NEPAL COUNTRY REPORT

GLOBAL ASSESSMENT OF RISK

ISDR Global Assessment Report on Poverty and Disaster Risk 2009

FOREWORD

Floods, landslides, fires, hailstorms, drOught and other hazards frequently affect the population of Nepal.

Floods, landslides, fires, hailstorms, drOught and other hazards frequently affect the population of Nepal. Every year natural disasters cause a large number of deaths and property losses.

Efforts have been made to understand the cause and effect of hazardous phenomena since 1970s through the use of topographic, geologic, hydrologic, climatologic, and land-use maps. Several large-scale disasters of the late 1980s and 1990s, and the influence of the International Decade for Natural Disaster Reduction (IDNDR, 1990-1999) further emphasized the need to address the problem of natural hazards such as earthquakes, landslides and floods, with the aim of reducing their potential impact, especially for securing infrastructure that started being constructed all over the country in those years.

As a signatory to the Hyogo Framework for Action (HFA 2005-2015) and as an active participant of the HFA process at national, regional and international levels, Nepal formulated the recently approved National Strategy for Disaster Risk Management through a participatory process involving all stakeholders working in all sectors of national economy.

Disaster risk reduction has been an integral part of certain sections of previous National Development Plans, especially with regards to large infrastructure development projects, but such considerations have not been common sections related to the "softer"areas of the country's development, such as poverty reduction. Development and disaster reduction specialists have worked separately, although subjective statements such as "disasters impact the poor the most" or "disaster offsets many years of development", are common, especially after a disaster event.

In this context, the present study is a first attempt at analysing the relationship between disaster impact and poverty. It is based on analysis of secondary data from the Disaster Information Management System (DesInventar Database for 1971-2007), Nepal Living Standards Survey, 1995/96 & 2003/04, census data and other statistics on poverty and economic development.

The empirical evidence supports the widely-held view that disasters generally exacerbate poverty (with the interesting exception of floods, where the evidence is much less clear). The study also reveals several methodological nuances. Aggregated data on poverty or disasters failed to reveal the relationship; but when the data are disaggregated to the sub-district level, the relationship starts revealing itself, enhancing the importance of disaggregated data in future research on the impact of natural disasters and poverty.

I hope that more detailed studies will be carried out in the future to reveal the two-way cause-effect relationship between disasters and poverty. And that policy-makers will encourage such studies and use their findings to better manage risk in Nepal.

Robert Piper
UN Resident and
Humanitarian Coordinator for Nepal
UNDP Resident Representative

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During the course of research, there was interaction with many specialists on poverty studies. Their cooperation is acknowledged in providing lead to pertinent literature and also useful suggestion. The study team was greatly motivated by their sincere appreciation of the research efforts.

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ABBREVIATIONS

BCPR	Bureau for Crisis Prevention and Recovery
CBS	Central Bureau of Statistics
CDO	Chief District Officer
CDR	Central Development Region
CDRC	Central Disaster Relief Committee
DDRC	District Disaster Relief Committee
DMG	Department of Mines and Geology
DOHM	Department of Hydrology and Meteorology
DOR	Department of Roads
DOSC	Department of Soil Conservation
DWIDP	Department of Water Induced Disaster Prevention
EDCD	Epidemiology and Diseases Control Division (of the Ministry of Health)
EDR	Eastern Development Region
FWDR	Far-Western Development Region
GAR	Global Assessment of Risk
GDP	Gross Domestic Product
GIS	Geographical Information System
GLOF	Glacier Lake Outburst Flood
GON	Government of Nepal
HKH	Hindu Kush Himalaya
ICIMOD	International Centre for Integrated Mountain Development
IDNDR	International Decade for Natural Disaster Reduction
ISDR	International Strategy for Disaster Reduction
JICA	Japan International Cooperation Agency
LARED	Latin American Network of Social Studies on Disaster Prevention
LDC	Local Disaster Committee
LDO	Local Development Officer
LNDR	Local Natural Disaster Relief Committee
MBT	Main Boundary Thrust
MCT	Main Central Thrust
MGDs	Millennium Development Goals
MOES	Ministry of Education and Sports
MOHA	Ministry of Home Affairs
MOHP	Ministry of Health and Population
MWDR	Mid-Western Development Region
NCDRM	National Commission for Disaster Risk Management
NCRA	Natural Calamity (Relief) Act, 1982
NDRR	Natural Disaster Relief Regulations
NRCS	Nepal Red Cross Society
NRs	Nepalese Rupees
NSDRM	National Strategy for Disaster Risk Management
NSET	National Society for Earthquake Technology - Nepal
OFDA	Office of Foreign Disaster Assistance
PRSP	Poverty Reduction Strategy Papers
RDRC	Regional Natural Disaster Relief Committee
RTSC	Relief and Treatment Sub Committee
SSRSC	Supply, Shelter and Rehabilitation Sub-Committee
TU	Tribhuvan University
UN	United Nations
UNDP	United Nations Development Programme
VDCs	Village Development Committees
WDR	Western Development Region

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1 BACKGROUND CONTEXT

1.1 INTRODUCTION

Nepal experiences a variety of natural hazards that occur throughout the year. People live with hazards, accepting them as part of life. A fatalistic view to nature's vagaries is widely held, although Nepalese have learned, to some extent, strategies to reduce their risk and to manage the impacts of smaller disasters particularly. But the frequency and intensity of hazards is on the increase – as is the risk, because of population growth, lack of natural resources and, most importantly, the absence of organized approaches to disaster reduction and response as the traditional coping mechanisms are no longer able to address the problems.

But since the 1950s, Nepal has emphasized science and technology as tools for hazard mitigation. It has also used opportunities created by developing knowledge and more recently, by global campaigns such as the International Decade for Natural Disaster Reduction (IDNDR), 1990-1999.

The Hyogo Framework for Action 2005-2015 (HFA) has proved a major inspiration. Nepal developed a Draft National Strategy for Disaster Risk Management (NSDRM) that seeks to reorganize the existing system of disaster reduction and emergency response. The country is also making efforts to improve the legal environment by working to create a new Act to replace the existing Calamity (Relief) Act 1982. Many other good practices and methodologies have also been developed and implemented.

Nonetheless, disaster risk reduction has remained largely detached from development. Disasters have not been included adequately in Poverty Reduction Strategy Papers or in the Millenium Development Goals. Development and disaster specialists did not consult and have been unaware of the necessity to jointly discuss the problems of poverty, migration and internal displacement, livelihoods and so on in the light of disasters as one of the causative factors. Mainstreaming disaster, a priority action of the HFA therefore became difficult.

At the same time, disaster responses over the past decade have not adequately recognized that the poorest people were those that suffered most, because of their inherent vulnerabilities, physical and otherwise. Socio-economic status is one of the main determinants of vulnerability to disaster. The need to research the cause and effect relationship between disaster and poverty has become crucial if disaster management is to be integrated into development efforts.

This Country Report presents the background on the disaster and poverty situation in Nepal, the methodology employed and the outcomes of research that explored the relationship between poverty and disasters in Nepal. It has been prepared by the National Society for Earthquake Technology – Nepal (NSET) under the guidance and supervision of the United Nations Development Programmeme, Nepal (UNDP–Nepal) as a part of the Global Assessment of Risk (GAR) project, led by UN-ISDR globally.

1.1.1 Objectives and structure of the Report

The main objective of the study was to explore, based on available limited secondary data, the relationship between disaster and poverty. The impacts of disasters on the dynamics of poverty have been analyzed quantitatively, while the susceptibility of existing vulnerabilities to disasters has been considered qualitatively, because of lack of relevant research-based data.

The report is structured into eight chapters. Chapter 1 describes the geographical, economic and administrative (political) situation of Nepal. Chapter 2 provides the current status of the poverty and human development profiles of Nepal. Chapter 3 discusses the disaster profile of the country based on secondary information on geology, geomorphology plus the disaster database (DesInventar database) that is available for the period 1971-2007. Chapter 4 analyses selected disaster types in order to understand risk and disaster impacts on populations. Extensive and intensive risk profiles of

the country are examined in Chapter 5, while Chapter 6 analyses the relationship between risk and poverty – a central thrust of this report. Chapter 7 reviews current policies and programmemes for disaster risk reduction and poverty reduction in the country, and explores strategies for a comprehensive disaster risk reduction (DRR) in the country. Finally, Chapter 8 offers conclusions and identifies possible next steps.

1.1.2 Nepal: Location & Geography

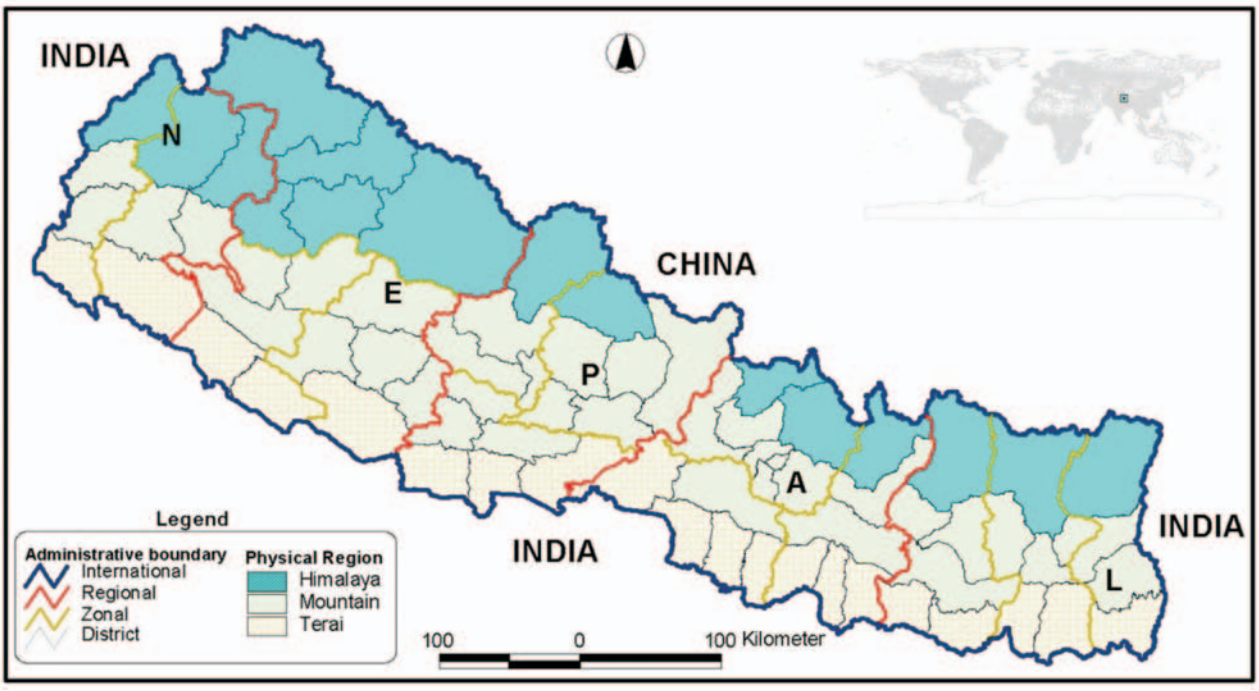
Nepal lies between 80°4′ and 88°12′ East longitude, and from 26°22′ to 30°27′ North latitude, covering a territory of approximately 147,181 km² that extends roughly 885 km from east to west. It is a landlocked country, surrounded by India to the east, west and south, and China t the north. Kathmandu is the capital.

Administratively, Nepal is divided into five Development Regions and 75 administrative Districts. The districts are further divided into smaller administrative units called Village Development Committees (VDC) and Municipalities. Municipalities are urban or urbanizing areas with relatively higher population density and with better public facilities than VDCs. There are currently 3,915 VDCs and 58 Municipalities in the country. Each VDC consists of 9 wards (the smallest administrative unit), with the number of wards in municipalities ranging from 9 to 35.

The country's Himalayan region can be divided into five primary physiographic provinces. These provinces run in a general east-west direction. From south to north, they include: the Terai, the Sub-Himalaya (Siwalik Hills), the Lesser Himalaya, the Higher/Tethyan Himalaya, and the Tibetan Plateau. The provinces' physiography and geology are largely controlled by the regional plate tectonic regime, and the provinces are separated from each other by major, east-west-trending, tectonic structures (fault systems) that have continental proportions.

The Terai is separated from the Sub-Himalaya by the Himalayan Frontal Fault System (HFF); the Sub-Himalaya are separated from the Lesser Himalaya by the Main Boundary Thrust Fault (MBT); the Lesser

Map 1: Nepal – location and administrative divisions



Himalaya are separated from the Higher/Tethyan Himalaya by the Main Central Thrust Fault System (MCT); and the Higher/Tethyan Himalaya are separated from the Tibetan Plateau by the Indus Suture Zone (ISZ).

The Terai is the northern extension of the Indo-Gangetic Plain. It has broad alluvial plains and extensive alluvial fans near its boundary with the Sub-Himalaya. The Sub-Himalaya contain numerous east-west-trending folded hills (anticlines and synclines) with uniform, long dip-slopes and abrupt gullies, produced by differential erosion of underlying folded and tilted sedimentary rocks. The Lesser Himalaya have mature, dissected landscapes with deep valleys incised into earlier erosional surfaces. The Higher Himalaya include all major peaks of the Himalayan range and the province has great relief and youthful topography.

For development planning purposes, the five physiographic provinces are simplified into three geographic units: the Terai, the Hills (Pahad) and the Mountains (Himal, Map 1). The Hills combine the Siwalik Hills and the Lesser Himalayas, and the Mountains combine the Higher/Tethyan Himalaya and the Tibetan Plateau.

The Hills and make up two-thirds of the country's territory. The southern Terai belt consists of plains about 20 -75 km wide, with elevation varying gently from approximately 60 m above mean sea level (amsl) to about 200m amsl.

The Hills occupy the central part of the country with elevations rising dramatically from a couple of metres to more than 4,000m. They have many valleys and Kathmandu, the capital, occupies the largest. The Mountains have elevations rising sharpely to the highest peaks in the world. Areas higher than 4,000m are usually devoid of vegetation. These topographic extremes give Nepal its extreme variations in climatic conditions – from sub-tropical in the Terai to temperate in the Hills and decidedly alpine in the Mountains.

Summer and late spring temperature maxima range from about 28° Celsius in the Hills to more than 40°C in the Terai. In winter, average maximum and minimum temperatures in the Terai range from a brisk 7°C to a mild 23°C. Much colder temperatures prevail at higher elevations. The Kathmandu Valley, at an average altitude of 1,310m, has a mild climate with temperature ranging from 19° to 27°C in the summer and from 2° to 20°C in the winter with occasional temperatures below freezing point.

About 80% of total precipitation falls as rain during the monsoon, from mid-June to mid-September. The winter precipitation is due to moisture coming from the Mediterranean Sea, and its intensity reduces to the east. Most parts of the country have an average annual rainfall of 1,500mm to 2,500mm, the maximum being about 4,500mm in Pokhara. A combination of sharp relief and fast-moving monsoon clouds brings frequent hailstorms and cloudbursts; the latter trigger numerous landslides, landslide dams and debris flow resulting from the subsequent bursts of the temporary natural dams. In many places, rainfall intensity exceeds 100mm/24 hours.

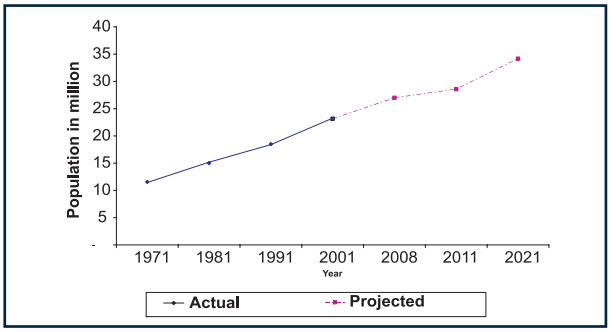
Nepal is divided into three major river systems from east to west: the Koshi River, the Gandaki River and the Karnali River. These systems originate from across the Himalayan range. All ultimately become major tributaries of the Ganges River in northern India. After plunging through deep gorges, these rivers deposit heavy sediments and debris on the plains, nurturing them and renewing their alluvial soil fertility. Once they reach the Terai Region, they often overflow their banks onto wide floodplains during the monsoon, shifting course periodically .

The main river systems originate in the Higher Himalaya, with some having their origin in Tibet. All three major river systems drain south into the Indo-Gangetic Plain, through the Himalaya. The rivers are deeply-incised across the east-west structural grain of Nepal and the Himalaya, having eroded with the uplift of the mountains.

The wide variation in climatic conditions has given rise to a rich diversity of forests and flora. Agricultural practices reflect that diversity – rice, lentils and oil-seeds are principle agriculture products of Terai. The Hills produce corn and wheat and have huge potential

Figure 1

Trend of population growth in Nepal 1971 – 2021



Data source: CBS (2007)

1.1.3 Nepal: Population Size and Demographic Indicators

Population censuses have been carried out in Nepal since 1911. However, the 1952/54 Census was the first to provide detailed information on the size and structure of the population. Table 1 summarizes the basic demographic indicators, using data from the 1971, 1981, 1991 and 2001 Population Censuses and for 2006. The total population in 1971 was estimated at 11.6 million. This had doubled to 23.2 million in 2001, just thirty years later. Data from the 1981 and 1991 Population Censuses show that the overall population of the country increased at an annual rate of about 2.6 per cent between 1971 and 1981, 2.1 per cent between 1981 and 1991, and 2.2 per cent between 1991 and 2001 (Central Bureau of Statistics, 2003). Despite the 25 per cent increase in the proportion of the urban population over the last three decades, Nepal has remained one of the least urbanized countries in the world, with only about 14 per cent of the country urbanized in 2001. Though life expectancy in Nepal has improved by about 20 per cent for both males and females, the improvement in female life expectancy at birth is more marked over time than male life expectancy (60.7 years versus 60.1 years).

1.1.4 Nepal: Economic Development Profile

According to the Global Human Development Report 2009, Nepal has the lowest GDP per capita among all South Asian countries (UNDP 2009). It is also below most of her neighbours in the Human Development Index (HDI) ladder. Table 2 summarizes Nepal's position vis-à-vis other South Asian countries in terms of some key socio-economic indicators. The figures suggest that Nepal is currently the region's least developed country.

Nepal has historically lagged behind her neighbours in both economic and human development. Figure 2 shows recent HDI trends for Nepal and other South Asian countries . The HDI for Nepal in 1975 was significantly lower than India, Bangladesh, Sri Lanka and Pakistan. Although Nepal has made progress in human development, it has continued to lag behind these neighbouring countries.

A similar trend in GDP per capita is observed in Figure 3. Nepal started at the bottom of the group in 1975 and has remained stubbornly rooted to that position for the last three decades. Furthermore, the gap in GDP per capita between Nepal and these countries has increased in recent years. In particular, the increase in GDP per capita for Nepal between 2000 and 2006 has been slower than the rapid increase experienced by Pakistan, India and Sri Lanka. The GDP per capita for Nepal in 2006 was just $323 – compared to $1,356 for Sri Lanka, the region's leading nation. The slow pace of economic growth in Nepal is also reflected in its GDP growth rates over recent years. Nepal recorded growth of 2.5 per cent in 2006 and averaged 3.4 per cent during the previous five years (NPC, 2007). The violent conflict between the state and Maoist rebels during the first half of this decade is partly responsible for this slow growth.

For the most part, Nepal is a rural country. Although the growth rate of the urban population (5.3 per cent) is four times higher than that of the rural population, 84 per cent of the national population continues to live in rural areas (UN, 2006). Agriculture is the main source of livelihood for the majority of the rural population. So approximately 66 per cent of the national population is engaged in agriculture. In terms of output, however, only 36 per cent of the nation's GDP is accounted for by this sector. The high poverty rate is linked to the relatively small share of national income going to the rural population.

Focussed heavily on processing agricultural produce, Nepal's small industrial sector has remained stagnant during the past two decades. The contribution of industry to national output was around 16 per cent of GDP in 1990 and remained at that level in 2006 (WDI, 2007). This lack of progress is also explained

Table 1: Demographic and socio-economic indicators of Nepal

Indicators	Census Years				
	1971	1981	1991	2001	2006*
Population (in number)	11,555,983	15,022,840	18,491,097	23,151,423	25,886,736
Population below 5 year	1,634,110	2,314,505	2,707,352	2,755,213	3,568,600
Population of 60 years and above	648,703	857,061	1,073,757	1,477,379	1,582,304
Annual growth rate (in %)	2.05	2.66	2.08	2.25	na
Population density (pop/sq.km)	79	102	126	157	176
Number of households	2,084,062	2,584,948	3,328,721	4,253,220	na
Average household size (persons/household)	5.6	5.8	5.6	5.4	na
Sex ratio (males per 100 females)	101.37	105.02	99.47	99.80	100.31
Child woman ratio [person aged (0-4) years per 1000 females (15 - 59) years	587	656	615	549	537
Total dependency ratio [persons aged (0 - 14) and 60+ years per 100 (15-59) years]	85.41	88.88	93.06	88.69	77.23
Singulate mean age at marriage of males	20.8	20.7	21.4	22.9	na
Singulate mean age at marriage of females	16.7	17.1	18.1	19.5	na
Urban population in number	461,938	956,716	1,682,274	3,269,451	4,322,996
Proportion of urban population (%)	4.0	6.4	9.2	14.2	16.7
Number of urban areas	16	23	33	58	58
Number of VDCs	3,915	2,912	4,015	3,915	3,915
Urban sex ratio	116.6	115.2	108.4	106.5	106.8
Total literacy rate in %	13.9	23.3	39.6	54.1	na
Literacy rate of males in %	23.6	34.0	54.5	65.5	na
Literacy rate of females in %	3.9	12.0	25.0	42.8	na
Crude birth rates (per 1000)	41.3	39.6	41.6	32.6	28.4
Crude death rates (per 1000)	21.4	13.5	13.3	10.0	8.7
Infant mortality rates (per 1000 live births)	na	147.0	97.0	64.4	48.0
Maternal mortality rate (per 100,000 live births)	na	na	515	539**	281
Total fertility rate (children per woman)	6.3	5.3	5.1	4.1	3.1
Life expectancy at birth (years)	41.0	49.5	54.2	60.4	63.3
Life expectancy at birth for males (years)	42.0	50.9	55.0	60.1	62.9
Life expectancy at birth for females (years)	40.0	48.1	53.5	60.7	63.7
Total economic activity rates (%)	59.33	65.13	56.56	58.21	na
Total agriculture holdings (' 000)	1,721	22	2,736	3,364	na
Area of holdings ('000 ha)	1,654	2,464	2,597	2,654	na
Average holding size (area in ha/holding)	0.97	1.13	0.95	0.79	na

* Not a census year ** Reference data refer to the year 1996

Source: CBS, Population Profile of Nepal, Population Censuses of Nepal, Agriculture Censuses of Nepal, Demographic and Health Surveys of Nepal ((http://www.cbs.gov.np/Population/PopulationProfileofNepal.pdf) accessed: 30 June 2008.)

