significantly interrelated to the dependent variables in Pearson Chi-square text (Table-7.7.1).

Table 7.7.1

Pearson Chi-square test Between Months of Food Sufficiency, and Independent Variables

Explaining Variables	**□2**	**df.**	**P-value**
Domain of earthquake affected districts	209.998	4	.000*,b
Place of residence	108.603	2	.000*,b
Sex of HH head	21.963	2	.000*,b
Occupation of HH head	80.042	8	.000*,b
Highest level of education of HH member	53.051	8	.000*,b
Religion	25.121	6	.000*,b
Caste/ethnicity	236.79	12	.000*,b

Note: Results are based on nonempty rows and columns in each innermost sub table.

* The Chi-square statistic is significant at the .05 level.

b. Some cell counts in this sub-table are not integers. They were rounded to the nearest integer before the computation of the Chi-square test.

7.5 Security of Girls

Girls in a family were asked if she/they felt unsecured/ secured before, and aftermath of the earthquake, on 25 April 2015. In earthquake hits domains, girls from the severely-hit account for 88.6 percent who felt very much secure before the earthquake, which declines to 15.6 percent after the earthquake. On the other hand, girls who were unsecured accounted for 11.4 percent before the earthquake increased to 84.4 percent after the earthquake (Table-7.8).Among respondents from the earthquake-hit domains, Kathmandu Valley accounts for over 92.7 percent of girls was found to be secured against 7.3 percent unsecured before the earthquake but in the aftermath of the earthquake, the situation goes just the opposite- secured accounted for 17.7 percent against the unsecured accounted for 82.2 percent.

Table 7.8

Distribution of Girls with Feelings of Security, and Insecure Before, and After Quake

Background	Categories	Prior to Quake		After to Quake		Total	
		Secured	Insecure	Secured	Insecure	No.	%
Domain	Severely hit	88.6	11.4	15.6	84.4	338	100
	Crisis hit	87.8	12.2	17.8	82.2	143	100
	Kathm, andu Valley	92.7	7.3	17.7	82.3	134	100
	Rural	87.8	12.2	16.8	83.2	385	100
Residence	Urban	91.9	8.1	16.2	83.8	229	100
	Male	NA	NA	NA	NA	NA	NA
Sex	Female	89.3	10.7	16.6	83.4	614	100
Occupation	Agriculture	88.4	11.6	18.7	81.3	371	100
	Self-employed	89.9	10.1	15.9	84.1	32	100
	Wageworkers	100.0	0	7.3	92.7	17	100
	Salaried W.Worker	86.4	13.6	22.2	77.8	16	100
	Others	90.5	9.5	12.6	87.4	179	100
	No education	80.5	19.5	19.5	80.5	64	100
Highest	NFE & Primary	86.1	13.9	10.4	89.6	81	100
Education	Secondary	90.8	9.2	19.8	80.2	195	100
	Higher secondary	90.7	9.3	13.3	86.7	213	100
	Bachelor & above	93.1	6.9	22.9	77.1	61	100
	Hindu	90.1	9.9	15.6	84.4	422	100
Religion	Bouddha	89.8	10.2	21.1	78.9	145	100
	Kirant	37.3	62.7	25.0	75.0	13	100
	Christian	97.6	2.4	6.0	94	34	100
	Brahman (Hill)	95.3	4.7	12.2	87.8	56	100
	Chhetri/Thakuri	85.2	14.8	16.8	83.2	129	100
Caste/ethnicity	Tamang	89.6	10.4	20.8	79.2	135	100
	Newar	92.3	7.7	12.1	87.9	98	100
	Other Hill Janajatis	95.0	4.5	15.9	84.1	102	100
	Dalit (Hill)	92.1	7.9	19.6	80.4	71	100
	Others	45.8	54.2	14.4	85.6	22	100

Source: CDPS, 2015

Respondents from a place of residence are shown as the domains shown. Girls from urban places were far better (91.9%) against their rural counterparts (87.8%), as far as the feeling of security prior to the earthquake. It went just the opposite, in the aftermath of the earthquake, secure girls in urban accounted for 16.2 percent against their rural counterparts (16.8%). The percentage of unsecured at both urban (83.8%), and Rural (83.3%) places increased unexpectedly.

Earthquake disaster brought much insecurity among occupationally Wageworkerss. Prior to the quake, girls with Wageworkers felt 100.0 percent secure but became 7.3 percent secure after the earthquake. From a religious point of view,

Christian girls felt secure at 97.7 percent prior to the quake but it became 6.0 percent after the earthquake in 2015. Hindus also felt very secure before the earthquake by 90.1 percent, which became 15.6 percent after the earthquake.

> How do families form? In our days, we married and got 2/3 children then separated from our parents. But now a day most brides come with a bag, wear jeans or pants, don't go for grass, and do household chores. But, mothers-in-law go to jungles for grass for cattle so make cry with newly married brides, and newly brides replied that they got marriage not for cutting the grass for cattle in the house. So, after marriage either for up to one year or at least six months, and got separation from the family, and form a nuclear family.

He further said,

> Psychosocial problem: We couldn't touch any jobs at least for ten days. Shasu *lai bha cha…Chad maniyo. Bihe garne bela bhaka chhan ni, gharko thar thegan chhaina, k gari lyaunu. Poila jane chori jaun, chorako bhe garne kura aena* (if a daughter wants to go can go but cannot marry the son, and bring the bride. Because there is no home and place to accommodate newly married couples. RH, we are in menopause, so don't have a problem. But daughters-in-laws are in cities, how do they stay there we don't know. Those family members, who were abroad prior to the earthquake, didn't come. But those who were in Kathmandu, came (they didn't get to eat in Kathmandu, they must come to the house and ate the rice that we got in relief), and some of them also took relief materials distributed.

In summary, girls in Kathm, andu valley were secured before the earthquake that turned out in to insecure in aftermath of earthquake. It means relatively urban places were found more secure prior to earthquakebut after earthquake obviously girls felt insecure in the shelters especially. Education is the instrument that empowers the mankind, so presumably girls with tertiary level of education were found to be secured than the no education., and by religion, Christian girls were found to be more secured, and the Kirati girls were found to be the least secure. From the caste/ ethnic point of view girls Hindu girls were more secured than the other religious girls.

Table 7.8.1

Pearson Chi-square test Between the Girls Perception of Secure or Insecureg Variables

Explaining Variables	**□2**	**df.**	**P-value**
Domain of earthquake affected districts	16.456	4	.002*,b
Place of residence	6.228	2	.044*,b
Sex of HH head	.-	-	-
Occupation of HH head	8.4	8	.395b,c,d
Highest level of education of HH member	11.613	8	.169b,c
Religion	38.671	6	.000*,b,c,d
Caste/ethnicity	59.187	12	.000*,b,c

Note: Results are based on nonempty rows, and columns in each innermost sub table.
* The Chi-square statistic is significant at the .05 level.
b. Some cell counts in this sub table are not integers. They were rounded to the nearest integer before the computation of Chi-square test.
c. More than 20% of cells in this sub table have expected cell counts less than 5. Chi-square results may be invalid.
d. The minimum expected cell count in this sub table is less than one. Chi-square results may be invalid.

After the quake, Wageworkers girls were found to be extremely low numbers who were secured, and from religious background, Christian girls accounted for the least number who were secured. As far as the results the cross tabulation between the dependent, and independent yield, statistically tested using the Chi-square test, the distribution of the respondents prior to the earthquake is significantly inter related. But it doesn't, as far as the distribution of the results after the quake is concerned.

7.6 Psychosocial Issues

A suddenly occurred natural or manmade hazard events make shocks to us make cause to psycho-social problems. Recurrent insecurity or threats make us a fear inside us may also raise such a problem. Distress due to various reasons induces such problem in us. In a question, have any family member in a household experiences psycho-social problems[13] in aftermath of earthquake? Every family member was asked about psychosocial problems. So, all together 14,987 survey population was asked if any family member had a symptom related to psychosocial problems.

Of the total surveyed population, about 3 percent reported that they had the psychosocial problems in aftermath of the earthquake. Almost 97 percent denied the psychosocial problems they encountered in aftermath of the earthquake.

Among the respondents of domains, about 3.4 percent surveyed populations confessed that they had the psychosocial problems in aftermath of earthquake. Contrast to the domain, about 3.1 percent of the urban place of residence said that they experienced problems.

Table 7.9

Distribution of Head of the Hhs with Psychosocial Problems

Background Characteristics	**Categories**	**Psychosocial Problem**		**Total**	
		Yes	**No**	**N.**	**%**
	Severely hit	3.4	96.6	7829	100
	Crisis hit	2.2	97.8	4346	100
Domain	Kathm, andu Valley	2.1	97.9	2812	100
	Rural	2.7	97.3	10057	100
Residence	Urban	3.1	96.9	4930	100
	Male	2.7	97.3	12267	100
Gender	Female	3.6	96.4	2720	100
	Agriculture	2.7	97.3	9063	100
	Self-employed	2.5	97.5	1456	100
	Wage-workers	3.5	96.5	1374	100
	S. wage-workers	3.5	96.5	962	100
Occupation	Others	3.1	96.9	2133	100
	No education	7.0	93	317	100
Highest	NFE & Primary	2.7	97.3	1270	100
Education	Secondary	3.0	97	5086	100
	Higher secondary	2.7	97.3	5920	100
	Bachelor & above	2.5	97.5	2395	100
	Hindu	3.1	96.9	9762	100
	Bouddha	2.5	97.5	4260	100
	Kirant	1.1	98.9	226	100
Religion	Christian	1.4	98.6	739	100
	Brahman (Hill)	1.8	98.2	1956	100
	Chhetri/Thakuri	4.2	95.8	2704	100
	Tamang	2.1	97.9	3955	100
	Newar	2.8	97.2	2450	100
Caste/	Other H. Janajatis	3.0	97	2436	100
ethnicity	Dalit (Hill)	4.2	95.8	1119	100
	Others	1.9	98.1	368	100
Total		2.8	97.2	14987	100

By gender, it is interestingly noted that female population experienced (3.6 %) the psychosocial problems against the male (2.7%).

It is remarkable that no education accounted for 7.0 percent who encountered the psychosocial problems in aftermath of earthquake (Table- 7.9). In survey population of the households of Caste/ ethnic group background, Chhetri/ Thakuri, and *Dalit* (hill) each reported that above 4.2 percent reported the psychosocial problems during the survey.

In order to show the level of significance in the distribution of cross-tabulation of independent, and dependent variable, Pearson Chi-square test is applied. Except place of residence, and occupation, all the explaining variables show the significant at the level of 95 percent. The results we got from the data analysis show the interrelationship between two dependent, and independent variables (Table- 7.9.1).

Table 7.9.1

Pearson Chi-square Test Between Dependent, and Explaining Variables.

Explaining Variables	**□2**	**df.**	**P-value**
Domain of earthquake affected districts	20.966	2	.000*,b
Place of residence	1.812	1	.178b
Sex of HH head	6.959	1	.008*,b
Occupation of HH head	5.728	4	.220b
Highest level of education of HH member	21.065	4	.000*,b
Religion	12.307	3	.006*,b
Caste/ethnicity	42.458	6	.000*,b

Note:Results are based on nonempty rows, and columns in each innermost sub table.
* The Chi-square statistic is significant at the .05 level.
b Some cell counts in this sub table are not integers. They were rounded to the nearest integer before the computation of Chi-square test.

7.6.1 Types of Psychosocial Problems

Head of the households were asked if any family members were afflicted with psychosocial problems, than they can report what type of the symptoms family members had.

Respondents of Crisis hit districts account for 31.2 percent, the highest, that family members are found to be tense, followed by aches, and pains in limbs (16.2%), crying, and fainting (8.8 %), irregular blood pressure (6.8 %), vomiting (9.3 %), and faint (3.5 %). , and it was also observed in rural place of residence, where largely respondents accounted for 16.6 percent, aches, and pains in limbs (Table-7.10).

Respondents from Kathmandu largely accounted for 8.1 percent afflicted with irregular blood pressure.

Table 7.10

Distribution of Head of Hhs with Psychosocial Problems

Background Characteristics		Multiple Response						Total (N)
		Tense	Aches	Crying	Irregular BP	Vomiting	Faint	
Domain	Severely hit	9.1	14.6	9.2	6.3	6.1	3.9	1,601
	Crisis-hit	31.2	16.2	8.8	6.8	9.3	3.5	792
	K.Valley	7.7	4.7	3.4	8.1	1.5	1.7	607
Residence	Rural	17.3	14.0	8.9	6.8	6.9	4.0	2,004
	Urban	14.4	9.1	4.9	7.4	4.0	1.7	996
Gender	Male	15.8	11.9	7.6	6.7	5.4	3.1	2,381
	Female	16.9	11.7	5.2	8.6	6.5	2.6	619
Highest Education	No Edu.	15.0	13.1	6.5	5.7	5.0	3.5	730
	Primary	20.9	12.0	9.4	5.8	7.1	2.8	891
	Secondary +	13.7	11.2	6.2	8.4	5.1	3.0	1,379
Caste/ethnic group	Tamang	20.5	9.5	7.5	6.1	6.7	4.1	781
	Newar	12.1	8.4	4.9	8.6	3.2	2.0	488
	Chhetri/T.	14.3	14.8	5.9	9.8	5.5	2.7	567
	Brahman	18.0	14.1	8.5	8.8	4.4	3.4	396
	Other H. Ja.	14.9	12.7	11.0	1.9	7.4	3.3	445
	Hill Dalit	14.6	15.6	6.8	5.9	9.3	2.9	235
	Others	16.7	14.1	6.4	1.3	5.1	1.3	87
	Total	16.0	11.8	7.1	7.1	5.6	3.0	3,000

Source: CDPS, 2015

Respondents from rural place of residences accounted for 17.3 percent against the urban place of residence (14.4%) who encountered the tense in the aftermath of the earthquake and from a gender point of view, female respondents accounted for about 17 percent against the male respondents (15.8%) who are afflicted with the tense.

From acquired educational capacity, non-formal or primary level education background accounts for 20.9 percent often experienced the 'tense' situation in aftermath of earthquake, and that of female (16.9%) respondents experienced more than their male (15.8 %) counterparts. On the other hand, male respondents experienced aches and pains in limbs 11.9 percent slightly more than their female counterparts (11.7%).

From caste/ ethnic groups backgrounds, Tamang experienced tense situation the most accounts for 20.5 percent, followed by followed by Brahman (18.0%), and others (16.7%). On the other hand, Tamang (9.5%), and Newar (8.4%) experienced less (single digit), whereas rest of other groups- Chhetri/ Thakuri (14.8%), Brahman (18.0%), another hill *Janajati*s (14.9%), all experience more, to the extent of two digits. Other hill *Janajati* also disproportionately accounts for 11.0 percent frequent crying, and fainting (Table-7.10).

In summary, most of the heads of households were found in tense situations except the respondents from the severely hit districts. It could be a matter of debate to be 'tense' in the aftermath of an earthquake should be taken as the symptom of a psychosocial problem or notsince a regular aftershock also makes people tense.

7.7 Disability

Natural disasters, including earthquakes, pose direct, and indirect harms to health, too, as Paul (2003) notes:

> Direct health impacts include deaths and injuries, and the indirect health impacts include the potential for an increase in communicable, waterborne, and other diseases such as hepatitis, and malaria as well as pneumonia, eye infections, and skin diseases. These health issues pose a significant threat to the lives and well-being of disaster survivors. Deaths often occur from communicable, and other diseases after a disaster, and for this reason these indirect health impacts are often referred to as the "second wave of death, and destruction." The occurrence of communicable, and other diseases are disaster- as well as country-specific (p. 144).

Research demonstrates that disasters have a two-pronged impact on disability. First, they disproportionately affect persons with existing disabilities, and, second, they create new persons with disabilities who need rehabilitation services. In resource-constrained settings, the impact of a disaster on both those with existing, and those with new disabilities can be long-term, and far-reaching. There is much evidence regarding the pathways that increase the vulnerability of the disabled and on the impact of various approaches designed to reduce disaster-related risks to this group.

Table 7.11

Distribution of Disability by Background Characteristics

Background Characteristics		**Disability**		**Total**	
	Categories	**Yes (%)**	**No (%)**	**(N)**	**%**
Domain	Severely hit	1.6	98.4	7,829	100
	Crisis-hit	2.2	97.8	4,346	100
	Kathm, andu Valley	1.5	98.5	2,812	100
Residence	Rural	1.7	98.3	10,057	100
	Urban	1.9	98.1	4,930	100
Gender	Male	1.7	98.3	12,267	100
	Female	1.9	98.1	2,720	100
Education	No education	2.7	97.3	2,874	100
	Primary	1.7	98.3	4,660	100
	Secondary Plus	1.5	98.5	7,453	100
Caste/ethnic group	Tamang	1.5	98.5	3,955	100
	Newar	1.8	98.2	2,450	100
	Chhetri/Thakuri	1.6	98.4	2,704	100
	Brahman	1.9	98.1	1,956	100
	Other Hill Janajati	1.9	98.1	2,436	100
	Hill Dalit	1.7	98.3	1,119	100
	Others	4.5	95.5	368	100
	Total	1.8	98.2	14,987	100

Source: CDPS, 2015

About two percent of the surveyed household has members with some form of disability. Among different background attributes, other groups of caste/ethnic group accounted for 4.5 percent, followed by no education (2.7%) category of education attribute (Table-7.11).

In different domains, crisis hit accounts for 2.2 percent, followed by severely hit (1.6%), and Kathm, andu Valley (1.5%). In place of residence, urbanites account

for 1.9 percent against the rural counterparts (1.7%). They are slightly more number disables than the rural household members.

It is also surprising, female accounts for 1.9 percent against male (1.7%), just opposite of place of residence.

Injuries due to disaster may turn out to death, and live., and physical injuries may be the attribute of physical, and mental disability, if injuries go to worse case. Incidence of disability is measured before or after the earthquake. There were 263 cases recorded while about 15 thous, and people were interviewed in 3000 households (Table-7.11).

Among study domains, in severely hit there were accoun125 cases recorded, of them 93.6 percent were prior to the earthquake, and 6.4 percent have occurred after the earthquake. Kathmandu Valley accounts for the alarming situation. It accounts for 30 percent after the earthquake, whereas 70 percent disability cases were prior to the earthquake (Table-7.12).

By place of residence, urban household members who are disabled after the earthquake account for 16.2 percent against the rural disabled (7.6 %). Disability with respect to gender doesn't see any significant impact; but by education highly educated accounts for 12.7 percent in comparison to primary level education (9.5%), and no education (8.7 %).

In summary, out of the interviewed family members of 3000 households, about 1.8 percent reported that they are afflicted with physically different abilities. By domains, household members of crisis-hit domain account for 2.2 percent of disables. Household members of the urban place of residence accounted for 1.9 percent disabled against their rural counterparts (1.7%), and female family members also accounted for 1.9 percent disabled against their male counterparts (1.7%). From caste/ ethnic groups point of view, other groups accounted for 4.7 percent which is the highest number, and from educational point of view respondents with no education accounted for 2.7 percent, the highest number against the family members with other caste/ ethnic background.

In order to look at the relationship between dependent, and independent variables, Pearson Chi-square statistical test is applied to results found from cross-tabulation of data. The test shows that except for the variables on the place of residence, and occupational background of the respondents, all the variables show statistically significant at 95 percent (Table- 7.11.1).

Table 7.11.1

Pearson Chi-square test Between Disables and Explaining Variables

Explaining Variables	**□2**	**df.**	**P-value**
Domain of earthquake affected districts	20.966	2	.000*,b
Place of residence	1.812	1	.178b
Sex of HH head	6.959	1	.008*,b
Occupation of HH head	5.728	4	.220b
Highest level of education of HH member	21.065	4	.000*,b
Religion	11.29	3	.010*,b
Caste/Ethnicity	45.566	6	.000*,b

Note:Results are based on nonempty rows, and columns in each innermost sub table.
* The Chi-square statistic is significant at the .05 level.
b. Some cell counts in this sub table are not integers. They were rounded to the nearest integer before the computation of Chi-square test.

7.7.1 Incidences of Disability

There are 263 family members who are found to be disabled in 3000 households. But what about the disability before, and after the earthquake?

From caste/ ethnic point of view Newar accounts for 21.8 percent, disabled after the earthquake, in 2015. Following this, Others (19.2%), Chhetri/ Thakuri (11.7%), and Other-hill Janajati (8.5%), and so on. Brahmin accounts for the least (4.2%) (Table- 7.12).

