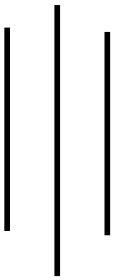
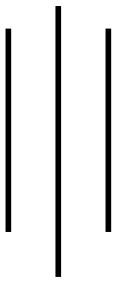
Disaster Risk Management in Nepal: A Case Study from selected hospitals of Kathmandu Valley



A dissertation submitted to the Central Department of Sociology/Anthropology
Tribhuban University in partial fulfilment of the requirement of Master's Degree in Sociology



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RECOMMENDATION LETTER

This is to certify that Ms Niva Upreti has prepared this dissertation entitled **Disaster Risk Management in Nepal:** A Case Study from Selected Hospitals of Kathmandu Valley under my supervision. I, therefore, forward this dissertation for final evaluation and approval.

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This dissertation entitled **Disaster Risk Management in Nepal:** A Case Study from Selected Hospitals of Kathmandu Valley submitted by Ms. Niva Upreti has been accepted as partial fulfilment of the requirement for the degree of Master of Arts in Sociology.

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Niva Upreti

ABSTRACT

Nepal is one of the most disaster-prone countries in the world. According to a study conducted by UNDP/BCPR, Nepal stands at 11th and 30th respectively with regard to relative vulnerability to earthquake and flood among 200 countries around the world. Kathmandu Valley which, is located in the earthquake-prone area, has experience of several devastating earthquakes in the past. Based on the historical records many experts believe that a major earthquake similar to that of 1934 AD (IX MMI intensity) can occur anytime. Today, earthquake risk in Kathmandu Valley is increasing due to rapid population growth and high density, increasing unsafe construction practices, low level of awareness and unplanned urbanization. According to the study carried out by the National Society for Earthquake Technology Nepal (NSET) under the Kathmandu Valley Earthquake Risk Management Project (KVERMP), an earthquake with similar level of shaking as that of 1934 AD earthquake today would result into approximately 40, 000 deaths and 95, 000 injuries in the Kathmandu Valley (Dixit et al., 1999). Hence, this study focuses on assessment of the status of preparedness and earthquake response capacities of health related institutions, agencies and hospitals system operating in Kathmandu Valley and draws conclusion for enhancing the preparedness.

All together, 41 major hospitals from Kathmandu district (29 hospitals), Lalitpur district (7 hospitals), and Bhaktapur districts (5 hospitals) were surveyed as sample hospitals. The target hospitals were the government, as well as private ones. Different health related institutions / agencies located in the valley were inquired to identify their efforts in disaster risk management. Primary data was collected from the hospitals with the help of structured questionnaire. Personal interviews and Telephone interviews were also used as a method of data collection.

A majority (71%) of the hospitals are located in the core urban area inside the Ring Road of the valley. There are a very small number of hospitals with small capacities in Bhaktapur District. Large part of the rural Village Development Committees (VDC) of the valley has no hospitals except one hospital located at Sankhu, at Kathmandu District. Two of other hospitals located at Jorpati, are very close to Kathmandu Metropolitan. Hence, large part of VDCs in the valley are dependent on primary health care centres, health post and sub-health post that usually suffer from insufficient health resources both in terms of human and medical

supplies. The existing number of beds available in the valley is 4,900 and with the addition of extra bed and mattress, the emergency state capacity increases to 5,400. This number of available beds is extremely low as compare to number of victims due to an earthquake of VIII or IX MMI intensity where nearly 1,00,000 to 1,50,000 injuries is expected. The number of doctors available in the hospitals is difficult to calculate, as there is no systematic association of doctors with the hospitals. However, it is calculated to be around 2,050 doctors and 2, 500 nursing staffs. It is also found that VDCs are more vulnerable with unavailability of doctors (with only one doctor is present in Primary Health Care Centre) during any major disasters. Other major surgical facilites like operation theatre (132) , ICU (88), X-rays (86), blood banks (11) and ambulances (60) in number seems to be extremely insuffecient for any huge earthquake disaster. Similarly availability of other critical lifeline facilites in the hospitals such as water supply, electricity, communication is likey to suffer during major earthquake. However, all hospitals have backup generator and many (50 percent) with suffecient alternative water supply system such as boring. Very few hospitals (24 percent) have suffcient space outside the hospitals. Almost all hospital administrators consulted during survey lack any formal classes, training, workshop etc. on disaster risk management. 32 hospitals (78 percent) lack disaster management plan and out of 9 hospitals (22 percent) having disaster management plan, only 6 hospitals have conducted drill to test the plan.

In general, capacities for preparedness and response during disaster have started being developed in health sector of Kathmandu Valley although much effort is required to improve the present situation. The existing hospital capacity will be extremely insufficient for huge earthquake of VIII or IX MMI intensity where the injuries is estimated to be around 1,00,000 to 1,50,000 in number. Efforts are being made by government, non-government, institutions / agencies, international bodies, UN systems and hospitals to enhance preparedness and capacities and of the health sector in the valley as well as throughout the country.

TABLE OF CONTENTS

8 Annexes

1 Photographs of Hospitals
2 List of Hospitals
3 List of Hospitals with Blood Bank Unit
4 Hospital Survey Questionnaire

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS / ACRONYMS

AJK	Azad Jammu Kashmir
ANM	Auxiliary Nurse Midwife
BCPR	Bureau for Crisis Prevention and Recovery
BHU	Basic Health Unit
CCRC	Central Calamity Relief Committee
CDO	Chief District Officer
CMA	Community Medical Auxiliary
CSSR	Collapsed Structure Search and Rescue
DCRC	District Calamity Relief Committee
DHS	Department of Health Services
DHWG	Disaster Health Working Group
EDCD	Epidemiology and Disease Control Division
EHA	Emergency and Humanitarian Action
GESI	Global Earthquake Safety Initiatives
GIS	Geographic Information System
HOPE	Hospital Preparedness for Emergency
HMG	His Majesty's Government
IDNDR	International Decade for Natural Disaster Reduction
INGO	International Non-Government Organisation
ISDR	International Strategy for Disaster Reduction
JICA	Japan International Cooperation Agency
KVERMP	Kathmandu Valley Earthquake Risk Management Project
LCRC	Local Calamity Relief Committee
MCH	Maternal and Child Health
MFR	Medical First Respondent
MMI	Modified Mercalli Intensity
MoHA	Ministry of Home Affairs
MOH	Ministry of Health
MOHP	Ministry of Health and Population
NGO	Non-Government Organisation
NHDR	Nepal Human Development Report
NRCS	Nepal Red Cross Society
NSET	National Society for Earthquake Technology
NWFP	North West Frontier Province
PEER	Program for Enhancement of Emergency Response
RCRC	Regional Calamity Relief Committee
RHC	Rural Health Centre
UN	United Nations
UNCHS	United Nations Centre for Human Settlements
UNCRD	United Nations Centre for Regional Development
UNICEF	United Nations Children's Fund
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VDC	Village Development Committee
WHO	World Health Organisation
WCDR	World Conference on Disaster Reduction

CHAPTER ONE
INTRODUCTION

1.1 Background

Nepal is one of the most disaster-prone countries in the world. Rugged topography, high relief, active tectonic process and intense monsoon rains are some of the characteristics that make the country prone to hazards. The country is potential to several types of natural events such as floods, landslides, droughts, windstorms, avalanches, debris flow, Glacial Lake Outburst Flood (GLOF), cloudburst, hailstorms, fires, epidemics and lightning (thunderbolts). A combination of these hazards with existing poor economic condition, unplanned settlement, rapidly increasing population, low level of awareness and low literacy rate has made Nepal a country with very high disaster risks. During the period of 33 years (1971 – 2003) around 12,500 disaster events have been reported and the total losses are found to be: about 25,000 deaths, about 200,000 buildings destroyed, about 500 Km road damaged, and about 150,000 livestock killed with more than NRs. 531,959 million total loss in monetary terms (NSET, 2004). According to a study conducted by UNDP/BCPR (Website 1), Nepal stands at 11th and 30th respectively with regard to relative vulnerability to earthquake and flood among 200 countries around the world.

1.2 Natural hazards

Nepal faces high magnitudes and intensities of a multitude of natural hazards such as flood, landslide, earthquake, fire, cyclonic winds and hailstorms, cloudburst, drought, famine, and epidemics. Industrial accidents, explosion, traffic accidents and hazardous events associated with poisonous substances are also recorded.

An inventory of past disastrous events during 1971-2006 reveals that epidemics takes the largest toll of life every year, and that landslide, flood (including the flash floods) and urban or rural fire are the principle hazards in terms of their extent and frequency of occurrence as well as the spread and intensity of physical and socio-economic impacts. Earthquake is a major potential hazard to reckon with – the country is located on an active seismic belt and the exponential urbanization trend over the past decade with general disregard of earthquake-resistant measures in building construction is the cause of ever-increasing earthquake risk.

Different government departments have made significant efforts in the past in mapping the natural hazards of Nepal. A variety of geologic, hydrologic, climatic hazard maps has been prepared at various scales by the respective technical departments of the government and

other agencies. Many of these maps are available in the public domain. The scale usually is 1:100,000 or smaller. Such maps are useful for development planning and for disaster risk management.

The entire country falls in a high earthquake intensity belt: almost the whole of Nepal falls in high seismic risk scale of MMI IX and Xi for the generally accepted recurrence period. The seismic zoning map of Nepal, which depicts the primary (shaking hazard), divides the country into three zones elongated in northwest-southeast direction; the middle part of the country is slightly higher than the northern and the southern parts. The flat plains of Tarai in the south of the country show the highest level of susceptibility to liquefaction. The middle hills and the higher mountains are highly susceptible to landslides including earthquake–induced ones. The middle hills and the high mountains are typically also susceptible to the phenomena of debris flow, including those due to landslide damming, cloudbursts and the resulting debris slides and flows, excessive erosion on the hill slopes, and rock falls. The flat plains of the Tarai faces sheet flood, and the problem is exacerbated by huge deposition of debris in the riverbed and by construction of embankments across the river flows, especially just across the international border with India.

Fire is a problem for all settlements. It is a huge problem in the rural as well as urban areas of the Tarai where the summer temperatures go as high as 45 deg Celsius.

Cyclonic wind is a hazard that destroys horticultural crops in spring, while hailstorm causes significant harm to the summer as well as winter crops, especially in the mountainous areas of the country.

Glacier lakes outburst floods (GLOF) and avalanches are typical of high Himalayan regions. GLOF hazard results from outburst of glacial lakes because of the destruction of the natural dams that contain the lake water. Most of these lakes are dammed either by ice-core moraine or by moraine debris. The damage occurs due either to the destruction of the moraine dam by backwater erosion due to overtopping of the dam by rapid melt or by avalanche in the background, or by melting of the ice-core of the damming moraine. The problem of Glacier Lakes Outburst Flood (GLOF) is being intensified due to the climate change resulting in accelerated melting of the glacier tongues and rapid enlargement of the glacial lakes contained by natural moraine dams. Several dangerous lakes have been mapped in Nepal Himalayas.

[i] Source: Global Seismicity Hazard Assessment Program (GSHAP)

Snow avalanches are prevalent in the Himalayan region – they pose risk to the high mountain tourism industry.

1.3 Disaster Risks and Vulnerabilities

The high level of hazards easily translates into risk because of the vulnerabilities that have been built up and are being built.

A recent study (UNDP/BCPR, 2004) ranked Nepal, in terms of relative vulnerability to earthquakes, as the eleventh most at risk country in the world, and thirtieth with respect to floods. Another report (World Bank, 2005) classifies Nepal as one of the global 'hot-spots' for natural disasters. The DesInventar database in Nepal prepared for 1971-2003, shows the trend of one disaster event with two resultant deaths occurring every day over this period.

Among the major hazards, floods and landslides are the most recurrent in Nepal, claiming on an average of about 211ii lives annually in the past ten years. A devastating earthquake does not occur frequently, and hence its impact is not reflected in any statistics covering 30-40 years. However, should it occur, the damage could be of very large extent amounting to a significant proportion of the national GDP. The life loss from a strong earthquake in Kathmandu valley is estimated to be about 40,000 along with injury cases to the tune of 90,000, and almost all of the lifelines and critical facilities such as hospitals damaged at 50%. Among all the natural hazards, epidemics usually take the largest human toll in the country every year.

Official statistics of recent years say that about 1000 people die in Nepal every year due to the natural hazard events; about 300 deaths occur only due to floods and landslides. The country suffers a direct loss of an average of nearly 1208 million Nepali rupees per year. The accompanied indirect losses, in terms of lost time and opportunities, and the lack of services and the repercussions thereof, may be several times more than the above figure. This is a huge impact to neglect, especially if one considers that the losses due to natural hazards are increasing alarmingly.

Poor quality of construction of buildings and infrastructure is the main cause of structural vulnerability. Prevalence of non-engineered construction (>90%), poor quality control of materials and the construction processes make the construction poor enough even for normal conditions. Lack of awareness, and concentration of knowledge and skills only in academic centers contribute to the vulnerabilities. Development of settlements and public services in

[ii] Source: Ministry of Home Affairs, GoN

hazardous areas and marginal lands, because of the lack of proper land use assessment or the implementation of the land use policies, are yet another source of vulnerabilities.

Table 1: Disaster Losses Compared to GDP and Development Expenditure in Nepal

Disaster Year	Major hazard event in that year	Deaths	Direct Disaster Loss by all hazard events in that year, MNR (Prices in same year)	GDP MNR (for the Disaster year)	Loss as %GDP 2	Average Annual GDP Growth, %2	Develop. Expenditure (MNR)
1987/	(Floods)	881	2,005	76,906	2.6	4.6	
1988/	(Earthquake)	1584	6,099	89,269	6.83		
1989/	(Fire, flood, epidemics)	1716	4,172	103,416	4.0		
1991/	(No specific major hazard event, "normal year?")	971	43	149,485	0.03		91/92= 15,979
1993/	Floods	1524	5,189	199,216	2.6	4.8	93/94 = 21,188
1996/	(Floods)	895	1,579	280,513	0.56		96/97 = 26,542

Notes:

1: Source: Ministry of Home Affairs quoted in Disaster Review, 2005, Series XIII, July 2006, pp.13; Min. Water Resources, DWIDP, Kathmandu

2 Source: Statistical Pocket Book Nepal, 2000, Central Bureau of Statistics, Kathmandu

Table 1 shows the losses due to disasters in six sample years in Nepal in terms of number of deaths and the direct losses in terms of the money value of damaged structures. It is seen that in "normal" year (without large events) the annual direct loss is or the order of less than a 0.01% of the national GDP and in the year of a significant large hazard impact, the direct loss reaches up to 4% of GDP. However, if the impact is by an earthquake, the damage loss can go much higher; for example, it was more than the annual GDP growth in 1988 despite the fact that the earthquake was a medium-sized event with an epicentral intensity of VIII MMI

only. In case of a larger event, such as the one in 1934, the losses could be several ten times higher.

Table 2: Direct Losses due to Earthquakes (1970-2003)

Item	Number	Value of direct losses (NR)
Total number of events	22	
Death	876	
Injury	6,840	
Affected	4,539	
Buildings Destroyed	33,706	8,200,838,000
Buildings Damaged	55,234	1,309,606,450
Livestock death	2,215	11,075,000
Total loss at present value (NR)		9,566,605,507
Average loss per year due to earthquake		289,897,136

Table 3: Disaster Losses in Nepal during 1971 – 2006 (37 Years)

S. No.	Events	Death	Injury	Peoples Affected	Buildings destroyed	Buildings damaged	Land Loss (Ha)	Livestock Death	Reported Direct Loss (Million NRs)
1	DROUGHT	1	-	1,512	-	-	329,332	-	10
2	EARTHQUAKE	873	6,842	4,539	33,710	63	-	2,257	22.8337+50
3	EPIDEMIC	15,529	37,773	323,896	-	-	1	78	0
4	FIRE	1,081	735	218,128	62,634	2,762	352	113,922	6,244
5	FLOOD	2,864	349	3,315,781	70,115	1,041	196,955	31,117	3,713
6	FOREST FIRE	24	13	10,178	1,698	18	3,173	82	1,031
7	LANDSLIDE	3,899	1,188	480,069	16,779	1,209	21,797	9,046	835
8	OTHER	2,385	2,670	360,725	3,917	388	290,323	79,935	2,030
	TOTAL	26,656	49,570	4,715,828	188,875	5,482	841,954	236,459	13,885

Notes:

1 Epidemics means peoples seriously affected, hospitalized etc by epidemic events

2 The number "o" does not mean that the events were not occurred, it does mean the event is not reported.

The table shows that flood is the largest cause of materials losses while landslide appears to be the largest killer-hazard. However, that is true only in non-earthquake years. Earthquake happens to be the most lethal hazard – death per event due to an earthquake is much larger and so are the losses in terms of areal extent of damage and intensity of destruction. Even a medium earthquake of 1988 (6.6 Richter, Epicentral intensity of shaking VIII MMI) caused death of 721 persons and a loss of 5 billion Nepali Rupees as per the official estimates. Informal estimates put these figures much higher.

The escalation of the political conflict and the resulting internal displacement of population over the last decade have increased vulnerability and risk due to issues of security, population migration/displacement with deterioration of livelihood opportunities, restricted access and poor information flow. Though traditional modes of response may have been relevant in urban areas, the conflict has greatly inhibited capacities in search and rescue and relief works in the rural hinterlands. It has also been observed that a discernible proportion of internal displacement occurred due to the dual exposure and risk of living in fragile areas prone to natural disasters and the conflict though with varying levels of impact. This intersection of natural hazards and human-made vulnerability gave rise to the potential threat of a humanitarian crisis.

With an HDI ranking of 136 (HDR 2005), Nepal is among the least developed countries in the world. Disaster, among others, is one attribution of poverty. To take a basic example of floods, which is the recurrent hazard in Nepal, the problem tree would show poverty and disempowerment among the fundamental causes and lack of land tenure in safe areas as one of the underlying causes. As one of the immediate causes of the floods, becoming a disaster would be the population staying in flood prone areas including river valleys. While disasters create instant poverty through the loss of lives and productive assets, poverty accentuates natural disasters through encroachments in the high-risk marginal areas. Hence, poverty is both cause and consequence of disasters in countries with high vulnerability. Nepal has embarked on meeting the Millennium Development Goals (MDGs) and has reported a considerable headway in the first five years of the millennium. However, disaster risk reduction is essential for sustaining the achievements of all the MDGs since it provides a safety net for the hard-earned development gains of the country. Hence, the high levels of structural, non-structural, social and institutional vulnerabilities of the country to the various natural and human-induced hazards remain a severe impediment to reaching the goals.