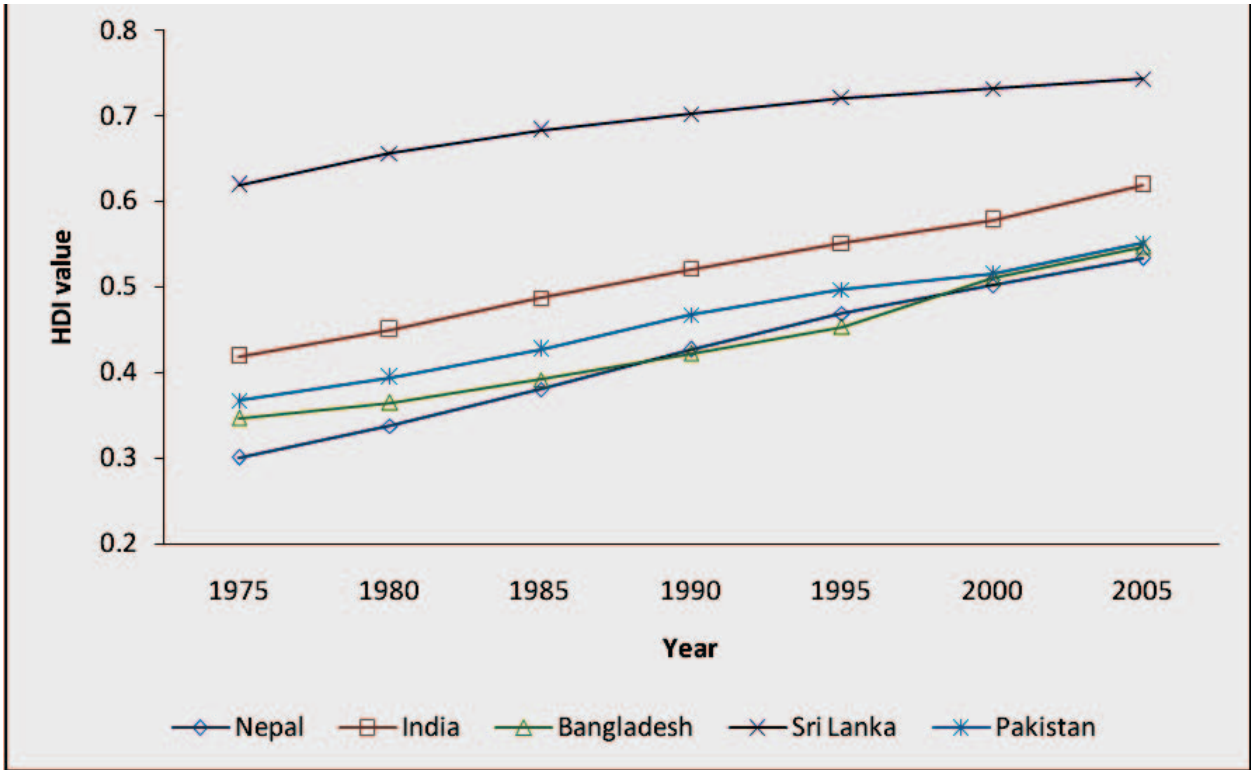
Note: na = data not available

Table 2: Key development indicators for Nepal and other South Asian countries

Country	HDI value	HDI rank	Life expectancy at birth (years)	Adult literacy (15+ years)	GDP per-capita (PPP US $)	Population below poverty line (%)	
						$1 day (percent)	National
Maldives	0.771	95	71.1	97.0	5,196	..	..
Sri Lanka	0.759	102	74.0	90.8	4,243	5.6	25
Bhutan	0.619	132	65.7	52.8	.4,837	..	..
India	0.612	134	63.4	66.0	2,753	34.3	28.6
Pakistan	0.572	141	66.2	54.2	2,496	17	32.6
Nepal	0.553	144	66.3	56.5	1,,049	24.1	30.9
Bangladesh	0.543	146	65.7	53.5	1,.241	41.3	49.8
Afghanistan	0.352	181	43.6	28.0	1.054		

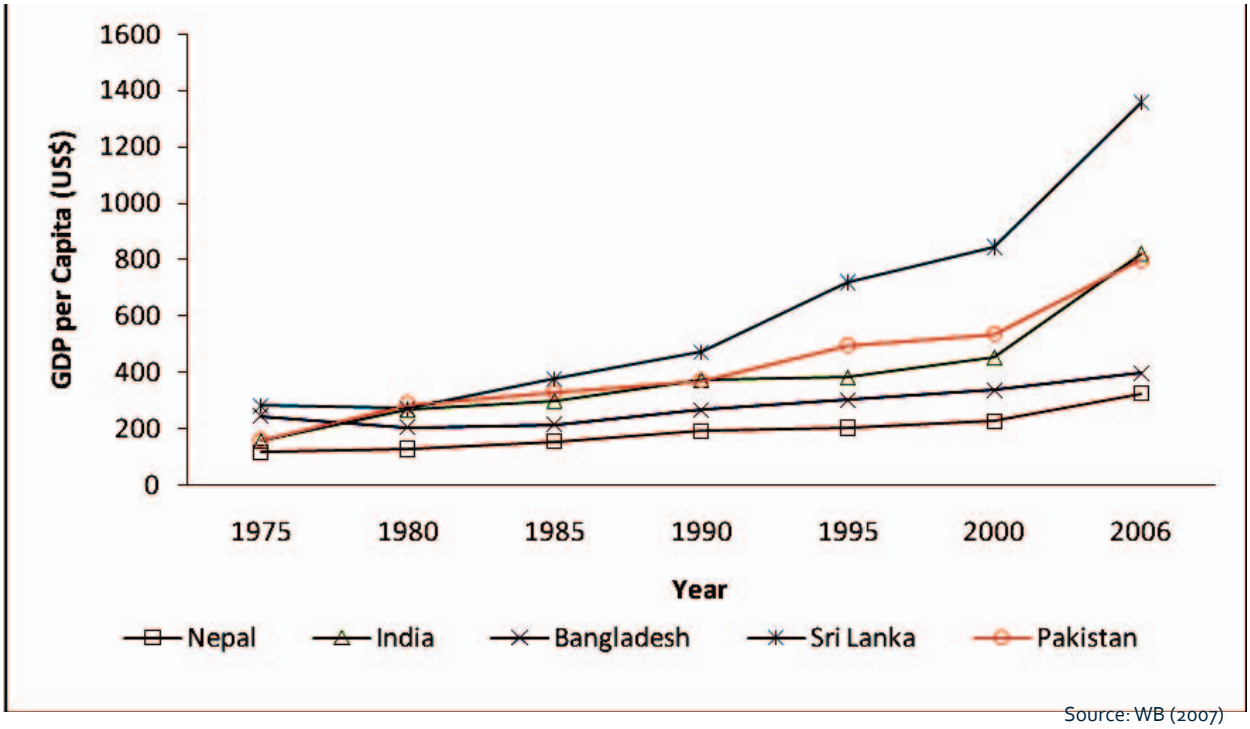
Source: UNDP (2009)

Figure 2: HDI trends in South Asia, 1975-2005



Source: UNDP (2007)

Figure 3: GDP per capita trends in South Asia, 1975-06



Source: WB (2007)

in part by the disruptions caused by the Maoist insurgency. Nepal's export-oriented industries were particularly hard hit by the unfavourable political and business climate during the past decade. The share of exports in national GDP fell from 23 per cent in 1996 to 14 per cent in 2006. Furthermore, fuel shortages, rising fuel prices, slow progress in post-conflict reconstruction and political uncertainties have adversely affected the industrial sector during the past two years.

Nepal's difficult mountainous terrain, its lack of access to the sea and susceptibility to natural disasters are key factors that continue to hamper the development of a globally competitive economy. Low levels of human and physical capital, weak government institutions, and political instability are among other important factors that continue to negatively affect the economy.

The Nepali government has implemented several macro economic reforms over the last three decades with the aim of strengthening the economy. Starting with an economic stabilization programme in 1985, it introduced a Structural Adjustment Programmeme (SAP) in 1987. Economic reform and liberalization accelerated in the 1990s to make production more market-oriented, to decrease the role of the state in the economy and encourage private sector investment. These reforms, however, had a limited impact on poverty and inequality reduction. From the late 1990s, the government began to promote the concept of broad-based growth with a special emphasis on developing the agricultural sector.

1.2 NATIONAL HAZARD PROFILE

The Himalaya is believed to be the most active and fragile mountain range in the world, because it is still rising and its rocks are under constant stress. The resulting strain build-up is released from time to time as earthquakes. That stress is also responsible for the complexities in folding, faulting and fracturing of subsurface rock strata, making the entire Himalayan range very fragile and susceptible to other natural hazards such as landslides and erosion. Intense monsoon rainfall and earthquakes serve as triggers for floods, landslides, debris flow and other secondary hazards.

A combination of rough topography, steep slopes, active tectonic and seismic process and the intense impact of monsoon rain has made this fragile environment vulnerable to a variety of natural hazards. Nepal is one of the world's most disaster-prone countries and has experienced several natural catastrophes causing high economic and human losses. Heavy rain and storms cause severe flooding. They trigger landslides that have an enormous effect on property, structures and lives. As if that were not enough, fire and drought are a constant threat in the dry season. The country is also prone to epidemics, pollution and other disasters.

The most frequent hazards are floods, landslides, epidemics, fires, earthquake and other hydro-meteorological disasters, causing heavy loss of human life as well as economic loss including housing and infrastructure. The 1934 Bihar-Nepal Earthquake (M8.3) and the 1988 Udaypur Earthquake (M6.6) were the most devastating earthquakes in Nepal in the past 75 years. The 1993 floods in south-central Nepal caused a huge loss of life and property. The economic cost associated with natural disasters has increased substantially.

The Terai experiences sheet flooding that becomes serious when the flow along braided rivers overflows the banks because of heavy deposition of sand and gravel in the river bed. Fire, drought and epidemics are also prevalent in this region. The Hill region, including the Siwaliks (or the Churia Range) experiences regular landslides, debris flow along creeks and steep slopes, flooding in the lower stages of river terraces and erosion of river banks during the monsoon. The higher Mountain region is exposed to rock and snow avalanches, rock slides, and debris flows. The many lakes of glacial origin in the higher Himalayan regions are expanding rapidly in both area and volume, because of glacial melting, which is in turn thought to be due to rising global temeparatures. 20 lakes are potentially dangerous. The lives of tens of thousands of people who live high in the mountains and in downstream communities could be at severe risk," writes Pradeep Mool (ICIMOD, 2007; Mool, 2001). The following table provides an overview of the hazard exposure of Nepal.

The seismic record of the country seems to suggest that a major earthquake of the 1934-magnitude (up to MMI Scale X) occurs approximately every 75 years. Athough this is only a statistical estimate, major earthquakes are an unavoidable part of Nepal's future.

A large part of the country is affected by disasters caused by severe meteorological events during the rainy season. Floods and landslides are frequent. Almost every year, substantial rainfall causes debris flow, landslides and landslide-dams in the watershed. Precipitation records show that 80 per cent of rainfall occurs during the monsoon, with the rest occuring during pre-monsoon (5 per cent during April – May) and post-monsoon (15 per cent during October to March). Precipitation varies from place to place and ranges from 250mm to over 5,200mm per annum (Pokhrel, 2003). Landslides are the most common and frequent natural hazard, especially in hill and mountain areas. They cause huge damage to property and loss of human life every year. Floods are common in the Terai plains during the rainy season and affect not only the population, but also cause major damage to infrastructure, agricultural land and crops.

Global environmental change, a continuous theme throughout time, generates a complexity of risks and vulnerabilities for areas and societies. The impact of global change is more readily visible in the form of melting of glacier ice and in the increasing potential of glacier lakes outburst floods (GLOFs). These lakes contain huge volumes of water and remain unstable.

Table 3: Types of natural and human-induced hazards in Nepal

Types of Hazard	Prevalence
Natural Hazards	
Earthquake	All of Nepal is a high-hazard earthquake zone (Map 2 and Map 3).
Flood	Terai (sheet flood), Middle Hills
Landslide and landslide dam breaks	Hills, Mountains
Debris Flow	Hills and Mountain, severe in areas of elevations greater than 1700 m that are covered by glacial deposits of previous ice-age
Glacier Lakes Outburst Floods (GLOF)	Origin at the tongue of glaciers in Higher Himalayas, Higher Mountains, flow reach up to middle Hill regions
Avalanche	Higher Himalayas
Fire (forest)	Hills and Terai (forest belt at foot of southern-most Hills
Drought	All over the country
Storms/ Hailstorm	Hills
Man-Induced Hazards	
Epidemics	Terai and Hills, also in lower parts of Mountain region
Fire (settlements)	Mostly in Terai, also in mid-Hill region
Accidents	Urban areas, along road network
Industrial/Technological Hazards	Urban / industrial areas
Soil erosion	Hill region
Social Disruptions	Follows disaster-affected areas and politically disturbed areas

Source: Dixit, 1996 (with modifications)

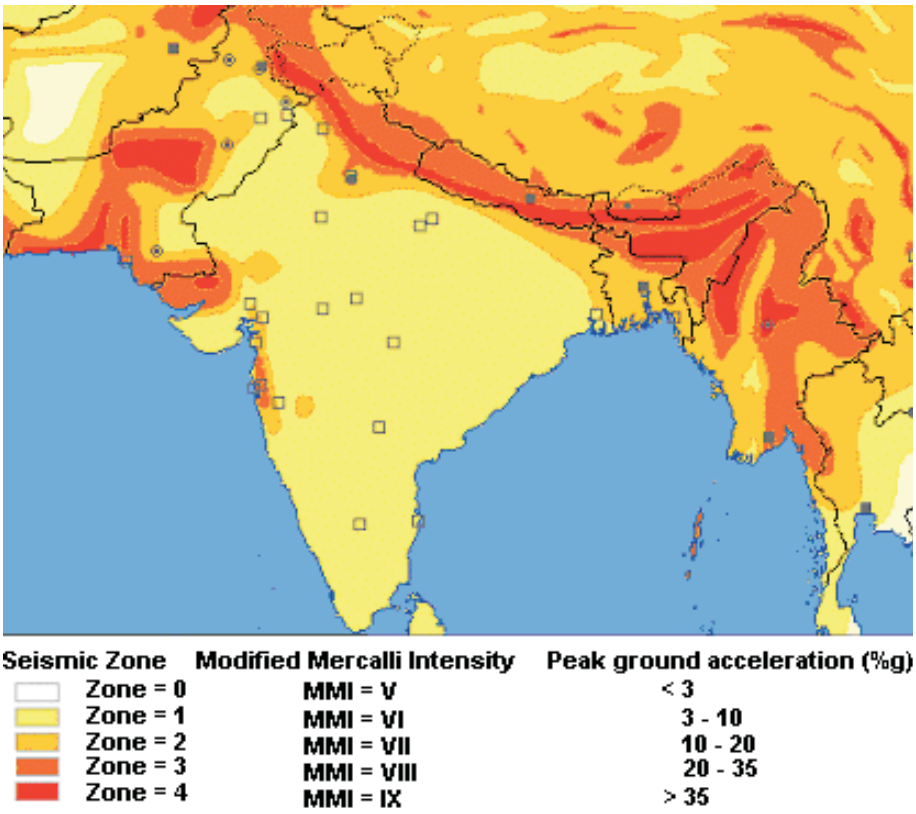
Epidemics and fires are other most significant type of disaster. They are frequent during hot and wet months. Poor access to health facilities makes epidemics all the more dangerous, particularly in remote areas and for poor people. Fires are frequent in thatched-roof houses in the Terai and also in slum areas. Fire is increasingly common in small industries that use or produce synthetic materials.

Nepal therefore faces a variety of natural hazards of geologic and climatic origin. Every part of the country is exposed to one or more types of natural hazard. The extent and frequency of natural hazards are much higher than the global average. Most hazard events are easily translated into disasters, because of high vulnerability.

If the Kathmandu Valley experiences another earthquake of IX Modified Mercalli Intensity (MMI), similar to that experienced in 1934, at least 40,000 deaths can be expected along with 95,000 injuries, and serious damage to critical facilities and infrastructure that will reduce their operational capacity by more than 50 per cent.

The estimated number of homeless people in Kathmandu Valley is likely to reach between 600,000-900,000 (NSET, 19981; NSET, 19982). And the risk is growing further (Figure 4). Lack of proper urban planning for an annual urban population growth of 5.3 per cent and hazard-insensitive landuse, poor quality of construction and the lack of an emergency response system and preparedness capacity are identified as the major causative factors.

Map 2: Seismic hazard map of Nepal



Source: Global Seismic Hazard Assessment Program (GSHAP), http://www.seismo.ethz.ch/GSHAP/

Map 3: Seismic intensity map of 1934 earthquake in Kathmandu Valley (Modified Mercalli Scale - MMI)

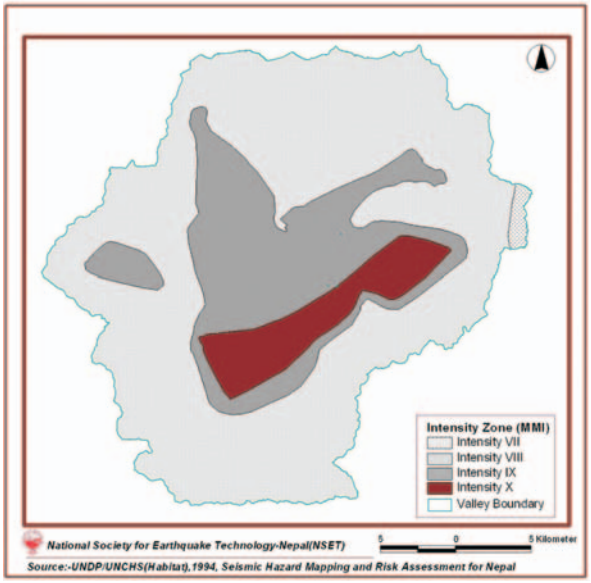
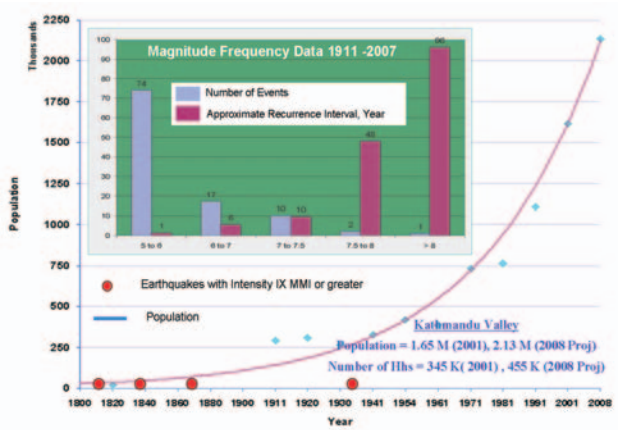


Figure 4: Earthquake hazard and risk of Kathmandu Valley



Floods and landslides take an annual toll of more than 300 people. The problem is exacerbated by the rapid deposition of sand in Terai riverbeds, because of increasing erosion in the Churia Hills, along with obstructions to normal river flow (e.g. from roads and embankments). The floods of 1993 in south-central Nepal destroyed eight major bridges linking Kathmandu with the outside world. They also destroyed other infrastructure, including road segments and minor bridges, and caused a massive loss of property and social disruption (Table 4)

July 1993 Floods and Landslides in South Central Nepal

The south-central part of Nepal experienced unprecedented floods, landslides and debris flows following uninterrupted rainfall between 19 and 21 July 1993. The maximum rainfall recorded was 540mm in a single day, with nighttime rainfall of 65mm/hour. The disaster was followed by further floods and landslides on 8-9 August. The total effect of the two events was 1,460 people dead or missing, 73,606 families seriously affected, 39,043 houses destroyed (fully or partially), about 43,330ha of cultivated land washed away or covered with debris, 367km of roads damaged, 213 bridges, including six concrete bridges on national highways, 38 large to small irrigation schemes. 452 schools, hospitals and government offices were destroyed in a couple of days. Vital supplies to Kathmandu were virtually cut off for more than a month because of the road breaches and damage to the bridges. Damage to the Kulekhani hydropower system, consisting of two power plants and providing 40 per cent of the national power, resulted in major power cuts that affected not just normal life, but the whole national economy (UNDP, 1997).

In addition to large disaster events, smaller disasters happen almost daily throughout the country. These events often go unnoticed and unreported both nationally and internationally. For example, the medium earthquake of July 2003 in Gorkha was not discussed because of there were no deaths. Although the damage was significant – including serious damage and even collapse of about 400 residences and significant damage to critical facilities – the response amounted to distribution of scanty relief.

The Natural Calamity Relief Act, 1982 (NCRA 1982), with amendments in 1986, 1989 and 1992, is the legal framework for disaster risk management. The Act provides for the establishment of central Disaster Relief Committee (CDRC), a Regional Disaster Relief Committee (RDRC), a District Disaster Relief Committee (DDRC) and a Local Disaster Relief Committee (LDRC).

The CDRC (headed by the Home Minister) and the DDRC (headed by the Chief District Officer) have been constituted. The RDRC and the LDRC have not yet been set up permanently, because of a lack of understanding on their functions and responsibilities.

The Ministry of Home Affairs (MOHA) has been designated as the apex agency responsible for addressing issues of disaster management, formulation of policies, plans and programmes. The MOHA exercises that responsibility through a division within the ministry that is responsible for narcotics drug control and disaster management, and it also serves as the secretariat of CDRC. Although with limited human and technical resources allocated to disaster management, that division has been tasked with coordinating rescue and relief activities, collecting disaster data, managing disaster relief and coordinating an international response.

The Act continues to be relief-focused. The national system it has been able to establish is adequate only for responding to small to medium disasters.

There is a general belief that a new comprehensive Act, one that can incorporate modern approaches for disaster risk reduction and preparedness for effective response commensurate with the high level of disaster risks in the country, especially to earthquakes and floods, and reflect the aspirations of the new Draft National Strategy for Disaster Risk Management (NSDRM), should replace the existing Act.

Table 4: Damage due to flood and landslide in July 1993

District	Family Affected	People Affected	No. of Deaths	House Collapsed	Land Washed (ha)	Land Affected (ha)	Livestock lost	Infrastructure damage/ collapsed
Makwanpur houses	14748	84196	247	3010	4112	NA	1872	Kulekhani Hydro power plant/ roads, Schools/
Sarlahi	16812	91110	687	16708	379	16681	11310	Bagmati Barrage/ roads Schools/ houses
Rautahat	14644	89146	111	6411	1366	6748	3211	Schools and houses, roads
Sindhuli	16163	83441	53 2	718	5918	1418	2045	Same as above plus bridges and roads
Kavrepalanchok	3318	18915	24	885	1244	NA	114	Same as above
Dhading	1113	6358	24	827	1066	NA	353	Same as above
Chitwan	5293	34943	24	2206	741	2321	5880	Same as above and road
Total	**72091**	**408109**	**1170**	**32765**	**14826**	**27168**	**24785**	**-**

Source: Annual Disaster review, 1993, DPTC.