Among different types of disability physical disability accounts for 52.8 percent, followed by eyesight/hearing (23.2%), mental or cognitive (8.7%), multiple (8.6%), and vocal disability (6.7%). So, above 75 percent disabled are physically impaired including eyesight, and hearing. If we look it with explaining variables, Kathmandu Valley as the domain of study of study accounts for the highest physical disable cases with 64.3 percent, followed by severely hit (55.1%), and crisis hit (44.6%).

In eyesight/ hearing problems, Crisis hit domain accounts for 28.9 percent, followed by severely hit (24.4%), and Kathmandu Valley (7.1%). Kathmandu Valley also accounts for 12.9 percent in mental/cognitive disability among the family members that are badly affected by April 25, earthquake (Table- 7.13).

Table 7.12

Distribution of Incidences of Disability

Background Characteristics	**Categories**	**Incidence of disability in percents**		**Total**	
		Before	**After**	**N**	**%**
Domain	Severely hit	93.6	6.4	125	100
	Crisis-hit	92.6	7.4	96	100
	Kathm, andu Valley	70.0	30.0	43	100
Residence	Rural	92.4	7.6	172	100
	Urban	83.8	16.2	91	100
Gender	Male	89.4	10.6	212	100
	Female	89.4	10.6	51	100
Education	No education	91.3	8.7	76	100
	Primary	90.5	9.5	78	100
	Secondary Plus	87.3	12.7	109	100
Caste or ethnic group	Tamang	93.7	6.3	57	100
	Newar	78.2	21.8	45	100
	Chhetri/Thakuri	88.3	11.7	43	100
	Brahman	96.0	4.0	35	100
	Other H. Janajati	91.5	8.5	47	100
	Hill Dalit	95.8	4.2	19	100
	Others	80.8	19.2	17	100
	Total	89.4	10.6	263	100

Source: CDPS, 2015

As far as the physical disabilities by place of residence is concerned, slightly urbanites (53.6%) exceeds the rural counterparts (52.3%); however, in eyesight/ hearing problem urbanites (19.1%) are better than rural residents (25.4%).

With respect to gender, physical disability among male accounts for 54.3 percent against female counterparts (46.3%), almost 8 percent worse. But in eyesight/ hearing, female accounts for better (26.6) than male (22.4%). In multiple disabilities, female accounts for 16.5 percent, much worse, than their male counterparts (6.7%).

Table 7.13

Distribution of Head of the Hhs with Type of Disabilities

Background Characteristics		Type of disability					Total (N)	
	Categories	Physical	Eyesigh/ hearing	Mental cognitive	Multiple	Vocal	No.	%
Domain	Severely hit	55.1	24.4	6.4	6.4	7.7	125	100
	Crisis-hit	44.6	28.9	9.9	10.7	5.8	96	100
	K. Valley	64.3	7.1	12.9	10.0	5.7	43	100
Residence	Rural	52.3	25.4	8.4	7.7	6	172	100
	Urban	53.6	19.1	9.3	10.1	7.9	91	100
Gender	Male	54.3	22.4	9	6.7	7.5	212	100
	Female	46.3	26.6	7.5	16.5	3.1	51	100
Education	No Edu.	44.6	27.5	9.2	10.4	8.4	76	100
	Primary	49.6	26.7	6.2	11.3	6.2	78	100
	Secondary +	60.8	17.9	10.2	5.3	5.9	109	100
Caste/ethnic groups	Tamang	47.9	34.3	4.9	6.2	6.6	57	100
	Newar	51.5	17.1	14.1	7.9	9.3	45	100
	Chhetri	61.7	19.6	4.7	8.4	5.6	43	100
	Brahman	43.0	22.0	6.2	26.6	2.2	35	100
	H. Jana	50.4	25.6	12	3.4	8.6	47	100
	Hill Dalit	62.3	16.7	4.2	4.2	12.6	19	100
	Others	66.7	14.2	19.1			17	100
	Total	52.8	23.2	8.7	8.6	6.7	263	100

Source: CDPS, 2015

From educational background, secondary education plus, educated population account for 60.8 percent physical disabilities, followed by primary (49.6%), and no education (44.6%). In eyesight/ hearing problems, the population with no education (27.5%) accounts for the worse situation, followed by primary education (26.7%), slightly more;, and secondary education plus accounts for only 17.9 percent, which is pretty good.

With respect to caste/ ethnic groups, two out of three disables are physical, followed by hill Dalit (62.3%), Chhetri/ Thakuri (61.7%), and so on. The least physically disables are Brahmin (43.0%), Tamang (47.9%), Other hill Janajatis (50.4%), and so on (Table-7.13).

In eyesight/ hearing, one out of three disables is Tamang ethnic group, followed by other hill Janajati (25.6%), Brahmin (22.0%), Chhetri/ Thakuri (19.6%), and so on.

FGD participants from the Majhi community in Ramechhap said that differently- abled persons did not get a proper place in which to reside after the earthquake, and that they really had a hard time. The Rai community in Okhaldhunga complained that differently-abled persons had not been provided with disability identification ID card, and that, as a result, they had been unable to access the facilities provided by the government. Besides not receiving help form the government, the differently-abled had to endure a lot of insults by so-called good people in society.

In summary, over 10 percent disables are found to be disabling after the earthquake. Among the disable in Kathmandu valley account for the largest 30 percent after the earthquake, whereas in other domains it is very, very less likely. From a place of residence point of view, urban accounts for more than the rural area, and from caste/ ethnic point of view Newar ethnic group of Kathmandu accounted for more than the other groups.

7.8 Elderly Citizens

Older people are particularly vulnerable and face specific threats from man-made, and natural disasters. Their needs are very different from those of other groups, such as children. Population just over 60 years is taken as elderly. Inquiries concerned with the elderly were made especially in two aspects. First, there were elderly people during the earthquake hazards, and second, if any injuries to the elderly due to earthquake hazards.

Of the surveyed household population (14987), there were 1565 categorized as elderly (60 Years, and above). During the earthquake, 34.3 percent, just over one-third was inside the house or room, against 65.7 percent, about the two third who were outside the house or room. In the second inquiry, about 6.2 percent of the elderly fell into injury, against 93.8 percent not injured during the 25 April, earthquake.

With respect to the earthquake domains, Kathmandu Valley accounts for 41.6 percent, the elderly were inside the house or room, followed by crisis hit (39.3%), and severely hit (28.6%). So, those family members who were inside the house or room would be taken as in high risk to earthquake hazards in comparison to those outside

remaining. Among the elderly populations, by domain Kathmandu Valley accounts for the highest injuries (8.2 %), followed by severely hit (6.2%), and crisis hit (4.8%).

Table 7.14

Distribution of Older Population During Quake and Injury

		House/ Room			Injury		Total
		Inside	**Outside**	**Not**	**Injury**	**N**	**%**
Domain	Severely hit	28.6	71.4	93.8	6.2	796	100
	Crisis-hit	39.3	60.7	95.2	4.8	459	100
	K. Valley	41.6	58.4	91.8	8.2	310	100
	Rural	32.9	67.1	93.8	6.2	1,028	100
Residence	Urban	36.9	63.1	93.7	6.3	537	100
	Male	33.9	66.1	93.7	6.3	1,302	100
Gender	Female	36.3	63.7	94.0	6.0	263	100
Education	No Education	30.9	69.1	91.8	8.2	451	100
	Primary	36.5	63.5	95.2	4.8	421	100
	Secondary Plus	35.2	64.8	94.2	5.8	693	100
Caste/	Tamang	36.3	63.7	94.4	5.6	397	100
	Newar	36.8	63.2	92.4	7.6	267	100
ethnic	Chhetri/Thakuri	32.7	67.3	93.7	6.3	291	100
group	Brahman	35.7	64.3	95.4	4.6	253	100
	Other Hill *Janajati*	29.6	70.4	93.1	6.9	243	100
	Hill *Dalit*	32.4	67.6	93.2	6.8	91	100
	Others	33.1	66.9	90.8	9.2	24	100
	Total	34.3	65.7	93.8	6.2	1,565	100

Source: CDPS, 2015

From the place of residence point of view, we don't see any significant variation between the rural, and urban elders who were inside or outside of the house or room nor do they vary in the number of injuries. Is there any correlation between the elderly stay inside the house, and room with the possibility of injuries?

With mobility-related vulnerability in mind, and assuming that some older people would be housebound or resting, the survey asked whether older persons in the surveyed households were inside or outside of their homes when the earthquake struck. It found that two-thirds of the elderly were outside of their homes, and slightly more than one-third were inside their homes Some six percent of 1,565 elderly reported that they sustained an injury because they had fallen.

Table 7.14.1

Pearson Chi-square Test between the Dependent and Independent Variables

Explaining Variables	**□2**	**df.**	**P-value**
Domain of earthquake affected district	24.203	2	.000*,b
Place of residence	2.455	1	.117b
Sex of HH head	0.552	1	.457b
Occupation of HH head	6.25	4	.181b
Highest level of education of HH member	22.32	4	.000*,b
Religion	11.785	3	.008*,b,c
Caste/ethnicity	4.482	6	.612b

Note:Results are based on nonempty rows, and columns in each innermost sub table.
* The Chi-square statistic is significant at the .05 level.
b Some cell counts in this sub table are not integers. They were rounded to the nearest integer before the computation of Chi-square test.
c More than 20% of cells in this sub table have expected cell counts less than 5. Chi-square results may be invalid.

7.9 Discussions and Conclusions

As far as the displacement of the affected population is concerned, first, and foremost issue is where they settled in the aftermath of a disaster. In the case of Nepal, the Government of Nepal (GoN), home affairs (PDNA, 2015) estimated about 0.6 million families were displaced from the place where they used to stay prior to the earthquake. The study shows that about 0.8 million were displaced from their huts but didn't confirm whether they were displaced due to the damage to their house or not. Hurricane Katrina displaced more than one million people who were low-income minorities (Levine et al., August 2007). In the case of Nepal, a study shows that about 96 percent of households of Crisis hit the domain was currently residing in the same place where they used to be prior to the earthquake, followed by Severely hit (85%), and Kathmandu Valley (83%). In America, Morrow (2005) noted that twelve years after Hurricane, Andrew struck Miami-Dade County in South Florida, many vulnerabilities in terms of now owning a house, and were still remained in rental housing for certain groups, notably the poor, minorities, the elderly, large households, and female-headed households, were disproportionately affected.

Dalit communities are the most observed vulnerable group in Nepal. About 93 percent of them are still living in the same place, and about 7.5 percent changed their place of living in the same ward, and VDC. The Dalit community, they are very much constrained to move or transfersince other groups especially upper caste Brahmin,

and Chhetri/ Thakuri take them untouchables, so might not get the residence in rents or the place they can build their shelter or huts as they want. Once they had a hut, they have to think twice before change the place they want.

In the aftermath of an earthquake, affected people immediately thought about the loss of life, and property; followed by the building a temporary shelter. About 3 out of 5 affected household were found in shelter even after 6 months. The most needed items of earthquake-affected population were long-term shelter (housing), followed by financial support, and short-term shelter (tent/ shelter box) (Ground Truth Solutions (GTS) (2015). In a question about whether earthquake affected population's main problem was being addressed, about 50% responded 'not at all'. Districts with lowest scores were Makwanpur, Sindhupalchowk, Nuwakot, and Kathmandu against the People in the districts of Ramechhap, and Gorkha were less negative. In Nepal, most of the residents have at least a piece of l, and where they have own huts. The Gorkha Earthquakebadly hit them.

Of the total households, 470 households reported that they stay in others' l, and, households of severely hit domain accounts for 71 percent who are currently temporarily settled in others' land, followed by Crisis hit (62.3%), and rent (22.1%). It is true that renters live in Kathmandu Valley (33.7%), and study also shows that people who built their shelter in public land bets 22.6 percent, highest.

The public land or place accounts for the highest in Kathmandu Valley since many open publics are open for use when such an earthquake or disaster comes. Chhetri (24 March, 2020) reported that following the disaster of 2015, the city authorities realized the importance of open spaces, and as a result, designated 887 spots, identified by the Kathmandu Valley Development Authority, as open spaces- 488 are in Kathmandu, 346 in Lalitpur, and 53 in Bhaktapur (Wide open spaces: the state of public l, and in Kathmandu, 2020).

Nepalese people are predominantly agriculturalists, they meet their daily food consumption from own production., and seasonal cropping is the main source to meet their day-to-day need of food. The earthquake hit Nepal in April, the farmers began for seasonal cropping as usual. Mainly they cultivate maize, potato, beans, etc. in hill and low mountain areas.

Respondents of crisis hit (92.0%) domains overwhelmingly noted that they were engaged in seasonal cultivation in compare to Kathmandu Valley (69.0%). It was true that Kathmanduites are more business, and salaried workers. In the early days, Kathmanduits also produced their day to day need from the agriculture but most of the farm land are gradually converted in to metropolitan areas. The matter of discussion here is farmers who are hit by natural hazard such as earthquake, do they rely on the relief came from different agencies, or they do produce their day-to-day need as usually they produced?

Globally around 11% of the world's population is chronically undernourished since they don't have sufficient access to calories (FAO, 2017). One-third of the global population suffers from micronutrient malnutrition, mainly due to insufficient intakes of vitamins, and minerals to support a healthy life. Most food-insecure and undernourished people live in Asia, and Africa. In sub-Saharan Africa, the number of undernourished people is even increasing, and much of the food in Asia, and Africa is produced by smallholder farmers who are the most affected by food insecurity (Herrero, et al., 2010 & World Bank, 2007).

Developing nations are especially vulnerable to rural disasters as the majority of livelihoods (50–95% of the population) are based on farming (Chapagain & Raizada, 2017; FAOSTA, 2017). We don't know the calorie at rural setting, they needed but head of the houses reported the 'food sufficiency' in the respective number of months. For 1 to 5 months, over 55 percent households in Kathmandu Valley meet their food sufficiency. For all, twelve months about 15.1 percent household meet their food sufficiency from their own seasonal food cropping. The scenario of severely hit districts is different. About one-third of households meet food sufficiency for all twelve months in severely hit districts. Kathmandu Valley, and severely hit districts are just reverse. There are the least (21.7%) number households who meet their food sufficiency in severely hit districts, and more number of households who meet their food sufficiency more months. Relief distribution, and supply was seemingly abundant on the name of affected population. But people were busy for their seasonal plantation. Now the question is how to measure the food sufficiency in terms of daily need calories. Because food sufficiency is a perceptive

judgment, and could be converted into metric systembut there would be multiple products a farmer has, and reporting of all of them won't be possible.

Interestingly, in regards to the seasonal cropping, and food production own, among three domains crisis hit, severely hit, and Kathmandu valley; Kathmandu valley rated the least. So, Kathmandu valley is vulnerable as far as own food production is concerned.

Similarly, by Gender, female accounts for the least so, much vulnerable than the male counterpart. Urban found to be the least by place of residence; followed by Wageworkers, primary level education, Kirat religion and Dalit (hill) are identified as the vulnerable groups.

In regards to which months the unmet food production is alarming in earthquake hit districts. About 90 percent households said that they don't have food in Mangshir (from mid of November to mid of December), followed by push (from mid of December to mid of January) (89.1 %), Magh (from mid of January to mid of February) (81.7%) and so on. With the discussion about the post-2015 development agenda and the United Nations' Sustainable Development Goals, the need for making smallholder agriculture and food systems more nutrition-sensitive was prominently recognized (Sibhatu & Qaim, 2017). It aims to improve the diets of smallholder families in terms of both quantity and quality but how exactly this can be achieved the best remains elusive. But developing countries are hardly working towards that.

Girls found to be extremely feared in the aftermath of the earthquake. Prior to earthquake 93 percent girls were secured in crisis-hit domains, found only 18 percent secure in the aftermath of an earthquake. By residence, urban girls (91.9%) were almost no insecure before the earthquake, become insecure by 83.8 percent after the earthquake. Following this, Wageworkers girls were accounted for 92.7 percent insecure. The largest number found to be insecure by religion with Christian girls (94.0%).

As head of the households reported, female encountered the highest account 9.1 percent psychosocial problems in aftermath of earthquake, followed by no education (8.4%), Other educational background (7.3%), Chhetri/ Thakuri (7.0%),

and Kirat Religion, Urbanites, Severe hit each by 5.0 percent. Indeed, interest of study on effects of traumatic experience has increased sharply during the last 20 years; however, the increased interest was observed especially after the 1999, Marmara Earthquake, in which 17,000 people died and 44,000 people were injured in Turkey (Aker, Onen, & Karakilic, Fall 2007). Women and children, those most responsible for on farm labor in developing countries are most affected by post-traumatic stress after a disaster (Pynoos et al., 1993).

Especially following the Marmara Earthquake, the issues of natural disasters, and psychological health have become the subjects of extensive study. These studies demonstrated that post-disaster mental health problems are very prevalent and long-lasting. Risk groups and vulnerability factors were an additional topic of investigation in the post-earthquake period. The negative impact of the earthquake on mental health was demonstrated in the development of Post Traumatic Stress Disorders (PTSD), depression, adjustment disorder, familial problems, sexual problems, anxiety, and social isolation. Symptomatically, psychosocial problems were observed in study households. About 16 percent head of the households reported that any family members shown a 'tense' behavior in aftermath of earthquake, followed by aches and pains in limbs (11.8%), vomiting (9.3%), crying, and fainting, and irregular blood pressure each (7.1%), vomiting (5.6 %), and just faint (3.3%). These symptoms were encountered in the households after the earthquake implies that it was due to the traumatic stress. The psychosocial impact of disasters has attracted increasing attention, and there is a little consensus, however, about what priorities should be pursued in relation to mental health interventions, with most controversy surrounding the relevance of traumatic stress to mental health (Silove, Steel, & Psychol, 2006).

Disability can be the partly an output of the disaster. A survey of over 5,000 persons with disabilities representing 126 countries conducted by the UN Office for Disaster Risk Reduction (UNISDR) found that only 20% could evacuate their living spaces without difficulty in the event of an emergency, highlighting the importance of accessibility during a national disaster (UNISDR, 2013).

Of the disaster households, about 10.6 percent added aftermath of earthquake, though we don't know if it is due to the earthquake. Lord, Sijapati, Baniya, Chand,

and Ghale (2016) studied on disaster and disability, difference, focusing the challenges faced by persons with disabilities in post-earthquake Nepal, with a goal was to investigate the situation of disability, and social exclusion in Nepal using the 2015 earthquakes as a lens. The studies highlighted the systemic inequalities that produce 'inequalities of opportunity', and uneven vulnerabilities for persons with disabilities in Nepal, and identifying strategies, and programmatic opportunities that can help promote patterns of post-earthquake recovery, and development that are more inclusive of persons with disabilities in Nepal. The studies with the multidimensional exclusion perspective adopted a theory that the earthquake would have a differential impact on the socially disadvantaged groups.

Elderly aged 60 years, and above were about to 1500 interviewed in the study. Elderly who were inside the house or room accounted for 34.3 percent against the outside the house or room (65.7%). By domains, Kathmandu valley accounts for 8.2 percent injury. Similarly, from place of residence, urban population accounts for 6.3 percent more than rural counterparts. From gender point of view, male accounts for 6.3 percent. From caste/ ethnic groups point of view, other tiny groups account for 9.2 percent followed by the highest level of education respondents with no education accounts for the 8.2 percent elderly found injury.

Help Age International describes different five ways that disaster increased the vulnerability of elderly citizens:

> First of all their vulnerability is increased by restricted mobility cause by the loss of muscle strength, impaired sight, and hearing, and greater vulnerability to heat, and cold. Many frail or housebound older people are less able or willing to flee quickly or protect themselves from harm. Older people can struggle to obtain food, travel long distances or endure even short periods without shelter. Secondly disaster disturbs elderly people's taking proper food in routine basis, and leads them to take inappropriate food. The emergency food distribution programs rarely think to adjust the particular needs of older people, and their specific dietary requirements. Thirdly vulnerability of older people increases due to breakdown of healthcare system-inadequate healthcare. Walking sticks and frames, hearing aids, and eye glasses can make all the difference in reaching distribution points, accessing assistance,

preparing food or collecting firewood. Older people also need healthcare for chronic conditions, such as coronary heart disease, diabetes, strokes, respiratory illnesses, rheumatism and dementia. Fourthly, increased trauma and isolation related impact such as loss of family members, caregivers and community ties. Elderly are mostly excluded from labor markets such as food-for- work and cash-for-work as well as from credit markets such as micro credits and access to finance all these targets younger adults (http://www.helpage.org/what-we-do/emergencies/older-people-in-emergencies/).