Neglect of traditional wisdom and practices in construction or in the use of natural resources and unfamiliarity with the modern system of construction make the Nepalese very vulnerable. Similarly, rapid losses of the social cohesion system, for example the Guthi System, make us less resilient to the events of natural hazards.

Rapid population growth in Kathmandu and other municipal urban areas of the country, concentration of economic potentials and livelihood opportunities in urban areas, environmental degradation, and increasing pollution of air and water bodies are other causative factors of ever-increasing vulnerability of Nepal to natural hazards.

Insufficient disaster awareness among the development players and the communities fail to appreciate the strong correlation between hazards and vulnerabilities (existing and accumulating) and their interplay converting even a minor hazard-event into recurring disasters, which erode the hard-earned development gains and undermine the economic viability of communities and the affected regions. Lack of knowledge on such relationship, and the resulting mind-set, helped over the years to develop a sense of fatalism and complacency. Such mind-set needs to be changed, and this Strategy aims to create the conditions for such change in mind-set at all levels, encourage to bridge the disconnect between DRM initiatives and planning for sustainable development, and addresses all kinds of vulnerabilities, social, economic, cultural, as well as structural and non-structural.

The 1988 Udayapur Earthquake and the 1993 flood of south-central Nepal were the two medium-sized events that provided adequate lessons. Since then, Nepal has made significant progress towards disaster risk reduction, beginning with the formulation of the National Building Code and several other standards for safeguarding infrastructure, and a positive response to the Yokohama Strategy and Plan of Action by preparing the National Action Plan for Disaster Management in 1994.

1.4 Statement of Problem

Sociological studies are little concerned on natural hazards. Natural disasters are not only displaced and killed the number of people but it also reshapes the human behaviour and relation.

Expert says that “Earthquakes do not kill people but week constructions do” Due to our poor construction; infrastructure kills the people. In the local level there are no policies and plans for the government and it has not spelled out public policy to address the issues of natural disaster. The present studies seeks the answer that how government mechanism are worked in time of disaster. Beyond this, it is also try to find out current status of hospital and its capacities to address the issues of earthquake disaster. What would be the scenarios of the Kathmandu Valley’s hospital when the earthquake strikes?

1.5 Why disaster is the sociological Problem?

Disaster is one of those words which has many meanings and which is used in many different ways. Disaster often is used to refer to the impact agent, such as a hurricane, a fire, a flood, earthquake etc. Disaster often refers to the physical impact which has physical damage and the personal injury. Other meanings are more psychological and sociological. Disaster can mean the evaluation of the physical impact. We see some physical damage and evaluate it as "disastrous". That evaluation is dependent not just on the extent of the physical damage but on our standard of evaluation. The final meaning refers to the social disruption which can occur as a result of the physical impact. Social organization at many different levels--family, neighbourhood, organization, community, region and nation can be disrupted due to disasters..

In most of conferences, it is somehow assumed that a "sociologist” is a defender of people. And people are usually seen as being problematic to any respected or planned post-disaster activities. Often the assumption is made that certain activities are appropriate and important for mitigation, but they fail because of the “people”.

People are considered the province of sociologists with the implication that, if sociologists were able to “solve” the people’s problem, all else would be right with the world. Such schemes are assumed to be in the interests of the people. The role of Sociologist is considered as a residual, rather than central, in the planning process and if you ignore “people" in your planning, your planning will be ignored. In fact, instead of assuming that people are

incidental to mitigation related activity, it is more appropriate to assume that disaster itself is essentially a sociological concept, rather than based in the geologica1 world. In effect, it will be argued that "disaster" has to be seen in terms of social disruption or social problem. That disruption is only partially and incidentally related to physical damage.

In effect, the most appropriate sociological perspective is to view disaster as social disruption or problem and, in turn, point out that such disruption is only partially and incidentally related to physical damage. Unfortunately, we have few measures of this type of disruption. We do have a number of measures concerning disaster agents. We can measure wind speed and direction. We can measure storm surges and flood stages. We have Richter and Mercalli Intensity Scales to measure the earth movements. We have measures of physical damage. We can do body counts, and assessments of injuries. We can define “injuries” to building structures and to other environments. But when we do damage assessment, none of the measures we traditionally use touch on the most important impacts on social life. We have no good measures of broken social relationships, created by death or relocation. We have few clues as to the costs of fractured work patterns and other dimensions of disrupted lives. We keep no records on the segmentation and disorganization of community life nor do we have a clear idea of the social costs of delayed and destroyed futures. Therefore, in this chapter I am trying to interrelate that the earthquake disaster is also a sociological problem.

1.6 Nepal and Earthquake Disaster

Nepal, as a whole, is situated in the seismically active Himalayan mountain belt. High seismicity in the country is related to the presence of active faults between tectonic plates along the Himalayas, mainly in the Main Boundary Fault (MBF) and the Main Central Thrust (MCT). Among all disasters scenarios in Nepal, none is more frightening as the prospect of a major earthquake affecting the Kathmandu Valley (MOH, 2003).

The seismic risk map (Figure 1.1) produced by UNDP/UNCHS in 1994, showed that the middle and central parts of Nepal where Kathmandu Valley is located is an earthquake-prone zone. Moreover, the rapid population growth (Figure 1.2), high density, unsafe construction practices, unplanned urbanization, low level of awareness and prevailing poverty contribute to increasing earthquake risk in the valley. Based on historical seismic records of the valley,

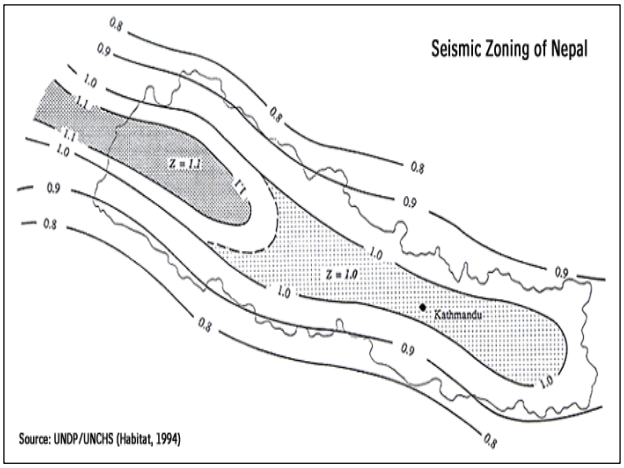

Fig 1.1 Seismic risk of Nepal
(Z = 1.1 and Z = 1.0 represents highest earthquake risk

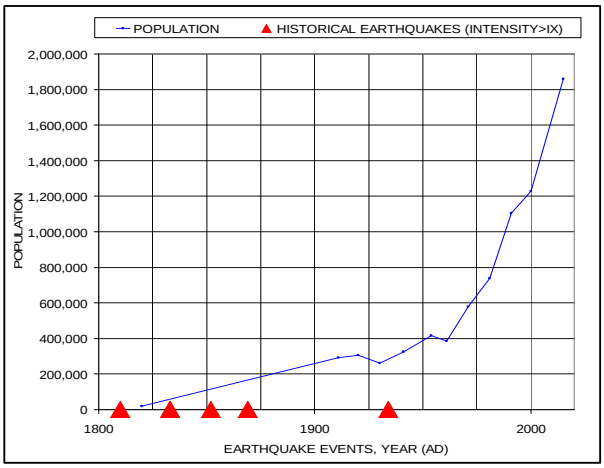

Figure 1.2 Growing earthquake risk in the valley (Source: NSET)

many experts believe that the large earthquakes particularly as that of 1934 (MMI IX) is likely to occur in the near future.

Some previous studies on earthquake damage estimation (Dixit et al, 1999; JICA/HMG, 2002; NSET, 2001) indicate the probability of huge human casualties (deaths and injuries), high damage of buildings and urban infrastructures during large earthquakes. According to the study carried out by the National Society for Earthquake Technology Nepal (NSET) under the Kathmandu Valley Earthquake Risk Management Project (KVERMP), an earthquake with similar level of shaking as that of 1934 AD earthquake today would result into approximately 40, 000 deaths and 95, 000 injuries in the Kathmandu Valley (Dixit et al., 1999).

With these frightening estimates, it becomes necessary to know about our existing emergency response capabilities during large disaster event such as due to an earthquake as well as preparedness efforts. This study focuses on assessment of the status of preparedness and earthquake response capacities of health related institutions, agencies and hospitals system operating in Kathmandu Valley and draws conclusion for enhancing the preparedness.

1.7 .Hospitals and Earthquake Disaster

Hospitals serve as a major resource for the intake, evaluation and treatment of patients affected by disaster. Hospital administrators and medical personnel have a responsibility to

prepare for likely disaster scenarios in their region and address several key issues that will affect the institutions ability to respond to a disaster or mass casualty event. Some of key issues includes, surge capacity for additional space, medication stockpiles, structural integrity, trained staff, infrastructure robustness, disaster plan etc. (HOPE, 2005).

A structural vulnerability assessment of 14 major hospitals in Kathmandu Valley (WHO – EHA, 2002) was conducted for MOH by WHO – EHA in collaboration with NSET. It involved both quantitative and qualitative analysis of hospital buildings. For different levels of earthquakes, the performance of hospitals in Kathmandu Valley was found as follows.

1) Frequent earthquakes of small intensity (MMI = VII): All or almost all hospitals may withstand the earthquake without collapse, 70 percent may be fully operational, and 30 percent partially functional.
2) Occasional earthquakes of moderate intensity (MMI = VIII): Most of the hospitals may withstand the earthquake without collapse, 10 percent may be fully operational, 30 percent partially functional, and 60 percent out of service from which few of them (10 percent) may collapse.
3) Rare earthquake of high intensity (MMI = IX): Many hospitals may withstand the earthquake without collapse. However, only 10 percent will be partially functional, 60 percent out of service in complying with a life-safety performance, and 30 percent of the structures may collapse.

Sometimes buildings may remain standing after an earthquake, but it might be functionless due to non-structural damage to the equipment, lifeline conduits and other non-structural elements like partition walls, veneers, ceilings, window panes etc. The cost of the non-structural elements, in the hospitals may be much higher than that of the structure and may reach up to 90 percent of the total facility value of the hospital (Guragain et al., 2004).

1.8 Health Effects of Various Hazards

Every disaster has serious implications for health. It is particularly important for the health sector to be prepared to cope with the health-related consequences of earthquakes, floods and landslides, epidemics, conflict situations and fires (MOH, 2003).

Some of the direct and indirect effects of adverse natural phenomena on the operations of health systems as identified by Noji, 1997 are:

- Direct effects include:
    - Damaged health care facilities;
    - Damaged infrastructure across the locality (including the destruction of access roads), leading to the breakdown of public services that are indispensable to health facility operations.
- Indirect effects include:
    - An unexpected number of deaths, injuries, or disease outbreaks in the affected community, exceeding the capacity of the local healthcare network to provide treatment;
    - Spontaneous or organized migrations away from the affected area towards other areas where health system capacity may be overwhelmed by the new arrivals;
    - Increases in the potential risk of a critical outbreak of communicable diseases, and an increase in the risk for psychological diseases among the affected population;
    - Food shortages leading to malnutrition and weakened resistance to various diseases

1.9 Objectives of the Research

The main objectives of the research is (1) to identify disaster risk management capabilities of the heath sector in the Kathmandu Valley (2) to get the level of awareness of earthquake risk perception from the general responders.

The specific objectives are:

- To identify existing earthquake disaster response capacities of hospitals in the Kathmandu Valley.

- To identify the priority needs for earthquake risk management in health sector of Nepal based on a capacity assessment in sample hospitals, and analysis of current efforts of government and non-government institutions in this field.

1.10 Organization of the Study

This research aims to identify disaster risk management efforts and response capacities of health sector in relation to previous studies. Based on the result, the study aims to identify

priority needs for earthquake risk management in health sector of Nepal. The figure below provides an overview of the research Framework.

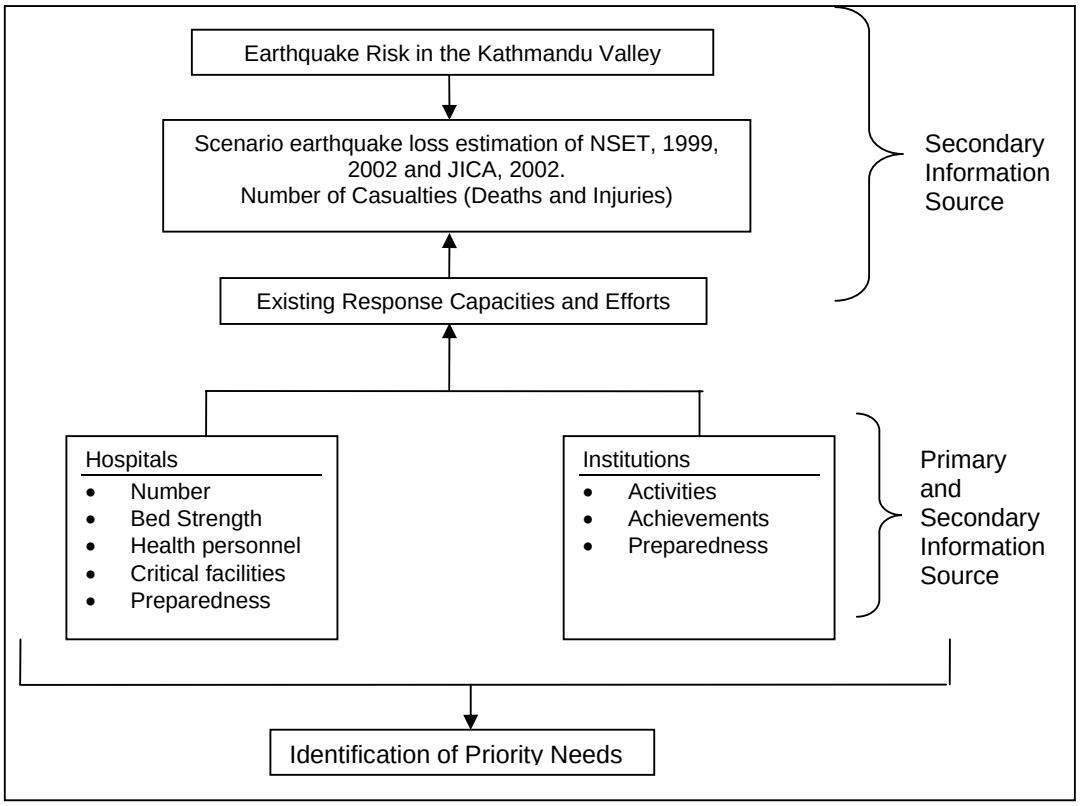

Figure 1.3 Conceptual framework of the research

This research is divided into six chapters. In first chapter has been divided into 9 sub chapters. Basically the first chapter we can get information about the existing condition of disaster risk management of Nepal especially in Earthquake risk management in Kathmandu Valley. The seconded chapter is literature review where researcher has been identifying the policies and issues regarding the DRM in Nepal as well as the incorporating between sociology and disaster. Similarly, in third chapter has been identified as a research methodology .and chapter four has given for the information about research study area. The chapter five has given finding data, analysis and presentation of existing capacities of hospital system of KTM valley. Chapter six has given for the summary, conclusion and recommendation.

CHAPTER TWO
LITERATURE REVIEW

Background

There is a lack of sociological literature on disaster management in Nepal. In this chapter I will review the current policies and plan in the field of disaster management in Nepal and most likely this chapter will address the policies and plans of DRM in Nepal and work done in DRM in Nepal so far. This chapter also reviews some of the past studies related to earthquakes and estimation of damage in the Kathmandu Valley and history of earthquake in Nepal. .

2.1 Overview of Disaster Risk Management in Nepal

The Ministry of Home Affairs (MoHA) is designated as the lead agency responsible for the implementation of Natural Calamity (Relief) Act, 1982, which has provision for adequate legal backups to implement Nepal Government's policies and strategies addressing to overall disaster management and risk reduction (MoHA, 2005). The major functions of MoHA are to formulate national policies and ensure its implementation, coordinate immediate rescue and relief works, data collection, dissemination, and collection and distribution of funds and resources to the affected areas through the structured process (Chhetri, 1999; NSET, 2004).

Natural Calamity (Relief) Act, 1982 is the legal instrument for handling disasters in the country. According to Dr. Chhetri, 1999; NSET, 2004 before the advent of Natural Calamity Relief Act, 1982 A.D. there was no well-structured disaster policy and relief and rescue works were carried out as a social works.

The Act provides for the establishment of Natural Calamity Relief Committees at the central, regional, district and local levels as Central Calamity Relief Committee (CCRC), District Calamity Relief Committee (DCRC), Regional Calamity Relief Committee (RCRC) and Local Calamity Relief Committee (LCRC). However, for all practical purposes, the committees at the central level (CCRC) and district level (DCRC) are functional and the use of institutional mechanisms such as regional committees (RCRC), and local level committees (LCRC), has not been seen on regular basis (NSET, 2004).

According to the Act, chairperson of CCRC is the Minister for Home Affairs and is the highest level of disaster related institutional mechanisms in the country. CCRC is mostly found to be engaged in formulating short-term directives and approaches for dealing with disasters, particularly large event. The district-level DCRC have been constituted in all 75 administrative districts of the country and the Act, assigns The Chief District Officer (CDO) as the chairperson of the committee, who is empowered to be the highest-level government official to take disaster-related decisions including rescue and distribution of relief materials following a disaster. CDO is also responsible for collecting disaster data with the aim of assessing disaster and providing rescue and relief. According to NSET, 2004, CCRC and DCRC can meet as many times as required but it is found to be assembling mostly twice a year – before and after the monsoon season. However, the current Natural Calamity (Relief) Act, 1982 focus more on post disaster rescue and relief rather than Pre-disaster preparedness and mitigation. Apart from Ministry of Home, other institutions working on disaster risk management are other line ministries and government departments e.g. Nepal Army, Nepal Police, Nepal Armed Police, Nepal Red Cross Society, Nepal Scout, several NGOs and many international agencies.