1.3 ANALYTICAL FRAMEWORK TO EXAMINE THE RISK – POVERTY RELATIONSHIP

Around 31 per cent of the Nepali population lives below the national poverty line. This reflects the continuing challenges to economic development faced by the nation at the macro-economic level. At the micro-level, there are a number of additional factors that determine the poverty status of households and individuals. Past research has shown that the key determinants of a household's poverty status in Nepal include household location, household composition, household human capital, and household wealth (Bhatta and Sharma 2006; CBS 2005).

One potential determinant of poverty that has not been included in quantitative analyses of poverty in Nepal is disaster risk. Evidence from around the world suggests that the poorest people are disproportionally affected by disasters. That makes it difficult for them to escape the poverty trap. And non-poor households often fall into poverty as a result of recurring natural disasters.

Contact with natural hazards can result in death, injury, disruption of socio-economic activities, and loss of property, natural resources and other physical assets at the household level (Fuente et al. 2008). Hazards can also damage community infrastructure such as roads, sanitation facilities, schools, health posts and electricity supply. Such damage can have a greater negative impact on economically and socially marginalized people.

Property losses can affect household welfare in two ways—by directly affecting the household's welfare, and by reducing the value of assets that can be used for income-generation. Damage and destruction of houses are among the most important asset losses associated with disasters both in urban and rural contexts. In many urban areas, housing is not just a source of welfare, but also a source of livelihood. Key property losses that directly affect the livelihoods of rural households include damage to agricultural land, loss of crops and loss of livestock. Loss of these assets reduces household food consumption, leading to negative impacts on education, health and other development indicators. For young children, nutritional shortfalls can have a lasting impact on their health and human development, which in turn can contribute to inter-generational transfer of poverty. Asset losses can also push people into sudden poverty by reducing their income-generating potential.

Deaths and injuries caused by disasters directly reduce the welfare of households. Related funeral and medical expenses can severely deplete already limited assets and savings. The death of an earning member of the household and the diversion of human resources from the labour market in a disaster's aftermath can also lead to a loss of income. Injuries can also have a long term negative impact on the ability of individuals to utilize their physical and human capital for income generation. Another channel through which households can be hurt after a disaster is through a drop in asset value. When a large number of households affected by a disaster try to sell similar assets at the same time, the prices of those assets can fall substantially.

There are, then, multiple channels through which natural hazards can exacerbate poverty. The relationship between poverty and hazards also exists in both rural and urban areas when poverty pushes households to marginal hazard-prone areas, such as steep slopes in rural areas and squatter settlements in urban areas (Fuente et al. 2008). Poor households are therefore more likely to be exposed to natural hazards than better off households.

The impact of hazards is not uniformly distributed. Becaue poor people typically live in structurally weaker houses and are engaged in production activities that are less resilient to hazard impacts, they are likely to suffer more losses from hazard events. Thus, poverty increases household susceptibility to hazard-induced losses.

A third channel through which poverty can affect hazards is related to the livelihood strategies

adopted by poor households. Poverty makes households pursue livelihood and coping strategies that tend to degrade the environment. In particular, their activities often involve deforestation, building settlements on steep slopes, and overgrazing. The impact on the environment resulting from such activities can magnify hazard risk and hazard levels.

Ideally, both directions of the two-way relationship between poverty and hazard risk should be considered. In this study, data limitations do not permit a thorough examination of the determinants of hazard risk with poverty as a determinant. It therefore focuses on how natural hazards contribute to poverty. An overview of the analysis methodology is presented in Chapter 6, along with the findings.

1.4 CONCLUSION

Experience suggests that poor people are more vulnerable to natural disasters than other socio-economic groups, there is an urgent need for poor communities to become more disaster resilient. Countries with low levels of (human) development are significantly more vulnerable to the impacts of natural hazards-disasters.

Nepal is one of the most disaster-prone countries in the world and has experienced several natural catastrophes causing major economic and human losses. A combination of rough topography, steep slopes, active seismic zone and intense impact of monsoon rain has made this fragile environment vulnerable to hazards/disasters. During the dry season, Nepal is prone to fires. In the mountain region, the most common disasters are avalanches and snowstorms, which cause physical damage and loss of life. Moreover, the country is also susceptible to other disastrous events such as epidemics and pollution. Every year a significant proportion of GDP is lost to natural disasters.

There has been a steady increase in the population in recent decades. Only 14 per cent of the total population lived in urban areas in 2001. Among other demographic characteristics, life expectancy in Nepal has improved by about 20 per cent. There has also been an improvement in the life expectancy of women. There has also been a gradual improvement in education, health and other socio-economic indicators.

Nepal has historically lagged behind her neighbours in both economic and human development. It has the lowest GDP per capita among all South Asian countries. In terms of some key socio-economic indicators, Nepal is currently the least developed country in South Asian region. But it has made some progress in human development. The slow pace of economic growth is also reflected in its recent GDP growth rates. The violent conflict of the last decade is partly responsible for Nepal's slow growth rate.

Nepal is largely a rural country. About 84 per cent of its population lives in rural areas. The growth rate of the urban population (5.3 per cent) is four times higher then its rural counterpart. Agriculture is the main source of livelihood for most of the rural population. Approximately 66 per cent of the national population works in agriculture. In terms of output, however, agriculture accounts for just 36 per cent of the nation's GDP. Nepal's high poverty rate is linked to the relatively small share of the national income going to the rural population. Nepal's difficult mountainous terrain, lack of access to the sea, and susceptibility to natural hazards and disasters are key factors that continue to hamper the development of a globally competitive economy. Low levels of human and physical capital, weak government institutions, and political instability are among other important factors that continue to negatively affect the economy.

Nepal experiences several natural disasters every year. It ranks 11th in the world in terms of vulnerability to earthquakes and 30th with respect to floods. The most frequent disasters are floods, landslides, epidemics, fires, earthquakes and other weather related disasters, causing heavy loss of human life and property, especially buildings and infrastructures. About 83 per cent of the total area of the country is covered by hills and mountains exposed to landslides particularly in monsoon season. Most of the middle Hills, especially the river valleys, and the plains of Terai are exposed to severe flooding. Fires and epidemics are the other most frequent disaster events.

2 POVERTY HUMAN DEVELOPMENT PROFILE

2.1 INTRODUCTION

As discussed in Chapter 1, Nepal is one of the economically least developed countries in South Asia. It also ranks low in terms of most other development indicators. According to the latest nationally representative living standards survey, 30.9% of the national population is living in poverty. Government statistics indicate that approximately 52% of the population cannot read and write, and both child and adult mortality rates are high. Furthermore, there are vast differences in living standards across rural and urban areas, across geographical regions and across population groups.

This chapter presents an overview of the poverty and human development situation in Nepal. It begins with a discussion of different approaches to defining poverty, and explains how poverty is defined and measured in this report. It then presents some statistics on monetary poverty and inequality in Nepal. Using results based on the Nepal Living Standard Surveys, it discusses the changes in Nepal's poverty rate, poverty depth and poverty severity in recent years. This section also presents measures of income inequality and illustrates the disparity in the economic status across urban and rural areas and across the various regions of the nations.

The next three sections present some non-monetary indicators of welfare including indicators for educational and health status of the population. They also discuss the concepts of human poverty and subjective poverty. This is followed by a discussion of the dimensions and evidence of social and economic exclusion in Nepal. The next section discusses the key development challenges facing Nepal and government responses aimed at meeting these challenges. The final section presents some concluding remarks.

2.2 DEFINING POVERTY

In many ways, poverty reduction is the overarching goal of most governments in developing countries. This is also the ultimate goal of most countries and organizations engaged in international development efforts. Interestingly, however, there is little agreement among policymakers, researchers and development project implementers on the definition of poverty itself.

Definitions of poverty can vary depending on whether we want to consider narrow or broad definitions, whether we want to focus on a single dimension or on multiple dimensions, whether we want to look at monetary indicators of welfare or non-monetary indicators, whether we want to look at absolute poverty or relative poverty and whether we want to focus on means or on ends. Here, we will restrict the discussion to four key approaches to defining poverty: the monetary, capability, exclusion and participatory approaches (Laderchi et al. 2003). These approaches differ in the broadness of the concepts they cover as well as in the indicators of welfare they use.

The monetary approach is the most widely used approach to defining and measuring poverty. In this approach, a poor person is defined as an individual whose consumption falls below a minimum threshold. The key underlying assumption behind this approach is that an individual's total consumption is an appropriate indicator of welfare. In other words, higher consumption means greater utility or welfare. Hence, if the individual's consumption falls below some minimum level (poverty line), she can be considered poor or deprived. The main strength of this approach to defining poverty is that it collapses the different dimensions of a person's welfare into a single dimension (monetary) which is easy to understand and measure. However, critics strongly question whether monetary measures alone can identify whether someone is severely deprived in multiple dimensions. The most common proxies used to measure welfare in this framework are expenditure and income.

Developed by Nobel Laureate Amartya Sen, the capability approach defines poverty as the failure to obtain certain minimal or basic capabilities, where capabilities are the range of choices open to the individual. This definition of poverty is consistent with viewing development as an expansion of human

capabilities (or freedoms) rather than as an increase in consumption (Sen 1999). It thus rejects the notion that monetary measures can properly capture an individual's well-being and views income and expenditure only as a means to capability expansion. At the same time, it recognizes the multidimensional nature of poverty and captures depravations in multiple dimensions. One major weakness of the capability approach is that since capabilities represent potential outcomes (what people can do) rather than actual outcomes (what people actually do), it is difficult to measure capabilities.[2] Hence, in practice, it is often only possible to measure what Sen calls "functionings" or actual outcomes, which constitute a subset of the capabilities we want to measure.

Sen's capability approach has helped to shift the focus of development debates from GDP growth to multidimensional concepts of poverty and development. For example, Sen's concept of human capabilities has strongly influenced the development of the human poverty index (HPI) and human development index (HDI). These indices are now routinely used by development agencies, academics and policymakers alike.

The third approach to defining poverty—the exclusion approach—also takes a multidimensional view of depravation. However, unlike both the monetary and capability approaches, it incorporates the process through which depravation occurs as well as the outcome. Furthermore, exclusion is socially defined in the sense that a person is often excluded because she belongs to a particular population group. Exclusion can be defined as a process and a state that prevents individuals from full participation in social, economic and political life and from asserting their rights (World Bank 2005a). Thus excluded individuals lack opportunities for full participation in society. For example, a person who is prevented from engaging in some social or economic activity because of her race, ethnicity or religion would be considered a deprived person in this approach. As in the case of the capability approach, however, social exclusion is often difficult to measure since it deals with opportunities rather than outcomes (CBS 2006). The measurement problem is also compounded by the fact that it is difficult to determine what is meant by "full participation in" social, economic or political life.

The last approach is the participatory approach. Rather than using some externally specified "objective" criteria to determine whether an individual is poor or non-poor, this approach allows each individual to define her poverty status. While it has the benefit of giving a greater voice to the poor, the individual-specific subjective nature of poverty status determination means that poverty comparisons across individuals and groups cannot be made in a straightforward manner.

Within the context of Nepal, the monetary approach is, by far, the most widely used approach to defining and measuring poverty. The Central Bureau of Statistics (CBS)—the premier institution involved in poverty analysis in Nepal—has done a number of surveys in the past to estimate monetary poverty.[3] The most systematic and rigorous household surveys done by CBS in recent years are the Nepal Living Standards Surveys I and II, conducted in 1995/96 and 2003/04 respectively. Based on data from these surveys, and taking into account differences in the cost of living in different areas of the country, CBS has derived a Cost of Basic Needs (CBN) poverty line of Rs. 4749 per year for 2003/04. Similarly the CBN poverty line has been estimated at Rs. 4655 for 1995/96 (CBS 2005a).[4] CBS categorizes a household as poor if its per capita expenditure falls below the poverty line. The analysis of the relationship between poverty and disaster presented in this report also uses the CBS definition of poverty.

[2] The ability to live a full normal life, the ability to have good health, the ability to obtain an education, and the ability to move from one place to another without undue restriction are some examples of capabilities. Examples of functions might include a person's age, health status, education level, and actual movement.

[3] The National Planning Commission and the Nepal Rastra Bank have also derived estimates of poverty lines in the past based on their own surveys (Chettri, 2004). However, their estimates are not commonly used.

[4] This poverty line is expressed in terms of the prices in the rural eastern Terai region of the country. CBS uses 2,124 kcal per day as the minimum caloric requirement for the average Nepali household. The food poverty line is the cost of a food basket with 2,124 kcal caloric content. The Cost-of-Basic-Needs poverty line is derived by adding to the food poverty line the amount spent by the average borderline-poor household on non-food items.

2.3 MONETARY POVERTY AND INEQUALITY IN NEPAL

The poverty rate, or the percentage of the population below the poverty line, is the most common indicator for measuring monetary poverty for an area or population group. While this measure is simple to use and to understand, it does not take into account the depth or severity of poverty. One set of poverty indices that capture the number of poor as well as the depth and severity of poverty is the Foster, Greer, Thorbecke (FGT) family of poverty measures. More specifically, the FGT Poverty Gap Index (P1) shows "how far below the poverty line the poor are on average as a proportion of that line" (CBS 2005: 3). And the FGT Squared Poverty Gap index (P2), not only looks at the depth of poverty but also gives more weight to the poorest of the poor, thereby reflecting the severity of poverty and inequality among the poor.

Table 5 presents the FGT poverty indices (P0, P1, and P2) for the Nation as a whole as well as for urban and rural areas separately. These are the most recent poverty estimates available for Nepal.

As is clear from Table 5, Nepal experienced a dramatic reduction in poverty between 1995/96 and 2003/04. The national poverty rate declined by 26 per cent, from 41.8 per cent in 1995/96 to 30.9 per cent in 2003/04. The decline in poverty depth (P1) and poverty severity (P2) was even more impressive suggesting that even among the poor, there was an improvement in living standards. While the whole nation experienced a decline in poverty, urban areas benefitted much more than rural areas. Compared to a reduction of 56 per cent in the urban poverty rate, the rural poverty rate declined by only 20 per cent. The disparity in living standards between the urban and rural areas of Nepal therefore increased during this period.

That increase can also be seen from the per capita expenditure values presented in Table 6. The per

Table 5:Poverty in Nepal, 1995/96 and 2003/04s)

	Poverty rate (P0)			Poverty Gap (P1)			Squared Poverty Gap (P2)		
Area	**1995/96**	**2003/04**	**% change**	**1995/96**	**2003/04**	**% change**	**1995/96**	**2003/04**	**% change**
Nepal	41.8	30.9	- 26	11.8	7.5	- 36	4.7	2.7	- 42
Urban	21.6	9.6	- 56	6.6	2.2	- 67	2.7	0.7	- 73
Rural	43.3	34.6	- 20	12.1	8.5	- 30	4.8	3.1	- 37

Source: CBS (2005a); CBS (2006)6)

Table 6: Distribution of real per capita expenditure (in real 1995/96 rupees)

	Real mean per capita expenditure (Rs./year)		Change in real mean per capita expenditure	
Area	**1995/96**	**2003/04**	**Total change (95/96-03/04)**	**Change per year**
Nepal	7,235	10,318	42.6% (Rs. 3083)	4.54%
Urban	14,536	20,633	41.9% (Rs. 6097)	4.48%
Rural	6,694	8,499	27.0% (Rs. 1805)	3.03%

Source: CBS (2005a); CBS (2006)

capita expenditure in urban areas in 2003/04 was Rs. 20,633 compared to Rs. 8,499 in rural areas. Overall, the real mean per capita expenditure in Nepal increased by Rs. 3,083 from Rs. 7,235 in 1995/96 to Rs. 10,318. In urban areas, the increase in per capita expenditure was Rs. 6,069—over three times the increase in rural areas. So if the current trend continues, we can expect further divergence in living standards between urban and rural area in the future.

To better understand the poverty situation, it is also useful to look at the geographical distribution of poverty alongside the geographical distribution of the national population. This information is presented in Table 7. We have seen that Nepal is still a predominantly rural country. But the percentage of the total population living in rural areas (85%) is less than the percentage of the total poor population living in rural areas (95%). This reflects the lower living standards in rural areas than in urban areas.

Table 7 also shows that the poverty rate varies significantly across the five development regions and the three ecological regions. In particular, the mid and far western development regions are much poorer than the rest of the nation and consequently bear a disproportionate share of the poor population in the nation. But the largest number of poor people live in the central region—the region with the largest population. The hill and the Terai ecological regions have the highest and lowest poverty rates, respectively. In both ecological regions, the poverty rate is much higher in the west than in the east. A visual representation of the geographical distribution of poverty rates is provided in Map 4, which shows how district-level poverty rates vary across development and ecological regions.

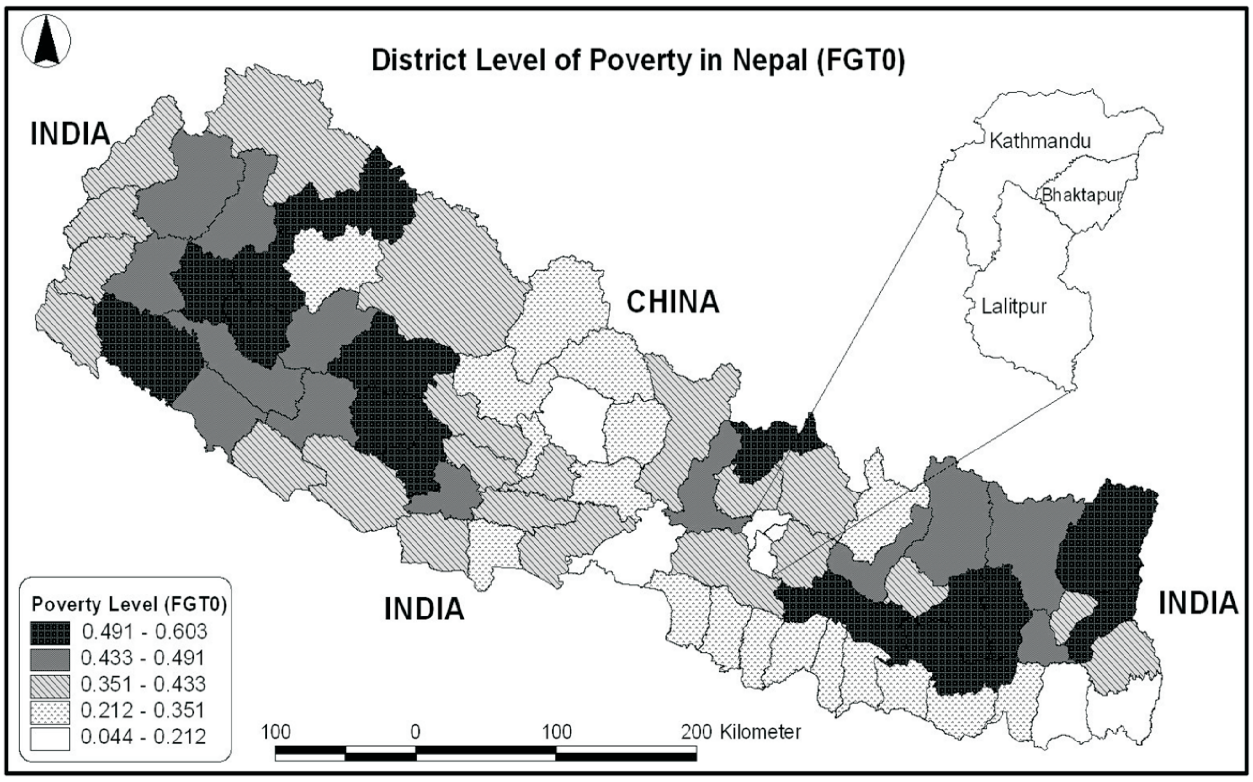
Table 7:Geographical distribution of the poor in Nepal, 2003/04

	Poverty rate (P0) (%)	Distribution of the poor (%)	Distribution of the population (%)
Rural vs. urban areas			
Urban	9.6	4.7	15.0
Rural	34.6	95.3	85.0
Development regions			
Eastern	29.3	23.4	24.7
Central	27.1	32.2	36.6
Western	27.1	16.7	18.9
Mid-Western	44.8	17.7	12.2
Far-Western	41.0	9.9	7.5
Ecological belts			
Mountain	32.6	7.5	7.1
Hill	34.5	47.1	42.1
Terai	27.6	45.4	50.8
Nepal	**30.9**	**100.0**	**100.0**

Source: CBS (2005a)

[5] Even among urban ar eas, the poverty rate varies significantly. While the poverty rate for Kathmandu is only 3.3%, around 13.3% of the population in other urban areas is poor.

Map 4: Distribution of poverty rates across districts, 2003



Apart from giving an overview of the poverty situation, the above discussion has also provided an understanding of the disparity in living standards across spatial units in Nepal. We will now look at the inequality in living standards within the national population.

The most common indicator of economic inequality within a population is the Gini coefficient. A Gini coefficient of 0 indicates perfect equality while a value of 100 corresponds to perfect inequality (all income concentrated in the hands of a single person). As shown in Table 8, there was a 21 per cent increase in inequality between 1995/96 and 2003/04 in the nation as a whole. The increase was far greater in rural areas than urban areas. Not all of the increase in inequality at the national level can be explained, though. by the increase in inequality within urban or rural areas; the increasing disparity between urban and rural areas also contributed to the overall increase in inequality in the nation.

Further understanding of economic inequality can be obtained by comparing the per capita expenditures of different income (or consumption) groups. Table

Table 8: Gini coefficient, 1995/96 and 2003/04

	Gini index		
Area	**1995/96**	**2003/04**	**% change**
Nepal	34.2	41.4	21.1
Urban	42.7	43.6	2.1
Rural	30.8	34.9	13.3

Source: CBS (2005a)

9 groups the population into five consumption quintiles and presents the per capita expenditures of each group for 1995/96 and 2003/04. In 2003/04, the annual per capita expenditure of Rs. 25,387 for the richest 20 per cent of the population (or the highest quintile) was almost seven times greater than the annual per capita expenditure of the poorest 20 per cent of the population (the lowest quintile). The per capita expenditure of the highest quintile was around five times greater than that of the lowest quintile in 1995/95.

Table 6 also shows that the richest quintile experienced the highest increase in per capita expenditure (both in absolute terms and in per centage terms) between 1995/96 and 2003/04.

The next highest increase was experienced by the second richest (fourth) quintile. The poorest two consumption groups saw the smallest increases in per capita expenditures. These findings are consistent with the earlier observation that economic inequality in the nation increased in the two years.

Table 9:Real per capita expenditure by consumption group (in real 1995/96 Rs.)