CHAPTE VIII

RECOVERY OF IMPACT OF EARTHQUAKE ON VULNERABLE POPULATIONS

8.1 Introduction

When hazards hit, the ultimate outcome would be the disaster. Depending on the degree of resilience, the recovery can be expected sooner or later. The concept of disaster resilience can be defined simply as the capacity to rebound from future disasters. Although no single model can quantify disaster resilience, the growing consensus is that resilience is a multifaceted concept, with social, economic, institutional, infrastructural, ecological, and community dimensions (NRC, 2010; Peacock et al., 2008). The impact of hazards is measured in different ways. This chapter focuses mainly on the ultimate aspect, the recovery.

When the earthquake, 2015 stroke, human life was inexorably interrupted. Initially, when people got out from the shocks, they thought about their family members, their numbers, counting, and finding of where about. Following this, rescue of family members, if they fell in a trap or debris to property lost and the neighbors, their condition, etc. The impact of the earthquake is revealed in the previous chapters; thus, this chapter constitutes the different aspects of recovery.

8.2 Recovery

A disaster is defined as the impact of a natural or technological catastrophe on a specific population, and its consequences are the product of that interaction (Lima & Gittelman, 1990). The U.S. According to Agency for International Development (US AID) (1986), since the beginning of the century, more than half a million persons have died in disasters each year. Eighty-six percent of all disasters occur in developing countries, where the toll of deaths, injuries, and mental trauma is highest (Ignacio & Perlas, 1994). They also reported that seventy-eight percent of the deaths occurred in developing countries where 97.5 percent of the affected people live and where the health, and response infrastructures are weak. More than any other group, it is the poor living in economically underdeveloped vulnerable groups, who suffer

mostly - who have the fewest resources, and the least amount of support for coping with disaster.

Housing is a core element of daily life, and a critical component of any disaster recovery effort (Comerio, 2014). As in most parts of the world, housing is privately owned in Nepal; as such, housing recovery is managed differently than recovery in the public sector (roads, schools, hospitalsand government, and cultural facilities). Even in the U.S., until the 1970s has no U.S. disaster assistance policies provided any funding for housing recovery. In Nepal, when a mega earthquake occurred in 1934, the autocratic Rana regime gave assistance to individual house owners.

8.3 Data Analysis

In a study on the State of Social Inclusion in Nepal (SOSIN, 2019), Community Resilience has been conducted with a Sample Survey of 3300 households randomly selected from the total number of affected households registered by the Government of Nepal. In the aftermath of the earthquake in 2015; there were 31 districts were hit, of them 14 districts were noted as ‘severely-hit’ and ‘crisis-hit’. SOSIN survey collected information from a representative sample of the earthquake-affected households from the 14 most earthquake-affected districts. The Ministry of Federal Affairs and Local Development (MoFaL) has collected information of affected households. Of them, 14 districts’ household numbers are taken as the sampling frame for the survey. There are 3300 households selected as the representatives of the total households affected by the earthquake in 14 districts.

The primary focuses of the survey were, among others, public and private utilities, and reconstruction. Using different variables, the analysis made prior to and after the earthquake on Conditions of Public, and Private Amenities with respect to broad caste/ ethnic. Following this, Probability of Purchasing Index (PPI) is estimated with respect to broad caste/ ethnic groups in order to pinpoint the recovery of vulnerable groups.

8.4 Public, and Private Amenities

People were residing in their private or rented houses, no matter how old, and resilient they were. Most of the areas hold old and traditional structures. In regards to the public amenities, most of the public buildings, such as schools and government offices, are built in a modern manner; however, private houses (Ghar) are built in a traditional manner and individual capacity. But in this study, private houses are only taken into account, and selected heads of the households were interviewed at the time of the survey. In the survey, respondents were simply asked: how were the following amenities prior, to and after the earthquake?

Amenities intended to measure are: source of drinking water- pipe, tube well/ boring, open well/ well with cover, natural spring, lake/ pond, mineral water, tanker, and others; toilet- flush with water connected to sewage system, pan without flush, improve latrine, not improve latrine, and open field; light- electricity, solar panel, biogas, kerosene, and wood; fuel for cooking food- electricity, firewood, LP/ Biogas, Kerosene, cow-dung. Similarly, materials used for the roof were zinc plate (Jasta), Concrete, tile/ slate, cardboard/ wood, thatch, etc.; material used for wall, and floor- concrete cement, stone/brick with mud mortar, cow dung, prefab, etc. The house has a separate kitchen room or not; all these categories are devised to measure the recovery before, and after the earthquake.

Firstly, frequency distribution was observed, followed by covariate analysis of data by merging a number of categories into one category named ‘other’, and the major variable one. For instance, by running the frequency of the ‘drinking water’ variable largely the respondents rated the ‘pipe’ means it would with, and against the other categories in different proportions. So, the former would remain one category and later merge as the other category to make it compatible for analysis. Therefore, the amenities are taken as the dependent variable, and broad caste and ethnic groups are taken as the independent variables., and simply a cross-tabulation between dependent, and independent variables is carried out to measure the recovery from the earthquake, 2015.

In analysis, heads of the households rated the pipe with a larger proportion, followed by others. Prior to the quake, about 54.4 percent of respondents were using

pipe as a source of drinking water, followed by others (45.6%). After 4 years, a household with drinking water from pipe has become 65 percent, which is about 11 percent more. So, it is the recovery better than the quake as far as the source of drinking water is concerned (Table 8.1).

A similar situation was observed in the use of toilet prior, to and after to earthquake. About 71 percent head of the households reported that they used a 'pan without flush' toilet prior to the earthquake. But now, after 4 years, about 77 percent of households used pan without flush, increase 8.8 percent. Prior to the quake, households used another type of toilets with 29.4 percent which decreased to 22.6 percent after 4 years. It shows a significant recovery in the use of the toilet as well.

In the use of cooking fuel for food, over 82.6 percent of households said firewood (daura) before the quake, and it is significantly decreased to 68.8 percent after the quake. About 20 percent decrease in the use of firewood. So, in the use of fuel energy, households have shifted from firewood to 'other' category. Other category in fuel use for cooking comprises electricity, LP/biogas, kerosene, dried cow dung, straw, etc. So, firewood users shifted largely to electricity and LP/biogas. From carbon emission point of view, it is a quite positive indication, but the LP/bio-gas users' are increasing high proportion, if it is available in the earth or can be produced from renewable energy.

Light is very essential for rural life setting because one has to spend the whole night often dark inside the house in the absence of light.

Kerosene lamp (kupi) or wood strips (bhata) people use to spend the whole night. Electricity is highly expected against the darkness to be removed in Nepal, and hydropower potentiality is also estimated by development agencies time, and again. Prior to the earthquake, over 88.0 percent had electricity for light increased to 93.2 percent after the earthquake. It is about a 5.4 percent increase during the 4 years. So, this could be taken as a good bounce back after the earthquake's hit.

Table 8.1

Distribution of Head of Households with Public, and Private Amenities

Amenities	Category	Before	After	Difference (%)
Source of Water	Piped Water	54.42	64.7	15.9
	Others	45.58	35.3	-29.1
Toilet	Pan without Flush	70.61	77.39	8.8
	Others	29.39	22.61	-30.0
Fire Fuel	Wood (daura)	82.55	68.82	-20.0
	Others	17.45	31.18	44.0
Light	Electricity	88.18	93.21	5.4
	Others	11.82	6.79	-74.1
Residence (Basobas)	Own	98.42	90.67	-8.5
	Others	1.58	9.33	83.1
Ghar-Ghaderi	Have	96.88	93.91	-3.2
	Don't have	3.12	6.09	48.8
Separate Kitchen Room	Have	55.36	70.09	21.0
	Don't have	44.64	29.91	-49.2
Roof Material	Jasta (Zink Plate)	54.36	74.39	26.9
	Others	45.64	25.61	-78.2
Wall Material	Brick/ Stone with Mud	88.03	54.64	-61.1
	Others	11.97	45.36	73.6
Floor Material	Soil, Cow dung (Guitho)	89.82	62.3	-44.2
	Others	10.18	37.7	73.0

Source: CDA, 2020

The house (ghar) owning is a very essential thing especially in rural part of the Nepal, since many households or families cannot stay in rent as urbanites do in urban areas. Striking feature is that the head of households who own the house decreased after 4 years. Prior to earthquake, head of households who own the house account for 98.4 percent, that has come down to 90.7 percent after the earthquake. It is what the effect of disaster to population. About 8.5 percent households lost their ownership following the earthquake. Now, they own only 83.1 percent. Other categories: living in camp/shelter, others' house without paying, and in rent increased with 83.1 percent. The owners turned into losers, and houses into shelters and camps. In a question to availability of l, and (Ghaderi) to build the house; only 3.1 percent didn't have ghar-ghaderi prior to earthquake, now it has become 6.09 percent, which is increased by 49 percent after the earthquake. So, these are some instances of how disaster did hit the mankind.

Another interesting feature is the status of a separate kitchen room do houses have or not. Prior to the earthquake, about 55.4 percent head of households said they had a separate kitchen room which increased to over 70 percent after the earthquake. It is about 21 percent more, means better than the earlier. Apparently in 4 years of interval houses with blue color rooftop cropped up across the region. Zinc plates (Jasta) are rooftops of newly built houses in the aftermath of the earthquake, since previously either they were of stones or wooden planks or thatch. Prior to the earthquake, over 54.0 percent head of households had a Jasta roof, but after 4 years, over 74 percent head of households noted that they have the Jasta as the rooftop material. About 27 percent increase in a number of households with a rooftop of Jasta. It is also an indicator of betterment bouncing back to affected families.

Prior to earthquake, most of the houses with wall were built by stone/ brick with mud mortar especially in rural areas of hill that account for 88.03 percent prior to the earthquake. It has become 54.6 percent, decreased by 61.1 percent in the aftermath of an earthquake. Others' category accounts for 11.3 percent prior to an earthquake, and that has become 45.4 percent after the earthquake. It is increased 74 percent in the last 4 years. Others category comprises concrete, brick/ stone with mud, wooden plank, plywood, prefab or Jasta, bamboo, thatch, etc. The concrete wall built increases in the last 4 years which contributed the other categories. It is also indicated in the floor. In earlier material used on the floor was soil/stone, mud, or cow dung with over 90 percent, which came down to 62.3 percent, which decreased by 44 percent in after the earthquake. The increment in significant change is because of the construction of houses with concrete design, and materials.

8.5 Covariate Analysis

8.5.1 Source of Drinking Water

The recovery achieved in the last 4 years in the aftermath of the earthquake is cross-analyzed with the broad caste/ ethnic groups to get the real picture of recovery.

The source of water was found to be improved in different earthquake-affected areas, and households. If we look it with caste/ ethnic group variable, prior to the earthquake, over 78.3 percent of other categories used to drink water from other sources, meanwhile only about 22 percent had access to pipe water. After 4 years, it is changed with over 65.0 percent, less than before; remain to drink water in other sources meanwhile about 34 percent of the households of other category prior to earthquake used to drink water in pipe increased up to 34.8 percent which is about has got drinking water in pipe. It is 13 percent increase. It apparently shows the recovery in drinking water for other category during the last 4 years is better improved.

Brahmin caste group accounted for the least (36.9 %) percent drank water in other sources than the pipe prior to earthquake. After the earthquake it is decreased by 29 percent which is about 8 percent decline during the 2015 to 2019. Hill Brahmin had the highest proportion (63.1%) that did drink water from pipe, prior to earthquake, had increased up to 71.0 percent drink in pipe in after the quake (8.2).

Table 8.2

Sources of Drinking Water Before and After the Earthquake

Caste/ Ethnic Groups	**Before**		**After**		**Change**		**Total No.**
	Others	**Pipe**	**Other**	**Pipe**	**Others**	**Pipe**	
Tamang	44.7	55.3	34.1	65.9	-10.6	10.6	938
Hill Chhetri	43.8	56.2	33.1	66.9	-10.7	10.7	728
Newar	48.4	51.6	41.9	58.1	-6.5	6.5	413
Hill Brahmin	36.9	63.1	29.0	71.0	-7.9	7.9	404
Hill Dalit	59.5	40.5	45.2	54.8	-14.3	14.3	259
Other Hill Janajati	49.7	50.3	37.3	62.7	-12.4	12.4	354
Magar	38.1	61.9	27.6	72.4	-10.5	10.5	181
Other	78.3	21.7	65.2	34.8	-13.0	13.0	23

Source: CDA, 2019

The highest percentage change in pipe water drinking among caste/ ethnic groups is noted to hill Dalit (14.3%), followed by others (13.0%), other hill Janajati (12.4%), and so on (Table 8.2).

8.5.2 Use of Toilet

Head of households rated mostly 'pan without flush' prior to the earthquake. So, the category is made binary, either 'pan without flush' or 'others'. Tamang, head of the households accounts for largest, 39.2 percent who use to have toilet other than pan without flush prior to the earthquake, against 60.8 percent pan without flush.

After 4 years, Tamang head of the households reported that they use a toilet characterized with pan without flush by 72.1 percent which is 15.7 percent increased. However, the highest increment in pan without flush after 4 years goes to hill Dalit (17.1%).

The interesting remark is that Newar, and hill Brahmin both account the negative change -5.0 percent and -0.6 percent respectively. Newar accounts for more decline in use of pan without flush than Brahmin (Table- 8.3).

Table 8.3

Toilet Facilities Before and After the Earthquake

	Before		After		Change		Total
Caste/ Ethnic Groups	Other	Pan without Flush	Other	Pan without Flush	Other	Pan without Flush	Number
Tamang	39.2	60.8	27.9	72.1	-11.3	11.3	938
Hill Chhetri	22.5	77.5	16.6	83.4	-5.9	5.9	728
Newar	29.3	70.7	32.7	67.3	3.4	-3.4	413
Hill Brahmin	19.8	80.2	20.3	79.7	0.5	-0.5	404
Hill Dalit	34.4	65.6	20.9	79.2	-13.5	13.6	259
Other H. Janajati	25.7	74.3	13.6	86.4	-12.1	12.1	354
Magar	27.1	72.9	19.9	80.1	-7.2	7.2	181
Other	34.8	65.2	34.8	65.2	0	0	23

Source: CDA, 2019

8.5.3 Use of Main fuel for Cooking

To use or depend on wood for cooking fuel might be the worse indicator, so hill Dalit (91.9%), Other H. Janajati (91.2%), and Magar Janajati (90.1%) are in worse situation in earlier days. Instead, Newar accounts for only 53.3 percent relied on wood as the fuel for cooking purpose, followed by Hill Brahmin (75.7%), and so on. After 4 years, a big change in use of fire wood decreased by 44 percent in Newar,

followed by Brahmin (-35.4%), Chhetri (-17.6%), and so on. The least (-5.6%) change, the other group shows, followed by the hill Dalit (12.3%), and so on (Table-8.4).

Table 8.4

Main Fuel for Cooking Purpose

Caste/ Ethnic Groups	Before		After		Change		Total Number
	Others	Wood	Others	Wood	Others	Wood	
Tamang	11.1	88.9	23.7	76.3	12.6	-12.6	938
Hill Chhetri	14.7	85.3	27.5	72.5	12.8	-12.8	728
Newar	46.7	53.3	63.2	36.8	16.5	-16.5	413
Hill Brahmin	24.3	75.7	44.1	55.9	19.8	-19.8	404
Hill Dalit	8.1	91.9	18.2	81.9	10.1	-10.0	259
Other H.Janajati	8.8	91.2	21.2	78.8	12.4	-12.4	354
Magar	9.9	90.1	22.7	77.4	12.8	-12.7	181
Other	17.4	82.6	21.7	78.3	4.3	-4.3	23

Source: CDA, 2019

8.5.4 Use of Light

Still there are many houses in mountains, hill, and *Terai* that people have to rely on kerosene, wood, etc., and solar lamps are also using nowadays. The electricity induced from hydropower is largely expected, and Nepal is potential too. When the earthquake hit the country, it had also hit the hydropower projects. However, there is still lack of transmission lines to reach the light in many remote places. So, there are significant numbers of households are yet to reach out the electricity. In a question of what source of light mainly households used in earlier days, prior to earthquake, and what about it at present?

Of course, the electricity is expected answer; so, it comes first, followed by solar, bio-energy, kerosene, and wood. The categories are manipulated, as first electricity, and under the other measures constitute the rest.

Table 8.5

Use of Light at House

Caste/ Ethnic Groups	Before		After		Change		Total Number
	Electricity	Other Measures	Electricity	Other Measures	Electricity	Other Measures	
Tamang	85.0	15.0	89.5	10.6	4.5	-4.5	938
Hill Chhetri	88.3	11.7	95.1	5.0	6.7	-6.7	728
Newar	97.6	2.4	97.3	2.7	-0.2	0.2	413
Hill Brahmin	95.8	4.2	99.0	1.0	3.2	-3.2	404
Hill Dalit	79.9	20.1	89.2	10.8	9.3	-9.3	259
Janajati	83.3	16.7	91.2	8.8	7.9	-7.9	354
Magar	86.2	13.8	92.3	7.7	6.1	-6.1	181
Other	95.7	4.4	95.7	4.4	0.0	0.0	23
Total	88.2	11.8	93.2	6.8	5.0	-5.0	938

Source: CDA, 2019

Over 88 percent households use the electricity as the light in the house in earlier or prior to earthquake. After 4 years, it increased 93.2 percent, which is about 5.5 percent increase. About 6.8 percent households still use other measures. About 5.2 percent households are using the solar lap, followed by kerosene lamp (1.2%), and wood (0.2%).

Among different caste/ ethnic groups, Newar accounted for over 98 percent used electricity as the light in earlier or prior to earthquake, followed by hill Brahmin (95.8%), and other (95.7%). Other hill Janajati used light the least (83.3%) in earlier days. Hill Brahmin accounts for 99 percent electricity now. The largest number (9.3%) of households of Brahmin increased during the last 4 years.

8.5.5 Status of Living Conditions

When tremors came one after another at least for 20 seconds, houses, and buildings turned into debris, especially in the traditional communities, and buildings were of aged of more than 70/ 80 years, and houses newly built with weak foundation. Many people took refuge to public places for temporary shelters. After four years, the head of the households were asked about the status of their present living conditions. Possible status was either own, or living at camp/ shelter, with or without paying rent.

The answers were manipulated into two categories: Own House, and Other Measures. Under the Other Measures remaining all categories merged into one.

In earlier prior to earthquake, 98.8 percent respondents use to stay in their own house, against 1.21 percent in other measures, might be in rent with or without paying. But in aftermath of the quake, and four years spent, about 90.7 percent currently living in their own house, no matter how it is., and, about 9.3 are living in other measures.

Hill Dalit noted that about 87.6 percent live in own house now, whereas they used to live 97.3 percent before earthquake hit. So, about 9.7 percent Dalit are living in other measures than in own house.

Table 8.6

Status of Current Living Residence

Caste/ Ethnic Groups	Before		After		Change		Total Number
	Own House	Other Measures	Own House	Other Measures	Own House	Other Measures	
Tamang	97.97	2.03	89.1	10.9	-8.8	8.8	938
Hill Chhetri	98.08	1.92	90.7	9.3	-7.4	7.4	728
Newar	98.79	1.21	91.8	8.2	-7.0	7.0	413
Hill Brahmin	100	0	92.8	7.2	-7.2	7.2	404
Hill Dalit	97.3	2.7	87.6	12.4	-9.7	9.7	259
Other Hill Janajati	99.15	0.85	92.1	7.9	-7.1	7.1	354
Magar	98.9	1.1	92.8	7.2	-6.1	6.1	181
Other	91.3	8.7	91.3	8.7	0.0	0.0	23
Total	98.42	1.58	90.7	9.3	-7.8	7.8	938

Source: CDA, 2019

Similarly Tamang used to live 98.0 percent in own house prior to earthquake, but they are now living in own house less likely (89.0%). So, about 9 percent Tamang ethnic groups don't have own house at the time of survey. Almost all head of households, except other (minor groups) noted that they didn't see any changes.

So, prior to earthquake there were less number of households live in others' house or place (ghaderi), now that increase significantly, on the one h, and, and there were more likely to stay in own house or place prior to earthquake, that significantly

decrease in aftermath of earthquake., and that especially hit to hill *Dalit*, Tamang, and others.