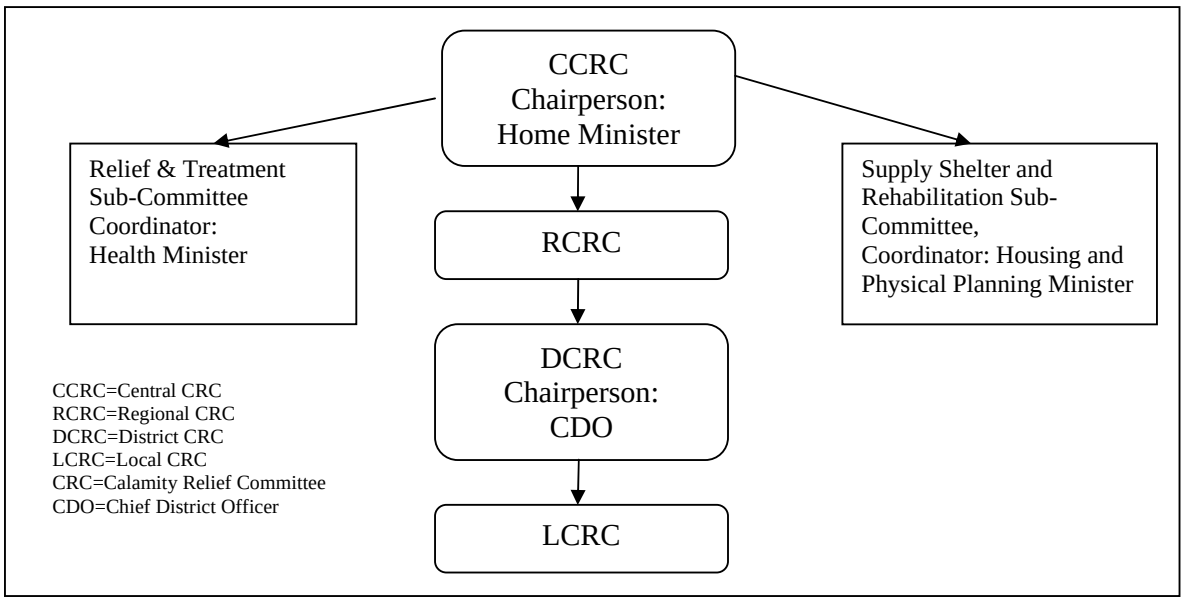

Figure 2.1 Disaster management institutions in Nepal

The United Nations declared the decade of 1990-2000 as an International Decade of Natural Disaster Reduction (IDNDR) to initiate a process toward global culture of prevention, and responding the global call of prevention, Nepal constituted IDNDR National Committee under the chairmanship of Honourable Minister of Home (HMG, 1996). The National

Committee for IDNDR was very effective in starting the proactive approaches in aspects of disaster management in the country (NSET, 2004). The first Preliminary National Action Plan was developed by IDNDR National Committee and presented to IDNDR World Conference in 1994. The plan was reviewed in the conference, then simplified to make it more practical and implemental with the incorporation of Yokohama Strategy (HMG, 1996) and finally became the National Action Plan for the country. However, lack of a well-articulated implementation strategy and mechanism made this document no more than a shopping list, with no responsibility assigned to any institution for monitoring the activity or updating the Action Plan (NSET, 2004). NSET, 2004 further identifies that the plan was never revisited after 1996. Major initiatives of disaster risk management in Nepal are undertaken by the UN systems, bilateral agencies, national and international NGOs, communities and municipalities. NSET is a unique NGO that focuses on earthquake risk management.

NSET, Nepal Red Cross society, UNDP and other several local NGOs and INGOs have started community based disaster management throughout the country. These programs focus on schools, municipal wards and village development committee (VDC) wards. Development of building code and its implementation in some areas, institutionalization of Earthquake Safety Day, concern on disaster management in ninth five year plan (1998-2002), separate chapter on disaster management in tenth five year plan (2003-2007)and Disaster Management Unit at Kathmandu Metropolitan City office are some of the remarkable initiatives towards Disaster Risk Management in the Country.

Some of the existing gap in disaster risk management in Nepal as identified by NSET, 2004 includes: a) Weak disaster information management system, b) lack of coordination among government agencies, NGOs and bilateral agencies and researchers, c) lack of appropriate awareness about natural hazards and their possible impacts to society and the environment from community level to the central governmental level.

There is a growing interest in earthquake risk management in Nepal, especially after the earthquakes of Turkey (1999), Gujurat (2001), and Pakistan (2005). For example, Nepal Government, with assistance from UNDP Nepal, is preparing Development of National Strategy of Disaster Risk Management in Nepal. It also wants to reformulate the National

Action Plan as called for by the Hyogo Framework of Action 2005-2015 AD adopted by the World Conference on Disaster Reduction (WCDR), Kobe, 2005.

Following the success in emergency response management in Pakistan, the UN agencies have initiated a Consolidated Appeal Process and have constituted several "clusters" in Nepal, including the Emergency Health and Nutrition Working Group, which draws members form a wide range of UN institutions, donors, and I/NGO operating in Nepal.

2.2 Past Earthquakes in the Kathmandu Valley

Nepal has a long record of destructive earthquakes, which extends back to 1255 AD (MOH, 2003). There are records of several devastating earthquake experiences at the valley in 1810 1833, 1866 and 1934 A.D (Dixit et al., 1999). Among the earthquakes recorded in the past, earthquake of 1934 A.D. also known as Great Bihar Earthquake was most destructing causing 12,397 houses collapsed, 43,342 houses partially damaged and the death toll were 4,296 (Rana, 1935) in the Kathmandu Valley. Casualties and damages made by past earthquake are shown in Table 2.1.

2.3 Earthquake Damage Estimation

Many initiatives have been taken by the experts form national and international organizations for the assessment of earthquake vulnerability in Kathmandu Valley (Jimee, 2006). Some of major studies in the Kathmandu Valley by national and international organisations are considered here. Although the damage estimation of these studies are different, the estimated loss is significant in terms of potential damage to humans and infrastructures in the valley.

Table 2.1 Casualties and Damage made by past earthquakes in the Kathmandu Valley

Year	Date	Earthquake Epicentre	Casualties		Buildings / Temples	
			Death	Injuries	Collapsed	Damage
1988	21 Aug.	Udayapur	8	71	650	1814
1934	15 Jan.	Bihar/Nepal	4,296	-	12,397	43,342
1837	17 Jan.	-	-	-	-	-
1833	26 Aug.	-	43	30	18,000	-
1823	-	-	-	-	-	-
1810	May	-	Moderate casualties		Many buildings and temples collapsed	
1767	June	-	-	-	-	-
1681	-	-	-	-	Many buildings and temples collapsed	
1408	-	-	Heavy casualties		Many buildings and temples collapsed	
1260	-	-	Heavy,		-	-

			Widespread famine and epidemic		
1255	7 June	-	1/3 of total population including King Abhaya Malla Killed	Many buildings and temples collapsed	

Source: JICA, 2002, NSET, 2002 and Rana, 1935

2.4 Kathmandu Valley Earthquake Risk Management Project (KVERMP)

National Society for Earthquake Technology Nepal (NSET) conducted a simple loss estimation study for Kathmandu Valley under the Kathmandu Valley Earthquake Risk Management Project (KVERMP) in 1999 in the collaboration with GeoHazards International. This loss estimation study examined what the consequences would be if the shaking similar to that of 1934 earthquake were to occur in modern day Kathmandu Valley. The study concluded that an earthquake with similar shaking pattern as that of 1934 AD today would result into approximately 40, 000 deaths and 95, 000 injuries in the Kathmandu Valley (Dixit et al., 1999). Apart from the huge number of casualties, there would be heavy damage to buildings, infrastructures and lifeline facilities.

It was also identified that the government medical facilities with around 2,200 beds that are full during non-emergency were highly insufficient to respond during huge disaster. There would be a major shortage of space for medical treatment in Kathmandu Valley (Dixit et al., 1999).

Table 2.2 Loss estimation due to scenario earthquake (1934 AD earthquake) in Kathmandu Valley

Impact	**Extent (approximates)**
Human	
Deaths	40,000
Injuries	95, 000
Homeless Population	900,000
Other Infrastructure	
Building damage beyond repair	60%
Bridges impassable	50%
Road length damaged	10%
Water supply pipe damaged	95%
Telephone exchange buildings damage	almost all
Telephone lines	60%
Electric lines	40%

Electric substations	almost all

(Source: Dixit et al.., 1999)

2.5 The Study on Earthquake Disaster Mitigation in Kathmandu Valley

Another study conducted by JICA/HMG in 2002 identifies three possible model source faults of an earthquake including 1934 AD earthquake as a reference in Kathmandu Valley. Based on these earthquake sources, different damage scenarios were developed to understand the loss to existing physical infrastructure and to estimate human casualties. For the study of earthquake disaster assessment in the Kathmandu Valley, the area was divided into grids with meshes of 500m by 500m and buildings were mapped from aerial photos and refined during field survey (Jimee, 2006).

This earthquake model was adopted, based on a distinct part of the lineament in the Valley.

The damage scenario in the Kathmandu valley form different source faults estimated by JICA/HMG, 2002 study are given in the Table 2.3.

Table 2.3 Estimation of casualties due to various earthquake fault model

Scenario Earthquake	Magnitude	Deaths	Injuries	
			Serious	Moderate
Mid Nepal Earthquake	8.00	17,695	53,241	93, 633
North Bagmati Earthquake	6.0	2,616	7,204	14,709
KV Local Earthquake	5.7	14,333	42,667	76,399
1934 Earthquake in present	8.2	19,523	58,728	103,313
During 1934 Earthquake	8.4	3,814	10,653	21,263

Source: JICA/HMG, 2002

2.6 Earthquake Risk of Kathmandu Valley as per the Global Earthquake Safety Initiative (GESI)

The Global Earthquake Safety Initiative (GESI) organised by GeoHazards International (GHI), USA and UNCRD, Japan, conducted earthquake risks studies in 21 cities from both developed and developing nations around the world. A GHI method for assessing community earthquake safety was adopted to estimate the risk of life loss from earthquakes in cities around the world (GESI, 2001). *For detail GESI methods refer Website 3 at reference section.* The study compared the earthquake risk of all the chosen cities with one another and also described the risk particular to each city.

The results suggest that the Kathmandu has the lowest performance among all 21 major cities. It does not only posses the highest risk of casualties in absolute terms but also the highest per capita risk. Figure 2.2 and 2.3 compares the expected number of casualties during same level of shaking of an earthquake as well as comparison of per capita risk of casualties in different cities around the world. All the figures in this section are adopted from GESI, 2001.

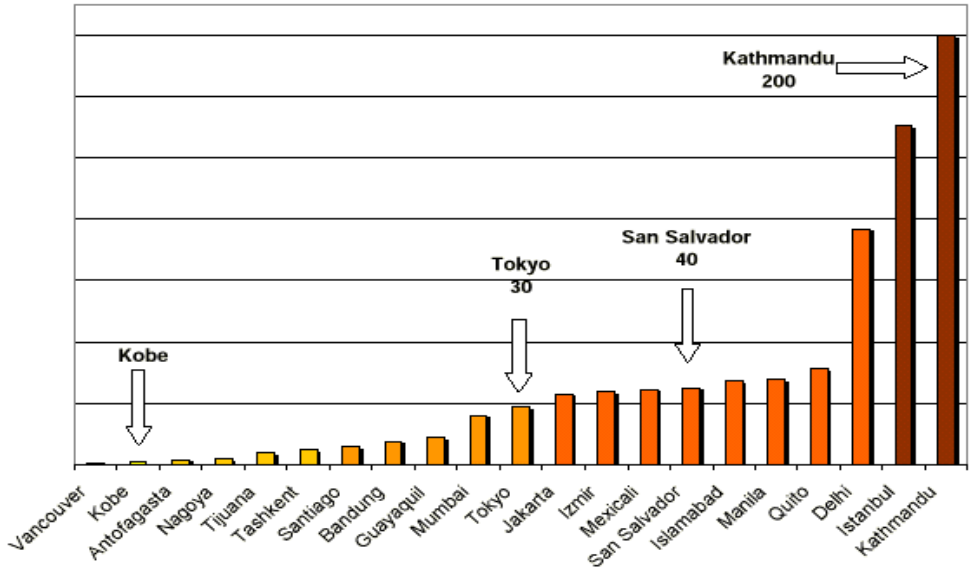

Figure 2.3 Risk of Casualties in different cities around the world (Source: NSET)

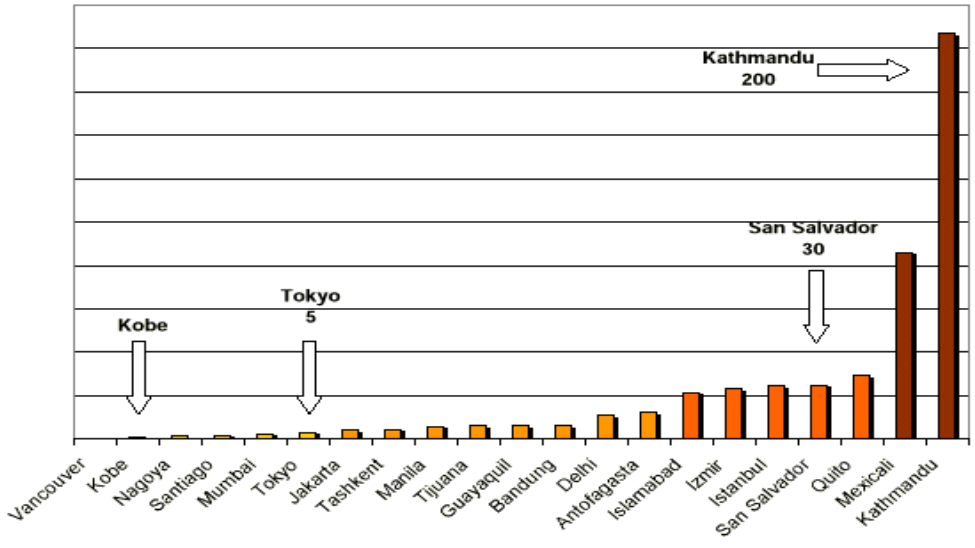

Figure 2.4 Per capita risk of casualties in different cities around the world (Source: NSET)

Two figures 2.3 and 2.4 shows that Kathmandu Valley has 200 times more risk of casualties from earthquake than the city with least risk in the world. The study further identifies that the major source of mortality in Kathmandu Valley is from building collapses followed by emergency response problems and medical care problems (Figure 2.5).

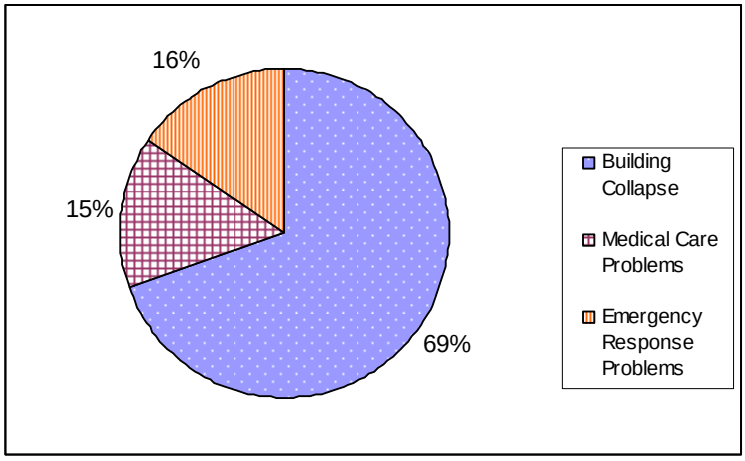

Figure 2.5 Sources of risk of mortality in Kathmandu Valley
(Source: NSET)

Hence, the best mitigation options in Kathmandu valley as suggested by the study are to increase the quality of buildings, improve medical preparedness and strengthen the level of emergency preparedness (Fig: 2.6)

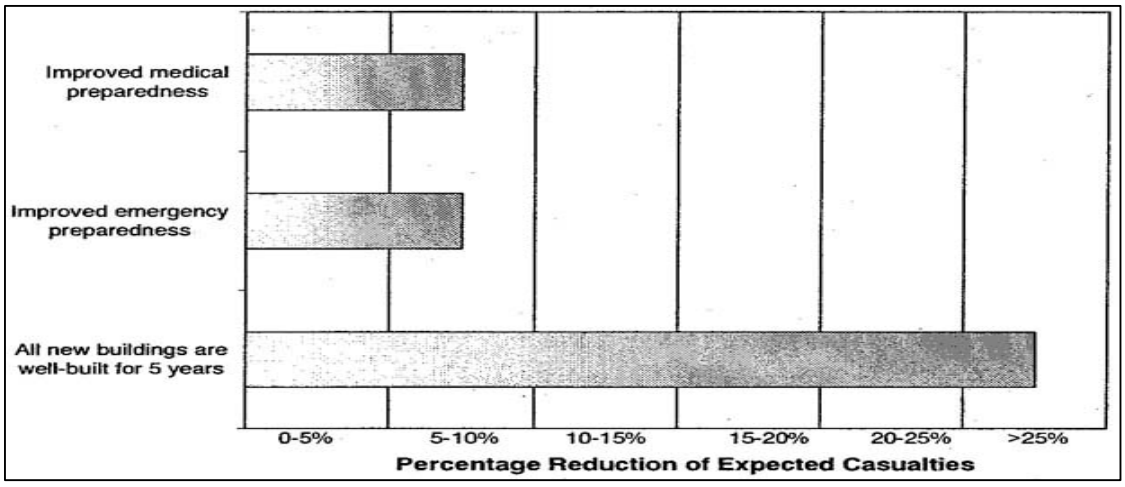

Figure 2.6 Risk mitigation options for the Kathmandu Valley (Source: NSET)

2.7 Earthquake Mass Casualty Simulation

To reach an understanding of how many people will demand hospital services, an earthquake mass casualty simulation was carried out for Kathmandu Valley. This simulation is based on the expected damage from the MMI scale to various buildings types and its stock (NSET, 2001). Using the estimated number of buildings with either very heavy damage or which are destroyed and the mean values from the empirical data compiled by Coburn & Spence, 1992, the number of people killed was calculated. The gross number of people severely injured was estimated five times the number of people killed. The population in Kathmandu Valley was assumed 1.5 million (WHO-EHA/MOH, 2002).The results are shown in the following table:

Table 2.3 Expected number of casualties in Kathmandu Valley

MMI	People Killed		People Severely Injured	
	Number	Percentage	Number	Percentage
VI	0 - 20	0 - 0.001	0 -100	0 - 0.005
VII	20 - 750	0.001 - 0.5	100 - 3, 750	0.005 - 2.5
VIII	750 - 22, 500	0.5 - 1.5	3,750 - 112, 500	2.5 - 7.5
IX	22, 500 - 75, 000	1.5 - 5	112, 500 – 375,000	7.5 - 25

2.8 What is Disaster?

Social scientists evince much interest to study disasters- which disrupt in order of life by causing injury, death and loss of property to large number of people residing in an area or a region. In general usage, “disaster”, implies a sudden or natural catastrophe that causes great damage or loss of life (Oxford English Dictionary: 2003: 249). The concept disaster highlighted differently by various disciplines - a geographer will define disaster in relation to the movement of earth’s plates or the occurrence of a high wind or heavy rain, a relief administrator in relation to relief needs, a political official in relation to political consequences, a economist consider on the losses to economy and a sociologist on severe danger to society; to broaden our knowledge.