Real mean per capita expenditure (Rs./year)			Change in real mean per capita expenditure (%)	
Consumption quintile	**1995/96**	**2003/04**	**Total change (95/96-03/04)**	**Change per year**
Lowest	2,898	3,524	22	2.47
Second	4,347	5,186	19	2.23
Third	5,687	7,121	25	2.85
Fourth	7,683	10,255	33	3.68
Highest	15,477	25,387	64	6.38
Nepal	**7,235**	**10,318**	**43**	**4.54**

Source: CBS (2006)

2.4 STATE OF EDUCATION

Regardless of which definition of poverty is used to analyze the welfare status of individuals, there is no disagreement about the strong link between education and poverty. When the focus is on monetary poverty, an individual's education can be considered one of the key determinants of poverty since their income generating ability is directly influenced by their education. On the other hand, education also has intrinsic value and can be viewed as an end it itself. Accordingly, indicators based on the capability approach such as the HDI and HPI include education as an essential component of the welfare indicator itself. This section discusses the status of education in Nepal, focusing on basic literacy and school level education.

According to data from the 2001 census, Nepal's adult literacy rate stands at just 48 per cent. In terms of literacy, Nepal ranks among the least developed countries of the world. As shown in Table 10, the literacy rate for women (35 per cent) is almost half that of men (62 per cent). It is worth pointing out, though, that only 10 per cent of adult males and 0.6 per cent of adult females were literate in 1952-54. So the 2001 total literacy rate of 48 per cent and the reduced male-female gap in literacy must be viewed as significant progress in Nepal's education sector.

Table 10:Adult (age 15+) literacy rate for different census years (%)

	Adult literacy rate (%)					
	1952-54	**1961**	**1971**	**1981**	**1991**	**2001**
Male	10.0	16.8	22.4	30.7	48.2	62.2
Female	0.6	1.5	2.6	9.1	17.2	34.6
Total	**5.1**	**8.9**	**12.5**	**20.6**	**32.4**	**48.0**

Source: Pande (2006), CBS census reports

Another important indicator of the status of education is the school enrolment rate. The gross enrolment rate (GER) shows the total enrolment at a specified educational level expressed as a percentage of total children of the age group appropriate for that level. Table 11 shows that in 2007/08, the GER at the primary level was 139 per cent, suggesting that there were more children enrolled at the primary level than the total number of children belonging to the primary level age group. The net enrolment rate (NER), on the other hand, was 89 per cent at the primary level. In other words, 89 per cent of children belonging to the primary level age group were enrolled at the primary level. The NER is significantly lower at the lower secondary and secondary levels, indicating that a large percentage of primary school students do not continue on to higher grades. According to the MoES (2005), only about 60 per cent of students who enrol in the first grade of primary education reach Grade 5.[6] And only 50 per cent of the students entering primary school complete the primary school cycle. The cycle completion rate for secondary schooling [7], however, is much higher (66 per cent).

Table 11 also shows enrolment rates by gender. While there is some difference between males and females in enrolment rates at each level, these differences are not as pronounced as the differences in adult literacy rate shown in Table 10. This suggests that the gap in educational attainment between males and females is being progressively reduced in younger generations.

Table 11:School enrollment rates by grade level and gender, 2007/08

	Gross enrolment rate (GER) (%)			Net enrolment rate (NER)		
Educational level	**Female**	**Male**	**Total**	**Female**	**Male**	**Total**
Primary (grades 1-5)	139.6	137.6	138.5	87.4	90.7	89.1
Lower Secondary (grades 6-8)	75.9	81.6	78.8	49.6	56.1	52.9
Secondary (grades 9-10)	52.4	59.3	55.9	32.8	37.7	35.3

Source: MoES (2008)

[6] This is known as the survival rate at grade five.

[7] This includes both lower secondary and secondary.

2.5 STATE OF HEALTH AND NUTRITION

Like education, good health can be viewed as both a means to, and an end of, development. It is both a determinant of poverty and an essential component of welfare indicators based on the capability approach.

One of the key indicators of a population's health status is early childhood mortality. Early childhood mortality rates based on the 2006 demographic and health survey by Nepal's Ministry of Health and Population are presented in Table 12.

The neonatal mortality rate and the postnatal mortality rates during the four years prior to the survey (2001-2005) are 33 deaths per 1,000 live births and 15 deaths per live birth, respectively. So, after a child has survived the first month of life, the risk of him or her dying during the remaining 11 months falls by half. This rate is also much lower than the neonatal mortality rates during the earlier two 5-year periods. The progressive improvement in early childhood survival in recent years is also apparent from the lower values of other mortality rates in the 2001 to 2005 period. For example, the under-five and infant mortality rates presented in Table 12 indicate that currently one in every 16 children die before reaching five, and one in every 21 children die before their first birthday. This is a vast improvement over the situation 10 to 15 years previously, where every eighth child died before their fifth birthday, and one in 12 children died before their first birthday.

Table 13 shows the early childhood mortality rates for males and females separately. Although there is little difference in mortality rates between males and females for all five indicators, it is relevant to note that female mortality is slightly greater at earlier ages.

Table 12:Early childhood mortality rates 8[8], 2006 (deaths per 1000 live births)

Years preceding the survey	Neonatal mortality	Post neonatal mortality	Infant mortality	Child mortality	Under-five mortality
0-4	33	15	48	14	61
5-9	43	30	72	26	96
10-14	49	33	82	38	117

Source: MoHP (2007)

Table 13:Early childhood mortality rates, 2006 (deaths per 1000 live births)*

Child's sex	Neonatal mortality	Post neonatal mortality	Infant mortality	Child mortality	Under-five mortality
Male	39	21	60	21	80
Female	37	24	61	18	78

*For the ten years preceding the survey.

Source: MoHP (2007)

[8] Neonatal mortality is the probability of dying within the first month of life. Infant mortality is the probability of dying between birth and the first birthday. And post neonatal mortality is the difference between infant and neonatal mortality. Child mortality is the probability of dying between exact ages one and five while under-five mortality is the probability of dying between birth and the fifth birthday.

Another important indicator of a population's health status is adult mortality. Table 14 presents estimates of age-specific mortality rates for females and males. The male mortality rate for adults (aged 15 to 49) is 2.4 deaths per 1,000 populations. As in most parts of the world, the female mortality rate is lower (2.09). For both sexes, the mortality rate is highest in the 45-49 years age group and lowest in the 20-24 years age group.

The nutritional status of children is another key indicator of health status. As in many other developing countries, children in Nepal are particularly vulnerable to malnutrition not just because of general poverty but also because of inequities in intra-household distribution of food and other resources. The problem of malnutrition is especially acute among girls.

Table 15 presents three indicators of nutritional status commonly found in literature: height-for-age, weight-for-height, and weight-for-age. Height-for-age reflects the long-term effects of malnutrition on an individual while weight-for-height describes their current nutritional status. The third indicator, weight-for-height is derived from the other two indicators and captures the effects of both acute and chronic malnutrition.

Table 12 illustrates how Nepali children compare to the WHO Child Growth Standards. If a child's indicator value falls below two or three standard deviations from the median of the WHO reference population, then the child is considered malnourished. For example, children with height-for-age below two standard deviations (-2 SD) from the median of the reference population are considered stunted or chronically malnourished; and children below three standard deviations (-3 SD) from the reference median are considered severely stunted. The table shows the percentage of Nepali children who can be considered malnourished by the three indicators.

The values for the height-for-age indicator in the last row of Table 15 show that 49 per cent of children under five are stunted and 20 per cent are severely stunted. Similarly, the weight-for-age values show wasting in 13 per cent and severe wasting in 3 per cent of the children.

Table 14:Adult mortality rates (per 1000 population), 2006*

	Age							
Mortality	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**15-49**
Female mortality rate	3.03	1.83	3.16	2.68	2.92	3.41	3.90	2.09
Male mortality rate	3.44	2.40	2.43	2.58	2.52	5.13	5.70	2.42

*For the period 0-6 years prior to the survey.

Source: MoPH (2007)

Table 15:Nutritional status of children under five, 2006 (standard deviation units below WHO Child Growth median value)

	Height-for-age		Weight-for-height		Weight-for-age		
Background characteristic	% below -3 SD	% below -2 SD	% below -3 SD	% below -2 SD	% below -3 SD	% below -2 SD	Number of children
Sex							
Male	19.5	49	3.1	12.9	10.1	37.5	2,705
Female	20.9	49.6	2.2	12.3	11.2	39.7	2,558
Residence							
Urban	13.7	36.1	1.2	7.5	4.8	23.1	639
Rural	21.1	51.1	2.8	13.3	11.4	40.7	4,623

Table 15:Nutritional status of children under five, 2006 (standard deviation units below WHO Child Growth median value) cont'd...

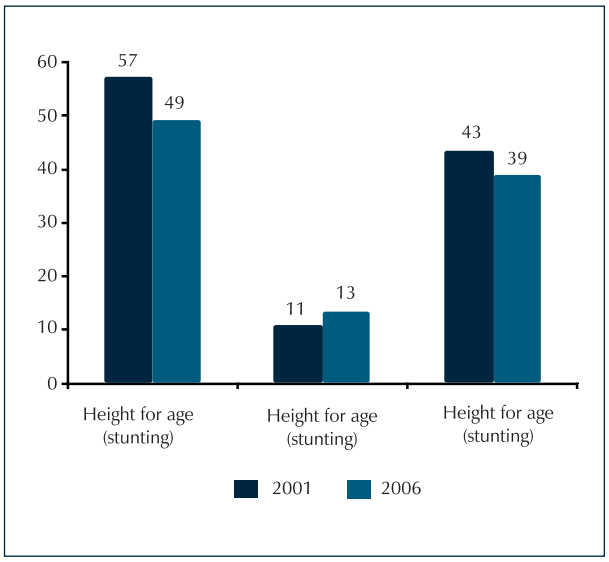
	Height-for-age		Weight-for-height		Weight-for-age		
Background characteristic	% below -3 SD	% below -2 SD	% below -3 SD	% below -2 SD	% below -3 SD	% below -2 SD	Number of children
Ecological zone							
Mountain	28.9	62.3	2.9	9.4	11.5	42.4	448
Hill	21	50.3	1.6	8.4	8.1	33.2	2,165
Terai	18	46.3	3.4	16.6	12.6	42.3	2,650
Development region							
Eastern	15.7	40.3	0.8	10.1	7.9	32.9	1,161
Central	20	50	3	13.8	11.4	38.2	1,708
Western	22.4	50.4	2.3	10.9	10.9	38.5	977
Mid-western	27.2	57.9	3.1	11.6	11.3	43.4	661
Far-western	18.3	52.5	4.8	16.7	12.2	43.7	755
Wealth quintile							
Lowest	29.3	61.6	3.2	11.5	14.2	47	1,319
Second	22.2	54.9	3.1	15.2	12.9	46	1,120
Middle	20.2	50.4	2.6	15.2	12.5	41.7	1,074
Fourth	14	39.8	2.5	12.8	7.8	31	961
Highest	9.5	30.9	1.2	7	2.5	18.8	788
Total	**20.2**	**49.3**	**2.6**	**12.6**	**10.6**	**38.6**	**5,262**

Source: MoPH (2007)

The weight-for-age indicator shows that 39 per cent of children under age five are underweight and 11 per cent are severely underweight. The table also suggests that while there is little difference nutritional status between males and females, there is substantial variation between urban and rural areas, across regions, and across wealth groups. In particular, nutritional status clearly improves as we move up the wealth quintiles from the poorest to the richest category.

Figure 5 shows the change in nutritional status of Nepali children between 2001 and 2006. The percentage of children suffering from stunting declined substantially during this period. There was also a decline in the percentage of underweight children. However, wasting among children increased slightly during this period.

Figure 5:Nutritional status of children under five, 2001-2006



Source: MoPH (2007)

2.6 HUMAN POVERTY AND SUBJECTIVE PERCEPTIONS POVERTY IN NEPAL

The education and health status of an individual can be viewed either as indicators of poverty or determinants of poverty, depending on the approach used. Using the capability approach, the concept of human poverty looks at education and health outcomes as essential components of poverty. The human poverty indicator developed by UNDP captures deprivations in three dimensions of human development—health, education and economic status.

According to UNDP (2007), the most recent HPI estimate for Nepal is 38.1, which place it in the 84th position in HPI ranking. The HPI value for Nepal was 48.1 in 1995, and 38.6 in 2001 (UNDP 2004), so there has been an improvement in human poverty status during the past two decades.

Table 16 presents HPI values for 1996 and 2001, disaggregated by development and ecological regions. The pattern observed is similar to the pattern for monetary poverty shown in tables 5 and 6. More specifically, rural areas and western regions are much poorer than the rest of the country.

Although poverty definitions based on the participatory approach are seldom used for quantitative analyses of poverty in Nepal, the Nepal Living Standard Surveys have included a number of questions aimed at capturing the self-perceived poverty status of individuals. Table 17 shows the perceptions of sample households regarding consumption adequacy in six areas. In 2003/04 around 67 per cent of households indicated that their total income was inadequate.

On average, households perceived a notable improvement in all aspects of consumption adequacy during the eight-year period, a finding that is generally consistent with the earlier finding of a decline in monetary poverty. The most significant improvement was in health—the percentage of households reporting inadequate healthcare declined by 30 per cent from 59 per cent in 1995/96 to 28 per cent in 2003/04.

CBS (2006) has estimated poverty rates based on subjective poverty lines derived from these qualitative responses on perceived consumption adequacy. These subjective poverty rates are presented in Table 18. It is interesting to note that the 1995/96 subjective poverty rate for the nation as a whole (43.6 per cent) is close to the monetary poverty rate of 41.8 per cent. The difference between subjective and monetary poverty rates was much greater in 2003/04

Table 16:Human Poverty Indices, 1996 and 2001

Region	HPI 1996	HPI 2001
Nepal	48.1	38.6
Rural vs.urban areas		
Urban	--	25.2
Rural	--	42.0
Development regions		
Eastern region	44.0	36.2
Central region	48.2	38.8
Western region	45.6	35.6
Mid-western region	54.8	44.5
Far Western region	50.7	44.8
Ecological belts		
Mountain	58.0	49.0
Hills	47.6	37.6
Terai	47.0	38.9

Source: UNDP (2004)

Table 18:Subjective poverty rates, 1995/96 and 2003/04

	Poverty rate (%).	
	1995-96	**2003-2004**
Kathmandu	0.7	2.7
Other urban	30.5	10.1
Rural Western Hill	71.1	24.4
Rural Eastern Hill	66.7	24.5
Rural Western Terai	22.6	30.6
Rural Eastern Terai	31.5	32.2
Nepal	**43.6**	**24.6**

Source: CBS (2006)

Table 17:Self-reported assessment of consumption adequacy by households, 1995-96 and 2003-04

Household's perception of consumption adequacy during past month	% of households with positive response	
	1995/96	**2003/04**
Family's food consumption was inadequate	51	31
Family's housing consumption was inadequate	64	41
Family's clothing consumption was inadequate	58	36
Family's health-care was inadequate	59	28
Family's children's schooling was inadequate	45	21
Family's total Income was inadequate	73	67

Note: 'Adequacy' is defined as the minimum consumption needs of the respondent's family (CBS 2005a).

Source: CBS (2004)

2.7 VULNERABLE POPULATION GROUPS AND THE PROCESS OF EXCLUSION

The discussion in Section 2.2 presented exclusion as one approach to defining poverty. At the same time, the process of exclusion is also a determinant of monetary poverty. Excluded population groups are among those most vulnerable to monetary poverty, because they are restricted from normal social and economic opportunities.

In Nepal, exclusion occurs across multiple dimensions (WB/DFID 2005; CBS 2006). A summary of the most important bases of exclusion in Nepal is presented in Table 19.[9] The table also shows who is excluded and who is in a dominant position.

2.1.1 Location-based exclusion

Individuals from rural areas, particularly those from remote rural areas, have limited access not only to economic opportunities but also to services and facilities provided by the state. Lack of economic opportunities is particularly acute in the mid and far western regions of the country. These regions have historically been at the periphery of the mainstream economy and have been generally neglected by the state. Consequently, they continue to lag behind other development regions in access to roads, health facilities, schools, and markets (CBS 2004; CBS 1996). The higher levels of monetary and human poverty in the mid and far western regions seen in Tables 7 and 15 are a reflection of the disadvantages suffered by people in these areas. These are also the areas that were hardest hit by the Maoist insurgency.

2.1.2 Gender-based exclusion

Women and girls have traditionally been marginalized in many ways by Nepal's largely patriarchal society. Economically, women are disadvantaged both in their homes and in their work. They have limited decision-making power in financial matters within their households and, until recently, had no legal right to inheritance. According to the 2001 census, the percentage of households with any female land ownership was just 11 per cent even though 84 per cent of all households own some land (Acharya 2007). Outside the home, women's wages are lower than those of men both in the wage-labour market and in better paying jobs (CBS 2006).

As indicated by the dismally low female adult literacy rates (Table 10), women are also disadvantaged in their opportunities for educational . The disparity in access to education is seen too in the significantly lower percentage of women that hold higher academic degrees compared to men (Acharya 2007). Gender-based exclusion is also reflected in the limited accesses

Table 19:Dimensions of exclusion in Nepal

Basis of exclusion	Who is excluded	Who is dominant
Location	Individuals from rural areas and remote areas	Individuals from the capital, from urban areas, and from district headquarters
Gender	Women/girls	Men/boys
Caste/ethnicity	Dalits, Madheshis, disadvantaged, Janajatis,other minorities	Brahmans, Chettris, Thakuris, Sanyasis, Newars, Thakalis, Gurungs, people of hill origin
Income	Poor individuals and families	Non-poor individuals and families

[9] Age and disability are other bases of exclusion in Nepal. The old, infirm and physically challenged individuals have limited opportunities to participate in normal economical and social life. Combined with other forms of exclusions, the plight of the physically handicapped becomes seriously acute.

women have to positions of power in politics and civil administration. In 2000, for example, only 6.4 per cent of MPs were women, and just 2.4 per cent of high ranking civil service positions were occupied by women (Acharya 2007). The political representation of women has increased substantially in the recently held constituent assembly elections. Women's presence in civil service, however, has not improved significantly.

2.1.3 Caste/ethnicity-based exclusion

Social and economic exclusion based on caste and ethnicity also plays an important role in exacerbating the poverty and deprivations faced by major segments of the population (Bhatta and Sharma 2006). Dalits, Madheshis, and some Janajatis are the three main disadvantaged population groups in Nepal.[10] Dalits in particular continue to face high levels of discrimination in all spheres of social life and are routinely denied access to economic, social and educational opportunities by the dominant groups. WB/DFID (2005) reports that Dalits rank at the very bottom when population groups are ranked using a composite wealth score (comprising of ownership of consumer goods, land and house). Terai middle castes and Janajatis stand in second place, while the privileged group (Brahmans, Chetris and Newars) are at the top. Similarly, the study finds that ethnicity has a significant association with schooling. More specifically, it finds that members of the Brahman-Chettri-Newar group have, on average, completed twice as many years of schooling as the Dalits.

It should be pointed out that much of the discrimination faced by Madhesis stems from the tendency among the non-Madhesi population to portray the former as non-Nepalis by misrepresenting the geographical and cultural proximity of Madhesis to India. By questioning the Nepali identity of Madheshis, the non-Mdheshi population has historically tried to justify the exclusion of Madhesis from the political and government power structures of Nepal.

2.1.4 Income-based exclusion

While exclusion is a determinant of poverty in the monetary approach to defining poverty, exclusion is also a consequence of monetary poverty. Opportunities for participating in economic and social activities are severely limited for the poor. Financial constraints prevent them from making adequate investments not only in physical capital but also in human capital including health and education. As a consequence, they are restricted to the lowest-paying sectors in the job market and are also unable to create adequate self-employment opportunities for themselves. The poor are also the most vulnerable population group to the adverse consequences of shocks and disasters.

Most socio-economic indicators are lower for people with low income (CBS 2006). For example, the percentage of 10-14 year old children engaged in child labour and not going to school is 22 per cent for the poor compared to 10.5 per cent for the total population. Similarly, the primary school completion rate for children from the lowest wealth quintile is only around half of that for children from the highest wealth quintile. According to the National Demographic and Health Survey 2006, the child mortality rates are twice as high for the lowest quintile as in the highest quintile (MoHP 2006). The poor also have less access to government-provided services (CBS 2006). Thus income-based social exclusion contributes to the perpetuation of poverty among poor families. This is reflected by the fact that almost half of the poor population are chronically poor (Bhatta and Sharma 2006).

[10] Dalits are the supposedly untouchable castes in the caste hierarchy. Madheshis are Nepalese who have traditionally lived in the Terai—the southern plains bordering India. And Janjatis are non-caste ethnic minorities.

2.8 KEY DEVELOPMENT CHALLENGES AND POLICY RESPONSES

2.1.5 Development challenges

Nepal is currently in the process of the adjusting to its status as a post-conflict democratic republic. Until April 2006, the nation was embroiled in a civil war between the state and a violent Maoist movement. What started as a small insurgency in a couple of mid-western districts in 1996 had spread across the entire country by 2003, significantly weakening the presence of the government in most rural areas of the country and systematically marginalizing the democratically elected parties in national political life. Taking advantage of this situation, the king overthrew the government of elected people's representatives and established himself as an absolute monarch in 2003. This move by the constitutional monarch pushed the democratic political parties into forming an alliance with their erstwhile foes—the Maoists—for the purpose of ending the king's dictatorship.

The result was the People's Movement of 2006. Supported by the democratic political parties, the Maoists and members of civil society, the Movement ended the king's rule and transferred power to a coalition of democratic political parties and the Maoists. This transition has led to the successful completion of Nepal's first constituent assembly elections and has also officially transformed the nation into a democratic republic. As the largest party in the constituent assembly, the Maoists are currently poised to lead the new government that will govern the nation for at least two years. But there remains the challenge of resettling the Maoist fighters and transforming the Maoists into a non-violent political party committed to democratic norms.

Many of the development challenges facing Nepal today are related to the disruptions in the economic and social spheres during the last few years of civil war. The direct costs of the conflict to infrastructure alone have been estimated at around $250 million (World Bank 2005). The inflow of tourists declined to negligible levels during this period. Periodic transport disruptions resulted in 20 per cent to 25 per cent lower sales by private firms to rural areas, exacerbating the deprivations in rural Nepal. Furthermore, there was a significant reduction in private sector investment during the conflict as a consequence of insecurity and uncertainty faced by potential investors. Extortion of rents by Maoists through threats of violence, and the systematic elimination of labour unions associated with democratic parties further discouraged businesses from engaging in production-oriented activities. At the same time, the uprooting of elected local government bodies by the Maoists resulted in disruptions in essential service delivery; public investment declined, health services in rural areas deteriorated and the education sector also suffered badly.[11] Violence by both Maoists and the state also prompted the flight of people and capital from conflict affected areas.