8.5.6 Separate Room for Kitchen

It was uncommon to have a separate room or partition for kitchen in traditional settlement in rural area of Nepal. Still in mountain, and hill, there are very traditional types of huts, where only down floor, and upstairs found in a house, but less likely to have separate kitchen space. Separate kitchen space or separate room is a matter or not; but it has been shown as an indicator of wellbeing, if you have a separate kitchen space or room in your house.

In earlier or prior to earthquake over 55 percent head of the households had a separate kitchen, but that became 70.1 percent which is about 14.7 percent increase during the last 4 years of aftermath of earthquake. Among different caste, and ethnic group, other groups accounts for 78.3 percent the highest, and Tamang indigenous ethnic group accounts for 44.0 percent the lowest in earlier or prior to earthquake.

After 4 years, Newar accounts for 80.4 percent who have a separate kitchen, followed by hill Brahmin (77.5%), hill Chhetri (73.5%), and so on. But Tamang ethnic group accounts for Hill Dalit accounts for the highest (23.6%) percent number of kitchen increased in the last four years

Table 8.7

Separate Kitchen Room

Caste/ Ethnic Groups	Before		After		Change		Total Number
	Yes	No	Yes	No	Yes	No	
Tamang	44.0	56.0	58.9	41.2	14.8	-14.8	938
Hill Chhetri	57.7	42.3	73.5	26.5	15.8	-15.8	728
Newar	75.1	24.9	80.4	19.6	5.3	-5.3	413
Hill Brahmin	63.1	36.9	77.5	22.5	14.4	-14.4	404
Hill Dalit	49.8	50.2	73.4	26.6	23.6	-23.6	259
Other Hill Janajati	50.0	50.0	69.2	30.8	19.2	-19.2	354
Magar	58.0	42.0	71.8	28.2	13.8	-13.8	181
Other	78.3	21.7	69.6	30.4	-8.7	8.7	23
Total	55.4	44.6	70.1	29.9	14.7	-14.7	938

Source: CDA, 2019

8.5.7 Materials for Roof

Once upon a time, material used in the roof of a house was taken as an indicator or rich people., and the zinc plate (Jasta) which was used as the roof of house in a village, the owner must be powerful or a rich person. It is so, because to buy it in town, to fetch it from to the village, and to build a house was a sign of prosperity, and it could be distinct, and differently seen from a distance. Now it is very common to have a house with the jasta, the material used on roof. There are very few houses still in the hill or mountain region, and some houses are exceptionally made of stone roof top, and many of them built as the communal or traditional way of building the house. The earthquake hit them very badly, so they might be turned into houses roofed with Jasta.

Table 8.8

Use of Material for Roof

Caste/ Ethnic	Before		After		Change		Total
Groups	Other	Jasta	Other	Jasta	Other	Jasta	Number
Tamang	38.6	61.4	18.2	81.8	-20.4	20.4	938
Hill Chhetri	52.1	47.9	24.5	75.6	-27.6	27.7	728
Newar	46.5	53.5	47.5	52.5	1.0	-1.0	413
Hill Brahmin	40.1	59.9	28.5	71.5	-11.6	11.6	404
Hill Dalit	46.7	53.3	17.8	82.2	-28.9	28.9	259
Other_H Janajati	54.0	46.1	22.6	77.4	-31.4	31.3	354
Magar	49.7	50.3	27.6	72.4	-22.1	22.1	181
Other	39.1	60.9	39.1	60.9	0	0	23

Source: CDA, 2019

Among head of the households of Tamang noted that over 61.0 percent had house with Jasta used for roof prior to earthquake. After four years, roof of Tamang' houses accounts for 81.8 percent which is 20.4 percent increased, and that become 22.6 percent after 4 years. It is decreased by 138.7 percent. The materials use in the roof of their house shows a drastic change. The other hill Janajati accounted for 46.1 percent, the least had the roof of houses prior to earthquake, became 77.4 percent; about 31.3 percent increased. In contrast, Newar accounted for 53.5 percent houses

with Jasta roof material prior to earthquake, became 52.5 percent, which 1.0 percent less.

8.5.8 Materials Used in Wall

In earlier days, or prior to earthquake head of the households noted that their houses were built with brick or stone with mud mortar, almost all., and that decreased in a significant way. For example, about 90 percent hill Brahmins houses' wall were built with brick or stone with mud mortar, became only 52 percent. That means significant numbers of houses are built with given guidance of Earthquake Building Code., and that is obviously not the brick or stone wall with mud mortar (Table- 8.9).

Table 8.9

Materials Used in Wall of the House

	Before		After		Change		Total
Caste/ Ethnic Groups	Others	Brick/ Stone	Others	Brick/ Stone	Others	Brick/ Stone	Number
Tamang	11.9	88.1	51.9	48.1	40.0	-40.0	938
Hill Chhetri	10.0	90.0	48.1	51.9	38.1	-38.1	728
Newar	18.2	81.8	34.9	65.1	16.7	-16.7	413
Hill Brahmin	10.2	89.9	33.7	66.3	23.5	-23.6	404
Hill Dalit	12.0	88.0	44.0	56.0	32.0	-32.0	259
Other Hill Janajati	10.2	89.8	46.9	53.1	36.7	-36.7	354
Magar	11.6	88.4	50.3	49.7	38.7	-38.7	181
Other	26.1	73.9	39.1	60.9	13.0	-13.0	23

Source: CDA, 2019

8.5.9 Materials Use in the Floor

Materials used on the floor measures the recovery. Of caste/ ethnic groups, Tamang ethnic group accounts for the least, only 3 percent cement used on the floor, means Concrete prior to earthquake; become 54.2 percent; that is about 51.2 percent increase during the 2015-2019 periods. If we look at the change in Brahmin caste group, prior to earthquake, the Cement used on the floor accounts for 10.2 percent; that become 74.5 percent during 2015-2019 period. It is about 64.4 percent increase.

Table 8.10

Concrete Floor of the Households

	Before		After		Change		Total
	Concrete	Others	Concrete	Others	Concrete	Others	Number
Tamang	3.0	97.0	54.2	45.8	51.2	-51.2	938
Hill Chhetri	6.2	93.8	61.1	38.9	55.0	-54.9	728
Newar	18.2	81.8	69.3	30.8	51.1	-51.1	413
Hill Brahmin	10.2	89.9	74.5	25.5	64.4	-64.4	404
Hill Dalit	4.3	95.8	65.6	34.4	61.4	-61.4	259
Other Hill Janajati	7.6	92.4	63.0	37.0	55.4	-55.4	354
Magar	8.8	91.2	58.6	41.4	49.7	-49.7	181
Other	13.0	87.0	73.9	26.1	60.9	-60.9	23
Total	7.5	92.6	62.3	37.7	54.9	-54.9	938

Source: CDA, 2019

Summary Table

	Pipe	Non Flush Toilet	Electricity	Own House	Kitchen room	Jasta	Cemented Wall	Concrete	Total Number
Tamang	10.6	11.3	4.5	-8.8	14.8	20.4	40.0	51.2	938
Hill Chhetri	10.7	5.9	6.7	-7.4	15.8	27.7	38.1	55.0	728
Newar	6.5	-3.4	-0.2	-7.0	5.3	-1.0	16.7	51.1	413
Hill Brahmin	7.9	-0.5	3.2	-7.2	14.4	11.6	23.5	64.4	404
Hill Dalit	14.3	13.6	9.3	-9.7	23.6	28.9	32.0	61.4	259
Other Hill Janajati	12.4	12.1	7.9	-7.1	19.2	31.3	36.7	55.4	354
Magar	10.5	7.2	6.1	-6.1	13.8	22.1	38.7	49.7	181
Other	13.0	0	0.0	0.0	-8.7	0	13.0	60.9	23

8.6 Multivariate Linear Regression

Of the total, 33298 respondent 25231 (75.8%) opined that they got their ghar (house). So they were asked about their newly constructed house whether they were fully satisfied, satisfied and not satisfied. Nearly about one third said fully satisfied, followed by satisfied (63.8%), and not satisfied (5.8%). All together cumulatively reported that they were satisfied with 94.2 percent, which is overwhelmingly satisfaction.

S.N.		N=33298		%	Cumulative %
1	Fully satisfied	7664	23	30.4	30.4
2	Satisfied	16095	48.3	63.8	94.2
3	Not satisfied	1472	4.4	5.8	100
	Total	25231	75.8	100	

Source: CDA, 2019

As the general satisfaction level of respondent is found that from highly affected districts account for almost two out three households head satisfied against the not satisfied, 6.3 percent. About 27 percent reported that they were fully satisfied with the newly built house.

There is almost 10 percent gap between the highest level educational attained head of the household inversely related to their satisfaction level. That means higher the educational attainment, less likely to be satisfied with the newly built house. Highest level of education attained is found to be not satisfied 8.6 percent against the head of household who attained up to 10 class accounted for 7.2 percent. Though there are less no. of respondents the others, characterized by Masters level of above account for 12.7 percent not satisfied with newly built house.

By religion, respondents with Christianity account for the highest above 2 out of 3 houselds are satisfied against the Kieat religion 30 percent satisfied with their newly built house.

Independent Variables	Categories	Fully satisfied	Satisfied	Not satisfied	Total	%
Affected area	Highly affected district	27.3	66.4	6.3	17197	100.0
	Crisis hit	37.1	59.3	3.6	5413	100.0
	Kathmandu Valley	37.0	55.8	7.2	2621	100.0
Sex	Male	31.1	62.5	6.4	19357	100.0
	Female	28.1	68.0	3.9	5874	100.0
Highest level of edu.	Upto class 10	29.6	65.1	5.3	10580	100.0
	SLC	29.5	63.3	7.2	1978	100.0
	Certificate level	34.5	58.6	6.8	1859	100.0
	Bachelor level	40.1	53.0	6.9	641	100.0
	Masters level	35.3	56.1	8.6	221	100.0
	Other	20.3	67.1	12.7	79	100.0
Religion	Hindu	28.8	65.1	6.1	16997	100.0
	Buddhism	34.2	60.7	5.1	6916	100.0
	Islam	38.5	61.5	0.0	130	100.0
	Kirant	62.7	29.9	7.5	134	100.0
	Christianity	26.3	66.8	6.9	914	100.0
	Prakriti	14.3	85.7	0.0	70	100.0
	Other	28.6	71.4	0.0	70	100.0
Literacy	Can read and write	30.7	63.3	5.9	15084	100.0
	Cann't read and write	29.4	65.0	5.7	7906	100.0
Marital Status	Unmarried	30.4	62.9	6.6	6991	100.0
	Endogamy married	30.6	63.7	5.6	12183	100.0
	Exogamy married	28.1	63.2	8.7	780	100.0
	Widow/widower	29.8	65.7	4.5	1987	100.0
	Divorced	28.4	65.1	6.4	109	100.0
	Separated	18.3	81.1	0.6	180	100.0
Citizenship	Yes	30.3	63.9	5.8	18243	100.0
	No	27.6	65.9	6.6	1233	100.0
Caste/ Ethnic Groups	Tamang	32.7	62.3	5.0	7099	100.0
	Chhetri	27.0	65.4	7.7	5494	100.0
	Brahmin - Hill	32.1	61.2	6.7	3170	100.0
	Newar	31.5	62.5	6.0	2697	100.0
	Magar	29.2	63.9	6.8	1477	100.0
	Gurung	40.3	54.9	4.7	843	100.0
	Kami	21.2	74.0	4.8	831	100.0
	Sarki	32.3	65.0	2.7	743	100.0
	Damai/Dholi	31.8	68.2	0.0	440	100.0
	Sunuwar	29.0	67.6	3.4	290	100.0
	Rai	56.5	43.5	0.0	283	100.0
	Thami	8.7	91.3	0.0	230	100.0
	Majhi	6.1	93.9	0.0	163	100.0
	Chepang/praja	53.3	20.0	26.7	150	100.0
	Pahari	26.7	66.7	6.7	150	100.0
	Danuwar	33.3	58.3	8.3	120	100.0
	Jirel	22.2	77.8	0.0	90	100.0
	Others	21.9	72.8	5.3	961	100.0
		30.4	63.8	5.8	25231	100.0

Source: CDA, 2019

Multiple linear regression:Variables that are using to predict the criterion variable are Predictors or say Independent Variables (IV) here that are Head of the households with Citizenship Card, Literacy, Caste/Ethnicity, Sex, Affected Area, Religion and Highest Level of Educational Attainment. In multiple regressions, if there is one Dependent Variable (DV) and more than one IVs are acting to each other, the MR shows the significance or not. If there is only one predictor or IV, then that is simple regression. When we have more than two IVs, then we do employ the multiple regressions (MR).

In the model summary, we intend to look at the predictability of IV into DV. In R is a measurement of about of variance in the dependent variable that IV or predictors accounted for when taken as a group? It doesn't measure how much an independent variable makes a change in a dependent variable. Square value is taken after two digit of decimal, here it is 1 percent of the criterion of dependent variable, the newly built ghar (house building) is satisfactorily built as the predictors, Citizenship Card, Literacy, Caste/Ethnicity, Sex, Affected Area, Religion and Highest Level of Educational Attainment accounted for.

Criterion or Dependent Variable (DV) is whether respondents were satisfied with newly built ghar (house building)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.100a	0.01	0.009	0.548

In a ANOVA table, R square is greater than 0. If we look at P value which is less than 0.05 hints that the test is significant to the regression. It simply means that the R square is significant whether 1 percent even it is less, but it implies that the IVs have significantly accounted for the criterion or DV.

The overall regression model is significant, F(7, 11306)= 16.169, p< .001, R2=0.01.

Analyss of Variance (ANOVA)						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**P-value**
1	Regression	33.949	7	4.85	16.169	.000b
	Residual	3391.162	11306	0.3		
	Total	3425.111	11313			

A Dependent Variable: 811. You said you have completed building your house. Are you satisfied with you? It won't be completed if we don't talk about a long awaited drinking water project for Kathmandu Valley, Melamchi drinking water project, initiated for more than 2 decades ago. Historically Kathmandu Valley was a huge natural pond, and the water was drained out by cutting the southern edge with the sword of Lord Manjushree[14], according to the mythology of Kathmandu Valley.

Coefficient Table gives an each of the predictors individually significant or not. *(Test each predictor at alpha= 0.05)*

Affected area	P-value	(p= 0.000)
Sex	Not P-value	(p= 0.305)
Caste/ Ethnicity	Not P-value	(p= 0.687)
Religion	P-value	(p= 0.001)
Literacy	Not P-value	(p= 0.199)
Highest Level of Edu.	P-value	(p= 0.026)
Citizenship Card Possession	P-value	(p= 0.000)

	Coefficientsa	**Unstandardized Coefficients**		**Standardized Coefficients**		
		B	**Std. Error**	**Beta**	**t**	**P-value**
1	(Constant)	1.91	0.063		30.398	0.000
	Affected area	-0.063	0.007	-0.082	-8.768	0.000
	Sex	-0.013	0.013	-0.01	-1.025	0.305
	Caste/Ethnicity	0	0	0.004	0.403	0.687
	Religion	-0.02	0.006	-0.032	-3.396	0.001
	Literacy	-0.024	0.019	-0.012	-1.285	0.199
	Highest level of Education	-0.003	0.001	-0.021	-2.233	0.026
	Citizenship Card Possession	0.07	0.017	0.039	4.111	0.000

Source: CDA, 2019

8.7 Discussions and Conclusion

Water is one of the basic human necessities, but a large proportion of the Nepalese population is devoid of access to safe, and adequate drinking water. According to Nepal's Millennium Development Goals (MDGs) Report[15], around 270,000 households in the country have access to safe drinking water. There are 26,494,504 households in Nepal as national census, 2011 enumerated. It does not mean that Nepalese people have access to the best quality water. However, United Nations officials believe that any kind of access to clean water is a step toward achieving sustainable access to clean drinking water–one of the UN's MDGs for developing countries such as Nepal.

Fourteen districts, the earthquake hit, account for 1, 237,342 households as the national census, 2011 reported. Out of fourteen districts, seven districts are of mountain, they are the sources of clean drinking water.

Most of the water sources are wells, streams, rivers that account for about 25 percent to around 80 percent. Nepalese government officials have reported that this dramatic increase is due to rural-centric water supply projects; especially the use of water supply pipes, deep tube-wells, and rainwater harvesting systems.

It was in 1959, Mont., earthquake of August 17, affected on water levels of wells was called "most pronounced ever recorded in United States," (Waller, Thomas, & Voshis, Feb.1965). The earthquake effect the level of water ups, and downs as the fault line hits the land consists of water sources or level. In contrast, in another places, the crevices, and fractures absorbed surface water, leading, in one instance, to an erroneous report of a "dry river." The biggest water problem the US facing during times of disaster would be the effective distribution to the affected population, rather than the provision of bulk water sources, and portable treatment (Frank & Bell, April 1975). It means the quantity of water the earth discharge is not a serious matter in compare to access, distribution, and need to the affected population.

Rising global population, income, and urbanization are causing strong growth in food, and water need intensified competition for water. More than one-third of the global population—approximately 2.4 billion people—already live in water-scarce

regions or river basins with annual water withdrawals greater than 40 percent of total renewable water (Cousin, Kawamura, & Rosegrant, 2019). Nepal is also facing a challenge and problem in use of fresh drinking water day by day. However, as the head of households reported, prior to earthquake over 54 percent had access to pipe water, became 65 percent after four years. It shows that the recovery after the earthquake destruction shows improved better than the previous situation the supply of clean drinking water is concerned.

Personal hygiene and sanitation is essentially taken care when disaster occurs. The cholera broke out in Haiti in aftermath of an earthquake of 12 January, 2010 is a worse example of personal hygiene, and sanitation after the earthquake hit a society. Everyone deserves the privacy, health benefits, and dignity of a safe toilet, and this is especially true for women since they are often vulnerable to the effects of poor sanitation, and especially during the disaster. It was ridiculous to know that while planning resettlement sites for the Sardar Sarovar dam, at Vadodary, Gujarat, for affected families was made, necessity of toilets were ignored (Sikka, 2016). Of 26 percent of the surveyed households have toilets in their premises, where as nationally and provincially, Gujarata account for 30.7 percent, and 34.2 percent respectively as the census 2011 reports.

According to United Nations Office for the Coordination of Humanitarian Affairs in collaboration with the Office of the Humanitarian Coordinator (UN-OCHA, 2015) an estimated 4.2 million people were urgently in need of water, sanitation, and hygiene support when the earthquake, in 2015 hit Nepal at the end of April, followed by early May. The cluster seeks to cover 20 percent of these needs with this appeal, to assist approximately 840,000 people. As per need of affected population, Government and humanitarian agencies had trucked water, created the water storage, and distribution for persons whose houses have been damaged or completely destroyed. This was the scenario of early hour in the aftermath of the earthquake. Now everything seem to be recovered better than in the earlier days.

Many issues came along with the disaster; however the recovery is made better than before. The primary element of recovery is precisely housing, and for this reason relocation on the same site is always preferable, with the exception of high-risk areas (Audefroy, August 2010). Mr. Audefroy pin points the five dimensions of

uprooting: territorial or spatial, related to l, and housing; socio-economic, linked to work, and income; organizational, linked to social, and community ties; socio political, related to the legal, and institutional framework; and socio-cultural, related to the identity, perceptions, and visions of the affected population.

Regarding the building structures (Gharko banot) types used throughout Nepal are mostly of the structures of stone/brick masonry with mud mortar (SBMM); followed by stone/brick masonry with cement mortar (SBCM) in the *Terai* region, and reinforced cement concrete (RCC) structures have only a small share, whereas wooden frame structures (WFS) are widely used in the Terai region (Parajuli & Kiyono, 2015). Structural types that cannot be characterized as above are specified as other (OTH), along with structures not specified (NS) during data collection. The wall of the houses prior to earthquake accounts for 88.0 percent built with brick/ stone missionary with mud mortar, reduced to 54.6 percent after in the last 4 years. It is about 61 percent decline. Similarly, the floor made of 89.8 percent with soil, mud, or cow dung prior to earthquake, become 62.3 percent after the earthquake that is 44.2 percent decrease. It means obviously the concretization of wall, and floor is happened, which is an indicator of better bouncing back after 4 years.