When a disaster is a disaster?

When is a natural or man-made phenomenon, such as earthquake, volcanic eruption, landslide, cyclone, drought, flood, fire and war, called a disaster? In this scenario it must damage physical settings and human lives.

Is disaster determined by the magnitude of the effects? Can a disaster occur when only one individual is involved or only a small proportion of the population is affected, or must the effect be community-wide or further reaching? Is the availability or resources a factor? Is an earthquake a disaster when houses are destroyed and victims must borrow heavily from locally available sources, or only when local resources are insufficient to meet immediate demand? Is the definition dependent upon whether or not a public authority declares the existence of a disaster and by what criteria are such decisions made?

The above questions include the different characteristics most frequently singled out in attempts to define disaster as a physical phenomenon (e.g., earthquake, cyclone); as physical impact (damage); by degree of physical impact (damage); as social disruption from the physical impact (threat as a stimulus); as a political definition (definition based on political considerations); and as a special social situation relating only to certain demands (collective ability to meet the requirements of a situation) (Quarantelli: 1981: 5).

Why Study Disaster?

The study of disaster from a social science perspective facilitates the social scientist to understand the impact of disaster on human beings. Earlier writing on disaster and its analysis was based on the past experience of people. But the systematic study on social aspects of disaster was emerged in the early twentieth century. The first attempt to apply systematic social science concepts to the study of disasters was S. H. Prince's investigation of the Munitious ship explosion in the harbour of Hallifax, Nova Scotia, in 1917 (Prince: 1920). His pioneering study of the social effects of disaster has provided a major source of stimulating ideas and hypothesis for subsequent investigation. But in the 1950s, a planned, systematic empirical and theoretical research on disaster in sociological studies emerged, which stimulated and supported by various agencies charged with responsibility for handling the hazards.

Relationship to Sociology

Sociologists have taken interest in disaster studies and considered as the leading pioneers and researchers in this area. There has been a close relationship between disaster studies and sociology from the earliest days of work in the area (Killian: 1952; Form and Nosow: 1958). A systematic sociological definition by Fritz (1961: 655) on disaster as "an event that concentrates in time and space, in which a society or a relatively self-sufficient sub-division of society, undergoes severe danger and incurs such losses to its members and physical

appurtenances that the social structure is disrupted and the fulfilment of all or some of the essential functions of the society is prevented". Keeping above definition in mind it is clear that disaster is an event that disturbs the vital functioning of a society. It affects the system of biological survival, i.e., subsistence, shelter, health, reproduction; the system of order, i.e., division of labour, authority patterns, cultural norms, social roles; the system of the meaning, i.e., values, shared definitions of reality, communication mechanisms and the motivation of the actors within all these systems (Fritz in David, L. Shills: 1968: 202). It affects social, cultural, economic and institutional set up of a region or a country causing widespread damage to the existing social and economic infrastructure.

In a close relationship, sociology's contribution to disaster studies are research techniques (e.g., field studies and open-ended interviewing), the research methodology (e.g., "grounded theory" approach and the employment of inductive analytical models), the theoretical ideas (e.g., the notion of emergence from collective-behaviour thinking and the idea of informal and formal structures of organisations), and the general perspectives (e.g., that there can be latent as well as dysfunctional aspects of any behaviour and that societies and communities have a social history that is not easily set aside). The relationship has not been one-sided, since disaster research has also contributed to sociology. Studying collective behaviour in disaster research is most influential area to sociology. Other than this, the significant contributions to sociology are the study of formal organisations, social roles, social problems, organisational and social change, mass communications, the urban community and medical sociology .

Disaster as a changing concept

The concept and definition of a disaster has changed over time as sociologists have interpreted disasters as special type of societal phenomena in past because they are dramatically historical happenings (events) and also because they compel collective reactions (social catalysts), (Kreps; in Quarantelli: 1998:32). The conceptualisations and definitions of disaster have slowly evolved from acceptance of every-day usages of the term, through a focus on social aspects, to the attempts to set forth more sociological characterisations on the question of disaster as "Acts of God" or "Acts of Society". The earliest definitions perceived disaster with features of physical agents as "Acts of God". Earlier people considered disasters as supernatural forces and to prevent or weaken them, steps of a religious nature have to be taken. The word disaster was applied more to physical disturbances such as earthquakes and

floods, or what came to be traditionally known as actions attributable to the supernatural. In past, disasters were eventually and formally considered as Acts of God, with the implication that nothing could be done about their occurrence.

In contrast to astrological or supernatural forces the development of secularism and science obtained knowledge on disaster in a different perception. In a sense, responsibility was shifted from the concept of sacred to a secular view. Now in this framework, disasters could not be eliminated or prevented. But the greater understanding of what was supposedly involved encouraged the taking of actions that could weaken the impact of many disasters. In particular, engineering measures such as strengthening buildings and constructing dams and taking other structural measures would make much sense.

However the shift to a focus on Acts of Nature latently set the stage for an even more drastic shift in perception. As Voltaire said about the large casualties and losses in the 1775 Lisbon earthquake, it should not be perceived as an Acts of God, but as resulting from building without heed in a highly seismic zone in Portugal (Dynes: 1999). Implicit in such a statement is that non-structural measures such as decisions not to be build at all in vulnerable localities, would be a way to cope with possible disasters. In this general view about the basic source of disasters, while the natural hazard itself, such as cyclonic winds or volcanic eruptions, could not be directly controlled, steps nevertheless could be taken to lessen the negative effects of the ensuring disastrous occasion.

But after this, it is not surprising that a different view of the source of disaster appeared. By systematic analysis disaster is seen as resulting from the actions, or perhaps better, inappropriate actions of human beings. As a result of now half a century of study, we have come to see disaster not as Acts of God, or Acts of Nature, but as resulting from the Acts of Men and Women. The view developed among sociologists upon the fact that floods, droughts and other so-called natural disasters relate directly to human intervention into the ecological system as well as outright technological interference and human exploitation. Although they may be natural factors, ‘disasters are social phenomena’. As emphasizes by Blaikie et al., the natural and the human are so inextricably bound together in almost all disaster situations, especially when viewed in an enlarged tome and space framework, that disasters cannot be understood to be natural in any straightforward way (1994:6).

The change in the perceived general source of disasters- from the supernatural through nature to social actors (human beings or society) has been somewhat paralleled by changes in the

attempted collective response. The programme disaster management will be meaningful with the active involvement of the actors, like the individuals, organisations and communities in the pre- trans and post disaster period.

So sociologists respond to disasters in an important way to understand the process of evolution of responses. It is an important subject for study because, as noted by Oliver-smith (1996:303), they 'signal the failure of a society to adapt successfully to certain features of its natural and socially constructed environments in a sustainable fashion'.

Pakistan 2005 Earthquake

This section is adapted from "Pakistan 2005 Earthquake Early Recovery Framework November 2005" report prepared by Pakistan UN systems (UN, 2005).

An earthquake measuring 7.6 on the Richter scale struck the northern areas of Pakistan and India on 8 October 2005. Its epicenter was 19 km northeast of Muzaffarabad. Azad Jammu and Kashmir (AJK) and North West Frontier Province (NWFP) were severely affected. As of November 2005, the estimated death toll was 73,000, and was expected to rise. Most buildings in the affected area had poor earthquake resilience. Of the total housing stock, 84 percent was damaged and destroyed in AJK and 36 percent was damaged or destroyed in NWFP. About 3.2 million to 3.5 million people have been affected by the disaster and were in need of assistance, including winterized shelter, medical care, food and water and sanitation facilities.

Health facilities in affected districts have suffered severe damage. The five District Headquarters Hospitals in the affected districts were completely destroyed, and the tertiary care hospital suffered structural damage. Most of the first-level care facilities, including dispensaries, BHUs, RHCs, civil hospitals and MCH centers, were destroyed or rendered uninhabitable due to structural damage. This led to a drastic disruption of primary health care and basic curative services in the affected region. Out of total 564 Health facilities in affected area, 291 were destroyed, 74 partially damage and 199 functional.

The earthquake had a dramatic impact on human resources in the health sector, including on medical and paramedical staff. Some health workers lost their lives, while most of the others have lost family members, loved ones and their own houses. Survivors are therefore not in a proper frame of mind to start their duties immediately. The acute shortage of medical, paramedical and nursing staff was a huge challenge, which needed to be addressed through different approaches, including temporary postings from other districts and the training of local staff. Moreover, there was a real shortage of specialists, including surgeons; ear, nose and throat specialists; eye doctors; obstetrician-gynecologists; radiologists; and blood bank and laboratory workers. At the same time, in-patient capacity was reduced to around 10 per cent of pre-earthquake levels.

Preventive government programmes for tuberculosis (TB), HIV, Expanded Program on Immunization (EPI) and malaria were in complete disarray. This disruption could result in drug resistance for tuberculosis, with a subsequent surge in its incidence and prevalence. There was also a high risk of a measles outbreak if displaced populations were not immediately immunized.

CHAPTER THREE
METHODOLOGY

3.1. Background

A brief discussion of the research methodology regarding selection of the study area, research design, sample size and sampling procedure nature and sources of data, data collection techniques, modes of data analysis and limitation of the study has been made in this study.

3.2 Introduction of the Study area

Kathmandu Valley which, is located in the earthquake-prone area, has experience of several devastating earthquakes in the past. Based on the historical records many experts believe that a major earthquake similar to that of 1934 AD (IX MMI intensity) can occur anytime. Today, earthquake risk in Kathmandu Valley is increasing due to rapid population growth and high density, increasing unsafe construction practices, low level of awareness and unplanned urbanization. According to the study carried out by the National Society for Earthquake Technology Nepal (NSET) under the Kathmandu Valley Earthquake Risk Management Project (KVERMP), an earthquake with similar level of shaking as that of 1934 AD earthquake today would result into approximately 40, 000 deaths and 95, 000 injuries in the Kathmandu Valley (Dixit et al., 1999).

Hence, this study will focus on assessment of the status of preparedness and earthquake response capacities of health related institutions, agencies and hospitals system operating in Kathmandu Valley and conclusion for its enhancing the preparedness.

3.3 Selection of the Study area

Nepal, as a whole, is situated in the seismically active Himalayan mountain belt. High seismicity in the country is related to the presence of active faults between tectonic plates along the Himalayas, mainly in the Main Boundary Fault (MBF) and the Main Central Thrust (MCT). Among all disasters scenarios in Nepal, none is more frightening as the prospect of a major earthquake affecting the Kathmandu Valley (MOH, 2003).

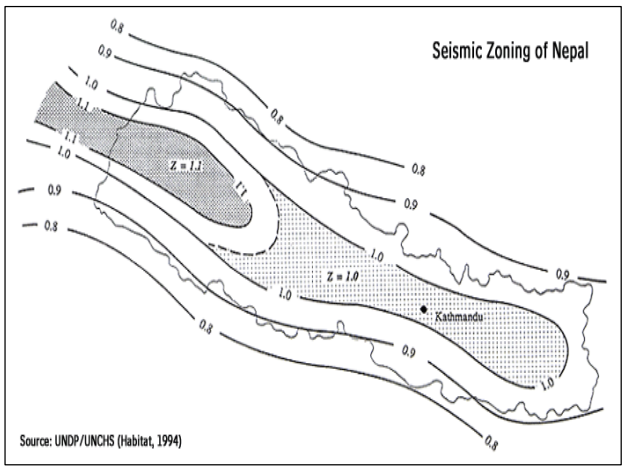

Fig 1.1) Seismic risk of Nepal
(Z = 1.1 and Z = 1.0 represents highest earthquake risk)

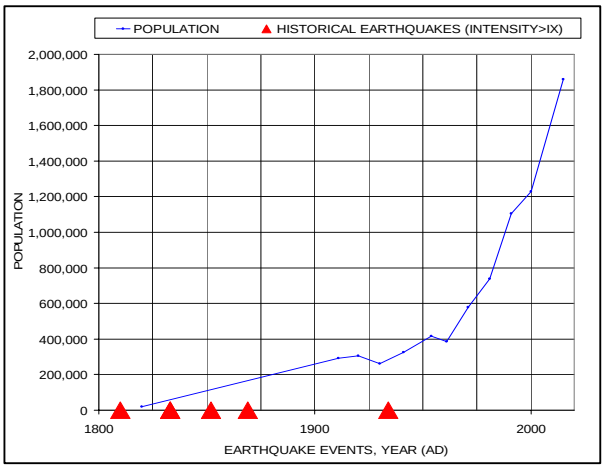

Figure 1.2) Growing earthquake risk in the valley (Source: NSET)

The seismic risk map (Figure 1.1) produced by UNDP/UNCHS in 1994, showed that the middle and central parts of Nepal where Kathmandu Valley is located is an earthquake-prone zone. Moreover, the rapid population growth (Figure 1.2), high density, unsafe construction practices, unplanned urbanization, low level of awareness and prevailing poverty contribute to increasing earthquake risk in the valley. Based on historical seismic records of the valley, many experts believe that the large earthquakes particularly as that of 1934 (MMI IX) is likely to occur in the near future.

Some previous studies on earthquake damage estimation (Dixit et al, 1999; JICA/HMG, 2002; NSET, 2001) indicate the probability of huge human casualties (deaths and injuries), high damage of buildings and urban infrastructures during large earthquakes. According to the study carried out by the National Society for Earthquake Technology Nepal (NSET) under the Kathmandu Valley Earthquake Risk Management Project (KVERMP), an earthquake with similar level of shaking as that of 1934 AD earthquake today would result into approximately 40, 000 deaths and 95, 000 injuries in the Kathmandu Valley (Dixit et al., 1999).

With these frightening estimates, it becomes necessary to know about our existing emergency response capabilities during large disaster event such as due to an earthquake as well as preparedness efforts. This study focuses on assessment of the status of preparedness and earthquake response capacities of health related institutions, agencies and hospitals system operating in Kathmandu Valley and draws conclusion for enhancing the preparedness.

3.4 The Sampling Procedures

The random sampling survey of hospitals was carried out in the three districts of the Kathmandu Valley. Different health related institutions / agencies located in the valley were inquired to identify their efforts in disaster risk management. Altogether, 41 major hospitals from Kathmandu district (29 hospitals), Lalitpur district (7 hospitals), and Bhaktapur districts (5 hospitals) were surveyed as sample hospitals. The target hospitals were the government, as well as private ones.

3.5 Data Collection Techniques

Primary data was collected from the hospitals with the help of structured questionnaire (Annex 1) Additional questions were added related to their effort in disaster risk management. The Personal interviews and Telephone interviews were also used as a method of data collection at the hospitals and other relevant institutions / agencies. Detail data collection procedure for hospitals is given below.

Every hospitals and nursing home identified inside the Kathmandu Valley were inquired. Preliminary telephone survey was conducted to make sure that only potential hospitals are listed for survey.

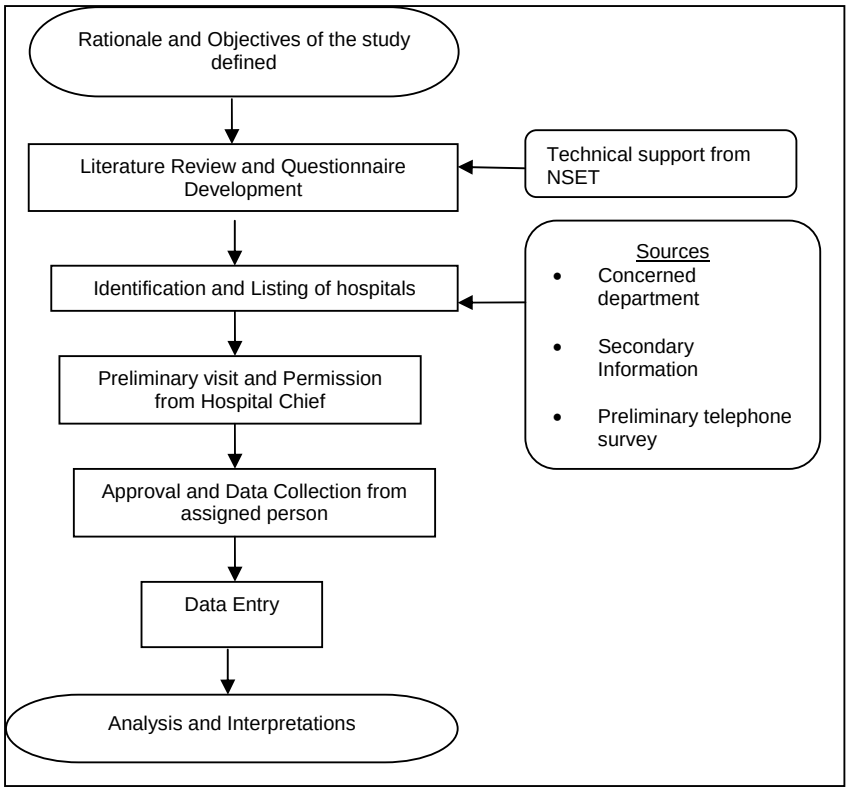

Figure 3.1 Flowchart for Hospital Capacity Survey

Some noted hospitals could not be covered by the survey because of technical reasons. Institutions such as Eye Hospital, SAARC T.B. and HIV Centre and Dental Hospitals are not seen as being potentially involved in emergency response, and hence they do not have any emergency response system, and so were left out of this survey.