Although the Maoist insurgency has ended, and the nation is rapidly moving to establish a sustainable democratic political system, problems of insecurity and uncertainty still plague the country. As the Maoist fighters and their paramilitary organization—the Young Communist League (YCL)–remain under the command of the mother party, the Maoists continue to behave as a military force rather than as a political party. The presence of the state is still weak in most areas of the country, encouraging violent groups such as the YCL and certain extremists groups in the Terai and the eastern hills to take the law into their own hands. The task of rebuilding infrastructure destroyed during the conflict has not begun in earnest.

The first development challenge facing Nepal is to build a relationship of mutual trust between the state, the citizens and the private sector, and to re-establish the state's presence across the nation (NPC 2007). This means that the state must actively establish the rule of

[11] Because of violent attacks on teachers by the Maoists, many teachers in rural areas fled to district headquarters.

law, deliver basic services to the people, improve the safety and security of the general public, and provide relief to those affected by the conflict.

An encouraging outcome of the People's Movement was the recognition by both politicians and the general public that sustainable development in Nepal is not possible without giving due attention to the need to create a more inclusive society. There are multiple dimensions of social exclusion in Nepal, including the ethnic dimension. A number of ethnically-based political organizations are calling for the formation of a federal structure based along ethnic lines even though ethnic diversity is one of the defining features of the vast majority of Nepal's districts. Consequently, the mid and eastern Terai regions of the country in particular are currently experiencing heightened levels of political violence along ethnic lines. Thus, another key development challenge facing Nepal now is that of building a new constitution and a federal structure that is, at the same time, both inclusive and non-divisive .

Apart from the challenge of post-conflict rebuilding and restructuring the political structure of the nation, other persistent development challenges need to be tackled World Bank (2005).

These include the problem of high and uneven transport costs resulting from Nepal's difficult geographical terrain. Most hill and mountain areas do not have ready access to roads for four-wheeled vehicles. The disparities in economic and social outcomes between rural and urban areas and across the various regions discussed earlier are partly a consequence of the natural differences in accessibility across the nation. It is also relevant to note that the Maoist insurgency was launched from some of the most inaccessible and neglected districts of the country.

Another persistent challenge is that of poor governance. The Nepali Government itself has recognized that its over-centralized, weak and inefficient institutions are partly to blame for the continuing high poverty in the country (NPC, 2003). Unresponsive and unmotivated administration at all levels has made most government agencies highly ineffective in delivering services to poor and needy people. Following historical trends, political and economic power continues to be concentrated in the capital. Furthermore, both the power centres of political parties and the government bureaucracy are heavily dominated by males form the Brahmans, Chettris and Newar ethnic groups. Hence, citizens from remote areas (especially in the mid and far west), women and disadvantaged minorities have received far less than their share of development benefits to date.

Maintaining competitiveness in an increasingly integrated and competitive global economy is another major challenge. Over the years, there has been a sharp decline in Nepali exports, including in the once-booming carpet industry, while Nepal's competitors have increased their competitiveness in the global economy. Implementing trade barriers to promote import substitution is no longer a practical option. It is therefore essential for Nepal to introduce reforms that will increase productivity and make the economy more competitive. The creation of an investment-friendly climate is a prerequisite for the development of a globally competitive national economy.

A final development challenge currently facing the nation is that of making significant improvements in the social sector. Nepal has experienced significant increases in literacy rates and primary school enrolment rates during the past few decades. Nevertheless, the trends suggest that achieving the Millennium Development Goal of universal primary education by 2015 is going to be very challenging (NPC 2005). Apart from the challenge of achieving these quantitative improvements in education, the government of Nepal has also identified the need to improve the quality of public education as one of the major problems in the education sector (MOES 2007). Nepal's progress in the health sector has been more satisfactory than in the education sector. The challenge is to sustain this progress in the future as well. Another challenge in the social sector is the need for programmes and safety

nets designed to protect the most vulnerable portions of the population, especially in the face of shocks and disasters. Such programmes need to go hand in hand with efforts to reduce poverty.

2.1.6 Government responses to development challenges

Planned development was initiated in Nepal in the mid 1950s with the launch of the first five-year plan (1956-61). Although the government began to play an active role in tackling poverty with this plan, poverty reduction entered the national planning framework as an explicit goal only in the seventh plan (1985-90). But since then poverty reduction has remained the central focus of the government's national development agenda. The ninth plan (1997-2002), in particular, presented poverty reduction not only as its top priority but also established long-term targets for all sectors based on their potential for alleviating poverty (IMF 2003). Further emphasizing the government's focus on poverty reduction, the tenth plan (2002-2007) was developed as Nepal's Poverty Reduction Strategy Paper. The current three-year interim plan (2007/2008-2010/2011), while addressing issues specific to Nepal's post-conflict transitional period, continues to give special emphasis to poverty reduction.

In the early 1990s, the poverty reduction strategy employed by the government was growth focused. Guided by the eight plan (1992-1997), the government relied on economic reform measures such as trade liberalization, exchange rate unifications, financial and capital market promotion and export promotion to accelerate economic growth (NPC 2003). While these measures did have a positive impact on the urban economy, they largely bypassed the agricultural sector and the rural population. Thus the impact of this strategy on poverty in general and rural poverty in particular was limited.

Recognizing the limitations of a narrow growth focused approach, the ninth plan developed a three-pronged development strategy that called for broad-based economic growth, accelerated development of social and rural infrastructure, and targeted programmes for disadvantaged communities and areas. The plan aimed to reduce the monetary poverty rate from 42 per cent to 32 per cent within the plan period by achieving a sustainable growth rate of 6 per cent per year. The growth would be broad-based in the sense that the neglected agricultural sector would be accorded high priority while promoting tourism, labour-intensive manufacturing, and hydropower in the non-agricultural sector. The 20-year Agriculture Perspective Plan (APP) sought to raise the nation's agricultural growth rate from 3 per cent to 5 per cent within twenty years.

Disruptions caused by the escalation of the Maoist insurgency, adverse weather conditions, and other external factors resulted in limited progress during the ninth plan period. The GDP growth rate stagnated at around 3.6 per cent, the agricultural growth rate reached only 3.3 per cent and the growth rates in the non-agriculture sector fell far short of the plan targets. Furthermore, by the end of the plan period, the government was unable to carry out development activities and deliver essential services in vast areas of the country because of the insurgency. Interestingly, the poverty rate declined substantially during this period. Although reliable poverty rate estimates for 2002 are not available, the impressively low NLSS II-based poverty rate estimates for 2003/04 (Table 5) suggest that the poverty outcomes by the end of the plan period were relatively close to the original targets. The reduction in poverty, however, can be attributed to a large increase in remittances received from abroad.

The tenth plan broadened the government's poverty definition and made the reduction approach more inclusive by formulating a "four-pillar" poverty reduction strategy. The four pillars included broad-based economic growth; social sector development including human development; programmes aimed at social and economic inclusion of the poor, marginalized population groups, and backward regions in the development process; and good governance (NPC 2003). While the first pillar attempted to address

monetary poverty, the second and third pillars were designed to address human poverty and exclusion.

The tenth plan focused more on rural areas than previous plans—the areas where the majority of the population lives. Another new aspect in this plan was the explicit recognition that development in the Nepali context is not possible without giving due attention to social inclusion. Implementation of the tenth plan relied heavily on the private sector, NGOs, INGOs and CBOs for carrying out development activities. It also proposed separate achievement targets for two scenarios: the normal case scenario and the lower case scenario. Under the normal case scenario, the plan aimed to reduce the overall poverty rate from an estimated 38 per cent[12] to 30 per cent, and maintain a real GDP growth rate of 6.2 per cent per year.

Further intensification of the conflict after 2001, however, took a heavy toll on the economy. The royal takeover of the government in 2003, and the events leading to and following the 2006 People's Movement also disrupted the economy and the normal workings of government. In 2002, for example, the annual GDP growth dropped to 1 per cent, and fluctuated between 4.7 per cent and 2.5 per cent during the next five years. The overall GDP growth rate during the 10th Plan period was 3.4 per cent – around one per cent lower than the lower case scenario target of 4.3 per cent per year. The agriculture sector grew at 2.67 per cent per year (the lower case scenario target was 2.8 per cent). It is, therefore, unlikely that national economic growth had any substantial impact on poverty reduction. Service delivery was largely ineffective during the entire plan period.

The current three-year interim plan (2007 – 2010) gives continuity to the four-pillar approach to poverty reduction even whilst focusing on post-conflict rebuilding. Promoting pro-poor and broad-based growth, promoting good governance and effective service delivery, and adopting an inclusive development process are among the key development strategies outlined by the plan (NPC 2007). Other strategies specified by the plan include accelerating the relief, reconstruction and reintegration effort, creating and expanding employment opportunities, and increasing investments in infrastructure.

In promoting broad-based growth, one change in the interim plan is that it reemphasizes the need to expand the manufacturing and service sectors. It also seeks to promote cooperatives and public-private partnerships while creating a more secure and transparent investor-friendly economic environment. The target annual GDP growth rate for the interim plan period is 5.5 per cent. In order to make the development process more inclusive, the plan calls for legal action against discrimination and guaranteed participation of individuals from marginalized groups and areas in the processes of policy making, planning, implementation, supervision and evaluation.

[12] This estimate of 38% was not based on a proper living standard survey of households. The 2003/04 NLSS II data show that the poverty rate in 2003 was 30.8%. Hence, it is very likely that the poverty rate at the beginning of the plan period (i.e., in 2002), was already well below 38%. Thus the plan's end-of-period poverty rate target of 30% should have been revised downward if the goal was indeed to reduce the poverty rate by 8 percentage points.

2.9 CONCLUSION

This chapter has given an overview of the deprivations faced by Nepalis, the current development challenges facing the nation, and the government's past and present approaches to tackling the problems of poverty and inequality. It is clear that while poverty has declined over the years, it remains widespread. At the same time, there are wide variations in monetary poverty between urban and rural areas and across geographical regions. People living in rural areas and in the mid and far western development regions are more likely to be poor than people in other areas. These differences are also observed in non-monetary indicators of welfare such as health outcomes, human poverty indices and subjective poverty rates. There is also a gender gap in social outcomes, with women having lower education and health outcomes than men.

Some population segments have been and continue to be excluded from the mainstream economic and social processes in the country. The most important bases for social exclusion in Nepal are location, gender, ethnicity and economic status. Excluded groups include the poor, women, Madheshis, disadvantaged ethnic minorities and residents of rural areas and remote western regions.

Many of the development challenges facing Nepal today are related to the political changes that have taken place during the past few years. They include issues related to post-conflict rebuilding and creating an inclusive federal democratic republic. Other challenges include the need to address problems associated with the nation's difficult geographical terrain, weak government institutions, and the reality of a competitive globalized economic environment. During the past decade, the government has tried to meet some of these challenges by promoting broad-based growth, social sector development, inclusive development processes and good governance.

The current three-year interim plan gives continuity to the poverty reduction approaches of the past. But it also tries to address problems associated with post-conflict reconstruction. While this plan is the guiding document for poverty reduction programmes, the extent to which the new government will follow these guidelines is unclear. A possibility exists that the new government will develop a new planning framework that incorporates some of the materials from the interim plan. The recently elected constituent assembly is required to write a new constitution by April 2010. And the new constitution must define, among other things, the boundaries, responsibilities and authorities of the federal units comprising a Nepali federal democratic republic. Policies and strategies for poverty reduction will most likely be different for the various federal units.

3 DISASTER AND SHOCK PROFILE

This study uses the DesInventar database to analyze selected types of disaster. Data are analyzed from different aspects and perspectives to create a picture of disasters from in Nepal 1971 to 2007.

In line with current global practice, disasters are conveniently classified as natural, and/or human induced[13]. Natural disasters include those that are triggered by, for example, earthquakes, landslides and floods. We have also included epidemics, because of their substantial impact. These natural disasters can also be sub-classified as geological, meteorological or epidemiological. Human-induced disasters are financial crisis (economic), ethnic, gender or religious, discrimination (political), civil strife and war (social), nuclear hazard (technological) and pollution and deforestation (environmental) (ISDR, 2007 – cited in Fuente et. al. 2008:33). This report deals only with natural disasters, and most of them are geological (earthquake), climatological (e.g. flood, landslide, drought, storm, hailstorm), and epidemiological (epidemics).

3.1 INTRODUCTION

In Chapter 1, we discussed the various types of natural hazards prevalent in Nepal and the topographic, geologic, climatic and other natural causative factors for their occurrence. It was shown that the magnitude and intensity of various hazards are high in Nepal. The events of natural hazards translate easily into disasters, indicating high levels of vulnerability inherent in aspects of Nepalese life.

Subsequent chapters of this study report discuss the nature and extent of vulnerabilities. This chapter aims to considers disasters in terms of their typologies, prevalence characteristics and their impacts.

[13] Disaster is a situation of disruption in society. While natural hazards are traditionally and even currently considered as the origin of disasters, the intensity of disasters depends on the extent of human society's exposure to a hazard; the conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequence after an event of hazard. Hence the use of the term "natural disaster" is used in this report for the purpose of convenience only.

3.2 NEPAL A REGIONAL HAZARD PROFILE

Nepal's natural hazard scenario has not always been treated with the gravity it deserves. Lean (1978) reported the occurrence of thousands of landslides occurring in a day in Nepal. The 1988 Udaypur Earthquake and the 1993 Flood in south-central Nepal were the two catalytic events that prompted recognition of the need for organized and systematic approaches. UNDP helped to consolidate the lessons from these two devastating events by organising the first national conference on disaster management in 1993, and creating specialised working groups – the Disaster Health Working group (DHWG), the Logistics Working Group, and the Food and Agriculture Working Group. It also prepared draft manuals on disaster preparedness and response and commissioned a study to develop a comprehensive database on disaster hazards and disaster management capacities in Nepal .

The Government of Japan too, through JICA, assisted Nepal in setting up a Disaster Prevention Technical Centre, DPTC (now transformed into a government department called Department of Water-Induced Disaster Prevention (DWIDP).

The declaration of International Decade for Natural Disaster Reduction (IDNDR 1990-1999), and the discussions at the annual IDNDR Day symposia (now ISDR Day), the problem of disasters from natural hazards started getting the attention of the government, the UN system and Kathmandu's international community. The first official recognition of Nepal as a disaster-affected country was in the national report submitted to the UN International Conference on Disaster reduction in Yokohama in 1994. During preparation of the report, Nepal made a national action plan for disaster management (NAP), following a wide consultative process. It become an active participant in subsequent regional IDNDR activities and in initiatives such as the World Seismic Safety Initiative (WSSI). The National Society for Earthquake Technology – Nepal (NSET) was established in 1994 with support and guidance from the then Ministry of Physical Planning and Works with the aim of assisting the government to implement the recently formulated National Building Code. Nepal joined the Asian Disaster Reduction Centre (ADRC) and the Board of Trustees of the Asian Disaster Preparedness Centre (ADPC).

The MOHA made disaster occurrence data publically available in mid-1980s, which gave further recognition to the problem.

Table 20 is reproduced from the EM-DAT/CRED in the annual IFRC World Disaster Report. The number of deaths and persons affected were normalised using World Bank statistics (www.web.worldbank.org/wbsite/external/datastatistics (Afghanistan and Bhutan data on population taken from those countries' websites). It becomes clear that a settlement with about 10,000 population had experienced between 2 and 19 deaths during the previous two decades.

The data also shows that Nepal has about 1/40th the population of India (with approximately similar proportions in terms of territory), but experienced about 2.5 time more deaths (pro rata) from disasters during that period.

Pakistan, Sri Lanka and Bangladesh show very high figures for "people killed". This is due to the huge impact of earthquakes, tsunami/s and cyclones. For example, the data on Pakistan is significantly influenced by the Kashmir earthquake of October 2005, which claimed some 70,000 lives.

Table 20: Death and population affected due to disasters in South Asia during 1988-2007

Countries	Population, million	Total No. of people reported killed by Disasters during	Persons Killed per 10,000 population	Total number of people reported affected by Disasters during (1988-2007)	Persons Affected per 10,000 population
Bhutan	0.634,982	239	3.76	66,600	1,049
India	1,123.3	127,387	1.13	987,387,343	8,790
Nepal	28.1	7,090	2.52	3,315,607	1,180
Pakistan	162.4	88,245	5.43	53,219,436	3,277
Afghanistan	31.890	14,780	4.63	11,061,856	3,469
Bangladesh	158.6	168,306	10.61	209,877,136	13,233
Maldives	0.3	143	4.77	52,812	1,760
Sri Lanka	19.9	36,859	18.52	11,512,659	5,785
South Asia Total	**1,520.4**	**443,049**	**2.91**	**1,276,493,449**	**8,396**
Asia Total		**1,477,880**		**4,103,921,243**	

Note: the figure in the 4th and last columns can represent respectively the average total number of deaths and disaster-affected population in a settlement of 10,000 population during 1988-2007.

Source: CRED/EM-DAT, as reproduced in IFRC, 2003-2008

The disaster risk index (DRI), developed by the Bureau of Crisis Prevention and Recovery (UNDP/BCPR, 2004) is a better indicator for understanding countries' disaster risk status. The DRI study compared selected countries exposed to floods, earthquakes and tropical cyclones by introducing the concept of DRI that includes exposure and vulnerabilities and other socio-economic parameters that together define the risks. The study reveals that Nepal has alarmingly high levels of relative vulnerability to floods and earthquakes – not relative to South Asia, but globally (Table 21). Nepal is the second highest country at risk of flooding, country second to Bhutan in South Asian, while it is third (behind Afghanistan and India) in its vulnerability to earthquakes.

A World Bank study classified Nepal as one of the world'd natural disaster hot spots.

Studies on earthquake risks at country or city level have shown alarming results for Nepal. The seismic hazard mapping and risk assessment for Nepal conducted during the building code development (UNDP/UNCHS (Habitat), 1994) indicated that the magnitude-frequency relationship of earthquakes for Nepal is comparable to that of California. The Global Earthquake Safety Initiative (GESI, 2001) compared the earthquake risk (in terms of potential deaths) in 21 cities located in the world's high seismic hazard zones and concluded that Kathmandu was the most at-risk city. The per capita earthquake risk of Kathmandu is not only the highest, but also more than six times greater than Mexicalli, the second most at-risk city in the world's seismic regions (Figure 6).

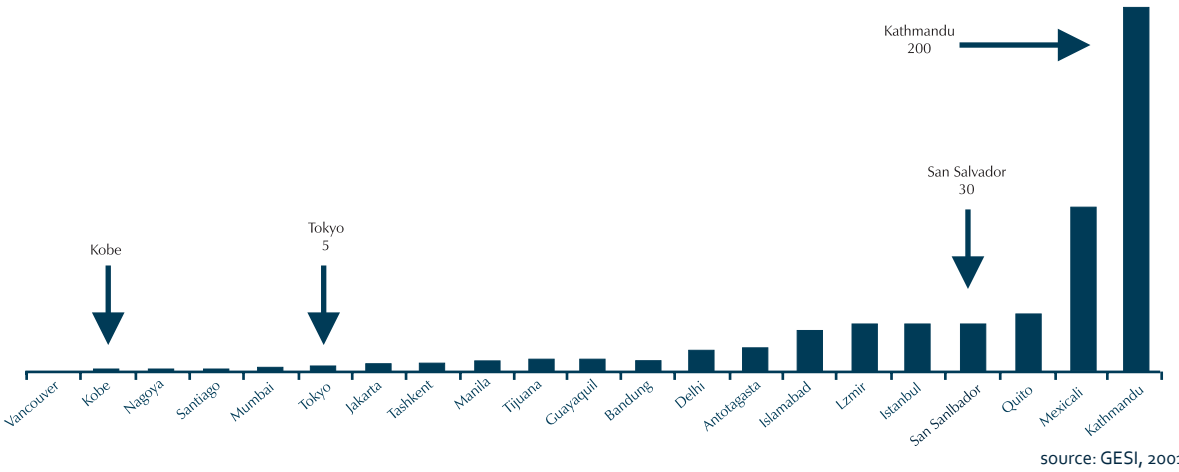
Until relatively recently, disaster data were classified. This meant that several local disaster events, especially in remote Himalayan regions, went unreported. Disaster risk studies for other natural hazards have not been conducted in detail at city or local levels. The real estimates of risk are therefore yet to be fully understood. The recent devastation in eastern Terai (and in the State of Bihar, India) by the breeching of the Koshi River embankment highlights these vulnerabilities and risks.

Table 21:Disaster risk for floods and earthquakes, 1980-2000

Country	Average number of events per year	Average number people killed of per year	Average number of people killed per million inhabitants	Average physical exposure per year	Physical exposure in percentage of population	Relative Vulnerability
	Event per year	Killed per	Killed per million year	people per year	%	Killed per million exposed
Disaster Risk for Floods						
Bhutan	0.1	10.57	5.44	127900	6.59	82.65
Nepal	0.9	199.38	10.92	4334045	23.74	46.00
Afghanistan	0.76	420.57	24.63	9841.123	57.63	42.74
Pakistan	0.95	200.38	1.77	8773423	7.73	22.84
India	3.86	1313.24	1.55	113041.3	13.33	11.62
Bangladesh	2	461.95	4.11	42168039	37.51	10.96
Sri Lanka	1.29	27.62	1.62	4064648	23.85	6.79
Myanmar	0.29	9.05	0.2	2166338	4.88	4.18
Disaster Risk for Earthquakes						
Afghanistan	0.81	933.95	2480	174 9097	0.11	228.1
India	0.67	576.52	0.73	273 0309	0.35	211.16
Nepal	0.10	38.52	2.42	512 716	3.22	75.14
Pakistan	0.62	30.95	0.30	793 845	0.77	38.99
China	2.10	92.24	0.08	349 3705	0.30	26.40
Bangladesh	0.19	1.38	0.10	925 173	0.73	1.49

Source - UNDP/BCPR, 2004

Figure 6: Per capita risk of casualties



source: GESI, 2001

3.3 DISASTER INFORMATION FOR NEPAL: THE DESINVENTAR DATABASE

With financial support from UNDP and with approval from the Government of Nepal, NSET established a new disaster information management system. The DesInventar was originally developed in Latin America by the LA RED network in 1994. DesInventar is a computer-based information management system that creates an inventory on large and small disasters and hazard occurrences. It analyzes the disaster data and produces disaster attributes and analyzed results in geo-referenced map and chart forms. The system is adaptable to the local context.

After completion of the UNDP-supported project, NSET continues to update the DesInventar database. At present, data on disasters in Nepal have been processed for the period 1970-2007. This DesInventar Nepal database is used for the analysis in this report.

Nepal DesInventar database includes attributes on the following types of hazard disasters.

- accident[14]	- explosion[15]	- plague
- avalanche	- famine	- pollution
- biological disaster	- fire	- rains
- boat capsize	- flood	- sedimentation
- cold wave	- forest fire	- snow storm
- drought	- heat wave	- storm
- earthquake	- landslide	- strong winds
- epidemic	- leak	- structural collapse
- frost	- liquefaction	- thunderstorm
- GLOF	- panic	- hailstorm

[14] caused by natural phenomenon.