There are many aspects come when we talk about the vulnerable populations. In the context of Nepal, analysis with caste/ ethnic group is one pertinent variable to define the vulnerability of a population. So, in recovery as well, the recovery is intended to measure by caste/ ethnic groups. According to (Wisner et al. 2004), distribution of disasters deaths is today skewed towards low-, and middle-income developing countries:

Why? Within these countries the rural, and urban poor, and marginalized are more heavily affected. Why? What has this distribution among nations, and within countries to do with power, and its distribution? Although human beings generall have to tread carefully and with reat ingenuity on a restless planet, whilst the hazards dealt with by this handbook are natural, disasters are not natural, rather they are more a matter of power and social justice."

If we take the sources of water drinking prior, and after the earthquake, hill Dalit has got a largest percent (14.3%) change. In contrast, hill Brahmin had the

highest proportion (63.1%) drank water from a pipe, prior to the earthquake, had increased up to 71.0 percent after 4 years, and with 7.9 percent increase seems to be meaningful.

From untouchability perspective water is one of the stuff, high caste Hindus consider not to be touched by Dalit people. Mostly in Hill, and Madhesh, Dalit women are betrayed by their high caste Hindu women when Dalit women take water from the well (Inar) or spring (Kuwa/ Dhara). So increase in access to drinking water much better to hill Dalit might be phenomenally better recovery for Dalit people (Table-8.2).

From hygiene and sanitation purposes, toilet is also essentially needed of a house. In this study, Tamang ethnic group who used pan without flush toilet, before earthquake, accounts for 60.8 percent against the other category 39.2 percent (largest proportion among the caste/ ethnic group who used the other category). After earthquake it is increased up to 72.1 percent, followed by other category (27.9%). So, it is also positive sign of recovery after the earthquake particularly happened in Tamang ethnic group.

Fire wood is the main fuel energy for cooking food in Nepal, especially in hill, and mountain region where jungle or forest still exists. Among cast/ ethnic groups, hill Dalit, especially blacksmith professionally need coal so, they use firewood for both cooking food, and professional work. Perhaps, it might be reason hill Dalit accounts for 91.9 percent rely on wood prior to the earthquake. After the earthquake, it has become 81.9 percent which is about 10 percent decline. Comparatively, hill Brahmin shows different scenario. Prior to earthquake over 75 percent hill Brahmin used the firewood as the cooking fuel, that come down to 55.9 percent. Almost 20 percent decrease. A significant proportion of each group goes to LP/biogas instead of firewood.

Among different caste, and ethnic group, other groups accounts for 78.3 percent the highest, and Tamang indigenous ethnic group accounts for 44.0 percent the lowest in earlier or prior to earthquake have a separate kitchen room. After 4 years Tamang accounts for 58.9 percent who has a separate kitchen, which is about 14.8 percent increase. It is also recovery with better sign. Recovery with best results can

be observed in Dalit community when we look at the material for roof of a house is observed. Prior to earthquake, and now, if we look at it, the change among Dalit household account for 28.9 percent. Similarly the material used in wall, a significant change we can observe in Tamang ethnic groups (40.0%), and in floor hill Brahmin accounts for 64.4 percent change.

CHAPTER IX

DISCUSSIONS, AND CONCLUSIONS

9.1 Introduction

About 10 thousand people lost their lives, and one hundred thirty sixty people are not known yet where they are injured thousand people, as many more cattle, personal properties, food grains, etc. As an impact is measured in different perspectives- social, physical, economic, demographical, and esthetical, this study covers to impinging of an earthquake on vulnerable groups or populations. Wisner, Blaikie, Terry & Ian (2003) argue that hazards, vulnerability, and risk are all uniquely intertwined in the development of death, and destruction from disasters. They realized this earlier in 1994 and argued that appropriate disaster mitigation is best realized from the potential that humans have to unite, persevere, and understand what affects them, and to take common action. They also argued that violent conflict, illness, and hunger lead to more loss of human life than earthquakes, illness, and epidemics. So, Disasters are taken as a brake on socioeconomic, and human development at the household level (when livestock, crops, homes, and tools are repeatedly lost), and at the national level when roads, bridges, hospitals, schools, and other facilities are damaged. People's exposure to the risk of loss of life, or damage of property differs as to their class (which affects their income, how they live, and where), gender whether they are male or female, ethnicity, age group whether elderly, children or adults, whether they are abled or disabled, and so forth.

The Gorkha Earthquake affected almost 3 million people in more than 35 districts out of 75 districts, followed by households completely damaged (510, 772), and partially damaged innumerably, particularly in the mid-hill, and mountain along with the Kathmandu Valley. About 9 thousand public facilities are affected especially public schools, health centers, and so on. Of course, the wave of the earthquake didn't go along with a particular group or population, but people with vulnerability were deadly affected by the quake than the able group or population.

Who is vulnerability? A simple working definition of vulnerability is the characteristics of a person or a group and their situation that influence their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard (Wisner et al., 2003). It constitutes a combination of factors that determine someone's life, livelihood, property, and other assets that are put at risk in nature, and in society. The concept of vulnerability calls for varying magnitude in the range of people who are at most risk: vulnerable people who are at the worse end of the spectrum against the opponent who is implied to be secured (cited in UNDP, 1994). Thus vulnerable groups are those who find it hardest to reconstruct their livelihoods following disasters. Here livelihoods imply an individual, a family, or a social group has an income or bundle of resources that can be used or exchanged to satisfy their needs. For example information, cultural or social capital, networks, and legal rights as well as tools, land or other physical resources. In earlier days, it was believed that if people's capabilities were all working properly then there would be few disasters emphasizing people's weaknesses, and limitations.

The International Decade for Natural Disaster Reduction (IDNDR) held a mid-decade conference in Yokohama, Japan in May 1994. In fact, the conference holds a position of an important watershed on it. Yokohama gave two clear messages:

1. ….Community involvement and their active participation should be encouraged in order to gain greater insight into the individual, and collective perception of development, and risk, and to have a clear understanding of the cultural, and organizational characteristics of each society as well as behavior, and interactions with the physical, and natural environment.
2. …impact of natural disasters in terms of human, and economic losses has risen in recent years, and society in general has become more vulnerable to natural disasters (IDNDR, 1994).

Vulnerability clearly involves varying magnitudes: some people experience higher levels than others. But we use the term to mean those who are more at risk: when we talk of vulnerable people, it is clear that we mean those who are at the 'worse' end of the spectrum. When used in this sense, the implied opposite of being vulnerable is sometimes indicated by our use of the term 'secure'.

Tribhuvan University, Central Department of Population Studies (CDSP) has conducted the Socio-Demographic Impact of Earthquake in 2015, and the Central Department of Anthropology (CDA) has also conducted the Community Resilience Capacity: A Study of Nepal's 2015 Earthquake, and Aftermath in 2020. The former study covered 3000 sample households of the total affected households of 14 districts and the same as latter did for 3300 households of 14 districts[16]. As a faculty member, I was involved in the first study as the research coordinator and also involved in the second study as a consultant to design the research study and operation. However, with a request to UNFPA, and CDA to get grant permissions to use the data, both data and information were used for the Ph.D. thesis. This chapter consists of a summary of conclusions and recommendations along with short discussions.

9.2 Conclusions

1. Key variables that are explaining variations of impact include earthquake-affected domains- severely hit, and crisis hit. Of the 7 districts of the crisis-hit domain, 'Kathmandu Valley' the third category with three districts- Kathmandu, Lalitpur, and Bhaktapur- is created. So, there are three domains: Severely hit, Crisis hit, and Kathmandu Valley. Following this, place of residence- (rural versus urban), gender (male vs. female), occupation (agriculture, self-employed non-agriculture, Wageworkers, salaried worker, and others), education (no education, non-formal, and primary, secondary, higher secondary, and bachelors, and above), religion (Hindu, Buddha, Kirat, and Christians), and caste/ ethnicity (Brahman, Chetree/Thakuri, Tamang, Newar, Other hills Janajati, Dalit, and Others) are taken as the explaining variables. As far as the impact of the earthquake on earthquake affected domain is concerned, Kathmanduits, male by gender, salaried workers by occupation, bachelor, and above by educational status, Hindu by religion, and Brahmin by caste/ethnicity are less likely to be than their respective counterparts.

2. People who are engaged in their day-to-day life, and livelihood, a notion of preparedness against natural hazards merely come into their usual mind or life. When they built their huts- the design, the size, etc. mattered more than

earthquake-resistant technology. Because an earthquake is a natural event, or believe to be controlled by gods or goddesses or the fortune of a person it occurs that ultimately brings a disaster. So, there is a gap in between hazards outcome, and human beings' efforts to avoid or minimize the effect. Natural hazards or natural shock is unlikely thought while a building\ hut is built. Rather people worship a god or lord before the outset of building a house than adopt measures of earthquake resistance. The 'notion' of preparedness against natural hazards is not acquired in the human mind but rather achieved through education, training, or exposure to awareness programs. People might get some knowledge of preparedness against the earthquake hazard that would instill in them that in every step they must think of the hazard, and disaster as an integral component of the relationship between the environment, and human beings. But study observed that the relationship looks more like rhetoric than reality. When preparedness was brought among affected people, rather people shared a lot of rumors in the society that measures against the disasters found to be impractical, and more adversary than protective.

3. Kathmandu Valley, the capital city of Nepal, generates information or knowledge about natural hazards, disasters, risks, reduction, and share them through media- Radio, Television, newspapers, and different agencies such as NGOs, INGOs, and GOs mostly. It is shown empirically that among households heads interviewed, households from the Kathmandu Valley domain informed about the earthquake account for 53.0 percent, against the severely hit (34.9%) domains. By occupation about 73 percent, the largest number of heads of respondents is informed about the earthquake, and disaster-risk reduction against the head of the households of agriculture, the least (38.0 %), and education is the important explaining variable. Heads of households characterized with tertiary educations who are informed about natural hazards, and ways to get rid of disaster accounts for 66.2 percent, the highest against those no education 23.1 percent, the least. As far as the groups of people known to be caste and ethnic groups are informed about the earthquake, and disaster-risk reduction, Brahmin accounts for 59 percent, the largest against the other hill Janajati (31.4%), the least.

It clearly shows that household heads of the severely hit domain, agriculturalists, no education, and other hill Janjatis are least informed, less prepared, and less resilient than their other counterparts- other hill Janajatis are much more vulnerable to earthquake-hit disasters than the Brahmins.

4. As far as the total effect of an earthquake is concerned, the loss of life, and injuries are the first fateful outcome from the event, followed by the damage to a house\ hut, the disaster second one, and so on. Loss of life is the end of life, and damage to a house is largely loss of everything to life in Nepalese context. Households of severely hit noted that about 94.1 percent, the highest number of households completely damaged, against the Crisis hi domain with 59.9 percent, the least number of households damaged. By caste\ ethnic groups, other hill-ethnic groups account for 91 percent, who has completely lost their house\hut against the Newar ethnic group accounts for 81.9 percent, the least number of houses\ huts damaged. Similarly, households with Christianity in religious faith also account for 92.5 percent, the highest number of houses\huts damaged, against that of households' faith in Hindu (83.5%), the least number of houses\huts completely damaged.

   So, the loss of everything in damage to house\hut indicate that other hill ethnic groups, Christianity in religious faith, and households from severely hit domains are much more affected households. The impact of earthquakes is obviously much deeper than the other counterparts.

5. As earthquakes made an impact by religious groups, Christians are found worse than their other religious counterparts. Christianity is a newly baptized religious practice in different groups, probably to the weakest groups, than other religions. Europeans and presumably economically, and socially well profess it in the West, but unlikely the downtrodden households do so in Nepal. However, a weak section of every society is also influenced, and so as the earthquake impact is observed in Christians than other religious groups. It is also shown by the cattle sheds lost. About 37 percent, the largest among respondents, Christians said that they lost their 4-legs live stocks in the

earthquake disaster. The lost in perceived cost the respondents estimated, up to 100000 (NRs.), account for 90.7 percent.

6. Although it is a rough estimation, the lost due to earthquake accounts for the highest two out of five households reported from one hundred thousand up to five hundred thousand, followed by about 3 out of 10 households (5-10 hundred thous, and), and one out of five households reported that they lost ten hundred thousand, and one and above. Up to one hundred thousand lost was reported to be only 6.5 percent households.

   It indicates that natural hazard such as earthquake tends to impact the lower middle class more than neither the lowest nor the highest class. The middle class is badly affected in terms of loss due to the earthquake.

7. The hypocenters for both the main quake, and aftershock were at depths of 8.2 km, and 18 km respectively (Manandhar et al., 2016b). They argue that because hypocenters are shallow-type, the consequences of such tremors produce strong shaking at the ground surface causing more damage across the affected area. So, traditional cities/towns, rural villages, new reinforced concrete buildings, world heritage sites, and historic temples together with landslides, and slope failures along the highways caused great loss of life. Head of the households accounts for 84.1 percent of house buildings were completely destroyed, followed by partially destroyed (13.7%), and slightly destroyed (2.2%). Buildings generally built prior to 1934 (older than 82 years) were generally severely damaged/ collapsed since many renovations on these old buildings were performed without considering any engineering designs (ibid, 2016). Contrasting with this argument, Manandhar, Soralump, Hino, & Kitagawa (2015) pointed out that newly built buildings were also damaged because they were poor design and improper construction. In perceived cost, estimated by the affected head of the household about 48.0 percent of house buildings were of cost up to 5,00,000.00; followed by up to 10 lakh cost covering almost 80 percent of house buildings.

8. Farmers usually stored their food grain in their store-room after harvesting. Largely farmers consume their products over the years. Few may sell food grains if they have surplus production. Respondents from severely hit domain account for 71.3 percent who reported that their food grain was damaged in the earthquake. In Barpak, the epicenter of the earthquake, respondents argue that millet is a stable food grain commonly available on the hill that would remain in the store forever, so they prefer to keep it. But all that food grain messed in debris. It was seen germinating in the street during monsoon. The extent of the loss of food grain in estimated cost in the earthquake, about 77.6 percent ahead of the households estimated their perceived value up to only 25,000. About 94 percent head of the households estimated the cost of food grain in the earthquake was about 50,000. It means the small farm holders' stored food, in perceived value, costs not much than 50,000.

9. In the rural area of South Asia, most of the house buildings are accompanied by cattle-shed, since they keep cattle along with them. When hazard event occurs, cattle sheds fell down first along with the house buildings, since cattle sheds are loosely built with stone in mud mortar and less skill, and care than the house buildings. Above 90 percent head of households reported that at least one cattle shed they possessed was destroyed in the earthquake. In perceived cost, the head of the households estimated up to 1,50,000 accounts for almost 65.7 percent. Almost two-thirds of cattle sheds were destroyed perceived cost estimated by the head of households. Cattle sheds collapse might affect the cattle that are the main source of economy for rural inhabitants.

10. The estimated cost of the perceived value of all assets damaged in an earthquake by a household, of the severely hit domain, is over 64.4 percent, largest percentage noted that it was between 5-25 hundred thous, and, followed by up to 5 hundred thous, and (31.2%), 25 to 50 hundred thous, and (3.7%), and 50 hundred thousand, and more (0.7%). The Government of Nepal (GoN), home affairs (PDNA, 2015) estimated about 0.6 million families were displaced from the place where they used to stay prior to the earthquake. The

study shows that about 0.8 million were displaced from their huts, but didn't confirm whether they were displaced due to the damage to their house or not. The study also shows that about 96 percent of households in the Crisis-hit domain were currently residing in the same place where they used to be prior to the earthquake, followed by Severely hit (85%), and Kathmandu Valley (83%). It shows that a very less number of affected populations have to be displaced from their original place.

11. Dalit communities are the most observed vulnerable group in Nepal. About 93 percent of them are still living in the same place, and about 7.5 percent changed their place of living in the same ward, and VDC. The Dalit community, they are very much constrained to move or transfer their place of residence since untouchability prevails in a society that restricts them to some extent. In Nepal, most of the residents have at least a piece of land where they have their own huts, but when an earthquake badly hit a house along with a piece of land, affected groups are forced to be displaced, especially the Dalit.

12. Of the total sample households, 470 households reported that they stay on others' land. Of them, households of severely hit domain accounts for 71 percent, followed by Crisis hit (62.3%), and Kathmandu Valley (22.1%). The public l, and or place accounts for the highest in Kathmandu Valley, since many open publics are open for use when such an earthquake or disaster comes.

13. Nepalese people are predominantly agriculturalists, they meet their daily food consumption from their own production, especially in rural areas and seasonal cultivation is the main activity for food grain plantation, and production. The earthquake came in April 2015; was off-season, so farmers were free. Mainly farmers cultivate maize, potato, beans, etc. in hill, and low mountain areas. Respondents of crisis hit (92.0%) domains overwhelmingly noted that they were engaged in seasonal cultivation in comparison to Kathmandu Valley (69.0%). It was true that Kathmanduits are more dependent on the business, and salaried work. In the early days, Kathmanduits also produced their day-to-

day need from agriculture, but most of the farmlands are gradually converted into metropolitan areas.

14. We don't know the calorie in rural settings, they needed but heads of the houses reported the 'food sufficiency' in the respective number of months. For 1 to 5 months, over 55 percent of households in Kathmandu Valley meet their food sufficiency. For all, twelve months, about 15.1 percent of households meet their food sufficiency from their own seasonal food cropping. The scenario of severely hit districts is different. About one-third of households meet food sufficiency for all twelve months. Kathmandu Valley, and severely hit districts are just reversed. There are the least (21.7%) number households who meet their food sufficiency in severely hit districts, and more households who meet their food sufficiency more months. Relief distribution and supply were seemingly abundant in the name of the affected population. But people were busy with their seasonal plantation. Now the question is how to measure food sufficiency in terms of daily need calories. Because food sufficiency is a perceptive judgment and could be converted into a metric system, but there would be multiple products a farmer has and reporting of all of them won't be possible. Interestingly, in regards to the seasonal cropping, and food production among the three domains crisis hit, severely hit, and Kathmandu Valley; Kathmandu Valley rated the least. So, Kathmandu Valley is vulnerable as far as its own food production is concerned.

15. Similarly, by Gender, females account for much more vulnerable than their male counterparts. Urban was found to be the least by place of residence, followed by Wageworkers, primary level education, Kirat religion, and Dalit (hill) is identified as the vulnerable groups. In regards to which months the unmet food production is alarming in earthquake-hit districts, about 90 percent of households said that they don't have food in Mangshir (from mid of November to mid of December), followed by push (from mid of December to mid of January) (89.1 %), Magh (from mid of January to mid of February) (81.7%), and so on. With the discussion about the post-2015 development agenda, and the United Nations' Sustainable Development Goals, the need for making smallholder agriculture, and food systems more nutrition-sensitive

was prominently recognized (Sibhatu & Qaim, 2017). It aims to improve the diets of smallholder families in terms of both quantity, and quality, but how exactly this can be achieved the best remains elusive. But developing countries are hardly working towards that.

16. Generally, everybody felt fear, and anxiety when the main shocks, followed by aftershocks hit time, and again. Even in that, girls were found to be more in fear, and anxiety. Prior to the earthquake, 93 percent of girls said that they felt secure in crisis-hit domains. But after the quake, only 18 percent of girls were found to be secured. By residence, urban girls were almost not insecure (91.9%) prior to the earthquake, and become insecure (83.8 %), in the aftermath of the earthquake. The largest number (94.0%) of girls with Christian-religious girls were reported to be unsecured.

    As head of the households reported, females encountered the highest number (9.1%) afflicted with psychosocial problems with gender in the aftermath of the earthquake, followed by no education (8.4%) in the qualification of respondents, Chhetri/ Thakuri (7.0%) in Caste/ethnic background, and so on. About 16 percent head of the households reported that any family members showed a 'tense' behavior in the aftermath of the earthquake, followed by aches, and pains in limbs (11.8%), vomiting (9.3%), crying, and fainting, and irregular blood pressure each (7.1%), vomiting (5.6 %), and just faint (3.3%). These symptoms were encountered in the households after the earthquake implying that it was due to the traumatic stress. The psychosocial impact of disasters has attracted increasing attention, and there is little consensus, however, about what priorities should be pursued in relation to mental health interventions, with the most controversy surrounding the relevance of traumatic stress to mental health (Silove, Steel, & Psychol, 2006).