The questionnaire focuses primarily on the basic hospital facilities, human resources (health related only) and their emergency preparedness efforts.

Preliminary visit to hospital was made for getting permission to collect information. Approval was taken from Hospital Chief (Medical Superintendent/Medical Director) and under his assigned person, data were obtained. Most of the time, the responder was hospital administrator. Information form the hospital's annual report and brochure were also considered in some cases. Collected data were entered in Microsoft Excel. Analysis was carried out and then interpretation was made.

The exact number of doctors in any hospital was not possible to calculate. Number of doctors from all the government hospitals represents permanent staffs that collect government salaries. Private hospitals have consulting doctors from government hospitals too. Hence, based on the study carried out by HMG in 2003, in case of private sector 1 doctor per 4 beds of a hospital is calculated in some private sector hospitals.

3.6 Secondary Data Collection

Secondary information was collected for Secondary data as in the form of all the relevant documents and reports for the study were collected from the following sources:

- Government, Private and NGO Hospitals
- Government Institution
- Non government Institutions
- Libraries of various Government and Non Government Organizations
- Published books, research papers, reports, documents, journals, thesis and internet sites

The reference section presents the list of such documents.

3.7 Limitation of Study

Time and resource has limited the scope of the research.

- The study considers only earthquake risk as a disaster risk of the valley.
- Disaster risk management capabilities in health sector are limited to :
    - number of hospitals (private, government and NGO) present in the valley including the strength of their surgical and non-surgical capacities (such as beds, operation theatre, intensive care units, ambulances etc.) critical facilities (water supply, electricity etc) and their emergency preparedness efforts and
    - efforts of government, non-government, international agencies and institutions in disaster risk management of health sector.

CHAPTER FOUR
THE STUDY AREA (THE SETTING)

4.1 Administrative Divisions

Kathmandu Valley consists of three districts namely, Kathmandu, Lalitpur and Bhaktapur. These three districts are divided into one metropolis, one sub-metropolis, three municipalities and ninety-eight Village Development Committees (VDC).

Table 4.1 Administrative divisions of the Kathmandu Valley

	District	**Municipality and VDCs**	**Number of wards**
Kathmandu Valley	Kathmandu	Kathmandu Metropolitan City	35
		Kirtipur Municipality	19
		56 VDCs	9 wards in a VDC in general
	Lalitpur	Lalitpur Sub-Metropolitan City	22
		26 VDCs	9 wards in a VDC in general
	Bhaktapur	Bhaktapur Municipality	17
		Madhyapur /Thimi Municipality	17
		16 VDCs	9 wards in a VDC in general
Total	3 districts	5 municipalities & 98 VDCs	110 municipal wards

4.2 Population

There is rapid growth of population in urban areas and adjoining VDCs with in-migration playing significant role (HMG, 1999). Population of Kathmandu Valley has reached about 1.6 million according to census in 2001.

Table 4.2 Population in Kathmandu Valley in 1920, 1991 and 2001 (Source: CBS, 2001)

District	1920 Valley Total	1991 census			2001 census		
		Male	Female	Total	Male	Female	Total
Kathmandu	306,909	351,316	324,025	655,341	581,361	512,053	1,093,414
Lalitpur		130,326	126,760	257,086	171,822	164,855	336,677
Bhaktapur		86,818	86,134	172,952	115,487	111,373	226,860
Total		568,460	536,919	1,105,379	868,670	788,281	1,656,951

The above census is primarily based on the residential population, which do not include temporary settler. The actual number of population present in the valley might be more than 2 million. Increasing population is increasing earthquake risk in the valley (Figure 1.2). Most of the population is concentrated in core urban areas of the valley. Population and households in urban areas i.e. municipalities in the valley is shown in the table below.

Table 4.3 Population and households (2001) in municipalities of Kathmandu Valley (Source: CBS, 2005)

Municipality	Households	Population			Area in sq.km	Pop.Density Per sq. km
		Total	Male	Female		
Kathmandu Metropolitan	1,52,155	6,71,846	3,60,103	3,11,743	49.45	13,586.37
Lalitpur Sub Metropolitan	34,996	1,62,991	84,502	78,489	15.15	10758.48
Bhaktapur	12,133	72,543	36,681	35,862	6.65	11058.38
Madhyapur Thimi	9,551	47,751	24,747	23,004	11.11	4,298.02
Kirtipur	9487	40,835	21,686	19,149	14.76	2,766.6

The population density of Kathmandu Metropolitan, Lalitpur Sub-Metropolitan and Bhaktapur municipality is higher than that population density of Delhi, which is found to be 9,339 /sq. km. according to census of 2001 (Website 2). Higher population density makes the city more vulnerable to disasters.

4.3 Human Development in 2001

	Kathmandu	Lalitpur	Bhaktapur
Life expectancy at birth Yrs	69.5	67.1	71.3
male	68.5	66.4	71.2
female	70.6	67.9	71.6
Adult literacy rate of 15 yrs + (%)	70.6	66.9	64.0
Male	85.0	79.4	77.6
Female	57.2	53.9	50.1
Infant mortality rate Per 1,000 live births	30.7	40.1	24.0
Human development index (HDI)	0.603	0.588	0.592
Per capita income US $	631	378	342
Gross Domestic Product PPP US $	3,438	2,059	1,862

Source: NHDR, 2006

The life expectancy at birth of Bhaktapur is higher than Kathmandu Metropolitan, Lalitpur Sub-Metropolitan city according to human development report 2006. Similarly, as compare to female life expectance at birth by year is higher than male in Kathmandu Municipality.

Looking at the GDP Kathmandu Metropolitan is higher than other two municipalities. So, if any kind of disaster strikes in the country that directly effects to the GDP.

4.4 Health Indicators of Kathmandu Valley

	Kathmandu	Lalitpur	Bhaktapur
Number of hospitals (Government only)	6	2	1
Number of primary health care centres	7	3	2
Number of health posts	6	9	7
Number of sub health posts	53	29	12
Number of ayurvedic health facilities	5	3	3
Number of pharmacies	865	156	105

Source: DHS, 2005a

The number of hospitals in different districts presented above is government hospitals only. Private hospitals present in these districts are not included. The current research tries to include all the significant hospitals from private, government and non-government sector.

4.5 Human Resources for Health, 2002

	Kathmandu	Lalitpur	Bhaktapur
Number of doctors	276	14	23
Number of nurses	600	86	61
Number of Para-medicals	417	97	76

Source: DHS, 2005a

Number of human resources presented above includes government employee only. This table shows as out of 1,093,414 population of Kathamndu Metropolitan City only 276 doctors are available. So if the earthquake disaster strikes 1 doctor has to handle 3961.64 people.

4.6 Health worker population ratio in '000 population *(based on government employee)*

	Kathmandu	Lalitpur	Bhaktapur
Doctor population ratio	3.9	24.1	9.8
Nurse population ratio	1.8	3.9	3.7
Paramedical population ratio	2.6	3.5	3.0

Source: DHS, 2005a

This table shows as out of 1,093,414 population of Kathamndu Metropolitan City only 3.9 doctors, 24.1 doctors in Lalitpur and 9.8 is in Bhaktapur are available . So, if disaster strikes at the Bhaktapur one doctor has to handle 9.8 (ratio) people and we all know that the role of doctor during disaster is very important. We can easily figure it out that how one doctor taken care 9.8 people at once

4.7 Sanitation and Drinking

	Kathmandu	Lalitpur	Bhaktapur
Population with access to toilet	92.3	81.4	83.2
Population with access to safe drinking water	89.0	84.2	80.3

Source: NHDR, 2004

4.8 Some Common / Specific Diseases associated with Disasters (2006)

	Kathmandu	Lalitpur	Bhaktapur
Malaria incidence Per 1,000 population	Nil	0.02	Nil
Kala-azar incidence Per 100,000 risk population	Nil	Nil	Nil
Diarrhoeal Diseases Total OPD new visits as % of total population	1.551 %	2.918 %	2.571 %
Tuberculosis Total OPD new visits as % of total population	0.022 %	0.063 %	0.074 %
ARI Total OPD new visits as % of total population	2.029 %	5.274 %	5.594 %

Source: DHS, 2006b

CHAPTER FIVE
ANALYSIS OF THE DATA

Background

This chapter is focused on analyze the finding data. Such as hospital capacity survey, category of hospitals, building ownership and access to the Hospitals, hardware capacity, bed strength , ambulances, Blood Bank Unit ,Other Critical Medical Facilities ,Health Personnel in Hospitals and critical facilities etc.

5.1 Hospital Capacity Survey

The hospital survey data have been analyzed against the following selected indicators with the focus to an earthquake disaster.

1. *Number and Location*
2. *Type of Hospitals*
3. *Building Ownership and Access to the Hospitals*
4. *Hardware Capacity of Hospitals*
5. *Health Personnel Availability*
6. *Critical Facilities (water supply, electricity, communication, and space availability)*
7. *Efforts in Disaster Risk Management*

5.2 Number and Location

Altogether 41 major hospitals (nursing home is also referred to as private hospital) from Kathmandu, Lalitpur and Bhaktapur districts were surveyed to determine the current status of disaster response capacity of the sample hospitals. Some noted hospitals could not be covered by the survey because of technical reasons. Eye Hospitals, SAARC T.B. and HIV Centre and several Dental Hospitals are not seen as being potentially involved in emergency response, and hence they do not have any emergency response system, and so were reluctantly left out of this survey. However, these hospitals do have responsibilities during disasters. First, they should have their own emergency response plans to ensure business continuity. Second, as a health institution, these health centres are expected to be forced to take care of patients with respective injuries and also the general injured because the overall capacity of other hospitals will be easily exceeded during a major disaster in Kathmandu Valley.

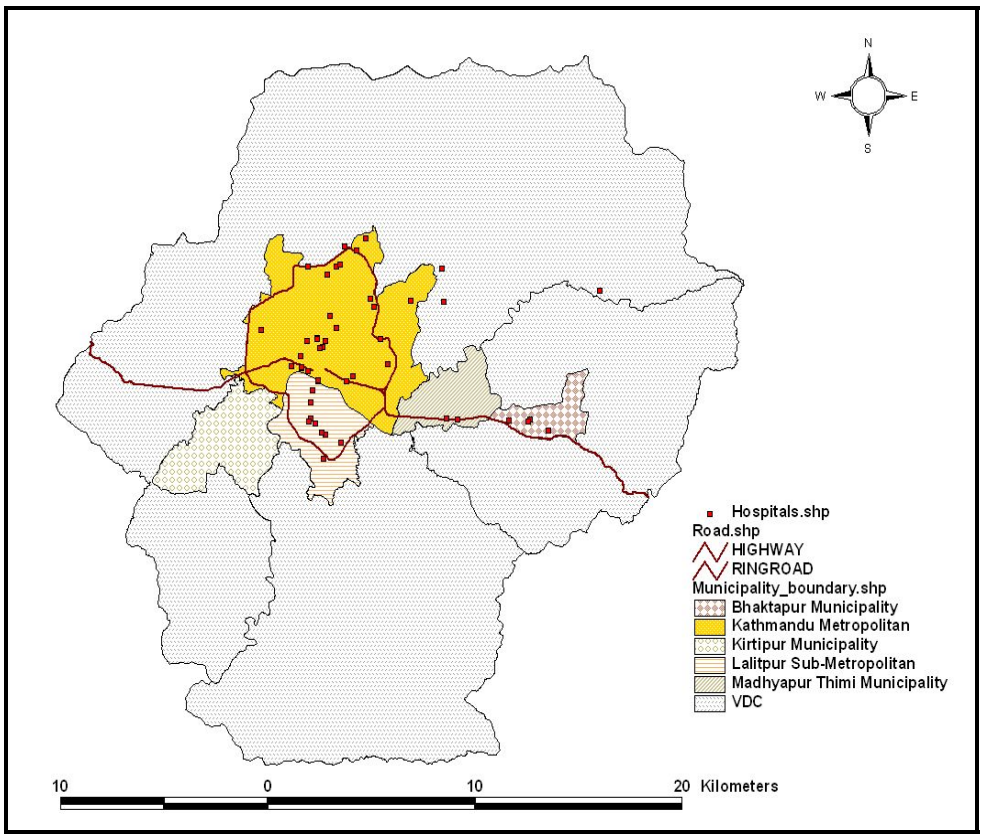

Figure 5.1 Administrative boundaries and Hospitals in the Kathmandu Valley

Apart from the hospitals and nursing home, there is large number of clinics concentrated at major dwelling areas of the valley. Generally, these clinics are of smaller capacity and, by their nature, lack facilities of keeping patient overnight. Because of this reason, the study focuses on health facilities that are comparatively larger in capacities and where patient can be admitted for providing medical services during disasters. Though 41 major potential hospitals are identified and surveyed, there may be around 48 – 50 hospitals for disaster response in the valley. Furthermore, the existing number hospital may not fully operate particularly during an earthquake disaster. According to the structural assessment conducted on 14 major hospitals (50 or more bed capacity) in Kathmandu Valley (WHO – EHA/MOH, 2002) by NSET in 2002, the number of fully operational hospitals reduces with more than VI MMI intensity earthquake Hence, the overall existing capacity of hospitals in the valley will be reduced during a major earthquake of more than VI MMI intensity earthquake.

A majority of the hospitals in the valley are located in the core area (inside the ring road) and its immediate periphery in the Valley. There are 29 major hospitals (71 percent) identified inside the ring road whereas 12 of them (29 percent) are outside the ring road. Furthermore, 26 hospitals are located in Kathmandu Metropolitan City area, and 7 hospitals in Lalitpur Sub-metropolitan City area; thus 33 major hospitals are inside the two densely populated municipalities

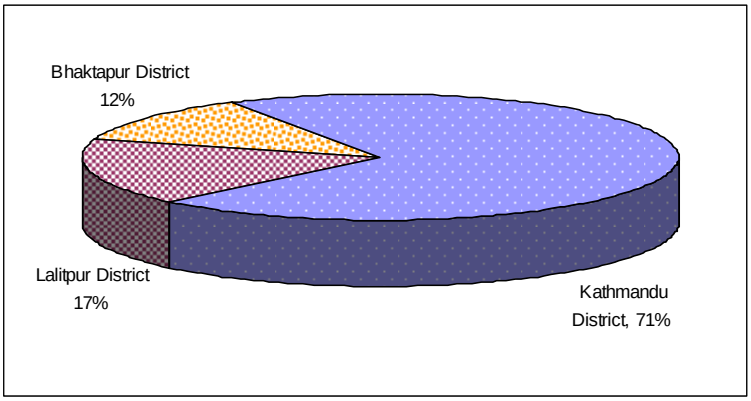

Figure 5.2.Proportion of hospitals surveyed from three districts of Kathmandu Valley.

The hospitals located in the core areas of Kathmandu and Lalitpur districts are comparatively closely located than the core area of Bhaktapur district. Five hospitals identified at the core area of the Bhaktapur are isolated and with connection of only a bridge and a highway. Dixit et al, 1999 has expressed its concern that major earthquake shaking as that of 1934 A.D. (IX MMI intensity) might isolate Bhaktapur from Kathmandu or Lalitpur because of the potential damage to roads and bridges rendering them impassable to vehicular traffic. Hence, a large earthquake with earthquake shaking equal to or larger than MMI IX might hinder coordination of these hospitals with the ones at the Kathmandu and Lalitpur cities.

Hospitals in the Kathmandu Valley are limited to metropolis and municipalities (Figure 5.2). Large portion of rural and sub-urban Village Development Committees (VDCs) do not have hospitals except one at Sankhu of Kathmandu district. Two other hospitals identified at Jorpati VDC of Kathmandu District are very close to Kathmandu Metropolis. Instead, Village Development Committees have to depend on primary health care centres, health post and sub-health post. These health centres and health posts have insufficient health resources both in terms of human and medical supplies. Primary health care centres have only one doctor and have only three beds capacity where as health posts are without any doctors and beds. Any serious patients are always suggested to refer to city hospitals. Therefore, these rural

health facilities might not play a large role for seriously injured during earthquake disaster unless their capacity is enhanced. However, they can play significant role in providing treatment to slightly injured and for assisting in the stabilization of seriously injured for transportation to the hospitals.

Table 5.1 Comparison of number of hospitals and population in the valley

District	**Population (2001)**	**Representative number of hospitals**	**Population per hospital**
Kathmandu	1,081,845	29	37,305
Lalitpur	3,37,785	7	48,225
Bhaktapur	2,25,461	5	45,092
Kathmandu Valley	1,645,091	41	40,124

Considering the estimated high levels of potential casualties in Kathmandu Valley and the negligible capacity of health centres and health posts, the overall capacity of the hospital is inadequate. It is assumed that the health centres, health posts and sub-health posts play a significant role in providing first aid or other primary health care. Since, the hospitals' capacity is inadequate, it is imperative that focus should be paid to enhance the capacities of the rural health facilites so that the burden on the urban hospitals is reduced during huge disaster.

5.3 Category of Hospitals

Most of the hospitals (61percent) found in the valley are form private sector followed by government (29 percent) and non government organisation hospitals (10 percent) (Figure 5.3). In the government sector there are 5 central level hospitals.

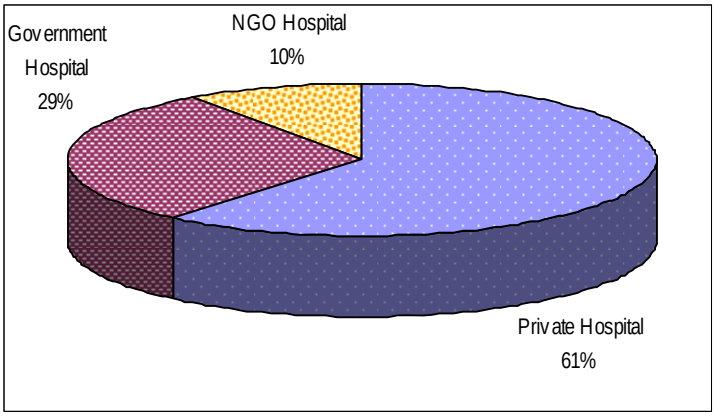

Figure 5.3 Category of hospitals and their percentage in the valley

Along with the sectoral category, hospitals can also be categorised according to their specialization. The table below illustrates the type of hospitals based on their specilization. Though all types of hospitals identified have emergency department except cancer hospital, the general hospitals (63 percent) as well as the teaching hospitals (10 percent) are usually considered to be effective in disaster response because of the broad availability of facilities.