[15] caused by natural phenomenon.

Disaster attributes include the characteristics and effects of the hazards, their types, location, effects in terms of casualty, damage to physical objects, and losses. Special attention is paid to register small, 'everyday' disasters that are usually invisible at the national or global scale. Since the information on disasters are geo-referenced, the data and their interpretation and analysis are expressed in time and space, and the system allows them to be shown cartographically, graphically and in tabular form in administrative, physiographic or political divisions.

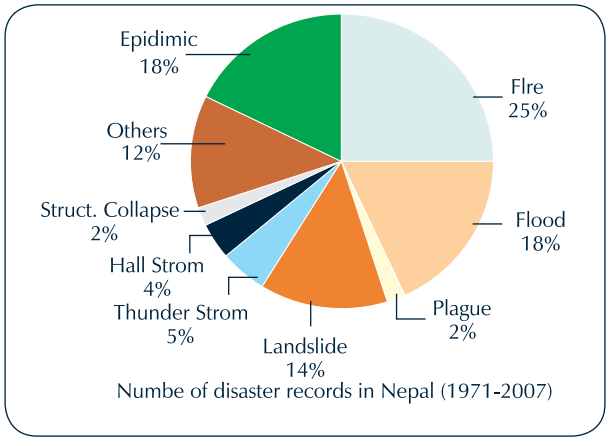
The DesInventar Nepal database (1971-2007) has data cards for 15,388 disaster events and reports 27,256 deaths, which means an average of more than two human lives lost every day.

About 57 per cent of deaths were caused by epidemics, 15 per cent by landslides, and 11 per cent by floods (Figure 7). The figure also shows that fires are the most frequent disaster events, and account for 25 per cent of data-cards (or number of disaster event records) of natural disasters. Epidemics and floods are next, at 18 per cent each.

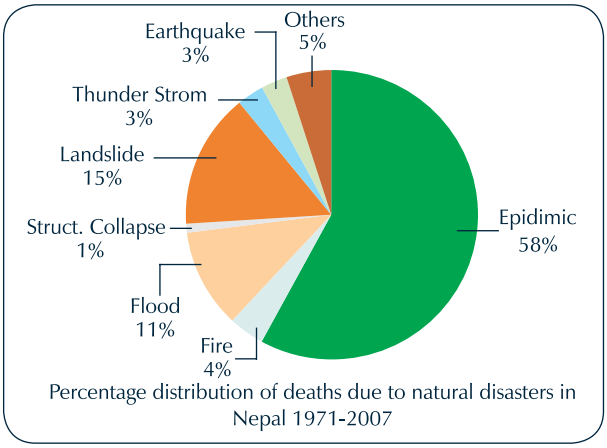
While figures on the number of events and casualty indicate the extent and intensity of impact, and usually are taken as parameters to estimate loss, the number of injuries, missing and affected are also important to interpret. For example, he number of 'dead' should be looked at with 'injured' – depending upon the nature of hazard, the proportion of 'dead' to 'injured' and 'affected' may be different.

In some case, events with fewer deaths may have high numbers of injured, missing and affected people. It is important to include these numbers in analysis, because serious injuries might die, missing people might not be found and affected people may take a long time to recover from losses and other impacts. Between 1971 and 2007, more than 50,000 people were reported 'injured', about 3,000 people were 'missing', and some 5 million people were 'affected'. Taking a closer look at the number of evacuees and affected people, the three most lethal types of hazard in Figure 7 have to be reinterpreted, as the 'dead' alone may not convey the true impact of the disasters. Flood disasters, for example, may be accompanied by fewer deaths, but the number of people 'affected' by flooding is severe – amounting to, on average, 70 per cent of the database's 'affected' people. The same is true, albeit to a lesser extent, for landslides and epidemics.

Figure 7:Occurrence (number of events recorded) of natural disasters in Nepal 1971-2007



Numbe of disaster records in Nepal (1971-2007)



Percentage distribution of deaths due to natural disasters in Nepal 1971-2007

Source: Nepal DesInventar data base, NSET 2007

Figure 7 shows that while fires, landslides, floods and epidemics are Nepal's most frequent hazards, epidemics and landslides have taken the most lives. Other frequently occurring events are thunderstorms, hailstorms, plagues and collapsed buildings. However, these events have different impacts on people and environment. Understanding disasters and their impacts demands a much more detailed analysis that segregates impacts into different categories.

3.1.1 Annual time-series distribution of disasters

Figure 8 plots the loss of life and number of events (represented by number of data cards) for each year. While an increase with time for both parameters is evident, the plot can be divided into three periods: 1971-1990, 1990-2000, and post 2000. During the first two decades (1971 – 1990), the number of data cards ranges between 200/year and 400/year with some exceptions; similarly for the number of deaths reported. The reason for the small number of reports may in part be due to weaknesses in the reporting system, due to limited access being available to disaster information. Since 1988-89, the number of events reported and the extent of fatalities increases dramatically to about double those of previous decades. That trend continues into the next decade.

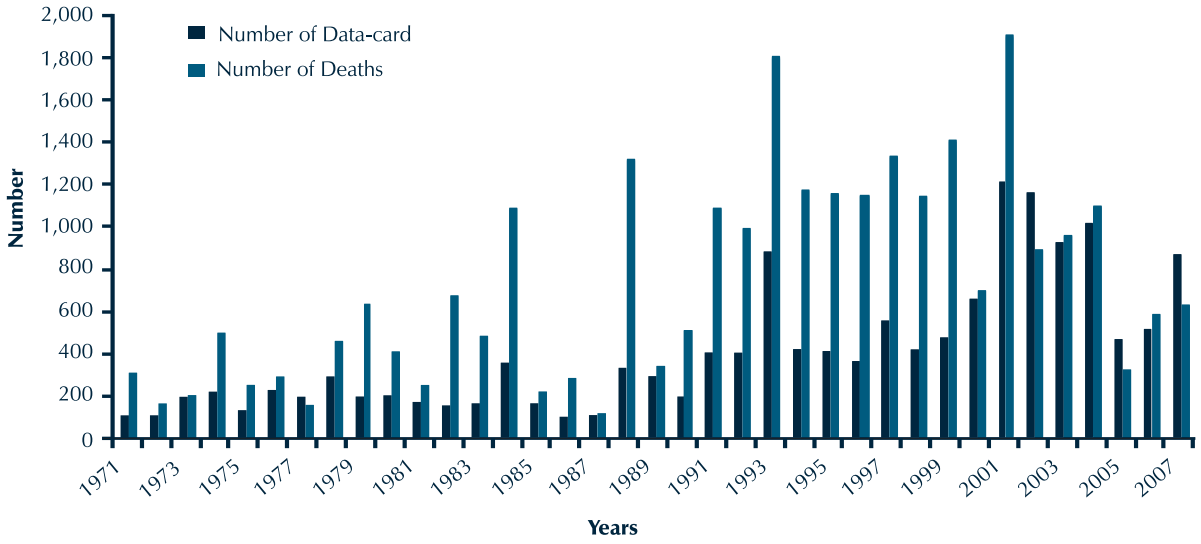
Population growth, expansion of settlements towards unsafe marginal lands (e.g. river banks, lowlands, steep slopes and forest areas) with resulting deterioration of public facilities help to explain the increase. The 1988 earthquake raised disaster awareness substantially, and demanded organized approaches for disaster risk management. It also appears to have led to better recording and reporting of disasters. After peaking in 2001, the curve shows a downward trend, which is interpreted as a reduction in the number of natural disasters and the consequent casualties.

Over the past ten years, the number of disaster-related deaths ranged from 500 to 2,000 every year. This means that, on average, about 6 people are losing their lives to natural disasters every day.

Surprisingly, the number of recorded events does not absolutely correlate with the number of fatalities: the correlation is visible only for the years with higher than average fatalities. But the number of deaths is always greater than the number of events, meaning that (for the most part) each reported event resulted in more than one death.

Figure 8 shows that the number of disaster events disaster-related deaths is on the increase, and there could be dramatic increase in these numbers at certain times. This is more than enough to warrant that greater attention be paid to enhancing national capacities in disaster risk reduction and preparedness.

Figure 8: Trend of human deaths and occurrence of natural disaster events 1971-2007



Note: Number of Data Cards does not mean the number of events; it reflects the extension of the particular event over different VDCs/Municipalities.

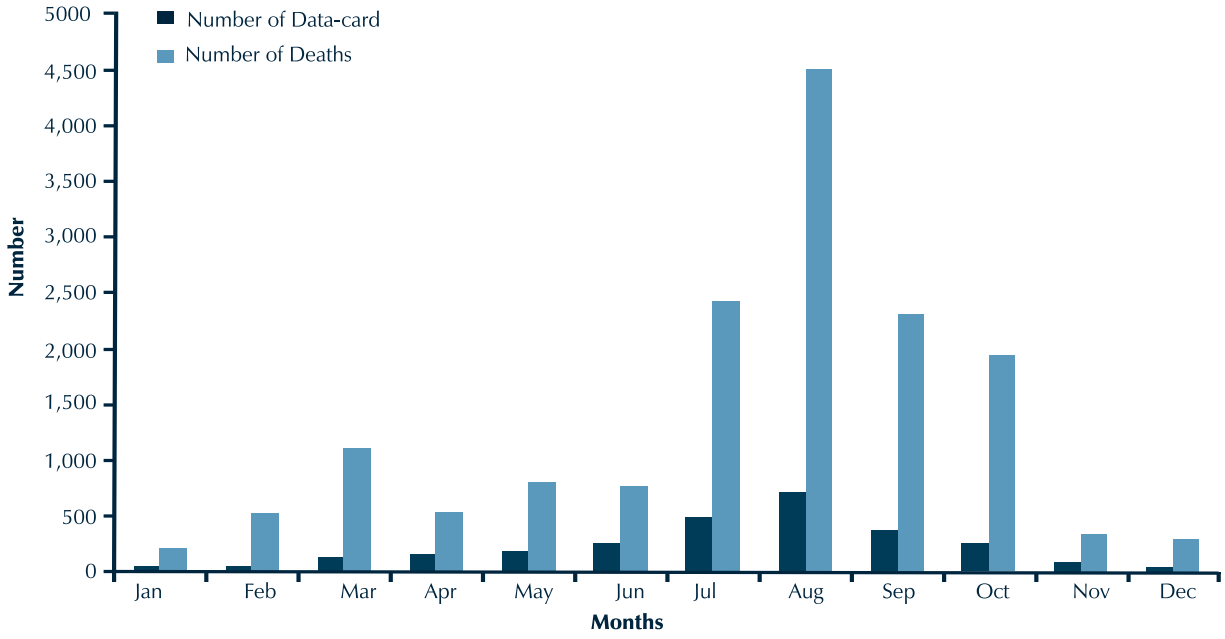
Source: Nepal DesInventar data base, NSET 2007

3.1.2 Seasonal distribution of disasters

There is a marked seasonality in the occurrence of disasters (Figure 9). They tend to peak in the monsoon, especially in July-August. This is normal. Floods and landslides are two of the four major disaster events, are strongly dependent upon precipitation and soil moisture contents. Another frequent disaster – epidemics – has its own seasonality, with waterborne diseases such as diarrhoea usually spreading in summer, while encephalitis and meningitis epidemics occur mainly in the cold seasons. In winter, Nepal faces cold waves, fire and snow storm disasters, while during the two moderate dry seasons (February to May, and September to early November) the most probable events are fire, epidemic, thunderstorms and hailstorms. But most epidemics happen in August and September, after the peak of the monsoon.

While most landslides and floods occur during the rainy season, they also happen throughout the year, triggered by factors other than intense rainfall.

Figure 9: Seasonality of all types of disaster events in Nepal 1971- 2007



Source: Nepal DesInventar data base, NSET 2007

In summary, the database shows a strong link between disaster occurrence and seasonality; the summer monsoon season is the peak time for many highly damaging and lethal disasters, such as floods, landslides and epidemics; with fire peaking in the dry season but presenting a threat throughout the year.

3.1.3 Spatial distribution of disasters

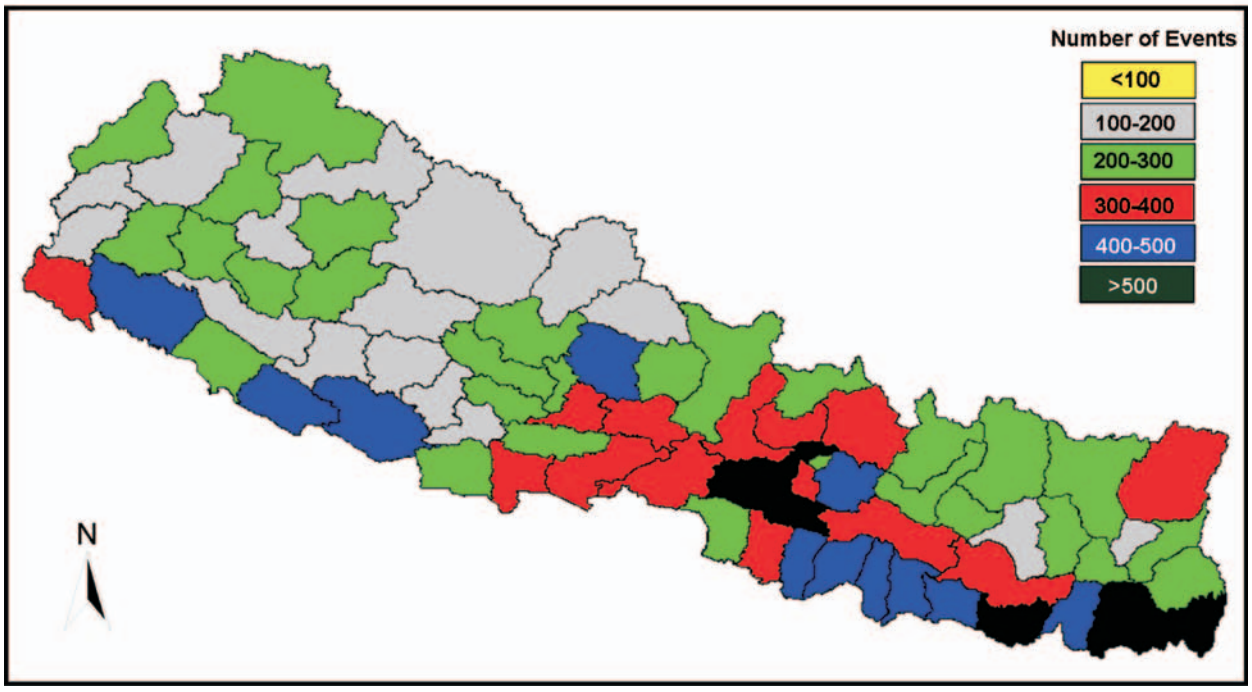
Chapter 1 showed that the country is highly prone to natural hazard and how due to the diverse topographic feature, climatic variation within the country, the type, frequency and degree of impact by natural hazards differs from place to place within the country. Chapter 2 discussed poverty characteristics and in part the socio-economic status and vulnerabilities in the country. Now we consider the spatial interpretation of the DesInventar data.

Disaster data for 1971-2007 in the DesInventar database show that all districts are susceptible to natural hazards. The Terai districts, together with some hill districts (e.g. Sindhupalchok, Surkhet and Achham) are conspicuous for the frequency of disasters. (maps 5 and 6). Mountain districts generally have fewer disasters, with Mustang and Manang having the lowest numbers of reported disasters. Some hill districts (e.g. Parbat and Bhaktapur) also have recorded lower number of disaster events. The scenario in the hill districts is mixed: while some districts experienced very high number of disaster occurrence, other few appear to be relatively safe.

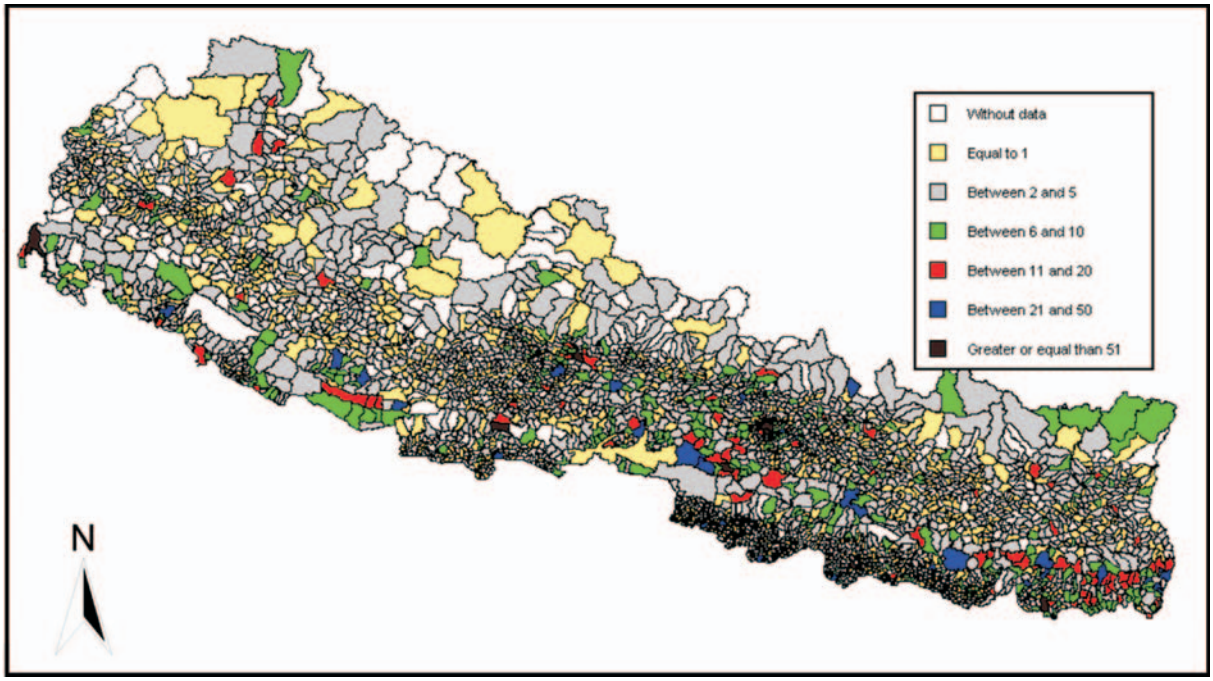
The Mountains and some Hill districts are remote. There could, therefore, be some under-reporting of disaster events, especially in the earlier periods of the database. Of course, there could be other contributory factors, but lower population size and density in 'relatively safer' districts could be significant.

Map 5 shows the distribution of disaster events in the Village Development Committees (VDCs, lowest level of administrative unit and also the lowest level of DesInventar resolution) of Nepal. This map provides a conspicuous pattern – there are three belts of disaster events corresponding roughly to the three physiographic divisions. The Terai VDCs and the middle hills are the worst hit. The Siwalik Range and the southern slopes of the Mahabharat Range have more disaster events than their western counterparts. The Mountains, even with several hotspots, experience fewer disasters.

Map 5: Occurrence of natural disaster events in Nepal by districts (1971-2007)



Map 6: Spatial distribution of occurrence of natural disasters in Nepal by VDC 1971-2007



3.4 PEOPLE AFFECTED BY DISASTERS

Affected population is also a major indicator of the impact of natural disasters. Between 1971 and 2007, natural disasters (floods, landslides, epidemics and other meteorological and/or weather-related events) affected about 5 million people throughout the country (Table 22). The data on populations affected by natural disasters shows a sharp increase after 1993. The following paragraphs analyse the effects of disasters on people according to the disaster types, annual time-series distribution, seasonality and spatial distribution.

3.1.4 Affected people by disaster types

Floods (68 per cent) followed by landslides (about 10 per cent) and epidemics (9 per cent) are the most significant disasters (Figure 10). Floods are frequent and repetitive, and affect the populated areas of the Terai and the fertile river terraces in the hills. The 1993 floods in the south-central Nepal were phenomenal. They directly affected the districts of Chitwan and Makwanpur, but the indirect effect extended to the entire nation when rainfall in one day destroyed eight major bridges, cutting road access from the Kathmandu Valley to the outside world for several months.

Landslides are also repititive and are concentrated during the monsoon season when agricultural activities are at the peak. Epidemics[16] are common in extreme temperature seasons (i.e. winter and summer seasons). Poor health facilities available in remote areas of Nepal, are a major reason for this.

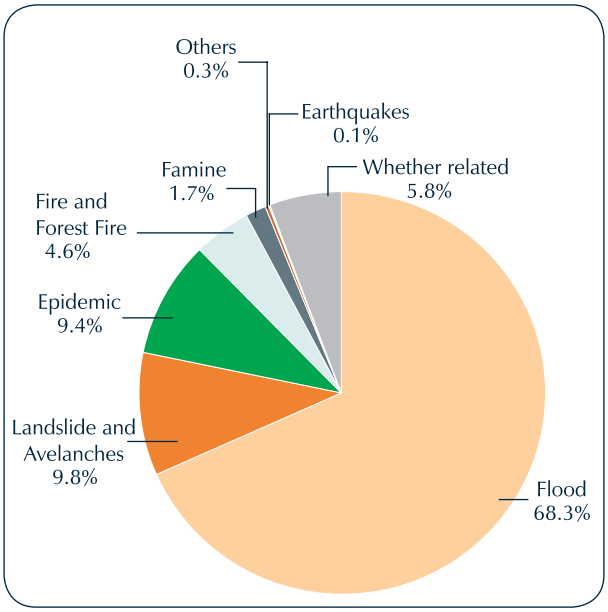
Earthquakes are rare, but when they do occur they affect a large area and population. The 1988 Udaypur Earthquake, with a moderate magnitude of 6.6 Richter, affected all 22 districts of eastern Nepal, including Kathmandu and Bhaktapur. The official records on 1988 earthquake show that total 721 people were killed and about 6,500 people were seriously injured (Thapa, 1989) in the eastern part of the country. Some 4,500 people were affected by earthquakes (Appendix 1) between 1971 and 2007.