17. Disability can be partly an output of the disaster. A survey of over 5,000 persons with disabilities representing 126 countries conducted by the UN Office for Disaster Risk Reduction (UNISDR) found that only 20% could evacuate their living spaces without difficulty in the event of an emergency, highlighting the importance of accessibility during a national disaster

(UNISDR, 2013). Of the disaster households, about 10.6 percent added the aftermath of the earthquake, though we don't know if it is due to the earthquake. Lord, Sijapati, Baniya, Chand, and Ghale (2016) studied disaster, and disability, & difference, focusing on the challenges faced by persons with disabilities in post-earthquake Nepal, with the goal was to investigate the situation of disability, and social exclusion in Nepal using the 2015 earthquakes as a lens. The studies highlighted the systemic inequalities that produce 'inequalities of opportunity', and uneven vulnerabilities for persons with disabilities in Nepal, and identified strategies, and programmatic opportunities that can help promote patterns of post-earthquake recovery, and development that is more inclusive of persons with disabilities in Nepal. The studies with the multidimensional exclusion perspective adopted a theory that the earthquake would have a differential impact on socially disadvantaged groups.

18. Elderly populations aged 60 years and above were 1500, interviewed in the study. Of them about one-third elderly were found inside the house or room during the quakes. Of injured, Kathmandu Valley accounts for the highest (8.2%) by domain, urban population accounts for the highest (6.3%) by place of residence, male population accounts for the highest (6.3%) by gender; and other caste/ethnic groups account for the highest (9.2%) by caste/ ethnic groups, and no education accounts for the highest (8.2%) by qualification.

9.2.1 Post Earthquake Recovery: Bring Back Better

19. After 5 years of earthquake occurred, the Central Department of Anthropology conducted a study, where 3300 respondents as the head of households were interviewed in a field study. Respondents were asked about their currently-living- residential status, place of their residence, and so on, during the field survey.

    Head of the households from Crisis hit domains accounts for 95.9 percent who are residing currently where they stayed prior to the earthquake, followed by those transferred to a different place in terms of ward or VDC (3.6%), and different place in terms of the district (0.5%). So, very few families Crisis hit domain displaced from their original place of residence. As far as their abode

(basobas) is concerned, before the earthquake, about 98.4 percent used to live in their own abode, and after 5 years, about 90.7 percent said that they were in the same place of residence, which means about 8.5 percent decreased in the last 5 years.

And for those, who were also asked whether they have a separate kitchen room or not in their current abode, about 55.4 percent reported that they had a separate kitchen room before the earthquake, but now, after 5 years, about 70.09 percent noted that they have a separate kitchen room. It is about a 21 percent increase in compare the prior to earthquake.

In a very plain concept, a material used to cover the hut or roof may indicate a better condition after 5 years from an earthquake-resilient point of view. Because there were almost all huts had stones on the roof of houses in Barpak might cause them to fall down almost all houses collapsed in the aftermath of the earthquake, in 2015.

The study shows that before the quake there were about 54.4 percent of houses covered by the Jasta (Zink Plate), now that became 74.4 percent, which is about a 27 percent increment. There are definitely cultural, emotional, and ecological grievances in building the huts using different types of materials unlikely prescribed by the different agencies, but from the earthquake-resistant point of view, the material used on the roof of the hut is as much better as other materials used in hilly mountains. So, Jasta is chosen much lighter, and more resistant to earthquakes. Making a building RCC would be much better than Jasta, but economically expensive, and unaffordable for many households.

It is an interesting inference that vulnerable groups are getting a better position after 5 years as far as available utilities now they have.

In public drinking-water utility, the largest number of hill Dalits got back better conditions compare to other Caste\ ethnic groups. Before the earthquake they were about 40.5 percent of households had drinking water in their pipe, but after 5 years, increases to 54.8 percent. It is about a 14.3 percent increase. In contrast, before the quake, hill Brahmin had drinking water through pipes

accounting for 63.1 percent, but after the earthquake 5 years; it accounts for 71.0 percent. It is about a 7.9 percent increase after the quake.

In sanitation too, hill Dalit recovery is the best among caste\ ethnic groups. Before the earthquake, they account for 65.7 percent had a toilet with a pan without a flush. But after the earthquake, 5 years of duration, about 79.2 percent of hill Dalits have a toilet, a pan without a flush in their abode. In contrast, about 80.2 percent of hill Brahmin had of toilets before the quake, but about 79.9 percent of hill Brahmin had got a toilet, a pan without flush after the quake.

In the use of wood as a cooking fuel, before the quake, hill- Dalit households account for 91.9 percent. After the earthquake, during the last 5 years, it is about a 10.0 percent decrease in the use of wood for food cooking fuel. But other castes \ ethnic groups account for the least 4.3 percent who use wood as the cooking fuel. In the use of electricity hill Dalits accounts for 79.9 percent before the earthquake, but after the quake, about 89.2 percent of households had electricity. It is about a 9.3 percent increase in the use of electricity duration of 5 years.

Before the earthquake 97.3 percent of hill Dalits used to live in their own house, but after the earthquake, even in the last 5 years only about 87.6 percent of households are living in their own house. It means about 9.7 percent of Hill Dalits do not have their own house even in the recovery process is running out.

In regards to the separate kitchen, in households before the quake, 49.8 percent of hill Dalits had a separate kitchen. But after the quake, in the last 5 years, about 73.4 percent of hill Dalits got houses where the separate kitchen is attached. It is about a 23.6 percent increase.

If we take a material used in the roof of a house, Jasta as an indicator of other hill-Janajati accounts for 46.1 percent before the earthquake. But it changed after the quake. In the last 5 years, they account for 77.4 percent of those who have used the Jasta as the roof material of their house. It is about a 31.3 percent change. As far as the floor used by different castes \ groups, Hill Brahmin's houses made significantly changed after the quake, or during the

last 5 years. Before the quake, 7.5 percent of households had a floor made of concrete which became 62.3 percent after the quake. So, it increased by 55 percent. If we look it by caste\ ethnic groups, Brahmins account for 64.4 percent, the largest number against Magar ethnic group (49.7%), which accounts for the least proportion.

20. Another important aspect is the public utilities a household uses before and after the earthquake. Prior to the quake, about 54.4 percent of respondents were using pipes as a source of drinking water, followed by others (45.6%). After 4 years, a household with drinking water from a pipe has become 65 percent, which is about 11 percent more. So, it is the recovery better than before the quake as far as the source of drinking water is concerned.

    Before the quake about 71 percent of households use to have a toilet- a pan without flush, but now, after 4 years, it is increased by 8.8 percent of households who use a toilet- a pan without flush. Similarly, in the use of cooking fuel for food, over 82.6 percent of households used firewood (daura) before the quake, and it significantly decreased to 68.8 percent after the quake. About a 20 percent decrease in the use of firewood implies that a significant number of households have shifted from firewood to the 'other' category. Another category in fuel use for cooking comprises electricity, LP/biogas, kerosene, dried cow dung, straw, etc. Another important utility is light; before the quake, about 88 percent of households use to have electricity as the light in the house, which become about 91.2 percent which is a 5.4 percent increase after four years.

9.3 Discussions

In America, Morrow (2005) noted that twelve years after Hurricane, Andrew struck Miami-Dade County in South Florida, many vulnerabilities in terms of now own houses, and were still remained in rental housing for certain groups, notably the poor, minorities, the elderly, large households, and female-headed households, were disproportionately affected. Natural hazards or shocks are taken as extreme natural events that bring or cause unrepairable loss of life, extreme damage to property, and upset human activities. "Natural" disasters are commonly understood as natural hazards caused by geophysical, hydrological, climatological, meteorological, or

biological events; “man-made” or “technological” hazards, on the contrary, are hazards caused by humans, such as environmental pollution, accidents, or the displacement of populations (Islam & Lim, Spring 2015). After 80 years of span, Nepal has been experiencing a recurrence of earthquakes with high magnitudes of more than 7.5 rector scale. The last one is 7.8 rector scale, epicenter about 80 kilometers west-north, Barpk VDC of Gorkha district on 25 April 2015. As the database of Natural disasters recorded, Asia was struck with 137 occurrences of natural disasters in 2011, which is about 45 percent of the world’s share of natural disasters, at the same time accounting for 85 percent of the world’s disaster-related casualties, and people affected (cited in Guha-Sapir, Hoyois, and Below 2013).

The Gorkha Earthquakedeath toll was more than 10 thousand, followed by more than 12 thousand injuries, and less than 200 loss of human beings. Although death, injuries, and missing cases are fateful, they could be minimized by human beings, if structures, both public, and private buildings are properly built, and maintained against the hazard. Most of the damaged houses or buildings were built in the aftermath of the 1935, mega earthquake., and Geophysicist and other experts also warned us for decades that Nepal was vulnerable to a deadly earthquake, particularly because of its geology, urbanization, and architecture (Achenbach, 2015). So, earthquake is such a distinct hazard, the disaster yield from this event is partly dependent on human construction play as an integral role in controlling the severity of hazard impact (Degg, April 1993b).

According to Alex (1985) over 95 percent of deaths in earthquakes result from building failures (cited in Blaikie, Cannon, Davis, & Wisner, 1994). The overwhelming majority of people who die in earthquakes are killed by the collapse of manmade structures particularly domestic dwellings, as Seaman et al. (1984) argued (cited in Blaikie et al., 1994). Earthquakes, landslides, floods, droughts, fires, and hailstorms are some of the natural calamities that occur every year, at any point, and anywhere, causing threats to the livelihoods of smallholder farmers, and their food security (Chapagain & 2017). Disasters can cause loss of human, and animal life, field crops, stored seeds, agricultural equipment/ materials, and their supply systems (e.g. infrastructure) as well as associated indigenous knowledge, thus disrupting not only

the immediate growing season but also future seasons (Sperling, 2008; McGuire & Sperling, 2013).

Nepal, is a mountainous country, and it's under a seismic zone created by the collision of the Eurasian and Indian plates, the latter one is considered to be penetrating deeper into the rest of Asia for at least 40 million years. In this process, it has lifted the Himalayas, and the Tibetan plateau; so, Nepal is located along the active Main Himalayan Thrust arc. Empirically it is observed that in every century more or less, a catastrophic geophysical hazard earthquake is inevitable.

It is universally known that hazards are out of our control, but we must concern about their impact. Impact is taken as the actual process of contact between an event, and a society or a society's immediate perimeter, and it also refers to both positive and negative influences produced by the event on the environment. It is also known that the fault line of an earthquake does not segregate the weaker, and the strongest inhabitants, rather it hits disproportionately along the fault line. Since the weaker group has a less resilient capacity to cope with the disaster and is able to bring back to the original position. So, vulnerable groups or populations come into notice as far as the impact is concerned. The extent of damage produced by the energy impacting on the environment is dependent upon the vulnerability, and preparedness of the environment, and the society for the specific event (TFQCDM/WADEM, 2002:43).

As far as the vulnerability to disasters is concerned it is usually inversely related to the ability of people to access adequate resources and means of protection. So, people affected by disasters are usually disproportionately drawn from the margins of society, and include, depending on the context, children, the elderly, people with disabilities, women, and gender, and ethnic minorities (Wisner et al. 2012). Vulnerability thus reflects how power and wealth are shared within society, and traces its roots to cultural, social, economic, and political structures, which lie beyond the reach of those who are vulnerable (Gaillard, 2010). People's vulnerability is tried to diagnose they may be unable to get back from their severely affected condition.

In varied cross-sectional analyses, obvious hill *Dalits*, Women, and Indigenous Peoples are found to be badly affected by the earthquake hazards. And as explaining variables, earthquake hit domains, gender, place of residence, educational qualification, occupational, and cultural attributes such as- caste\ethnic, and religious backgrounds have well explained their vulnerability. As far as the impact of the earthquake on vulnerable populations, most of the explaining variables show that hill *Dalit*, and Indigenous Peoples are very badly impinged. And the recovery in terms of current living conditions, and public utilities are concerned, vulnerable groups largely hill *Dalit* have got a better situation. The reasons to be observed better in the hill *Dalit* population is that they had the bad condition prior to the earthquake, and when reconstruction measures applied to the affected groups, more or less, identical showed the better position.

9.4 Recommendations

1. The study needs to be focused on looking at changing perspectives on a natural hazard-centric study to the community, and culture-centric studies, which may give some resilience to local people, and indigenous people who are coping with environmental, and physical catastrophes from time immemorial.
2. Social vulnerabilities are tried to identify in this study more from 'etic' perspective. Affected are much more seen from outsiders' eyes rather than how they see each other, and came up with some potential measures. In fact, communities deserve to get back from the disaster from their own strength, first. Following this, outsiders may support them as they need any kind of support. So, a study must focus on what communities really need, and what they do have. So, from 'emic' perspective what a support really disaster-affected community needs to be essentially fruitful.
3. Social coherence and capital were well understood during the recovery phase, but they were not formally adopted in the reconstruction work, since reconstruction was fully adopted as the 'modern' omnipresent approach prevail; however, many people or household has adopted to rebuild their houses\ huts in their communal approach. Now the question is how

earthquake-resistant technology was adopted to be investigated in order to resurrect knowledge available at the local level.

4. A further study that bridges the communal or local approach, and effort given by the external agencies.
5. Disaster is taken as a political, and economic interest. But a social approach is more philanthropic and needs to be linked up with a politico-economic approach.
6. A major striking interest further to explore out is that disasters hit society disproportionately, impact the vulnerable population severely, and almost unable to recover, but with disproportionate support reaching out to the vulnerable groups shows, better recovery than others.

NOTES

1. Magnitude is determined by instrumental observations and calibrated using the Richter scale. Each unit increases in magnitude the amplitude of the seismic waves increase 10- fold and there is about a 30- fold increase in the amount of energy liberated. An earthquake of magnitude 8.6 releases almost one million times more energy than a magnitude 4.3 event. The largest earthquake recorded so far is 8.9 Richter scale.
2. Intensity is measured in scale the Modified Mercalli (MM) scale of 1956 is widely used. It has 12 grades, denoted by Roman numerals, ranging from I (imperceptible) to XII (major disaster)
3. http://www.colorado.edu/geolsci/faculty/molnarpdf/1986AmerSci.Geology-Himalaya.pdf
4. The RC buildings consist of a frame assembly of cast-in-place concrete beams and columns. Floor and roof framing consists of cast-in-place concrete slabs. Lateral force resisted by concrete moment frames that develop their stiffness through monolithic beam column connections. The variation of the typical moment resistant frame in Nepal are presented as: (i) the first type corresponding to moment resisting frame design represent the current construction practices in Nepal (called CCP structure); (ii) the second design type is based on Nepal building code based on Mandatory Rules of Thumb (called NBC design structure); (iii) the third type of structure is the modified version of the Nepal building code (called as NBC+ structure) and the last type of RC frame represent the moment resisting frames which is designed based on Indian standard code with seismic provisions, namely seismic design with ductile detailing (called Well Designed Structure, WDS). Due to lack of adequate provisions for seismic design on RC building structures in Nepal Building Code (NBC), well designed structure (WDS) was designed by Indian standard codes. Most of the CCP buildings were based on non-engineered construction where as remaining building types are engineered buildings. Engineered buildings are designed and supervised by the engineers. These buildings are designed on the basis of some standard guidelines. Some of the newly constructed reinforced concrete buildings in Nepal are of this type. Whereas, non-engineered buildings are not structurally designed and

supervised by engineer during construction. This category also includes the buildings that have architectural drawings prepared by engineers.

5. Flowminder.org is a non-profit organization registered in Stockholm, Sweden. Ncell is a mobile operator in Nepal and part of the Telia Sonera group. Analyses are based on de-identified mobile network data and conducted in accordance with mobile industry (GSMA) *Guidelines on the protection of privacy in the use of mobile phone data for responding tothe Ebola outbreak*, published October 2014.
6. (http://www.hhs. gov/ohrp/humansubjects/guidance/45cfr46.htm)
7. The severely hit districts surveyed were Gorkha, Dhading, Rasuwa, Nuwakot, Sindhupalchowk, Sindhupalchowk, and Dolakha, while the crisis-hit districts surveyed were Makawanpur, Lalitpur, Kathmandu, Bhaktapur, Ramechhap, Sindhuli, and Okhaldhunga.
8. Rampur VDC-8, Ramechhap; Kalleri VDC-2, Dhading; Kiranchok VDC-9, Dhading; Deurali VDC -5, Gorkha; Makaising VDC -2, Gorkha; Dudhauli VDC -1, Sindhuli; Taluwa VDC-7, Okhaldhunga; and Harkapur VDC-2, Okhaldhunga.
9. Other Hill *Janajati*s include Gurung, Magar, Danuwar/Sunuwar, Kumal and Sherpa who accounts for larger number, but still not comparable.
10. Others include different caste/ethnic groups with small number of cases of INs like Rai, Limbu, Majhi, Thami, Yakkha, Thakali, Baramo, Jirel, Khaling, Brahman (*Terai*), Tharu, and Rajbanshi.
11. https://edition.cnn.com/2015/04/26/world/nepal-earthquake-buddhists-hindus/index.html
12. http://usa.chinadaily.com.cn/china/2014-11/24/content_18967489.htm
13. Psychosocial Problems: Physical disability, Visual disorder, Hearing disorder, Hearing disorder, and blindness, Voice disorder, Mental disorder, Intellectual disorder, Multiple disorder.
14. Scholars have identified Mañjuśrī as the oldest, and most significant bodhisattva in Mahāyāna literature. Mañjuśrī is first referred to in early Mahāyāna sūtras such as the Prajñāpāramitā sūtras, and through this association, very early in the tradition he came to symbolize the embodiment of prajñā (transcendent wisdom).
15. Scholars have identified Mañjuśrī as the oldest, and most significant bodhisattva in Mahāyāna literature. Mañjuśrī is first referred to in early Mahāyāna sūtras such as the Prajñāpāramitā sūtras, and through this association, very early in the tradition he came to symbolize the embodiment of prajñā (transcendent wisdom).

16. As GoN made classification 5 different categories, only two category-Severely hit (7districts), and Crisis hit (7 districts) are taken in the both studies

APPENDIXES

APPENDIX- I: Typologies of Existing Buildings in Nepal

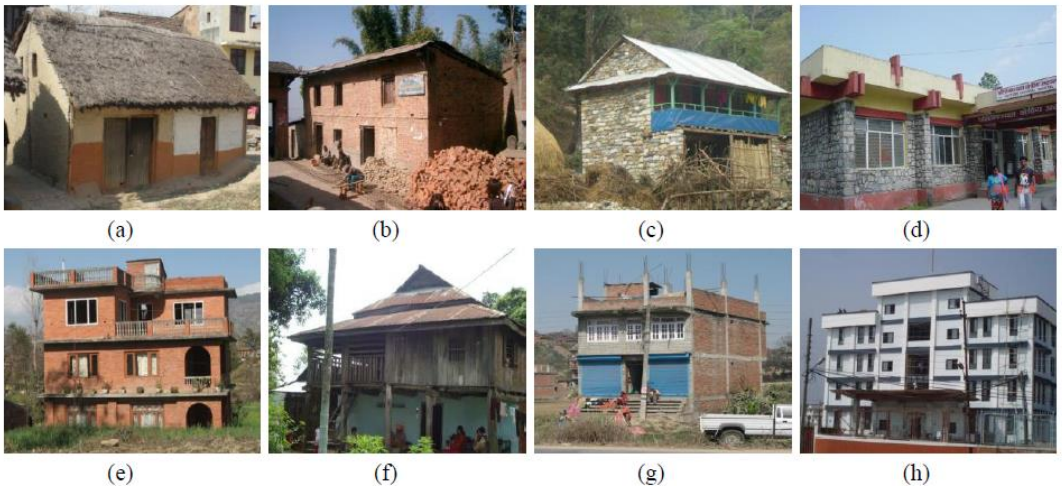


Fig. 1: Existing building typologies in Nepal: (a) Adobe, (b) Brick in mud mortar, (c) stone in mud mortar, (d) Brick in cement mortar, (e) Stone (Fired Brick) in cement mortar, (f) Wooden, (g) Non-engineered building, and (h) Engineered building

APPENDIX- II: Questionaire of Survey conducted by Ground Truth Solutions (GTS) (2015)

Question 1- Are your main problems being addressed?

Question 2- Are you satisfied with what the government is doing for ou after the earthquake?

Question 3- Do you have the information you need to get relief and support?

Question 4- Are you satisfied with what non-governmental agencies are doing for you after the earthquake?

Question 5- Is support provided in a fair way?

Question 6- Are you prepared for monsoon season?

Question 7- Do you feel you have been heard?

Question 8- Overall, is the post-earthquake relief effort making progress?