Table 5.2 Types of hospital and the available beds

Types of hospital according to specialization	**Number of Hospitals**	**Beds Available**	**Bed Percentage (%)**
General	26	2,353	48
Teaching	4	1,520	31
Maternity and Children	5	645	13
Infectious Disease	1	100	2
Orthopedic	1	75	1.5
Mental	1	43	0.8
Heart	1	89	1.9
Plastic Surgery	1	46	1.1
Cancer	1	32	0.7
	41	**4,903**	**100**

5.4 Building Ownership and Access to the Hospitals

About 34 percent of sampled hospitals were found running on rented building hinting that they are temporarily located at the current location. Some of the hospitals even have retail shop on the hospital buildings itself Many rented hospitals were also found to be adjecent and attached to other residential buildings The risk of functional collapse of the hospitals increases when they are developed in rental buildings because they are established in the residential buildings and lack typical hospital building design requirements.

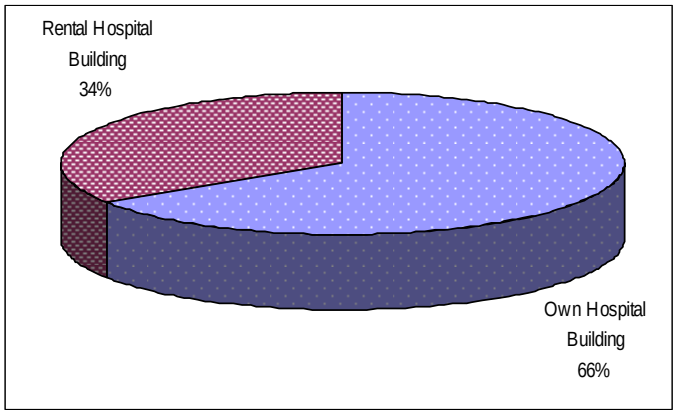

Figure 5.4 Number of hospitals accourding to ownership

Access routes to the surveyed hospitals were also observed with consideration of their possible conjestion during disasters, and based on the criteria below hospitals are classified into very critical, critical and comparatively safe categories.

Critical (C): Hospitals located with an access of inner major urban road but with higher vehicular traffic flow. Comparatively diffucult access for an ambulance due to higher vehicular flow except nighttime.

Very Critical (VC): Hospitals located with an access of minor or feeder narrow roads associated with higher vehicular flow major road. Generally ambulance access is very difficult except nightime. There is almost no parking space for the vehicles.

Comparatively Safe (S): Hospitals located with an immediate access of wider road such as ringroad, highway or major urban roads where there is comparatively thinner vehicular traffic flow. Easy access for ambulance. Suffecient parking space.

Out of 41 hospitals seven hospitals have been identified as having very critcal access twenty four (58 percent) with critical access and rest of ten hospitals (24 percent) are considered to have comparatively safe access. All most all of the hospitals lack alternative routes. Most of the critical and very critical access are heavely built on the both sides of the road. These conditions might hinder rescue and relief operation due to road block resulting from the damage buildings during earthquake disaster and hence might not contribute during earthquake disaster.

5.5 Hardware Capacity at the Hospitals in the Valley

Hospital hardware capacity has been analysed based on bed strength, ambulances, blood bank and other medicial servies.

5. 5.1 Bed Strength

Total bed capacity (including beds in emergency department)of the hospitals surveyed in the valley is found to be 4,903. Out of the total, 85 percent of the total hospital beds are found to be in Kathmandu district alone (Figure 5.1.8). There are around 300 beds in emergency department of these hospitals.

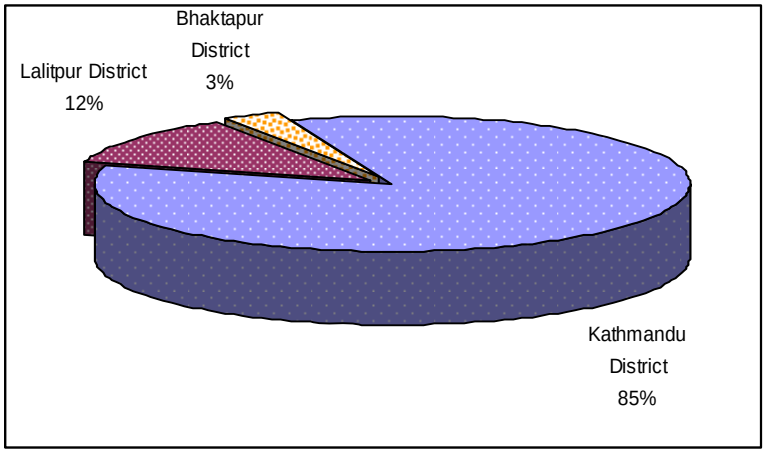

Figure 5.5 Distribution of hospital beds in three districts of the valley

In Kathmandu district too, most of the hospitals (26 out of 29) are located at Kathmandu metropolitan city making large portion of VDCs without any hospitals. The number of beds available in other two district is far less than beds available at the Kathmandu metropolitan city (Table 5.3).

Table 5.3 Distribution of hospital beds in Kathmandu Valley

Place	**Kathmandu District**		**Lalitpur District**		**Bhaktapur District**		
	Metropolitan	VDC	Sub-Metropolitan	VDC	Madhyapur Thimi Municipality	Bhaktapur Municipality	VDC
Number of Beds	3,346	821	591	0	5	140	0

Beds available in Primary Health Care Centres (usually 3 in each centres) are not included.

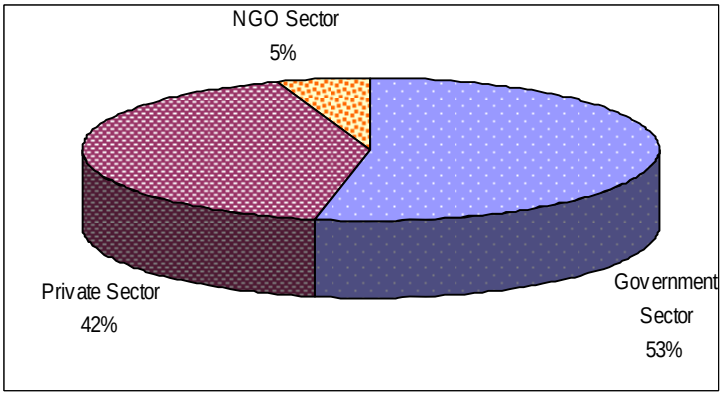

Figure 5.6 Distribution of hospital beds in different sector

Although the number of hospitals in private sector is more than that of public hospitals, the total number of beds in private sector is less than that of government hospitals. This is because many hospitals in private sector are of smaller bed capacity having less or equal to 25 beds (Table 5.4) Hospitals from government sector include central and district hospitals, hence they are of larger bed capacities with usually more than 50 beds. Most of these hospitals have more than 90 percent bed occupancy.

Table 5.4) Distribution of hospital beds in private, government and NGO sector

Number of beds (PS)	**Number of hospitals (PS)**	**Number of beds (GS)**	**Number of hospitals (GS)**	**Number of beds (NGO S)**	**Number of hospitals (NGO S)**
Less or equal to 25	12	Less or equal to 25	0	10	1
25-75	8	25 - 50	2	46	1
100-150	3	50- 125	4	75	1
270	1	200 - 350	3	125	1
700	1	350- 450	3		

PS = Private Sector, GS = Government Sector and NGO S = NGO Sector

Apart from these beds, additional beds and mattress available in hospitals particularly for the purpose of disaster response are 477 (400 mattress and 77 beds). With the addition of these extra beds the total bed capacity of the Kathmandu Valley becomes 5,380. Just as the number of hospitals are concentrated in core urban areas of the Kathmandu Valley their beds are also available for the people of only four municipalities of the valley (Table 5.1.6).

Table 5.5 Representative number of hospital beds and population in different municipalities

Municipality	**Population (2001)**	**Representative number of hospitals**	**Representative number of beds**	**Population per bed**
Kathmandu Metropolitan	6,71,846	28	4, 121	163
Lalitpur Sub Metropolitan	1,62,991	7	591	275
Bhaktapur Municipality	72, 543	4	140	518
Madhyapur Thimi Municipality	47,751	1	5	9,550

However, the existing number of beds available (including extra bed and mattress) in Kathmandu Valley is 5,380. The current capacity of around five thousand beds in hospitals might be just sufficient for the treatment of disaster victims from smaller earthquake intensity

(< VII MMI) provided that the medical supplies are available in the hospitals corresponding to number of beds. But the number of available beds is extremely low (less than 5 percent) as compare to number of victims due to an earthquake of VIII or IX MMI or greater intensity, for which the estimated number of injured is nearly 1,00,000 (Dixit et al, 1999)or 1,47,000 (JICA/HMG,2002) or 3,75,000 (NSET, 2001).

Table 5.6 Comparison of number of injured and total available beds in Kathmandu Valley

Earthquake Intensity	Maximum Injuries	Total Available Beds	Percentage Coverage	Status
VI	100	5,380	> 100 %	Highly Sufficient
VII	3, 750		>100%	Just Sufficient
VIII	112, 500		4.78%	Highly Insufficient
IX	375,000		1.4%	Extremely Insufficient

5.5.2 Ambulances

Most of the hospitals (75%) operate ambulace services. It is found that 10 hospitals are without ambulance. All of the ambulances from the hospitals have stretcher, provision of attaching temporary oxygen cylinder when needed, and a first aid box as the basic life support facilities. No facility exists in the ambulances for providing primary care for critical services such as those for head/spinal injuries, X-ray, etc. The total number of ambulances recorded from surveyed hospitals are 60.

Table 5.7 Distribution of ambulances in hospitals

Number of ambulances	None	One	Two	Three	Six
Number of hospitals	10	13	10	7	1

5.5.3 Blood Bank Unit

Blood Bank Unit is limited to Government hospitals only except in the private sector, Nepal Medical College Teaching Hospital and a NGO sector, Sushma Koirala Memorial Hospital. All of blood bank unit at hospitals, except Sushma Koirala Memorial, are established by Nepal Red Cross Society (NRCS). They are in coordination with Central Blood Transfusion Centre (CBTC) of NRCS. CBTC acts as the main source of blood in these hospital units.

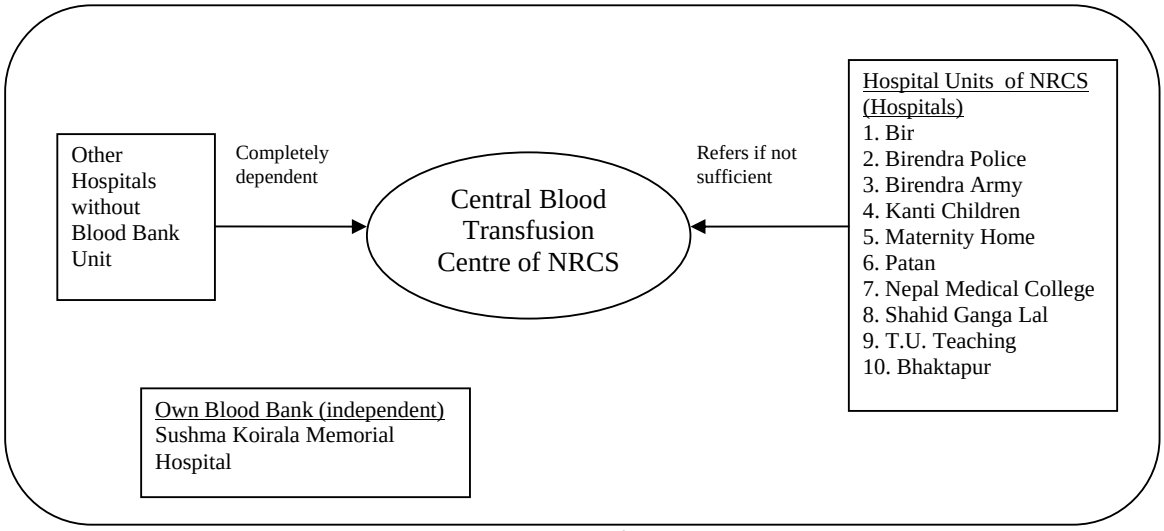

Figure 5.7 Blood Bank in hospitals of the Valley

However, hospital unit's primary function is to provide fresh blood whenever needed from the unit itself, if available. Otherwise from the main source, Central Blood Transfusion Centre of Nepal Red Cross Society (NRCS) or even from patient's relatives. Though these hospital blood bank units generally do not have suffecient stock of blood (with 4-5 units on average available), one of the important functions is to conduct various tests with the blood (blood screening) available to make it suitable for patient's use during an emergency situation.

5.5.4. Other Critical Medical Facilities

All the hospitals are equipped with basic hospital facilities such as x-ray, pathology laboratory and operation theatre. Total number of operation theatre recorded are 132. Other specialized services like Intensive Care Unit (ICU), CT Scan, MRI are not common services available to all hospitals. All together 88 beds for ICU were recorded and MRI facilities are limited only to Birendra Army hospital, MRI centre, Bir Hospital and Blue Cross Nursing Home. These number indicates that there will be huge inadequacy of Operation Theatre as well as ICU which are desperately needed during disaster emergency. Twenty four hour emergency service is available in almost every hospital surveyed except two 2 hospitals.

5.5.5 Health Personnel in Hospitals

The exact number of doctors working in a particular hospital cannot be estimated because of the nature of association of doctors to a particular hospital. However, number of doctors

available in three districts are calculated based on the hospital data collection and assumed number is given in Table. 5.9.

Table 5.9 Number of doctors available in sample hospitals of Kathmandu Valley

District	**Population (2001)**	**Number of doctors in hospitals (excluding interns)**	**Population per doctor**
Kathmandu	1,081,845	1,337	809
Lalitpur	3,37,785	162	2,098
Bhaktapur	2,25,461	51	4,420
Kathmandu Valley	1,645,091	1,550	1,062

It is assumed that there is around 500 intern doctors in the hospitals of the valley which will make about 2,050 doctors available from sample hospitals for the valley. Similarly, there are around 2,500 nursing staffs (includes matrons, sisters, staff nurses, auxiliary nurse midwives (ANM), health assistant, Community Medical Auxiliary (CMA) etc. except labrotary workers) available in hospitals in Kathmandu Valley. All together the valley has the strength of around 4,500 medical personnel to respond during to disasters. The table below shows that the health personnel available will be extremely insuffecient during earthquake intensity bigger than VI MMI.

Table 5.10 Comparision of number of casualties and health personnel available in the valley

Earthquake Intensity	**Maximum Injuries**	**Total Available Human Resources (Doctors and Nursing Staffs)**	**Injured population per Human Resources**	**Status**
VI	100	4,500	0.02	Sufficient
VII	3, 750		0.84	Sufficient
VIII	112, 500		25	Highly Insufficient
IX	375,000		84	Extremely Insufficient

All the hospitals have their own schedule for doctors visit. Generally morning (6am -11 am) and even more during evening (4pm-8 pm) are the most common time for Out Patient Department (OPD) patient or clinical consultation in many of the Small scale (S) (less than 25 beds) and Medium (M) scale private hospitals (less than 100 beds). Large scale (L) hospitals (grater than 100 beds) have more stability in number of doctors during daytime

particularly during office hours usually 9am to 2pm as they being permanent staff of the hospitals Many small scale private hospitals have consulting doctors who are on call doctors and asked to visit only when needed. At night time most of the specialists doctors are refered whenever needed.

The number of doctors and nursing staffs are more during daytime where as the number drastically reduces during the night time. During night small hospitals (S) have at least one night duty medical officer doctor while medium upto five doctors (M) and large (L) upto twenty specialists doctors. The figure below presents the general trend of number of doctors availability in small, medium and large scale hospitals. Generally, small and medium scale hospitals behave similarly hence are considered together. Number of doctors shown is an average and might not exactly represent the actual figure, but it rather shows the general trends of doctors in different scale hospitals.

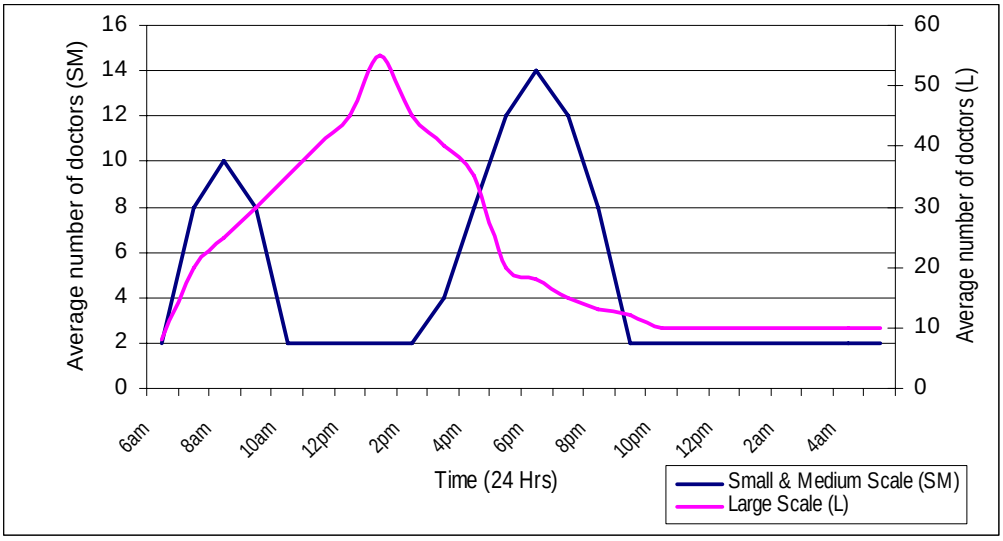

Figure 5.8 Trend of doctors availability in hospitals of Kathmandu Valley

In the case of VDCs, each primary health care centre is run by one doctor along with few other health personnel like staff nurse, assistant nurse midwife, helath assistant etc. Health post and sub-subhealth post do not have any doctors and staff nurses. It is handeled by other health personnel as above including village health workers. The vulnerability of hospitals resulting from unavailability of health personnel increases during night. It can be also be seen that VDCs are more vulnerable with unavailability of doctors during any major disasters.