[16] Epidemics means peoples seriously affected, hospitalized etc by epidemic events. The number "0" does not mean that the events were not occurred,

Table 22:Seasonality of affected people by months (1971 – 2007)

Month	Number of Affected people
January	25,345
February	8,884
March	282,298
April	163,229
May	61,747
June	79,746
July	3,062,008
August	800,964
September	336,868
October	42,165
November	5,131
December	58,177
Total	**4,926,562**

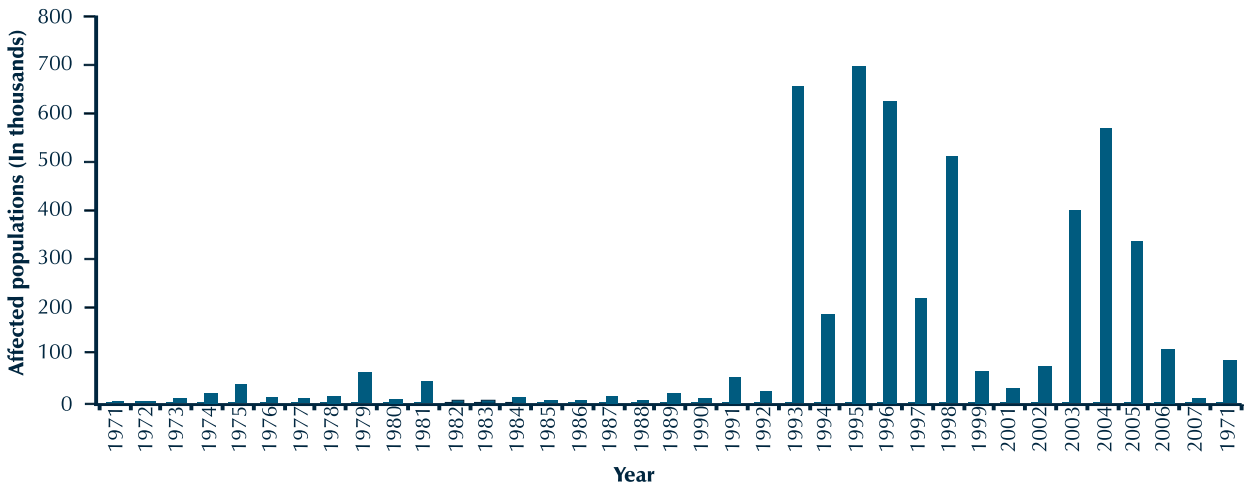
Figure 10: Affected people by different types of natural disaster in Nepal during 1971- 2007



3.1.5 Annual time-series distribution of affected people

The time-series distribution of affected people due to natural disasters is given in Figure 11. The devastating flooding of south-central Nepal in 1993 is a watershed. While the causative factors for such a change in the time-distribution may be many and could be the subject of further research, it seems that the "effects of cloudburst or even floods, especially in the hilly regions, in the form of unstable slopes and intermittently deposited debris along the river do not get flushed by the same flood and wait for years to clear". But this statement obviously does not explain all the effects faced by the people in subsequent years after 1993.

Figure 11:Year-wise distribution of affected population by natural disasters in Nepal



3.1.6 Seasonal distribution of affected people

The data shows a correlation between the seasonality of hazard events and that of the affected population. Figure 12 highlights the seasonal distribution of affected populations, and Figure 13 shows the number of people affected by natural disasters by month of occurrence. There are peaks in March, April and July-September. While earthquakes may affect the most people, they are neither frequent nor seasonal. Floods, landslides, epidemics and fire affect the widest areas and have strong seasonality.

Floods affect the most people each year, and are at their most damaging in July, August and September. March, July and September are the months most affected by epidemics. The dry month of April has fire hazards; and July, August and September are characterized by landslide hazards.

"Affected people" is an important indicator of the impact of a disaster. It represents the actual extent of disaster impact over the area where people live and how they are dealing with that impact. Plotting the seasonality of affected populations by disaster type can help improve preparedness.

Figure 12: Seasonality of affected people by months, 1971- 2007

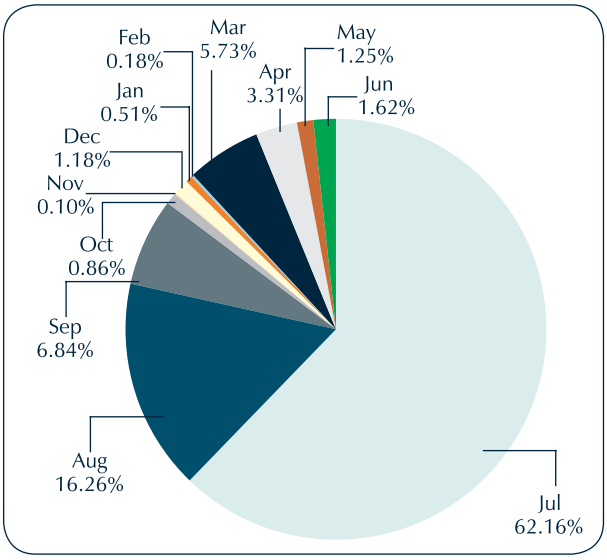
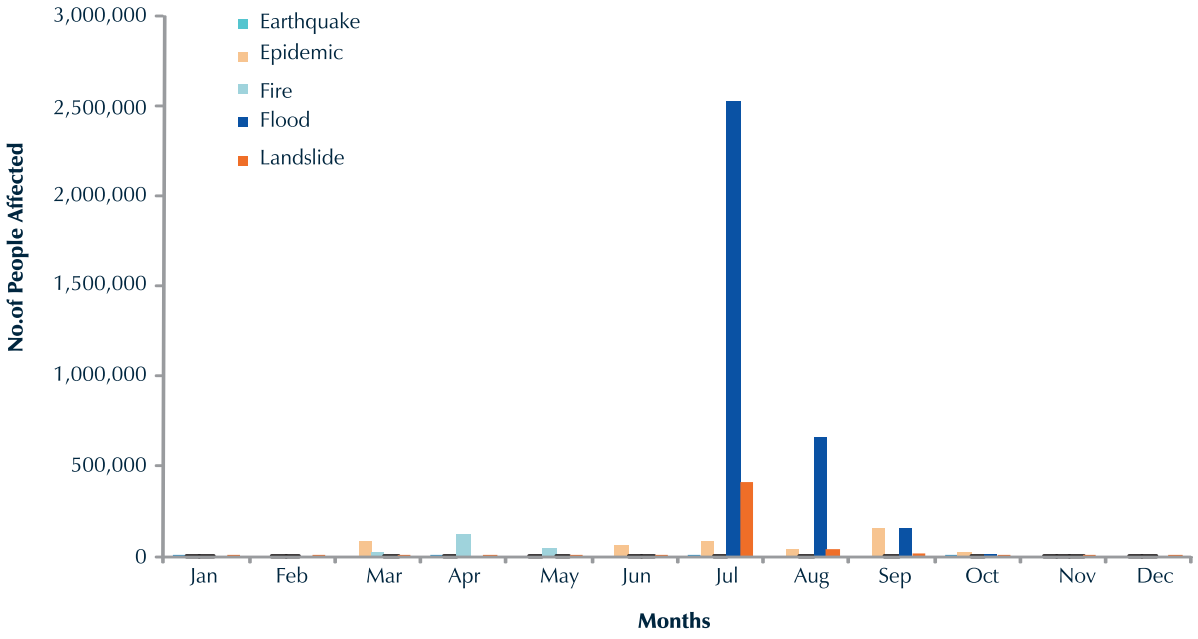


Figure 13:Seasonality of affected people by main hazards

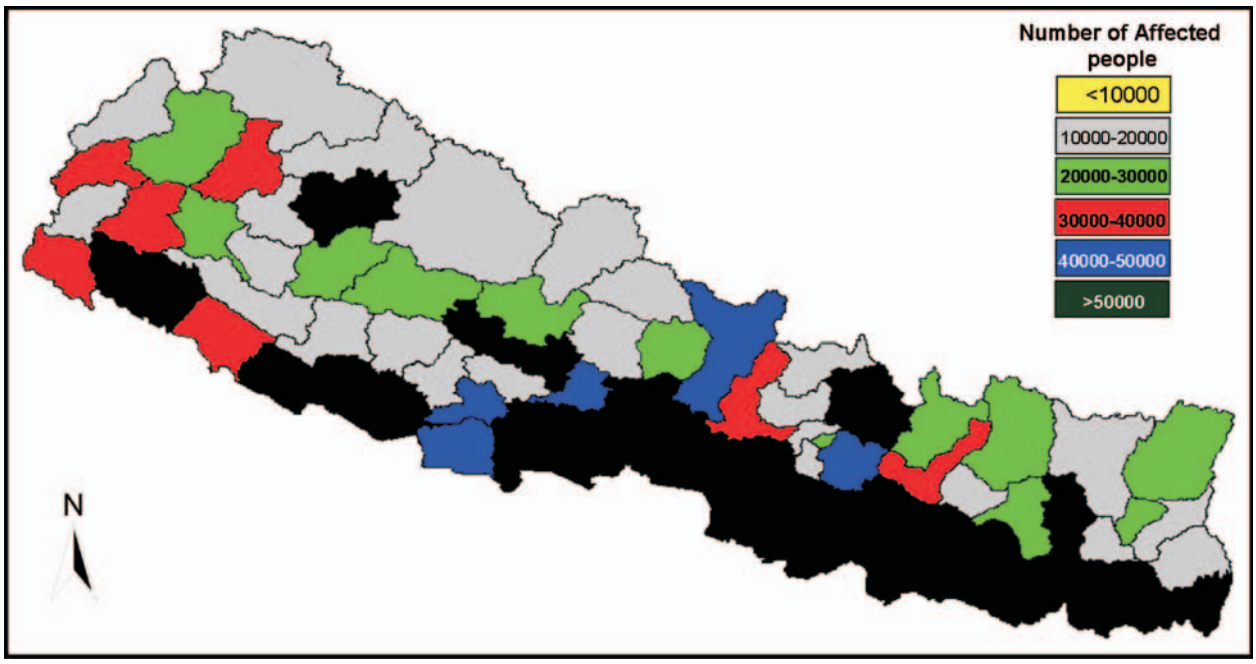


3.1.7 Spatial distribution of affected people

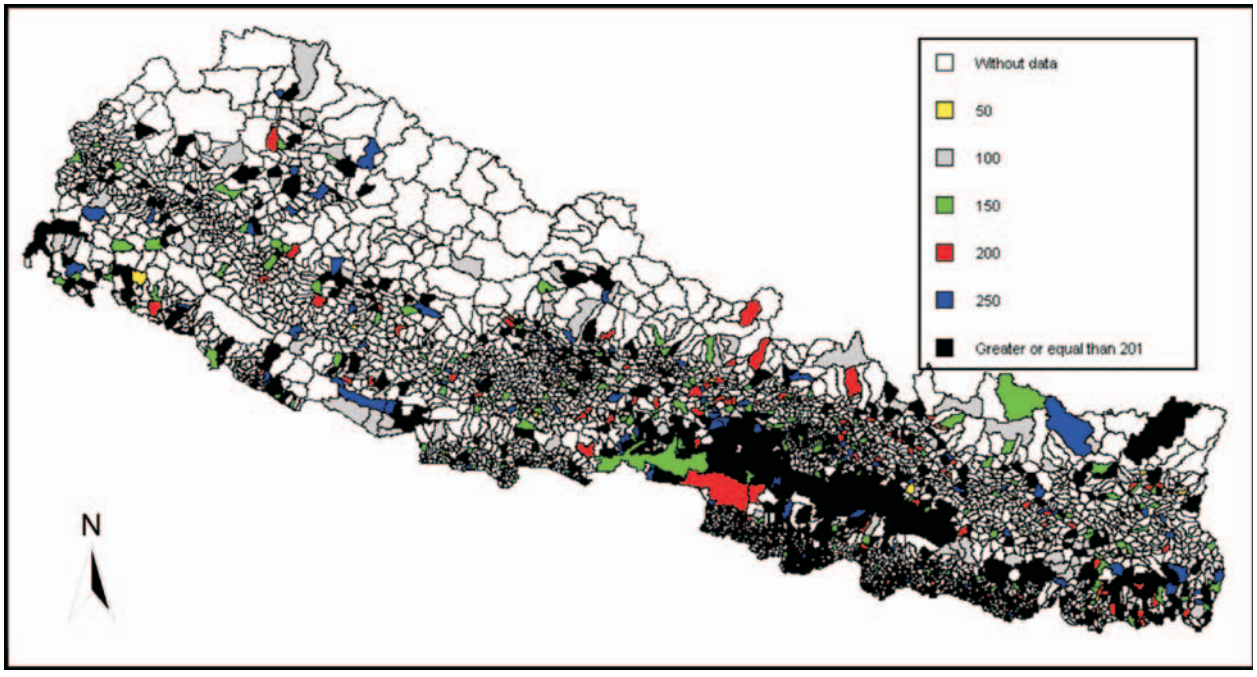
The database rightly shows that Terai districts are where disasters affect a significant proportion (>40,000) of the disaster-affected population (Map 7). This is the area where "disaster – death" is at its heighest, where most lethal natural hazards (floods, epidemics, fire) occur. Almost all Terai districts were affected by several types of disasters between 1971 and 2007, with more than 40,000 people affected.

The proportion in the Hills reduces with altitude, as these areas are less populated. There are some exceptions in the mid-western and far-western regions.

Map 7:Spatial distribution of disaster-affected people across districts (1971-2007)



Map 8:Spatial distribution of disaster-affected people by VDC (1971-2007)



3.5 LOSS OF LIFE DUE TO DISASTERS

The Nepal DesInventar database records more than 27,000 deaths between 1971 and 2007. This reveals that, on average, more than 2 people lose their lives to disasters every day. About 57 per cent of deaths were caused by epidemics, 15 per cent by landslides, and 11 per cent by floods. The number of casualties is generally taken as an indicator of natural disaster losses; however care should be exercised in interpretation, because events with fewer deaths may have a larger number of injured, missing and affected people. It is important to remember that due to a lack of proper medical care and preparedness of hospitals to disasters, people listed as seriously injured might subsequently die, missing people might not be found and affected people may take long time to recover. The database reports about 50,000 people injured, 3,000 people missing, nearly 30,000 evacuees and more than 4.9 million people affected by disaster events.

3.1.8 Loss of lives by type of disaster

Epidemics, landslides and floods appear to be the types of disasters that caused 57 per cent, 19 per cent and 11 per cent of all disaster-related deaths respectively. Fire accounts for 4 per cent of deaths. Earthquakes and thunderstorms were responsible for 3 per cent of death each. There were only two earthquakes with magnitudes of less than 6.6 Richter. A large earthquake could have taken many more lives – for example, only one earthquake event of October 2005 (Kashmir Earthquake, M7.9) contributed more than 90 per cent of all disaster-related deaths (total 88,245 deaths according to IFRC,2007) in Pakistan during 1988-2007.

Other disaster typologies made up around 6 per cent of deaths. These include ice avalanches in the Himalayas, accidents from natural hazards and other weather related events such as heavy rainstorms, heat/ cold waves and famines.

Table 18 and Figure 14 show the distribution of casualties and other effects for different disaster types.

3.1.9 Annual time-series distribution of loss of lives

There has been a visible increase in the average annual loss of life throughout the years in Nepal. Moreover, distribution of deaths until 1990 shows that there were periods of 2-3 years with average small number of deaths interspersed with larger disasters with death tolls about twice as high as in normal years. There were extreme disasters every five years on average that claimed huge numbers of deaths. The floods of 1984, the earthquake of 1988 are representative of such extreme events. Since 1991, however, the average annual death toll from disasters rose significantly and the number for extreme events such as the 1993 and 2001 floods and landslide and other disasters were unprecedented. What we see, therefore, is a drastic change in the pattern of disaster deaths with increasingly high death tolls. The base level has increased.

Since 2001, there is a slight decline in the average annual death toll. However, it is still higher than that in the 1980s.

The overall scenario of deaths is dominated by small and medium sized natural disasters, which have high impact on loss of human lives.

Table 23:Disaster impact on human populations by event types 1971-2007

Events	Data-cards	Deaths	Missing	Victims	Affected
Accident	97	112	3	-	5
Avalanche	90	217	33	-	1,012
Biological	12	-	-	-	-
Boat capsize	103	240	421	-	354
Cold wave	192	298	-	-	1,453
Drought	152	-	-	-	1,512
Earthquake	94	873	-	-	4,539
Epidemics	2,791	15,730	-	4,582	460,902
Explosion	40	32	-	-	19
Famine	20	2	-	-	83,902
Fire	3,880	1,101	186	-	218,278
Flood	2,720	2,936	578	-	3,367,974
Forest fire	98	24	403	-	10,178
Hail storm	597	57	2	-	197,843
Heat wave	31	25	-	210	261
Landslides	2,184	3,987	517	-	479,972
Panic	2	85	-	-	-
Plague	326	11	-	-	50
Pollution	12	-	-	-	1,000
Rains	187	82	3	-	62,431
Snow storm	174	69	828	-	7,600
Storm	109	50	2	-	1,817
Strong wind	292	140	-	-	6,161
Structural collapse	324	340	7	-	1,508
Thunderstorm	764	768	1	-	5,809
Others	97	77	11	-	11,982
Total	15,388	27,256	2,995	4,792	4,926,562

Figure 14: Loss of life by different types of natural disaster in Nepal (1971- 2007)

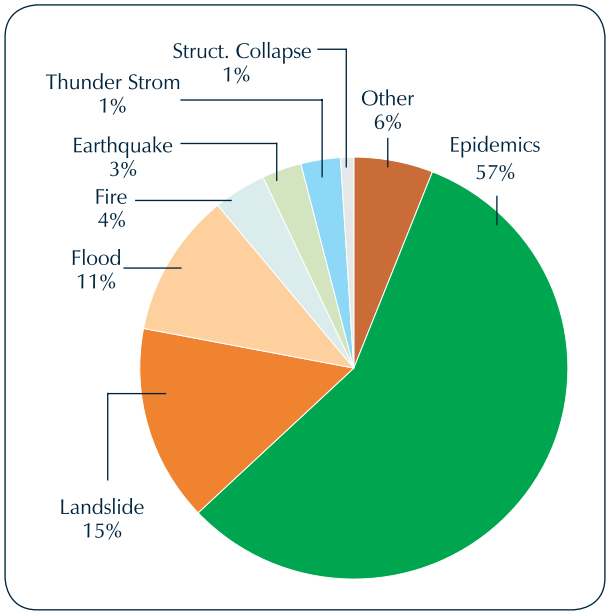
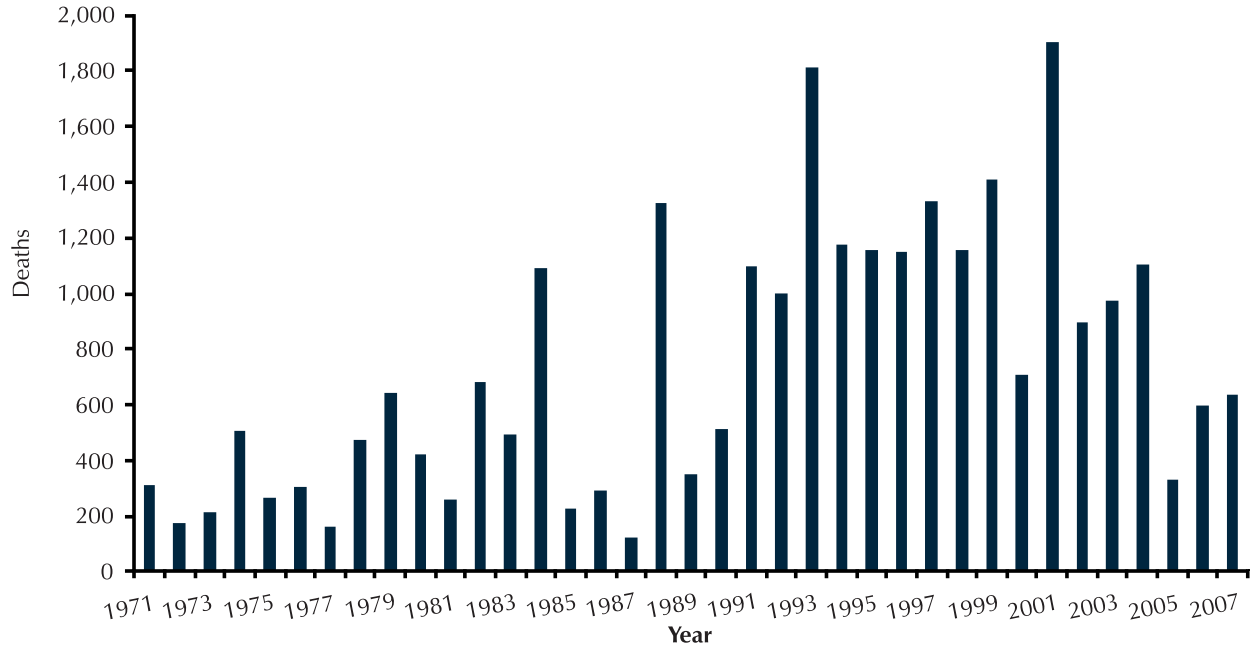


Figure 15:Annual time – series distribution of deaths (1971- 2007)



3.1.10 Seasonal distribution of loss of lives

Disaster-related human deaths shows similar seasonality as that for disaster occurrence, with concentrations during the months of May to August (Figure 16). July and August stand out as the two months in which the death toll appears to be about six times the average of other months.

are the two main periods for epidemics, with the latter taking more than two times the death toll. Landslide-related deaths are concentrated in June –September with July standing out as the month of maximum landslide-death in the country. Deaths from floods starts being significant in May and ends in October with a peak in July.