Question 9- As a woman, are your particular problem being addressed?

APPENDIX- III: Central Department of Population Studies

Tribhuvan University

Household Roster

Nepal Earthquake, 2015: Socio-Demographic Impact Study

Namaskar, my name is……It has been many years since the last major earthquake in Nepal, that of 1934, but this year a major earthquake occurred on 25 April and was followed by major aftershocks on 26 April and May 12. The epicenters of these tremors were in Barpak, Tatopani, and Sunkhani respectively and they, along with more minor aftershocks caused great damage in Nepal. Approximately nine thousand people died and about 22 thousand people were injured. In addition, about 600 thousand houses and 2,700 government buildings were completely damaged and it was estimated that nearly 3,800 buildings were partially damaged. This unimaginable human and physical damage had a massive socio-demographic impact on the nation. The Central Department of Population Studies at Tribhuvan University is going to conduct a study of this impact for the Ministry of Health and Population of the Government of Nepal. For this reason, I would like to ask you some questions related to the impact of the earthquake on you. This survey will take about an hour to complete. Accurate information from you can play a valuable role in helping the government make an accurate evaluation of the situation. Your support can help to decrease the impact on earthquake survivors as well as help return the country back to normal or build it back better if possible. I would like to request you to help us in this study by answering some questions related to your household. All the answers you give will be confidential, as is provided for in the Statistics Act of 2015. The information your provide will be used for statistical purposes.

SECTION 1: SURVEY INFORMATION & HOUSEHOLD IDENTIFICATION

101. PSU S.N. ☐☐☐ 102. Household S.N. ☐☐☐

103. Selected household S.N. ☐☐

104. Date of interview (B.S.): Day Month Year ☐☐

105. Name and code or surveyed district (see p. 20 for codes).....

106. Name and code of VDC/Municipality.....

107. Ward number ..... ☐☐

108. Name of settlement / village / nieghborhood_____

109. Result of the interview ☐☐
Completed in first attempt.....1
Completed in second attempt.....2
Completed in third attempt.....3

110. Respondent's name or code (Copy from SECTION 2: HOUSEHOLD ROSTER)
Name of respondent_____ ☐
ID CODE

111. Name of household head ..... ☐☐

112. What type of household is yours?
Nuclear family.....1
Joint family.....2

113.Do you have any type of earthquake survivor identification card? ☐
Yes, complete 1
Yes, partial.....2
No.....3

114. Enumerator's name and code ..... ☐☐ Signature ..... ☐

115. Supervisor's name and code..... Signature and date (B.S.) | | |

116. Editor's name and code : ..... Signature and date (B.S.) | | |

117. Data entry operator's name and code..... .....

118. Date of data entry ..... | | | | | |.....

SECTION 2: HOUSEHOLD ROSTER

201. List the names of members who were living with the household before April 25, during the earthquake, and after it. (Write the name of the household head first)	202. What is the relation of the (name) to to the household head? Household head..01 Hus/wife…02 Son/daughter in-law..03 Son-in-law/daughter..04 Father/mother…05 Mother-in-law/father-in-law…06 Brother/sister….07 Grandchild…08 Domestic labour…09 Other (mention)..10	203. What is (name)'s sex? Male …1 Female…2 Third gender…3	204. What is (name)'s age? *(Write years completed.* *If age is below one year, write '00'.)*	205. What is (name)'s caste? *(See caste-related code.)*	206. [What is (name)'s religion? *(See religion-related code.)*	Ask for only those aged 10 years above				Ask for only those aged 5 years above		Ask for only those aged 5 years below	Ask for only those aged 16 years above]	Ask for only those aged 18 years above]	214. Is (name) still living with this family? Yes…..1 No….2	215. Did (name) experience any types of psycho-social problems after the earth-quake? Yes…..1 No…..2	216. Does (name) have any types of disabilities? Yes…..1 No…..2
						207. What is (name's) marital status? Unmarried..1 Single marriage…2 Multiple marriage…3 Remarried..4 Widow/ widowed…5 Divorce..... 6 Separated.. 7	208. What is the major occupation of (name) *(See occupation- related code.)*	212. Does (name) have citizenship? Yes…..1 No…..2	210. What is the highest level of education that (name) hascompleted? *(See education related code.)*	211 Does (name) have a birth certificate? Yes…1 No….2		213. Does (name) have an election identity card? Yes…..1 No…..2 Don't know ….3			
						Earthquake											
						Before	After	Before	After								

SECTION 3: DAMAGE, RESCUE, RELIEF, REHABILITATION AND LIVELIHOOD

3.1: Damage

301. Before the 25 April earthquake did you know anything about safety measures during earhquake, rescue and relief materials?

Yes 1
No ..... 2 ➔Q303 ☐

302.If yes, how did you get this information? (Mention any one major source.)

Information about the 1990 and other earthquakes 1
From an earthquake risk reduction training 2
From different newspapers/pamphlets, studies, listening to the radio, watching T.V 3 ☐
From books 4
From earthquake-related posters 5
Other (mention) ……

302a. Was this information or knowledge useful during the earthquake?

Yes 1
No ..... 2 ☐

303. Please provide information about house damage

303.1 Information about loss	303.2 Loss of assets	A. Loss..... No loss	B.Type of loss Complete...1 Partial .....2 Normal.....3 Not related 8			303. 3 Unit	303. 4Total	303. Estimated price: ……. Rs.
			First	Second	Third	Kilo... Pathi ..... Muri..		
Loss of assets only ..... 1 Loss of humans only ..... 2 ..... ➔Q307 Both 3	1.House							
	2. Shed							
	3. Cereal rice, maize, wheat, millet							
	4. Four-footed animals							
	5Two-legged animals (chickens, geese)							
	6. Money, ornaments							
	7. Household facilities							
	8. Important papers							

304. What type of walls did/does your house have? (Mention any major type of structure.)

Made from bricks and mud 1
Made from stones and mud 2
Made from wood 3
Made from bricks and cement ..... 4 ☐
Made from stones and cement 5
Pillar system 6
Other (mention)_____

305. What type of roof did/does your house have? (Mention any one major type of structure.)

Thatched.....1
Stone, slate, tile, straw 2
CGI sheet 3
Bricks plotted RCC roof 4
Modern concrete 5
Wooden 6
Other (mention)_____

306. Which materials were/are used in the floor of your house?

Mud 1
Wood 2
Stone/Bricks.....3
Cement.....4
Other material (mention).....

307. Given the damage to and situation of houses, what are the important measures needed to minimize the loss?

Measures	Yes	No	Don't Know
1.Use techniques to minimize earthquake-related loss while constructing houses	1	2	8
2.Construct safe places for animals to live	1	2	8
3. Select safe places to save food grains and other assets.	1	2	8
4.Provide awareness programs and education about earthquakes and safety measures	1	2	8
5. Others (mention)	1		

3.2 Rescue, Relief and Rehabilitation

308. Who was involved in the rescue efforts immediately after the earthquake from your community?

Family members (including you).....1
Relatives/community 2
Both 3
No need for rescue or search .....4 →Q310

309. How long did it take to rescue your family members?

Rescue or search	309.1 Yes .... 1 No ..... 2 ↓	309.2 How long after earthquake was the rescue effort started?	309.3 How long did it take to complete the rescue activities?

	Next*csf]{*	Minutes	Hours	Days	Minutes	Hours	Days
1. Person							
2. Livestock							
3. Utensils							
4. Food grains							
5. Money, jewelry							
6. Household appliances							
7. Important papers							

310. Did any one other than the members of your community came to help in the rescue period?

Yes……1 No ……2➔Q317 ☐

311. If yes, who were the rescuers?

Security.....1
Volunteers.....2 ➔Q313a
NGOs.....3
INGOs.....4 } Q315
Others (mention)

☐

312. Which security unit helped in the rescue process?

National security unit.....1
International security unit.....2 ➔Q314
Both 3

☐

313. Which security unit of Nepal helped in the rescue? *(Allow multiple responses.)*

Nepal Police 1
Armed Police Force 2
Nepal Army.....3
Don't know .....4 } Q315

☐☐☐☐

313a. Who were the volunteers?

From different organizations 1
Members of political parties.....2
Other (mention)..... } Q317

☐

314. The security units of which countries helped in the rescue? *(Allow up to three names of countries.)*

1. _____ 2. _____ 3. _____ Don't Know …….8

315. How was the rescue?

Excellent 1
Good 2
Fair.....3
Not effective .....4 } Q317

☐

316. If the rescue was not effective, what were the causes? *(Allow multiple responses.)*

Lack of rescue weapons 1
Negligence .....2 Fill the box with

priority code (Left to Right)
Lack of united rescue effort.....3
Lack of technical knowledge of rescuers 4
Other (mention)

317. Which of the following relief materials did your family receive after the earthquake?

Relief Materials	317.1 Received…. ..... 1 Did not receive . 2 Rejected …. ..... 3 ↓ Other materials	317.2 After how many days did you receive relief materials?	317.3 Received materials		317.4 Usefulness	317.5 Source of relief providers		
			Unit	Amount (Mention more than one relief materials)	Useful..... Useless	Government	Institutions	Persons
						Nepali..... Foreign Govt. ..... Both ..... Don't know …...	Nepali ..... Foreign .... Both..... Don't know …...	Nepali ..... Foreigners ..... Both..... Don't know …...
1.Money (except money due to death)			Rs.					
2.Tarpaulin			Number					
3.Tarp			Number					
4.Mats Dof6			Number					
5. CGI sheeting			Bundle					
6. Rice, beaten rice, *dal*			Kilo					
7. Oil			Liter					
8. Noodles/ biscuits			Packet					
9. Blankets			Number					
10. Clothes			Number					
11. Dignity kits			Number					

318. Note: Ask only if they did not receive money in question no. 317: What were major reasons that you did not receive relief materials, particularly money from the government?

Live in the same family even though property has been divided 1
Did not own the land on which the house was built 2
Ownership of the land was not in own name 3
Other (mention)

319. Do you stil get relief or has it stopped coming

Still comes 1
Comes in small quantities 2
Has stopped coming 3
Don't know 8

3.3 Impact of Earthquake on Livelihoods

320. How did you manage food the night the earthquake occurred?

Did not eat	Borrowed from others	Ate in groups 8
Could not eat due to food shortage {Pg.....	Bought food from a nearby shop	Other (mention) .....
Ate buried food after digging it out.....	Got food from a shop on credit	

321. Where are you currently living?

Same place (same district, VDC, ward, village) 1
Other place (same district, VDC, ward) 2
Other place (same district, VDC) 3
Other place (same district) 4
Other place (other district) 5

322. In whose dwelling is your family currently living?

Living in a shed on our own land ..... 1 } Q325
Living in a permanent house on my own land ..... 2 }
Another person's home 3
Living in a shed on omeone else's land 4
Living in a temporary house on public or barren land 5
Other (mention)

323. In what type of dwelling is your family currently living?

Public dwelling (school, hospital, inn, etc.) 1
Temporary dwelling (shed, tarp, or camp) 2
Temporary house (by fixing or avoiding cracks and other damage) 3
Permanent house (safe house) 4
Other (mention)

324. If the answer to Q323 is "other," in what conditions are you living?

Securing persmission from someone else 1
Rent/conditions 2
Settled without thought during hardship; don't know what to do now 3
Other (mention)

325. Do you have make your livelihood on your own lnad or that of another (others)?

Yes 1
No ..... 2 →Q338

326. If yes, how much land do you have earn?

Own. A. Ropani ☐☐ Aana ☐☐ Paisa ☐☐ Others A. Ropani ☐☐ Aana ☐☐ Paisa ☐☐
B.Bigha ☐☐ Kathha ☐☐ Dhur ☐☐ B.Bigh ☐☐ Kathha ☐☐ Dhur ☐☐

327. Did the earthquake damage your land?

Yes 1
No ..... 2 ➔Q330 ☐

328. If ye, what type of damage has occurred?

Landslide 1
Cracked / dipped down and is useless 2
Water sources dried up ..... 3 ☐
Other (mention)_____

329. How much land was damaged?

Own A.Ropani ☐☐ Aana ☐☐ Paisa ☐☐ Others A. ☐☐ ppani ☐☐
Aana Paisa
B. Bigha ☐☐ Kathha ☐☐ Dhur ☐☐ B. ☐☐ igha ☐☐
Kathha Dhur

330. Did you crops sow this year?

Yes, sowed 1
No, didn't sow ..... 2 ➔Q334 ☐
Not enough land for farming ..... 2 ➔Q338

331. Which crops did you sow? *(Allow multiple responses.)*

Rice 1
Maize 2
Millet ..... 3 ☐☐☐☐☐
Potato 4
Other (mention)_____

332. How was your harvest?

It was good ..... 1 } Q335
It was moderate ..... 2 } ☐
It wasn't good 3

333. If your harvest was not good, what was the main reason behind its not being good?

Sowed late 1
Did not get time to weed 2
The earthquake caused the land to dry/crack/dip down..... 3
Unfavorable weather 4
Others (mention)

} Q335 ☐

334. If you did not sow, why did you not do so? Answer on the basis of priority. (*Allow multiple responses*.)

Sowing time had passed by 1
Was staying in camp 2
Land was cracked 3
Water sources had dried up 4
Was depressed after the earthquake 5
Other (mention)_____

☐☐☐☐☐

335. How many months of a year does your food production normally last? ☐☐ If yes12➔Q33

336. If if food is inufficient for 12 months, please indicate the months when food is insufficient.

November ==========08 December ========== 09
January==========10 February========== 11

March========== 12 April ==========01
May==========02June==========03 July ========== 04 August
==========05 September ==========06 October ========== 07

337. Please mention how you manage food durig these months of insufficiency. (*Circle the right option*.)

337.1 How do you manage food during insufficient months?	337.2 How do you manage to get money to buy food?	337.3 Did the problem of buying food decrease or increase after the earthquake?	337.4 If it decreased, how did it do so?
Buy ..... 1 Borrow ..... 2 Labor..... 3 Other (mention)_____	Livestock breeding ..... Business ..... International labor ..... Job/pension/labor..... Other (mention)_____	Increased.....1➔ Decreased .....2 Remained the same…….3	Received food as relief material..... Received financialsupport .....

Note: Questions nos. 338 to 344 are only for people living in camps

338.Why did you leave your village/place? *(Allow multiple responses.)*

Land was cracked and no longer suitable to live on..... 1
Neighbors suggested leaving..... 2
Government's decision 3
Geologist recommended it 4
Relatives died..... 5
Other (mention) _____

☐☐☐☐☐

339. How do you feel about camp life?

Good ..... 1 ➔Q341 ☐

Not good 2

340. If it is not good, what are you thinking about doing? *(Write one major option.)*

Willing to leave now 1
Hoping to be resettled by the government 2
Other (mention) _____ ☐

341. What are the conditions of food and living arrangements in the camp? *(Circle the right option.)*

Arrangement	Yes	No
1. Food	1	2
2. Job	1	2
3. Medicine/health checkups	1	2
4. Water supply	1	2
5. Toilet facilities	1	2
6. Sanitation facilities	1	2
7. School	1	2
8.Security (female)	1	2

342. Who manages the camp? *(Allow multiple responses.)*

Government 1
International government 2
NGOs 3
INGOs 4
Other (mention) _____ ☐☐☐☐

343. Is anyone in need of psychological or psycho-social support?
yes 1
No ..... 2 ☐

344. Would you like to return to your own place or not?

yes 1
No ..... 2 ☐

345. Do you plan to build a house or not ?

yes 1
No ..... 2 ☐
➔Q349

346. If yes, how do you plan to build a house ?

Own resources 1
Loan 2
Others will help 3
Government will help 4
If government helps 5
If government gives a soft loan 6
Othes (mention) _____ ☐

347. Where do you plan to build a house?

Previous place ..... 1 ➔Q349 ☐
New place 2

348. If plan to build a house in a new place, what sort of place is that?

Place with facilities 1
Place suitable for farming and rearing livestock……..2
Places constructed by others for us.....3
Other (mention).....

349. Have you talked about rebuilding your damaged house with INGO staff/government officials/other individuals?

Yes.....1
No.....2 ➔Q350.4

350. Please mention about rebuilding conversation of damaged house.(circle in the right answer)

350.1 If yes, whom did you talk to?	350.2 After the talk, was your house rebuilt?	350.3 Who built your house?	350.4 How could reconstruction be better?
Government officials ..... NGO staff..... INGO staff ..... Benefactor ..... *(Allow multiple responses.)*	Built it..... Being made ..... Planning to make ..... Not built..... ➔Q350.4	Government ... NGO…… …2 INGO…… …..3 Benefactor	Consult us……1 Better to construct where facilities are available……2 It is difficult to live in the same place so it's better to resettle us elsewhere……3 Better to provide construction materials to us…… 4

351.How did you/do you manage money for festivities,weddings and funerals? *(Circle the right answer.)*

351.1 What is your main festival?	351.2 How are you planning to celebrate/have you celebrated the festivals which you observe?	351.3 How do you/did you manage money for marriages, *upanayan* ceremonies, funerals, etc.?
Dashain/Tihar ..... Mha puja ..... Local *jatras* ..... Losar ..... Eid ..... Christmas ..... Other (mention)_____	Earthquake brought suffering, so will not celebrate..... For formality's sake only..... Have celebrated/will celebrate even if have to take a loan	Earthquake brought suffering, so will not celebrate ..... For formality' sake only..... Have celebrated/ will celebrate even by taking a loan ..... Will celebrate with my own effort, as before ..... No plans .....

Note: If there is no female in the house, go to question no. 355.

352. Note: Check household roster and ask this question only of female-headed households: How unsafe did you feel before the earthquake and how unsafe do you feel now?

A. Before the earthquake	B. After the earthquake
Felt safe ..... Felt insecure and afraid..... Felt very insecure	Felt safe..... Felt insecure and afraid ..... Felt very insecure.....

Note: Questions nos. 353 and 354 should be ask to the female members of families.

353. Did you experience any difficulty living, eating, or sleeping ina shed or camp or your own cracked houses?

Yes 1
No..... 2 ☐

354. What was the situation regarding women-related problems before the earthquake and what is it now?

Problems	A. Before	B. After	C.
	Yes..... 1 No ..... 2 Inappropriate…..3	Yes.....1 No.....2 Inappropriate……3	If you had problems how did you solve them? (Mention any two measures used to solve problems.)

1. Living and sleeping for unmarried daughters and sisters			
2. During menstruation			
3. Changing clothes			
4. Going to the toilet			
5. Calling friends			
6. Living, sleeping, and resting, for pregnant women			
7.Other (mention) _____			

355. Were you aware of the following activities in your community before or after the earthquake?

Activity	A. Before	B. After	
	Yes.....1 No .....2 Don't know…. 3	Yes.....1 No .....2 Don't know… 3	
1. Gender-based/sexual violence against women			
2. Child trafficking			
3. Intentionally taking children to traffic them			
4.Government initiatives for the resettlement of trafficked children			
5. Action against child traffickers			
6. Other (mention)_____			

356. Were any programs to minimize the above mentioned activities carried out in your community?

Program	A. Before	B. After	
	Yes ..... 1 No..... 2 Don't know…. 3	Yes ..... 1 No ..... 2 Don't know …3	
1. Awareness program for protecting women and children			
2. Awareness-raising program for preventing women and children from being trafficked			
3. Other (mention)_____			

357. Have you expereienced any caste-based discrimination or untouchability?

Initially no discrimination but slowly the same as before 1
No discrimination from the beginning 2
Discrimination from the beginning 3
Discrimination previously but now equality.....4

358. Was the rescue process equal for all?

Yes.....1
No 2

359. Was there equality in the distribution of relief materials?

Yes.....1
No.....2

360. Does your community have its own traditional social institutions?

Yes……1 No……2➔Q361 ☐

If yes,what is their name?

1. _____ 2. _____ 3. _____ ☐

360a. (a). Are there any clubs, cooperatives, or consumer groups? ☐

Yes……1

No…… 2

If so, what are they ?

Youth club..... 1

Cooperative..... 2

Consumer group..... 3

Other (mention).....4

360 (b). Were any local organizations involved in rescue or relief distribution?