5.5.6 Critical Facilities

5.5.6.1 Water Supply

The major sources of water for hospitals in the valley are from municipal drinking water supply, deep boring, and vehicle water-tanker supply when necessary. All the hospitals in the valley are supposed to get water from the city network of Nepal Water Supply Corporation. However, the supply is usually not sufficient and hospitals have to depend upon other alternative sources.

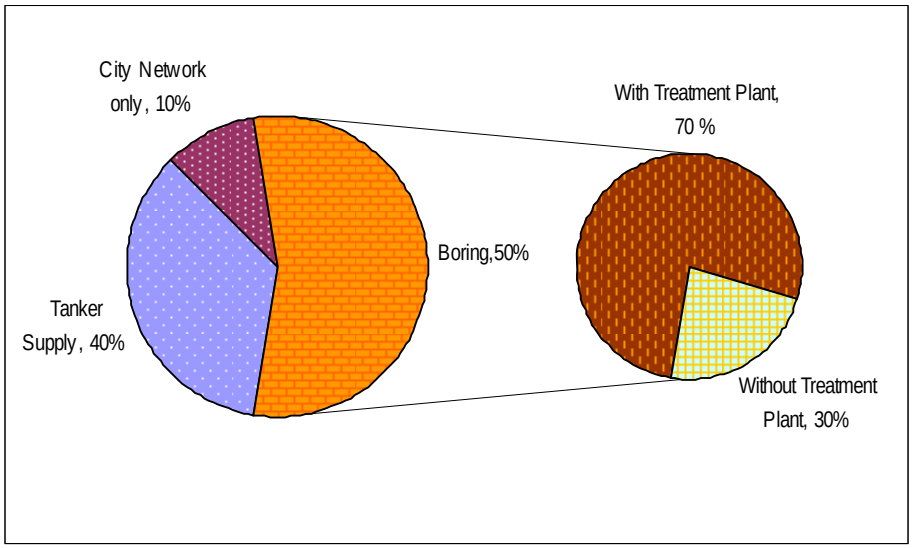

Figure: 5.9 Water Supply alternatives in hospitals

Most of the private hospitals (40 percent) located at the city area, which often depend upon water supply form city network, has an alternate source of water as vehicle water-tanker supply. About 10 percent hospitals are dependent on the water supply from city network only. Majority of hospitals (50 percent) have boring as an alternative or additional source of water, out of which 70 percent have the treatment plant to purify water supplied form boring (Table 5.9).

Availability of water at hospitals seems to be crucial during major earthquake disaster as Dixit, et. al. in 1999 estimates more than 95 percent of water supply pipe damage during major earthquake in Kathmandu Valley. About 50% of the hospitals (Table 5.11), which do not have boring or alternatives and depend upon municipal and vehicle water-tanker supply, is most likely to suffer from shortage of water during an earthquake disaster.

Table 5.11 List of hospitals found with deep boring as alternative water supply

S.No.	Name of hospitals	Water Treatment Plant
1.	Bir	Available
2.	Birendra Police	Available
3.	Birendra Army	Available
4.	Teaching	Available
5.	Om hospital	Available
6.	B&B	Available
7.	Patan	Available
8.	Shahid Ganga Lal	Available
9.	Norvic Escorts International	Available
10.	Sukraraj Tropical Infectious DH	Available
11.	Kathmandu Medical College	Available
12.	Nepal Medical College	Available
13.	Kathmandu	Not Available
14.	Sarvanga	Not Available
15.	Alka	Not Available
16.	Himal	Not Available
17.	Bhaktapur Hospital	Not Available
18.	Rest of the hospitals do not have boring water supply	

5.5.6.2 Electricity

Hospitals have a power supply depended on Nepal Electrical Authority supply through over ground transmission lines. In case of power failure, all of the hospitals surveyed have the alternative backup generator. Most Hospital administrator (95 percent) and responder do not know about the capacity of their generator. Hence, instead they were asked to explain what equipment would run during power failure. Twenty-five (62 percent) hospitals reported that, their generator would support only the most essential services that includes emergency department, operation theatre, ICU, X-Ray and Laboratories. In some hospital (10 percent), X-Rays do not run and ward lights are not fully operated during power failure. Fifteen hospitals (38 percent) reported that their backup generators would allow running every hospital facilities.

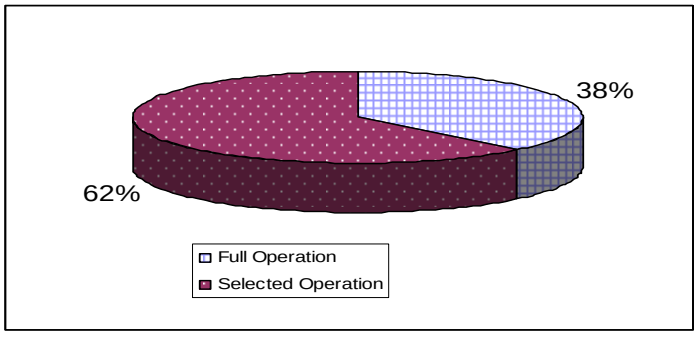

Figure 5.10 Status of back up generators in hospitals

However, all the hospitals have back-up power supply. It is essential especially during an earthquake event where about 40 percent electrical lines and almost all substations (Dixit, et. al., 1999) become useless. There are a large number of hospitals (62 percent) with insufficient back-up power supply in Kathmandu Valley.

5.5.6.3 Communication

Almost all of the hospitals have internal telecom facility but announcement system (mike system) is found only in six major hospitals of the valley.

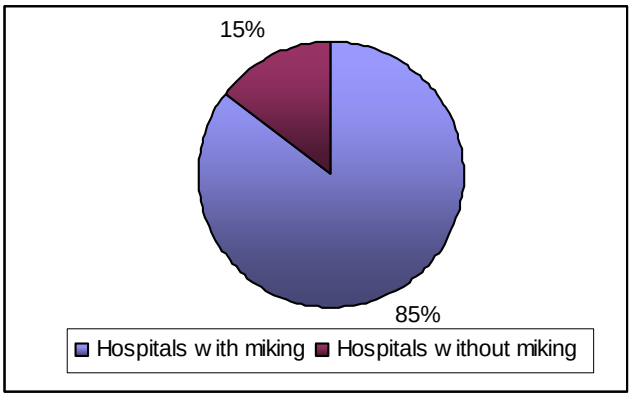

Figure 5.11 Hospitals with mike as announcement systems

These systems play a vital role during emergency for better communication inside the hospital. Though majority of hospitals are without proper announcement system, it seems likely that all the hospitals will be able to maintain communication through intercom or announcement systems.

5.5.6.4 Space Available

Shortage of extra space for medical treatment and temporary settlement for victims of huge disaster such as earthquake in the valley has always been one of major issues in past studies. Hospital surveyed was classified into three categories by observing space available outside the hospital building; no space (virtually no space), moderate space (for the treatment of about 50 patients) and enough space (more than 100 patients). The survey found that ten hospitals (24 percent) have enough space for the medical treatment of more than hundred casualties. Eight (20 percent) of them have virtually no space outside their hospital buildings. As identified earlier (Section 5.1.3), these hospitals are very close to or attached with other

residential buildings. Some of them are immediately adjacent to roads. The rest of the hospitals have some space outside for the treatment of casualties during large disaster.

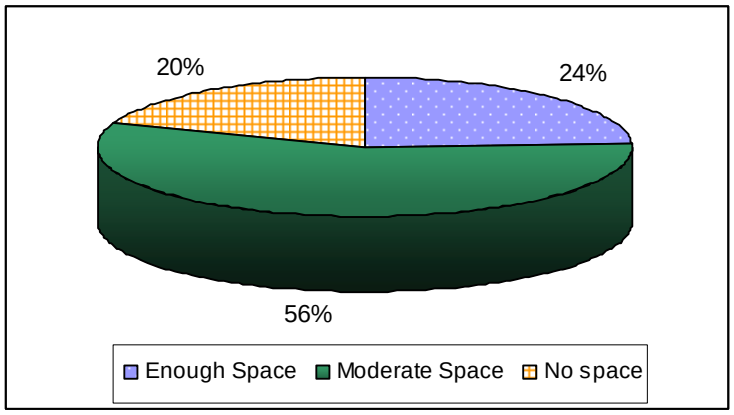

Figure 5.12 Space availability outside the hospitals

5.6 Efforts in Disaster Risk Management

5.6.1 Knowledge on disaster risk management

Most of the hospital administrators are found unaware of earthquake risks and lack seriousness on earthquake risk at the valley. Furthermore, they are unaware about the importance of their hospital during large-scale emergencies. Almost all hospital administrators consulted during survey lack any formal classes, training, workshop etc. on disaster risk management. Training and workshop were limited to few doctors and nurses in few major hospitals of the valley. Even if these staffs (doctors or other health personnel) have taken some training, the information is not disseminated to other hospital staffs. None of them had an idea about structural and non-structural vulnerability in the hospitals. They did not know about various publications that focus hospitals and disaster management.

Currently program like Hospital Preparedness for Emergency (HOPE) implemented by NSET in collaboration with Institute of Medicine, has been introduced to hospitals in various parts of the country. The program provides knowledge on assessing and addressing structural and non- structural vulnerabilities of hospitals as well as makes the participants learn how to develop disaster management plan for their institutions.

Table 5.12 List of health institutions in Kathmandu Valley whose staff has attended HOPE course

S.N	Name of the hospital	Doctors	Nurses
1.	TU Teaching Hospital /Institute of Medicine	9	8
2.	Bir Hospital	1	3
3.	Birendra Army Hospital	3	None
4.	Patan Hospital	3	None
5.	Kanti Children Hospital	1	1
6.	Kathmandu Medical College Teaching Hospital	2	None
7.	Nepal Medical College Teaching Hospital	1	None
8.	National Kidney Centre	None	1
9.	Rest of the hospitals in the Valley have not attended HOPE course		

5.6.2 Disaster Management Plans and Preparedness Efforts

It was found that nine of hospitals in the valley have developed a disaster management plan and two of them are planning to develop the plan. Some hospitals have their disaster management plan limited to oral plan and lack a written form and some needs to revise their plan because of some changes in the hospitals. Emergency management drill for at least once was found to be conducted in hospitals with disaster management plan. However, these hospitals do not conducted drills on regular basis except for Patan Hospital, which conducts this exercise annually. Several organisation / agencies such as NSET, NRCS, and WHO-EHA have been involved in conducting drills in the hospitals.

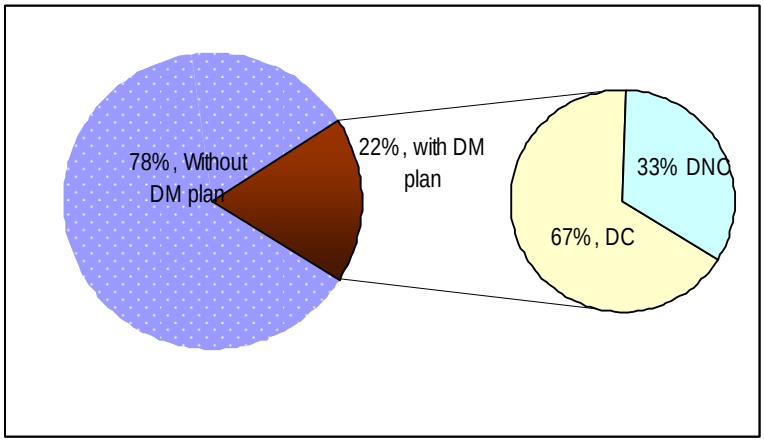

Figure 5.13 Percentage of hospitals with or without disaster management plan

DC = Drill Conducted DNC = Drill Not Conducted

Disaster stores are limited to hospitals having disaster management plan only. These hospitals have stock of emergency medical supplies too. The data on exact amount of stock of these supplies was not possible to collect in this study. However, it is recommended to collect information in this aspect. Usually, hospitals without disaster management plan rely on pharmacy of the hospital itself or pharmacies nearby hospitals for emergency medicine supply.

Table 5.13 List of hospitals having Disaster Management Plan

S. N	Name of the hospitals	Status	Performed Drill at least once	Presence of Disaster Store
1.	Bir hospital	no written plan	Yes	Yes
2.	Birendra Police	written	Yes	No
3.	Birendra Army	written	Yes	Yes
4.	T.U. Teaching	written	Yes	Yes
5.	Om hospital	written	No	Yes
6.	Model hospital	written	No	Yes
7.	B&B	to be revised	Yes	No
8.	Patan	written	Yes	Yes
9.	Sushma Koirala Memorial	no written plan	No	No
10.	Kathmandu Medical College	Planning to	No	No
11.	Nepal Medical College	Planning to	No	No
12.	Other hospitals do not have disaster management plan			

The hospital will not be capable to provide medical treatment to large number of casualties during the time of huge earthquake disaster if it continues to work with normal procedures. Therefore, it is necessary to have disaster management plan in order to have efficient and timely response to disaster victims. Above figures suggests that many hospitals (78 percent) in the valley lacks disaster management plan and even hospitals with the plan, have not conducted regular drills that tests the plan. This might be one of the several reasons for hospitals to suffer from functional collapse during major earthquake disaster in the valley.

5.7 Current Efforts for Improving Disaster Preparedness and Emergency Response Capacity Enhancement of the Health Sector

There are several efforts from Government agencies, UN, NGO and donor organisation for improving disaster preparedness and emergency response capacity enhancement of the health

sector. Currently following institutions / agencies are the major contributors for the disaster risk management in health sector.

1) Epidemiology and Disease Control Division (EDCD) of Ministry of Health and Population
2) World Health Organisation, Emergency and Humanitarian Action Nepal (WHO-EHA)
3) Disaster Health Working Group (DHWG)
4) National Society for Earthquake Technology Nepal (NSET)

5.7.1 Epidemiology and Disease Control Division (EDCD)

Epidemiology and Disease Control Division is one of the six divisions of Department of Health Services (DHS) under Ministry of Health and Population (MOHP) in Nepal. The main activities of this division is the prevention and control of vector borne diseases, food and water borne diseases, zoonoses, communicable diseases outbreaks management and early warning reporting system surveillance of selected diseases from sentinel sites.

The division is also the key institution for health sector emergency preparedness and response in the country. It has a Disaster Management Section for the emergency preparedness and disaster risk management that is actively supported by World Health Organisation (WHO) – Nepal. Together with WHO-EHA, and NSET, the division has carried out various activities in health sector disaster risk management. Some of the collaborative achievements are discussed section 4.2.4.

MOHP, DHS and EDCD has also established Rapid Response Team (RRT) at three levels: central team, 5 regional teams and 75 district teams, whose primary function is to establish an early warning and reporting mechanism (EWARS) for potential epidemics. This includes information gathering, investigation, verification, and appropriate response. Recently, EDCD with technical and financial support from Emergency and Humanitarian Action (EHA), WHO, has started providing training to district RRT to enhance the knowledge on emergency preparedness and the disaster response capacity of the districts.

5.7.2 WHO-EHA Nepal

Emergency and Humanitarian Action (EHA) of World Health Organization (WHO), is actively supporting the efforts of EDCD to enhance the capacity of the health sector to cope

with various type of emergencies. Apart from assessing, monitoring and planning, this involves conducting training seminars and simulation exercises, promoting best practice, institutionalizing coordination and enhancing preparedness. Simultaneously, WHO aims to reduce the vulnerability of the health system by assessing seismic risks, publishing guidelines and supporting mitigation.

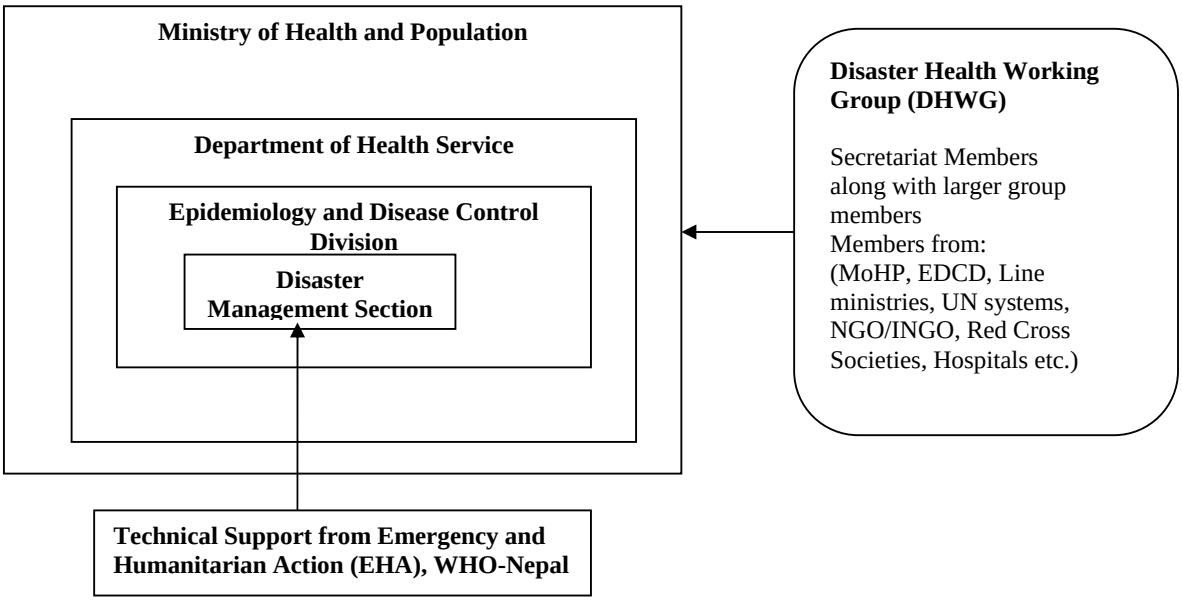

Figure 5.14 Overall coordination in the health sector disaster risk management

5.7.3 Disaster Health Working Group (DHWG)

The DHWG was formed as Health Working Group during the national flood disaster in 1993, when then His Majesty's Government requested the assistance of the United Nations for coordinating incoming disaster relief. By the end of 2000, WHO and EDCD decided to revitalise the Disaster Health Working Group and a Secretariat of interested organisations and institutions initiated. The DHWG and its Secretariat was institutionalised as a legal body for disaster preparedness and response within Ministry of Health in October 2003.