Yes.....1

No 2

Don't know..... 8

361. Whose help do you get to get governmental work accomplished in your VDC or municipality ?

Secretary 1
Office/technical assistant 2
Seek help from local political leaders and they help 3
Local knowledgeable people (but not politicians) .....4 ☐

362. Generally where do you find your VDC or municipality secretary when you need him or her?

In the VDC or municipality.....1
At the district headquarters.....2
Other places.....3 ☐

363. What is your current situation with regard to the following facilities?

S.N	363.1 Facilities	Yes but not now..... Yes and have now, too…….2 No and have not now..... Didn't but have now..... …	s|=;=	363.2 Have you done the following activities for the betterment of your family after earthquake?	Yes……1 No……..2
1	Electricity		1	Saved money in bank or cooperative	
2	Drinking water		2	Sold available land	
3	Toilet		3	Sold animals and quadrups	
4	Telephone (landline)		4	Had children drop out of school	
5	Mobile phone		5	Saved and decreased consumption of food	

6	Gas stove		6	Decided to migrate	
7	Motorcycle		7	Decreased the load of work or stopped working	
8	Cycle		8	Bought insurance	
9	Car, jeep, van		9	Gone into debt	
10	Sewing machine		10		
11	Computer, laptop		11		

SECTION 4: EMPLOYMENT, EDUCATION AND HEALTH

4.1 Impact of Earthquake on Employment

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Note : This section is related to the impact of the earthquake on employment.The questions are relevant for members of the family who are aged 10 years or older.

Check : Ask only if there were changes in the employment status of family members (Question no. 208) after the earthquake.

ID Code	401.1 Earlier job/ Employment/ Household roster	401.2 Current job/ Employment / Household roster	401.3 What was the reason for the job change? Due to earthquake…… 1 Others…….. 2	401.3(a) Which job is more satisfying? Previous =1 Current =2 Don't know =8

402. Did the earthquake cause any losses in the main traditional job or business of your family? ☐

Yes, it did 1

No, it did not ..... 2 ➜Q404

403. Is there any chance your family will return to its previous traditional job or business?

Yes.....1 ☐

No..... 2

404. Did the unemployed people in your family search for a job after the earthquake?

Yes.....1 ☐

No.....2 ➜Q406

405. If your family members left home in search of a job, tell about that.

ID Code	405.1 Place currently visited *(See code on p.20)-*	405.2 Reason behind going Had already decided to go .... Earthquake affected employment ..... Unemployment ..... Other (mention)_____	405.3 Used to work there doing service/earning daily wages ..... Self-employed in livestock breeding and agriculture ..... Self-employed in non-agricultural works ..... Other (mention_____	405.4 Has any money been sent back since they went away? Yes..... No .....

406. Were any members of your family working outside their hometown before the April 25 earthquake and have any of them returned since the earthquake?

Yes.....1
Some were outside but they have not returned .....2 } Q408
None .....3 }

407. If they were outside, but have returned, tell about that.

ID Code	407.1 Have they returned from international employment ? Returned, still living here ..... Returned, stayed for some time, and went back abroad	407.2 District or country where they went for the job (See code on p. 20)	407.3 Will they continue doing the same job or did they resign? Plan to continue 1 Resigned and returned... ↓ Q407.5	407.4 If they will return to the same job, will they get paid for the period of absence ? Will get full salary..... Will get partial salary..... Will get nothing	Ask only if there is 1 in Q407.1 407.5 If they are still living here, do they plan to go back or not? Will go ..... Will not go.... Don't know.....	Ask only if there is 2 in Q407.1] 407.6 Will they return to the previous job or get a new one? Previous……. 1 New..... 2	407.7 Did they bring any money for the emergency management of the family? If yes, how much money did they bring? If no, write '00'.
							Rs.
							Rs.
							Rs.=

4.2 Impact of Earthquake on Education

Note: This section focuses on the impact of the earthquake on education. Question should be asked for

all children and youths aged 5-19 years currently living in house. If there are no members of this age, go to ➔Q420

408. Are there children or youths in your family who have been able to go to school due to the earthquake?

Yes 1
No ..... 2 ➔Q410
Did not attend school before ..... 3 ➔Q420 [ ]

409. If yes what was the major reason preventing to go to school?

Fearof earthquake 1
Dilapidatedschool building. 2
Financial problem after earthquake 3
Injury or illness 4
Parents do not allow 5
Loss parents in earthquake 6
Other (mention)_____ [ ]

410. What was the major educational impact that the earthquake had on children and youths?

Schools damaged 1
Houses damaged ..... 2 ➔Q413
Both house and schools damaged 3
No additional problems ..... 4 ➔Q417
Other (mention)_____ [ ]

411. What major arrangements were made for children to study?

Temporary learningcentre were opened 1
Teaching and learning under the open sky 2
Classes in damaged school buildings 3
Dropping out of school ..... 4 ➔Q417
Chaning school ..... 5 ➔Q414
Study at home 6
Other (mention)_____ } Q417 [ ]

412. What are the problems with holding regular classes in damaged school buildings? *(Allow multiple responses.)*

Disturbance due to the combination of classes 1
Seepage from the roof 2
Lack of playground 3
Lack of clean drinking water 4
Lack of toilet facilities 5
Other (mention)_____ [ ][ ][ ][ ][ ]

413. What are the major arrangements you have made for children to study in your now damaged house?

Study where they live 1
Separate arrangements for studying ..... 2 } Q417
Other (mention) _____ [ ]

414. Where do you send your family member(s) to study?

City nearby or other places with facilities 1
District headquarters 2
Other (mention) _____ [ ]

415. Whom do you send to study?

Only son(s) 1
Only daughter(s) ..... 2 [ ]

Both 3

416. With whom are they living?

Relatives.....1
Hostel 2
Rented room 3
Other (mention),_____ ☐

417. Are there any child-friendly classes in this area?

Yes, before earthquake.....1
Yes, after earthquake 2
No .....3 ➔Q420 ☐

418. Do any children from your family go to child-friendly classes?

Yes.....1
No .....2 ➔Q420 ☐

419. If yes, have you noticed any positive changes in their learning, verbal communication, and/or social behaviour?

Yes.....1
No .....2 ☐

4.3 Impact of Earthquake on Health

Note: This section focuses on the impact of the earthquake on health. Questions are related to the impact of the earthquake on the health statuses of family members.

.Has anyone in your family been injured or suffered a serious impact on his or her health due to the earthquake ?

Yes.....1
No .....2 ➔Q422 ☐

ID Code	421.1 What is the major problem of the people who have been injured or otherwise undergone a serious impact on their health? Physical disability/ disfigurement..... Mental illness 2 Still unconscious..... Other (mention)	421.2 Was (name) Treated? Yes.....1 No.....2 ↓ Q421.5	421.3 Where was (name)'s treatment done? In the same district ..... Other (mention)____	421.4 Who provided financial support for the health treatment of (name) Self 1 Government 2 Institution 3 Relatives 4 Other (mention) ➔Q422	421.5 What is the reason that (name) was not treated Lack of health institution..... Lack of money..... Other (mention)____

421. Information about people in the family who were injured or seriously affected.

22. After the damage caused by the earthquake, has anyone in your family shown any of the following signs?

Signs	Yes	No
1.Vomiting	1	2
2. Fainting	1	2
3.Toes being twisted	1	2
4. Muscles cramping	1	2
5. Crying	1	2
6. Fainting after crying	1	2
7. Physically fit but stressed mentally	1	2
8. Low or high blood pressure	1	2

423. Information on people having physical disabilities

ID Code	423.1 Did the physical disablity of (name) occur before or after the earthquake? Before the earthquake..... After the earthquake	423.2 What type of disability does (name) have? Physical ……1 Visual..... Hearing ..... Hearing and visual..... Speaking ..... Mental illness ..... Intellectual ..... Multiple disabilities.....	423.3 Did (name) experience any kind of discrimination in rescue operations or the distribution of relief materials due to his or her disability? Yes..... No.....	423.4 If yes, who discriminated against the family member with a disability? Family..... 1 Society/neighbours ..... National rescuers ..... International rescuers..... Other (mention)_____

424. Information about people aged over 60 years.

ID Code	424.1 During the earthquake, where was (name) staying? Inside the house…....1 Outside of the house...2	424.2 Was (name) injured due to the earth-quake? No injuries..... ↓ Q424.4 Hands and feet..... In head..... Other parts of the body....	424.3 Did (name) get any treatment? No need for treatment……1 Did myself……..2 Done by family ..... Government did for free ……...4 Done by institutions….5 Other (mention) _____	424.4 How does (name) feel after the earthquake? Still afraid ..... Not scared then or now……….2 Scared earlier; not now……….3 Not scared earlier but scared now.....	424.5 The loss of which thing saddened you the most? Children ..... Grandchildren..... Crops, property..... Livestock.... Other (mention) _____	424.6 What is the main source of your personal income? Social security allowance..... Production of land ..... Business……...3 Shares/investment ..... Support of family members ..... Donations…….6 Pension…….7 Other (mention) _____ ↓	424.7 Have you still been getting your social security allowance since the earth-quake? Yes ..... No.....

						Q425	

425. Information about vaccinations given to children below five years of age

Note: BCG is given on the first day of birth; DPT/Polio/Hepatitis on the 30th, 60th and 90th days respectively, and measles in the 9th month.

ID Code	425.1 Have you been vaccinating (name) regularly?		425.2 What vaccines have you given to (name)?															
	A. Before the earth-quake	B. After the earth-quake	A. Before the earthquake Yes 1 No 2 (for all)								B. After the earthquake Yes 1 No 2 (for all)							
	Yes..... No.....	Yes..... No.....	BCG	DPT/ Polio 1	Hepataitis 1	DPT/ Polio 2	Hepataitis 2	DPT/ Polio 3	Hepataitis 3	Measles	BCG	DPT/ Polio 1	Hepataitis 1	DPT/ Polio 2	Hepataitis 2	DPT/ Polio 3	Hepataitis 3	Measles
	If no in both→ Q426																	

426. Do any family members have the following diseses?

S. N	426.1 Sick people	Yes 1 No 2 ↓ Q501	ID Code	426.2 Has treatment been given? Yes..... No..... ↓ Q501		426.3 How are you managing medicine? Governmental help..... Help from private institutions…….....2 Self-management ..... Other (mention)_____	
				A. Before the	B. After the earthqua	A. Before the earthquake	B. After the earthquake

				earthquake	ke		
1	HIV-infected						
2	Affected by kidney disease						
3	Affected by cancer						
4	Mental disorder						
5	Respiratory problem						
6	Other (mention)						

SECTION 5: POPULATION DYNAMICS

5.1 Impact of Earthquake on Fertility and Mortality

501. Did anyone in your family die due to earthquake?

Yes……1 No ……2➔Q503 ☐

502. Please give details about the deaths of family member(s) caused by the earthquake.

S. N	502.1 Name	502.2 Sex Male .. Female ..... Third gender.....	502.3 Age *(Write years completed.)*	502.4 Types of death Death on the spot..... Death during rescue..... Death during treatment..... Death after treatment.....	If a woman died		502.7 Did you get compensation from the government? Yes….1 No .....2 ↓ Q502.10	If you got compensation.		502.10 If you did not receive compensation, what are the reasons you did not? Don't have a death certificate ..... Don'thave citizenship..... Don't know .... Other (mention)____
					502.5 Was she pregnant? Yes…1 No…2	502.6 Did she die within 42 days of delivery? Yes...1 No...2		502.8 How much money did you get for the funeral? (In Rs.)		
1										
2										
3										
4										
5										
6										
7										
8										

Note: The following sections are related to the impact of the earthquake on reproduction and mortality. Each question asks about the situation before and after the earthquake. With regard to the period before the earthquake, respondents should consider only the single year before the earthquake. Women aged 15-49 years who were married within one year of the earthquake, should be asked questions 503 to 519. If there is more than one such woman in any single selected household, the respondent should be select by by lottery.

503. Please give information about family planning.

ID Code (Only married women aged15-49 years)	503.1 Are there any female health volunteers in your community? Yes .....1 No 2	503.2 Do they conduct regular meetings or other interactions regarding women's health or reproductive health? Yes .....1 No……..2

ID Code Female's]	503.3 Has (name) used any family planning method?		503.4 Which family planning method has (name) used?					
	A. Before earth-quake	B. After earth-quake	A. Before earthquake			B. After earthquake		
	Yes ..... No	Yes ... No.....	F.Sterilization ..... 1 M. Sterilization2 IUD.....3 Injectablels 4	Implant..... Pills ..... Condom.... Female condom..	Diaphragm..... Foam/Jelly..... Natural method ... Other (mention)	F.Sterilization ..... 1 M. Sterilization ..... 2 IUD ..... 3 Injectablels 4	Implant..... Pills ..... Condom.... Female condom..	Diaphragm..... Foam/Jelly..... Natural method .... Other (mention)

503a. Are you using any family planning methods to prevent pregancy in this unusual situation induced by the earthquake?

Yes …….....1
No……..
2

504. Please give information about pregnancies.

If no in both → **Q504**

ID Code Female	504. Is (name) pregnant?		504.2 Does (name) get regular antenatal care?		504.3 What are the major reasons that (name) did/does not have regular antenatal checkups?	
	A. Before earthquake	B. After earthquake	A. Before earthquake	B. After earthquake	A. Before earthquake	B. After earthquake

	Yes1➔Q504 No.....	yes ..... No.....	yes ..... No.....	Yes..... No.....	No health facilities..... Don't know ..... ue to fear..... Do not let from home ..... Other (mention)	No health facilities ..... Don't know ..... Due to fear ..... Do not let from home..... Other (mention)
						➔ Q507

If no in both➔ Q505

If yes in both ➔ Q507

505. Please give information about the delivery of babies

ID Code dlxnf sf]	505.1Has (name) delivered a baby?		505.2 Where did (name) deliver her baby?		505.3Why did (name) give birth at home, in a shed or other non-institutional place?	
	A. Before earthquake	B. After earthquake	A. Before earthquake	B. After earthquake	A. Before earthquake	B. After earthquake
	Yes…1➔Q No	Yes..... No	Health facilities..... Home ..... Shed ..... Other (mention)	Health facilities ..... Home ..... Shed..... Other mention)	No health facilities ... Did not know ..... Due to fear ..... Lack of money ..... Lack of skilled health service providers..... orced to deliver at home..... Other (mention)____	No health facilities... Did not know ..... Due to fear..... Lack of money..... Lack of skilled health service providers ..... Forced to deliver at home ..... Other (mention)____

If no in both➔ Q507

If answer 1➔ Q506

506. If you delivered a baby during the earthquake, did you receive a transportation allowence?

Yes 1
No 2

Note:Ask only if women have a baby aged up to 2 years in question numbers 507-512

ID Code	507. Was (name) breastfed regularly?		508. If (name) was breastfed, what were the reasons he or she was not?	509. At what age did you stop breastfeeding? *(Write number of months.)*	510. Have you given milk to your baby(ies), which you received as relief material?
	A. Before earthquake	B. After earthquake	Death of child..... Due to earthquake ..... Due to illness/injury.... Other (mention)____	☐☐	Yes ..... No ..... Did not receive as relief.....
	Yes ……..1 No …….	Yes1➔Q51 No			

	2				

ID Cod e (up to 2 years, latest baby)	511. What have you feed to your baby within the last 24 hours?	Yes	No	512. How many times did you feed your baby this item?
	1.Breastmilk	1	2	
	2. Liquid (*daal*, Lacto, juice etc.)	1	2	
	3. Solid food (*lito*, porridge, rice, fruit, etc.)	1	2	

513. Information about infant (under one year of age) and child (under five years of age) mortality

ID Code Female's	513.1 Did (name)'s baby die after a live birth? <		513.2 Number of (name)'s dead sons		513.3 Number of (name)'s dead daughters	
	A. Before earthquake	B. After earthquake	A. Before earthquake	B. After earthquake	A. Before earthquake	B. After earthquake
	Yes..... No.....	Yes..... No.....				

If yes in both→ **Q514**

If none of them died, write'**0**

If none of them died, write'**00**'

514. Till now how many times have you given birth (including stillborns)?

If have the repsondet has not given birth, write '00'.If '00'→Q516 ☐☐

515. When was your latest baby born?

Year ☐☐ Month ☐☐ Day ☐☐

516. Do you want to have a/another child?

Yes.....1
No.....2 →Q519 ☐

517. If you want to have a/another child, when (years later) do you want to do so? If within one year write '00'.

☐☐ If it is'00'→Q519

518. Why do you plan to postpone giving birth?

Due to hte earthquake 1
Due to a very young child 2
Due to the absence of husband 3
Other (mention).....

☐

519. Please provide information on spontaneous abortions and stillbirths. .

ID Code Female	519.1 Pregnancies that do not end in a successful birth are known as a"pregnancy loss" and a still birth is when a baby is born dead. Has (name) ever experienced such an unsuccessful preganancy?		519.2How many of (name's) pregnancies were not successful?		519.3 In your opinion,what are the reasons for pregnancy loss and still birth?	
	A. Before earthquake	B. After earthquake	A. Before earthquake	B. After earthquake	A. Before earthquake	B. After earthquake
	Yes ..... No.....	Yes ..... No.....				

If no in both

If there was no spontaneousabortion or baby(ies) who died, write 00

519 (a) "An earthquake might result in a difficult situation regarding childbirth. Since people may face problems sleeping, conceiving a child, delivery, and caring for a new mother and newborns, families will try their best to postpone the birth of a child." How do you feel aboutthis issue? (Circle one answer.)

Completely agree	Partially agree	Don't know	Partially disagree	Completely disagree
1	2	3	4	5

520. Has the marriage of a family member been cancelled or delayed due to the earthquake?

Yes 1 ☐

No 2

521. Did anyone in your family get married after the earthquake?

Yes.....1 ☐

No.....2 ➔Q601 ☐

522. If yes, at what age did the marriage take place? ☐☐

If over 18 years,➔Q601

523. If a marriage of seomone younger than 18 years took place, why did it take place at such a young age?

Due to problems caused by the earthquake 1
Did themselves 2
According to tradition .....3 ☐
Disturbance/left studies.....4
Due to the unreliability of the broker 5
Other (mention)_____

6. Impact of Earthquake on Population Mobility

601. Have anyone in your family been missing due to the earthquake?

Yes.....1
No.....2 ➔Q603 ☐

602. Information about family members missing due to the earthquake.

S. N	602.1 How/when did they go gmissing? Was with us but missing after earthquake ….1 Was outside or away from us and id missing after the earthquake….2 Was with us immediately after the earthquake but is missing now…..3 Other (mention) _____	602.2 Were there any initiatives to search for the missing person? Yes……1 No……..2	602.3 Who took the most inititative in searching? Governmental agencies..... Non-governmental agencies ..... Family and relatives ..... Friends and neighboures ..... Other (mention)_____

		➔Q603	

603. Was anyone in your family displaced due to the earthquake?

Yes.....1 ☐

No……..2 ➔Q605

604. Information about family members displaced due to the earthquake

S. N	604.1 What was the main reason for the displacement? House was completely demolished ..... All family members died ..... Landslide made it impossible to stay in the village ..... Government said it was too dangerous to stay ..... Others(mention)	604.2 Where are they residing now? Same district/place ..... 1➔ Same district but different village/place ..... Different district's different village/place ..... Abroad	604.3 Who initiated the return? Government agencies..... Non-governmental agencies ..... Self/family..... Neighbours/ friends…… …….4 No initiative..... Other (mention)_____

605. Did anyone from the family migrate before the earthquake but within the last year?

Yes…….. 1 ☐

No ……..2 ➔END

606. If yes, provide information about the migration.

S. N	606.1 Name of the person who migrated.	606.2 Sex of (name)	606.3 Age of (name) *(Write in years completed. If below*	605.4 Where did (name) go? Same district VDC Same district municipality Other district VDC Other district	605.5 What was reason he or she migrated? Natural disasters …1 Other	605.6 What kind of natural disaster drove (name) from home? Earthquake…. ….1	605.7 What are the other causes that (name) does not live in the house? Employed in agriculture ….1 Non-

		Male ..... Female..... Third gender.....	*1 year old, write '00'.)*	municipality Abroad (*See code for country.)*	reasons……2 ↓ Q 606.7 Natural disaster..... Other cause.....	Flood..... Landslide ..... Fire..... Snowfall..... Drought..... Others(Mention)	agricultural employment….2 Self-employed in agriculture …3 Self employed in non-agricultural work…4 Searching for a job…4 Other (mention)

607. Did any family member who was away from the house send money for you to manage the emergency after the earthquake?

Yes.....1
No .....2 ➔ END ☐

608. If yes, how much money was sent? Amount in Rs.

Thank you for providing your valuable time to complete this questionnaire.

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