The group consists of members from the Government, United Nations, donor agencies and Non-government organisations. While the DHWG Secretariat consists of 11 permanent members, the whole group consists of approximately 50 representatives from various agencies/institutions related to the emergency planning process. Along with Secretariat it consists members from Ministry of Home Affairs, Ministry of Health, Ministry of Local Development, Department of Health Service, Epidemiology and Disease Control Division,

USAID, NRCS, NSET, UNDP, UNICEF, WHO, Major Hospitals of the country, Nursing Home Association and Representative of Medical Colleges.

Under the guidance of the Ministry of Health and the Department of Health Services, the Disaster Health Working Group Secretariat is responsible for comprehensive and effective inter-agency emergency planning as well as initiation, implementation and evaluation of necessary preparedness programmes and response mechanisms in the health sector.

5.7.3.1 Major Activities and Achievements of Collaborative Efforts from EDCD, WHO-Nepal and Disaster Health Working Group

EDCD in collaboration with WHO-Nepal and a coordinate effort of DHWG has performed several activities in the field of disaster risk management in the health sector.

Major achievements until now includes:

- Publications and Dissemination of Guidelines
- Seismic Vulnerability Assessment of Hospitals and Related Publications
- Enhancement of Capacity for Mass Casualty Management

5.7.3.2 Publications and Dissemination of Guidelines

Following publications and templates have been produced for disaster risk management in health sector. Brackets contain the name of publishers.

- Health Sector Emergency Preparedness and Disaster Response Plan, 2003 (EDCD/DHS and WHO).
- Guidelines on Emergency Preparedness and Disaster Management for Hospitals, 2002 (EDCD/DHS and WHO).
- Guidelines for Seismic Vulnerability Assessment of Hospitals, 2004 (NSET and WHO).
- Guidelines on Best Public Health Practices in Emergencies for District Health Workers, 2003 (EDCD/DHS and WHO).
- Guidelines on Non-Structural Safety in Health Facilities, 2004 (EDCD/DHS and WHO).

- Computer-Based Mass Casualty Management Simulation Exercises MUSTER Guidelines, 2003 (EHA SEARO).
- A Structural Vulnerability Assessment of Hospitals in Kathmandu Valley, 2002 (EDCD / DHS, NSET & WHO).
- Rapid Health Assessment format and related guidelines.
- Mass Casualty Management – A Training Video from WHO Nepal (EDCD / DHS and WHO).
- Poster on Myths and Realities of Natural Disasters (EDCD / DHS and WHO).
- National template for triage tags utilising four colour codes.

5.7.3.3 Seismic Vulnerability Assessment of Hospitals

NSET- Nepal in collaboration with WHO- Nepal has conducted seismic assessment of hospitals that includes.

- Structural Vulnerability Assessment of 14 major hospitals in Kathmandu Valley
- Non-Structural Assessment of 9 hospitals (4 hospitals in Kathmandu Valley and 5 out side the valley).

5.7.3.4 Enhancement of Capacity for Mass Casualty Management

- Mass Casualty Management Simulation Exercises (MUSTER)- Computer-based Simulation Exercises has been conducted to several hospitals in Nepal.
- Mass Casualty Management (MCM) training and mock drills in Kathmandu, Pokhara & Bharatpur in the year 2002, 2003 and 2004.
- Development of a national template for Triage Tags for Mass Casualty Management.

5.7.4 National Society for Earthquake Technology Nepal (NSET)

National Society for Earthquake Technology Nepal is a national non-government organisation, which is continuously working in the field of earthquake safety both inside the country and as well as outside the country. It was formed in 1994 with a vision of achieving "Earthquake Safe Communities in Nepal by 2020".

Some of the highly recognized programs and projects of NSET includes,

- Kathmandu Valley Earthquake Risk Management Project (KVERMP),
- School Earthquake Safety Program (SESP),
- Community Based Disaster Management Program,

- Public Awareness Program,
- Disaster Inventory / Information Management System in Nepal (DIMS),
- Seismic Vulnerability Assessment of Major Hospitals of Nepal,
- Seismic Vulnerability Assessment of Drinking Water Supply Network of Kathmandu Valley,
- Kathmandu Valley Earthquake Preparedness Initiative (KVEPI) and
- Program for Enhancement of Emergency Response (PEER)

5.7.4.1 Health Sector Programs of NSET

NSET's work in health sector is based on the fact that lack of Medical Response contributes about 15% to the overall risk of casualty due to earthquake in Kathmandu Valley NSET's program in this sector can be classified into the following facilitating initiation for enhancing health-sector preparedness.

5.7.4 2 Survey, Awareness and Advocacy

A first-ever survey of the capacity of 12 major hospitals of Kathmandu Valley was undertaken as apart of Kathmandu Valley Earthquake Risk Management Project (KVERMP) Earthquake Scenario development. The lack of hospital capacity and hospital coordination urged during a scenario earthquake was highlighted in the action plan workshop and subsequently in the general awareness programs of NSET. NSET also initiated formal and informal policy dialogue with concerned government and agencies since 1998.

5.7.4.3 Capacity Building and Conducting of Drills

NSET undertakes regular orientation programs in both public and private hospitals. The HOPE course is conducted in Nepal as a part of the regional initiative. NSET is assisting the Institute of Medicine in institutionalisation of HOPE as regular course in the MBBS program and also as a continuing program. NSET has conducted drills on several hospitals. Details on capacity building is also highlighted in Section 4.2.5.2.

5.7.4.4 Publication and Outreach

NSET consolidated the experiences of vulnerability assessment of hospitals into a publications such as Guidelines for Seismic Vulnerability Assessment of Hospitals, Non-Structural Vulnerability Assessment of Hospitals in Nepal and Structural Vulnerability Assessment of Hospitals in Kathmandu Valley. The methodology of the assessment was

presented in a special session of the UNISDR World Conference in Disaster Reduction, Kobe, 2005 which NSET organised in association with WHO headquarters.

5.7.4 5 Program for Enhancement of Emergency Response (PEER)

Program for Enhancement of Emergency Response (PEER) is a regional training program initiated in 1998 by the U.S. Agency for International Development / Office of U.S. Foreign Disaster Assistance (USAID/OFDA) to strengthen disaster response capacities in the five countries of Asia. The purpose of the Program is to enhance disaster response capacities in five countries Bangladesh, Indonesia, India, Nepal, Philippines and the Pakistan. These countries were selected based on their high seismic vulnerability, their need to improve their disaster response capacity, and the interest on the part of their national governments to participate in the program.

PEER implements activities in Nepal under the coordinating authority of the Ministry of Home Affairs. PEER-NSET has signed a Memorandum of Understanding (MOU) with the Nepal Police and Ministry of Home Affairs that serves as the Lead Training Institution. To institutionalize Medical First Responder (MFR) and Collapsed Structure Search and Rescue (CSSR) training in Nepal, The Royal Nepalese Army, Nepal Armed Police Force and the Nepal Red Cross Society are also participating MFR/CSSR training institutions. PEER Hospital Preparedness for Emergencies (HOPE) programming is implemented in Nepal in partnership with the Institute of Medicine (IOM), Tribhuvan University, with which PEER-NSET has also signed a Memorandum of Understanding (MOU).

PEER training courses includes three principal courses:

1) Medical First Responder Course (MFR)
2) Collapsed Structure Search and Rescue (CSSR)
3) Hospital Disaster Preparedness (HOPE)

Apart from the above three principal courses other additional courses include:

1. Training for Instructors (TFI)
2. Training for Instructors Hand-off Workshop
3. Medical First Responder Workshop
4. Collapsed Structure Search and Rescue Workshop

5.7.4 6 Medical First Responder Course (MFR)

This course provides knowledge and skills necessary to assess, treat and transport the sick and injured as a result of an emergency or disaster. Staffs of emergency and disaster agencies with first responder roles including Fire Departments, Red Cross/Red Crescent Societies, Police Departments, and rescue organizations associated with local and national emergency response systems are the target audience for the course.

5.7.4.7 Collapsed Structure Search and Rescue (CSSR)

The course provides knowledge and skills necessary to search and mark collapsed structures and stabilizes and extricate victims using the safest and most appropriate procedures and available equipments. Emergency and disaster professionals with first response search and rescue roles, including staff of Fire Departments, Red Cross/Red Crescent Societies, Police Departments, and Search and Rescue (SAR) groups associated with local and national emergency response systems are the target audience for the course.

5.7.4.8 Hospital Preparedness for Emergencies (HOPE)

The course provides the knowledge and skills to assess and address structural and non-structural vulnerabilities of medical facilities to disasters. It provides knowledge for the development well-designed organizational and medical plans for effectively responding to mass casualty events and to maintain medical functions even during disaster when their facilities gets affected. The intended participants of the HOPE course include hospital administrators and leaders, doctors, nurses and other medical and management staff of medical facilities in vulnerable areas.

5.7.4 9 Achievements of PEER in Nepal

PEER conducted twelve different programs in Nepal during March 2003 – March 2008.

The course has produced following number of graduates and instructors until March 2008. These Instructor Workshop (IW) graduates can be utilized as assistant instructors and instructors for PEER courses.

Table 5.14 Number of PEER graduates until December 2007

Courses	HOPE	HOPEIW	MFR	MFRIW	CSSR	CSSRIW	TFI	MIW	K9
Total number of Graduates	69	26	78	31	64	25	61	7	20

HOPE: Hospital Preparedness for Emergency course
HOPEIW: HOPE Instructor Workshop
MFR: Medical First Respondent course
MFRIW: MFR Instructor Workshop
CSSR: Collapsed Structure Search and Rescue course
CSSRIW: CSSR Instructor Workshop
TFI: Training for Instructors Course
MIW: Master Instructor Workshop

5.8 Summary on Disaster Management Related Efforts in Health Sector

In summary, efforts from health sector include coordinated efforts in disaster risk management and covers pre-disaster preparedness to post-disaster rescue and assistance. Publications such as *Guidelines on Seismic Vulnerability Assessment of Hospitals (NSET /WHO, 2004), Guidelines on Non- Structural Safety in Health Facilities (EDCD/DHS/WHO,* 2004) and *Guidelines on Emergency Preparedness and Disaster Management for Hospitals, (EDCD/DHS/WHO, 2002)* are very useful for health facilities to understand the existing vulnerabilities and risks in their institutions. These documents acts a tool to alert and aware the hospital management and encourage them to develop disaster management plan for their institutions. Mass casualty management introduction and training has aware and has increased the disaster response capacity. The concept of DHWG is one of the major achievements in health sector emergency preparedness and response during disaster. DHWG acts as single platform for different line ministries, institutions and agencies responsible for disaster risk management. Health Sector Emergency Preparedness and Disaster Response Plan Nepal (DHWG/EDCD/WHO, 2003) is the most significant outcome of DHWG coordinated efforts. NSET–PEER for the first time in the country has introduced MFR and CSSR course. HOPE program directly aware hospital management regarding their responsibilities and roles disaster and assists them to develop disaster management plan for their hospitals.

Hence, health sector have realized the inevitability of earthquake disaster in Nepal and recognized their roles and responsibilities during disaster.

CHAPTER SIX
CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary and Conclusions

The study was carried out with the aim of finding out the existing disaster risk management capabilities in the health sector of Kathmandu Valley. For this purpose, forty-one hospitals (government, private and NGO) of the valley were selected as sample hospitals and detail capacity survey was conducted based on a structured questionnaire. Apart from the hospital capacity survey, various other health sector institutions / agencies' efforts in disaster risk management was identified. After identifying these capacities and efforts, priority needs in the health sector was determined. The data gathered from these health institutions were analysed based on the number and distribution of hospitals inside the valley, their hardware capacities, health personnel availability, conditions of the critical facilities, and their disaster management efforts.

A majority (71 percent) of the hospitals are located in the core urban area inside the Ring Road of the valley. Furthermore, these hospitals are limited to densely populated metropolis and municipalities except in the case of Kirtipur Municipality where there is no major hospital. Hospitals inside the ring road and its immediate periphery as being geographically near, can work in collaboration, if a mechanisms is established, to respond effectively during major a disaster. There is a very small number of hospitals with small capacities in Bhaktapur District. The hospitals in this district are isolated form hospitals inside the ring road with only a bridge and a single highway. Hence, a large earthquake with the earthquake shaking equal to or larger than MMI IX might hinder coordination of these hospitals with the ones at the Kathmandu and Lalitpur cities and cause extreme deficiency of medical facilities in Bhaktapur. Large part of Village Development Committees (VDC) of the valley has no hospitals. VDCs without hospitals are dependent on primary health care centres, health post and sub-health post. These rural health institutions suffer from insufficient health resources both in terms of human and medical supplies and hence, might not play a significant disaster response role during earthquake disaster unless their capacity is enhanced.

The existing number of beds available in the valley is 4,903 and with the addition of extra bed and mattress, the emergency state capacity increases to 5,380. This number of beds might

be just sufficient for earthquake of smaller intensity (less than VII MMI). But the number of available beds for the treatment of victims is extremely low as compare to the number due to an earthquake of VIII or IX MMI intensity where nearly 1,00,000 to 1,50,000 injuries is expected.

Fourteen hospitals (34 percent) in the private sector are found running on rented buildings and lack typical requirements for hospital buildings. About 71 percent of hospitals have critical and very critical access and almost all the hospitals are without any alternative access. Most of the roads to hospitals are narrow, with high vehicular flow and heavily built-up on both sides of the roads. Hence, access to hospitals is likely to be hindered during any major earthquake events reducing the overall available medical facilities.

Blood banks are limited to government hospitals and usually lack sufficient blood storage. Number of ambulances, operation theatres and intensive care units in the whole valley is found to be only sixty, one hundred thirty two and eighty-eight respectively. The numbers of these facilities is extremely low and should be considered before any major earthquake disaster.

The number of doctors available in the hospitals is difficult to calculate, as there is no systematic association of doctors with the hospitals. However, it is calculated to be around 2,050 doctors and 2, 500 nursing staffs. The number of attending doctors and nursing staffs is more during daytime whereas the number drastically reduce during night time. It is also found that VDCs are more vulnerable with unavailability of doctors during any major disasters.

About 50 percent of the hospitals which do not have boring or alternatives and depend upon municipal and vehicle water-tanker supply, is most likely to suffer from shortage of water during an earthquake disaster. All the hospitals have back up generator though not all of them could run all the hospital facilities during power failure. All the hospitals have intercom facilities while mike system or announcement system is limited to six hospitals only. Similarly, sufficient space outside the hospitals (for the treatment of more than 100 casualties) is found in ten hospitals (24 percent) only while (20 percent hospitals) virtually do not have any space outside the building.

Most of the hospital administrators are found unaware of earthquake risks and lack any formal classes, training, workshop etc. on disaster management. Only nine hospitals (22 percent) have made disaster management plan. Among them, seven of them have written plan while other two are limited to oral plan. Three (33 percent) hospitals having disaster management plan have not conducted drill to test the plan. With these estimates, many hospitals may suffer from functional collapse when there is sudden and large inflow of casualties during major earthquake disaster.

Apart from hospitals, government and non-government institutions / agencies, UN systems have carried out several activities in improving disaster preparedness and emergency response capacity enhancement of the health sector. Epidemiology and Disease Control Division (EDCD) is the key institution for health sector emergency preparedness and response in the country. Emergency and Humanitarian (EHA) of WHO is actively supporting the efforts of EDCD to enhance the preparedness and emergency response capacity of the health sector. Disaster Health Working Group (DHWG) institutionalised by Ministry of Health and Population (MOHP) acts as single platform for different line ministries, institutions and agencies responsible for disaster risk management and hospitals. "Health Sector Emergency Preparedness and Disaster Response Plan Nepal" is one of the most significant outcomes of DHWG coordinated efforts. NSET has played a significant role in facilitating initiation for enhancing health-sector preparedness. Major achievements of these coordinated efforts include; publications and dissemination of guidelines, seismic vulnerability assessment of hospitals including its publications and enhancement of capacity for mass casualty management through trainings and simulation exercises.

In general, capacities for preparedness and response during disaster have started being developed in health sector of Kathmandu Valley although much effort is required to improve the present situation. Considering that the number of fully functional hospitals reduces with the increase in intensity of earthquake (>VI MMI) and most of larger hospitals already with high bed occupancy, the existing hospital capacity in the valley will be extremely insufficient for huge earthquake of VIII or IX MMI or greater intensity. However, the concerned people have started realizing this enormous insufficiency and are taking some positive measures for response during earthquake disaster. Efforts are being made by government, non-government, institutions / agencies, international bodies, UN systems and hospitals to enhance

preparedness and capacities and of the health sector in the valley as well as throughout the country.

6.2 Recommendations

Based on the above mentioned conclusions, the following recommendations are made.

- There should be a comprehensive database of all the hospitals in the valley. The Ministry of Health and Population should establish such system and ensure that it is continually updated.
- All the hospitals must perform structural and non-structural assessment including the assessment of critical facilities and work forward fulfilling the gaps identified. The results of these assessments should be followed on and implemented on priority basis.
- The worst-case disaster scenario is considered as the one giving IX MMI or more shaking. Ideally, the hospitals should be prepared for such scenario. However to start with, health institutions should plan at least for an earthquake scenario of intensity VII MMI as these earthquakes are usually frequent in the Kathmandu Valley and cause potential damage to humans and health infrastructures.
- HOPE should be institutionalised by the current government as a part of national health program and introduce to all the hospitals in Nepal including Kathmandu Valley. The Institute of Medicine (IOM) should be supported in this endeavour.
- DHWG must meet on regular basis for emergency preparedness and disaster response of the health sector.
- Disaster management plan must be developed by every health institutions including performance of regular drills and simulation exercises to test the plan
- Health personnel must be well trained in disaster risk management and implementation of plan. As a short-term initiative, the workforce of emergency of hospitals should be trained in emergency response.
- Emergency preparedness and response planning and implementation should equally reach to the Primary Health Care Centres, Health Posts and Sub-Health posts at rural level.
- Rapid Response Team (RRT) must be strengthened for emergency preparedness and response especially for remote VDC areas.

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