Figure 16:Seasonal distribution of disaster casualty (1971- 2007)

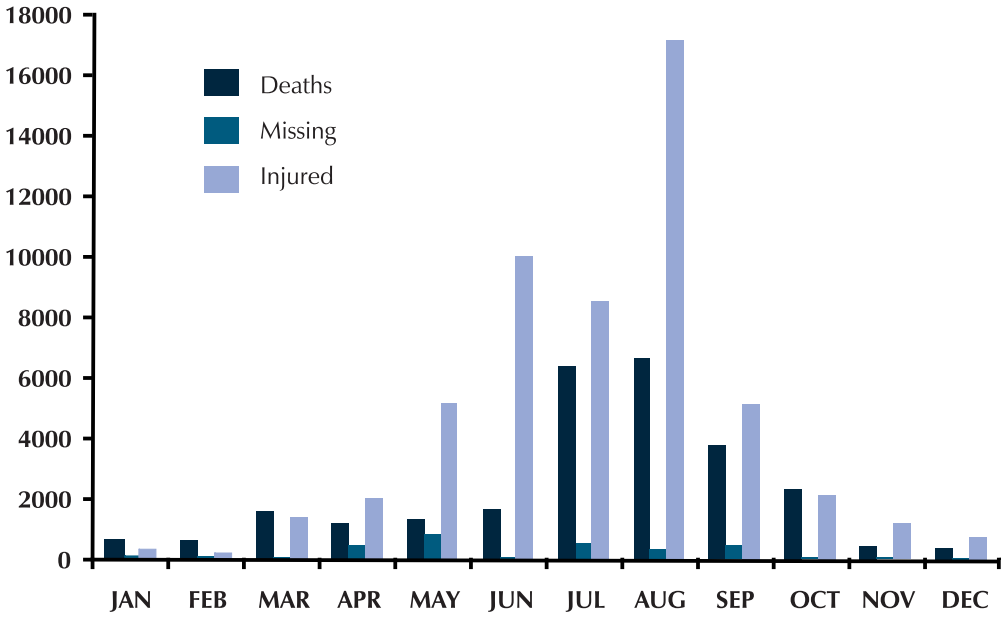
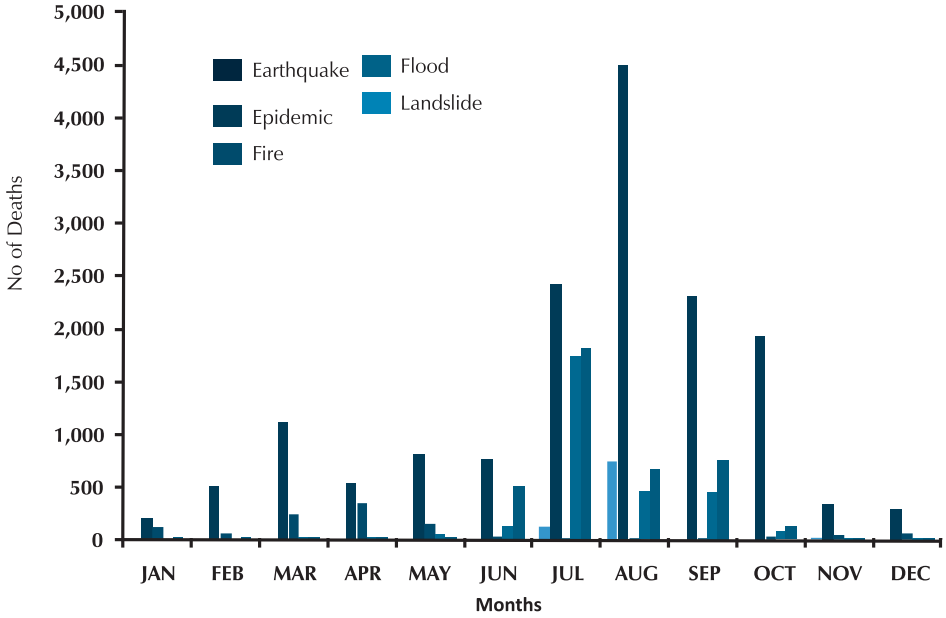


Figure 17:Seasonality of deaths due to main five disaster types in Nepa



3.1.11 Spatial distribution of loss of lives

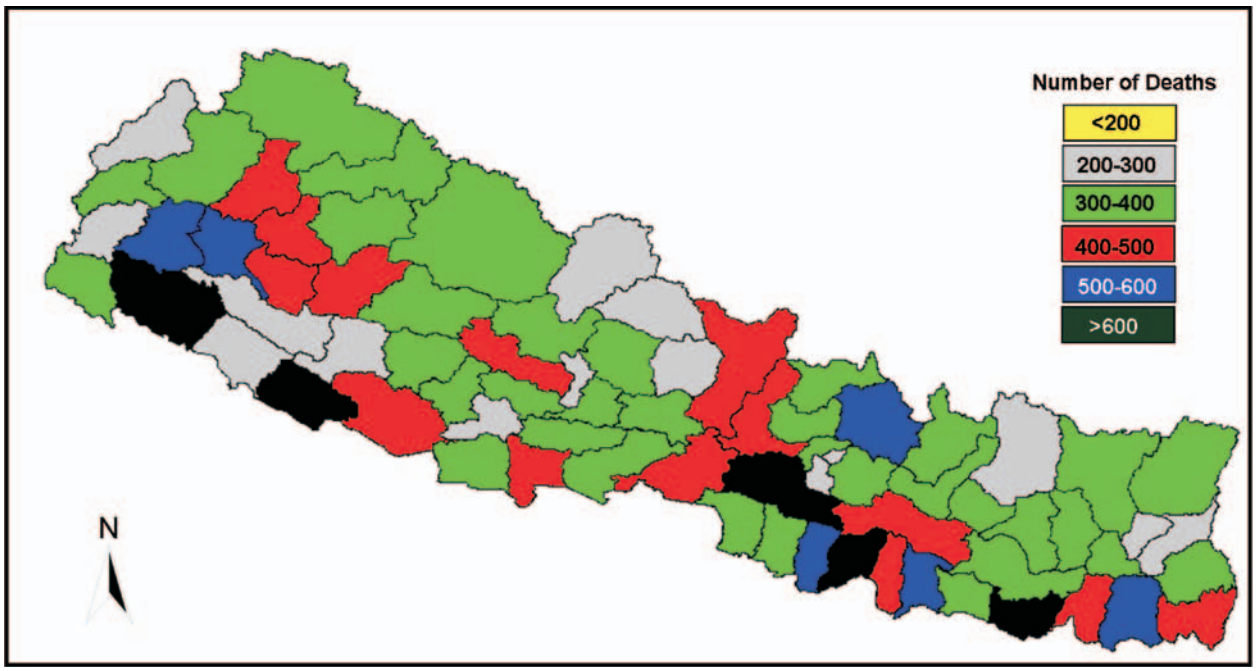
Map 9 shows the spatial distribution of disaster-related deaths by district, while Map 10 shows the same by VDC/municipality.

The distribution of disaster-related deaths follow the same pattern as described above (Map ??). In the Terai, the figures for deaths are highest in Kailali, Banke, Rautahat, Sarlahi, Dhanusha, Saptari and Morang which reported more than 600 deaths. Other districts had disaster-related deaths in the range 400-600, with the exception of Bardiya district which recorded less than 200 deaths. Most Hill districts reported deaths in the range of 200-400; the exceptions are Makwanpur (Central Region) and Achham and Doti (Far-Western Region) with figures in the range of 600-800. There are two concentrations of reported deaths in the Hills, one in the districts along the Karnali River, and the other along Gorkha-Dhading-Nawalparasi (drained by Daraudi and Trishuli rivers, with figures ranging between 400 and 600. This is higher than the the hill districts' average.

In the Mountain districts, Mustang, Manang, Lamjung and Solukhumbhu experience fewer than 200 detahs, while other areas range between 200 and 400. Sindhupalchok is the exception, with 600-800 deaths.

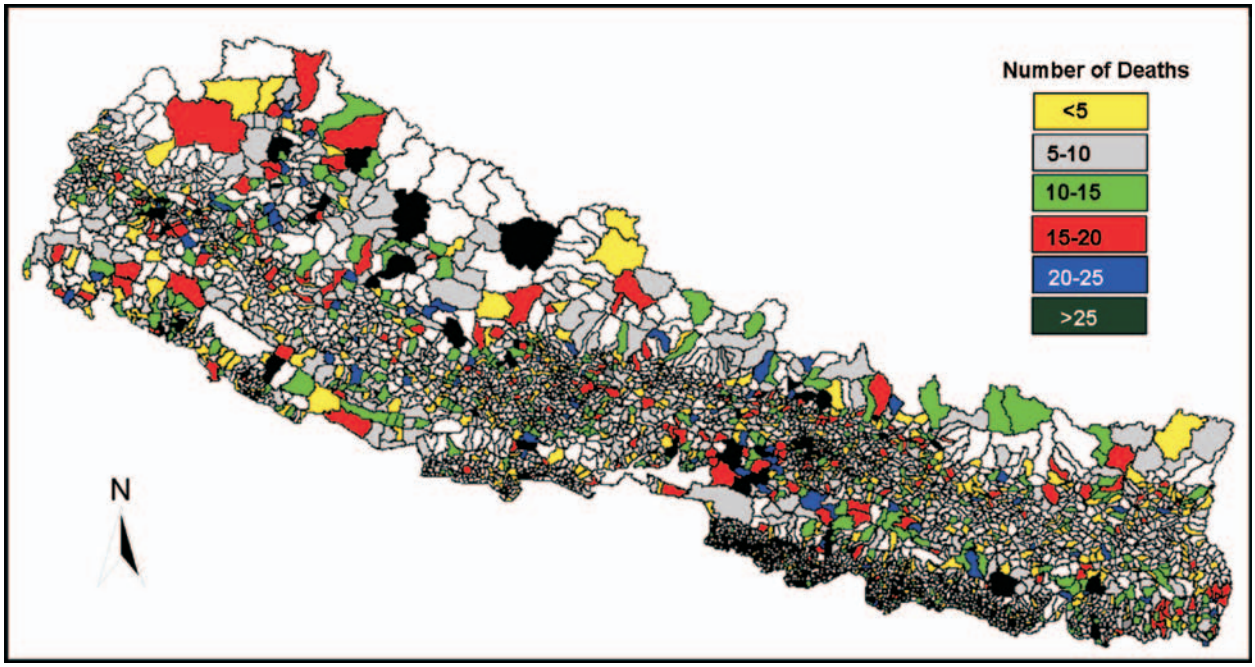
The figures are therefore lowest in the Mountains, and highest in the Terai, while the Hills region show a mixture of high to very high numbers of deaths. Population density and other socio-economic conditions appear to influence the spatial distribution of deaths.

Map 9:Spatial distribution of deaths across districts



Map 10 shows that disaster-related deaths are prevalent in most VDCs. This means that disasters are widespread and demand a nationwide strategy to protect people from disasters. The map offers vivid confirmation of the spatial distribution trends. Three belts – the Terai, mid-Hills and Mountains – are identified. It is also seen that the Siwaliks (Churia) range in eastern Nepal has relatively higher numbers of disasters than in the west. Similarly, the mid-hill belt of disasters in eastern Nepal is relatively wider in east Nepal than in the west, and that the high Mountains in the west appear to have larger concentrations of deaths than in the east.

Map 10:VDC-wise distribution of deaths due to natural disasters



3.6 INJURY DUE TO DISASTERS

3.1.12 Injury according to disaster types

The Figure 18 shows the causative factors for disaster-related injuries for the most significant injury-causing disasters. The definition for "injury" in case of epidemics includes also the person who was infected and sick (but did not die) including those who were hospitalised and assumed discharged alive.

Epidemics happens to top as the injury-causing hazard followed by earthquake, which is notorious for leave back traumatised people. In case of Nepal with poor public health facilities, especially for medical response to disasters, many of the injured may remained handicapped after the disasters.

[17] Updates on final account of death due to a disaster allow assuming that dead among those hospitalized have been recorded and the rest were discharged alive.

3.1.13 Annual time-series distribution of injuries

Annual time series distribution of injured people by disasters (Figure 15) also shows a growing trend with years, with peaks in 1988 and in 2003. The dominating contribution of Epidemics to the total number of injured is striking. Main reason for such prevalence of epidemics is the poor status of public health. Nepal's strategy for dieses surveillance and rapid response need to be further strengthen together with some comprehensive programme to address the issue.

3.1.14 Seasonal distribution of injuries

The seasonal variation of injury flows the same seasonality trend for "affected" and "occurrence" or "death".

3.1.15 Spatial distribution of injuries

The spatial distribution of injury also shows that all VDCs except some have been impacted by disasters, and that the distribution follows the same trend as that for "affected" or "dead" – the highest figures are for the Terai and some hilly districts, the hill districts being next, and the magnitude decreases as one goes to the high Mountains. Of course, there are some exceptions in all the physiographic regions with concentration of high figures for "injured" in some districts.

Figure 18:Top most injury-causing natural hazards in Nepal

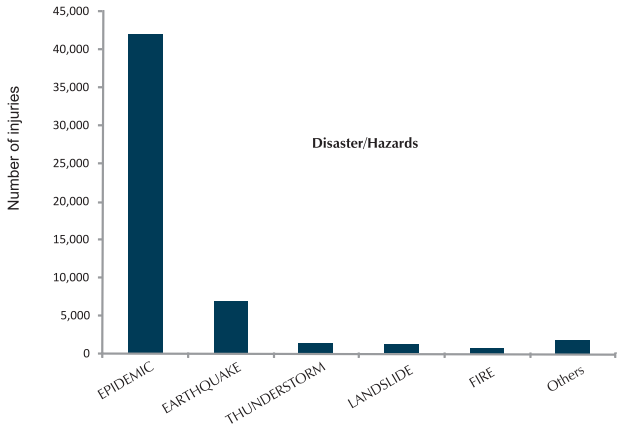


Figure 19:Year-wise distribution of injured by natural disasters

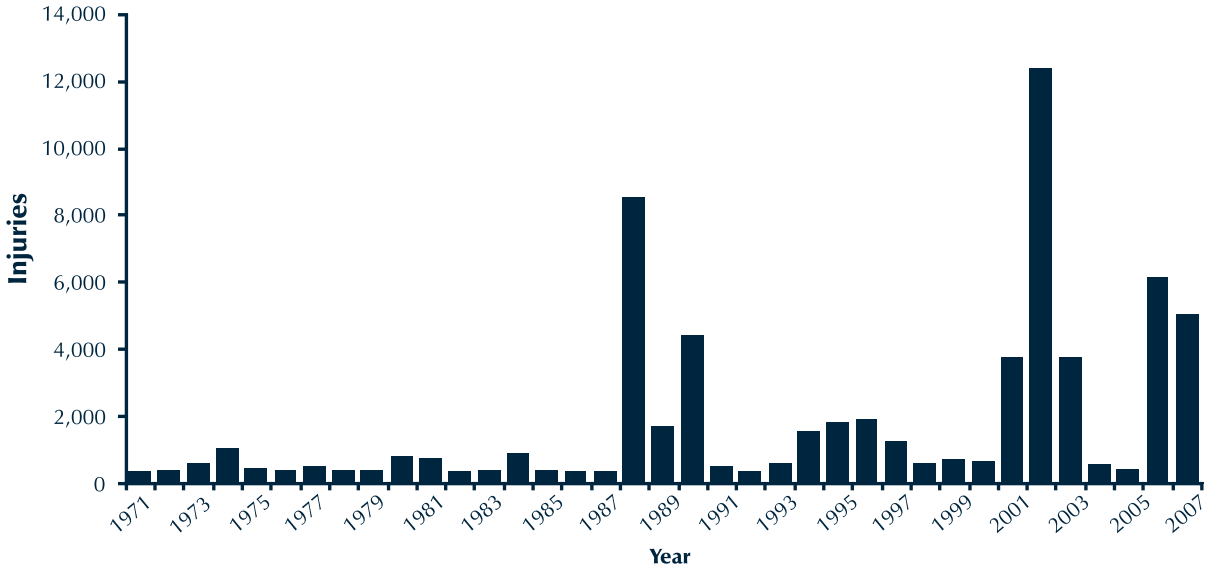
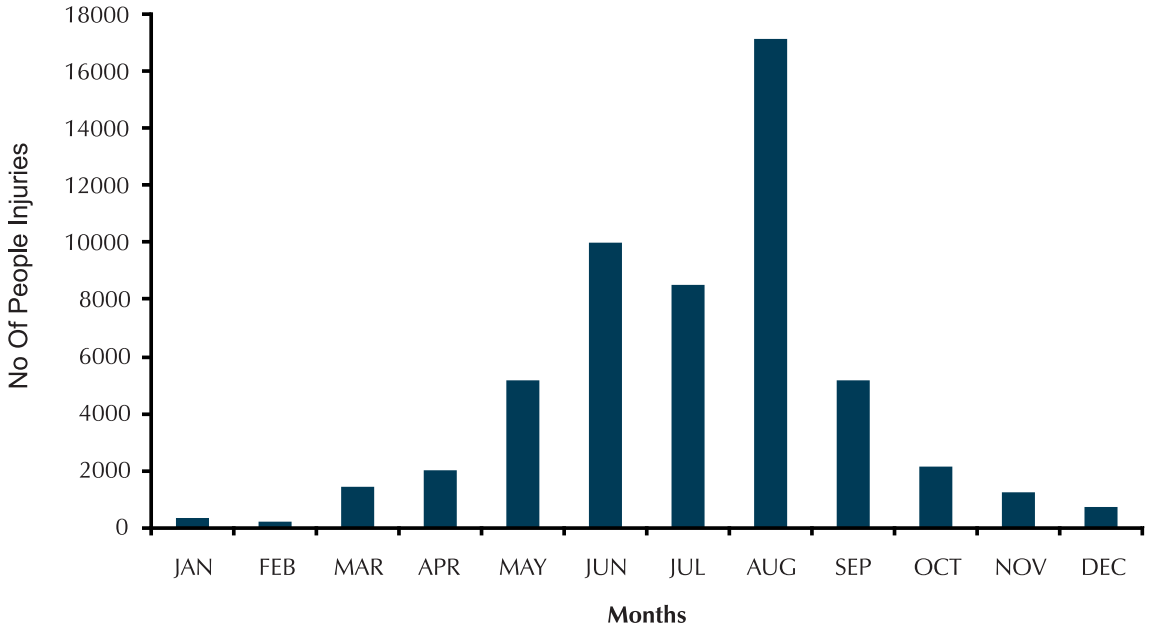
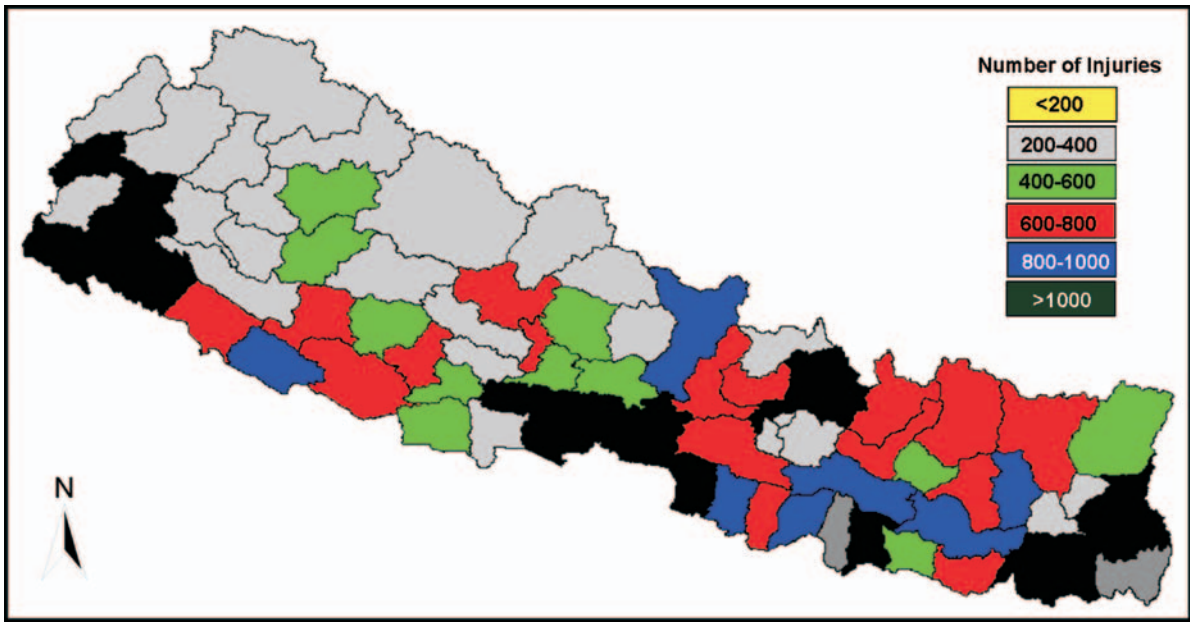


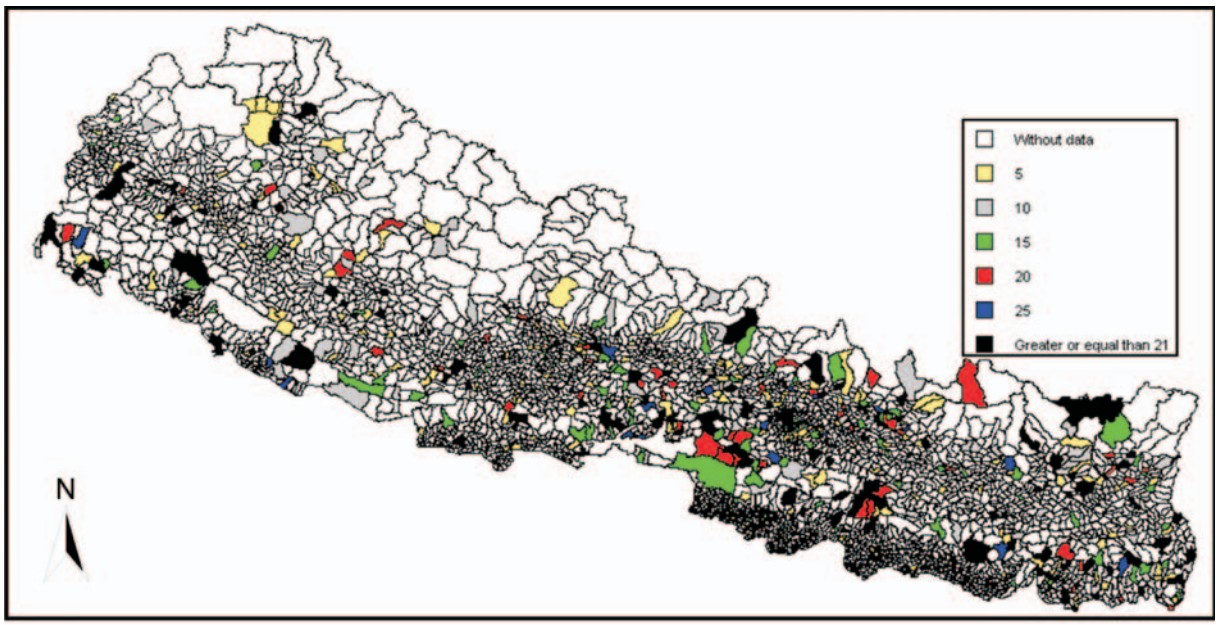
Figure 20:Seasonal distribution of disaster-Injury in Nepal



Map 11:Spatial distribution of disaster-related injury by districts



Map 12:Spatial distribution of disaster-related injury by VDCs



3.7 BUILDING DESTRUCTION & DAMAGE BY DISASTERS

More than 250,000 buildings were either destroyed or damaged[18] by natural disasters in Nepal during 1971-2007. This number is approximately 5% of the current building stock of the country. This is a huge loss for any country, especially for a weak economy country like Nepal. Therefore, it is necessary to analyze the building damage and destruction in more details. Further, damage and destruction of buildings could be used as an important proxy indicator for the estimation of total direct disaster damage losses. So we will look into the details of the data on buildings damaged by disasters.

3.1.16 Building destruction and damage by disaster types

The Table 24 provides the number of buildings (the terms "house" and "building" are used as synonymous) destroyed or damaged by different hazard/disaster events. Flood, earthquake and fire stand out as the main contributors of disaster-related losses of buildings. Landslide also causes building damage.

It should be noted that the largest earthquake during the period was the 1988 Udaypur Earthquake of 6.6 Richter Magnitude. Although a medium-size event, this earthquake destroyed significantly large building stock. Total death officially reported was 721[19] . There was another medium-sized earthquake in 1981 in farwestern Nepal. The rest of the earthquakes were smaller ones. In this context, it should be noted that relatively earthquakes, the larger ones, are the most lethal hazards and they can destroy/damage huge number of buildings as compared to other forms of hazard events.

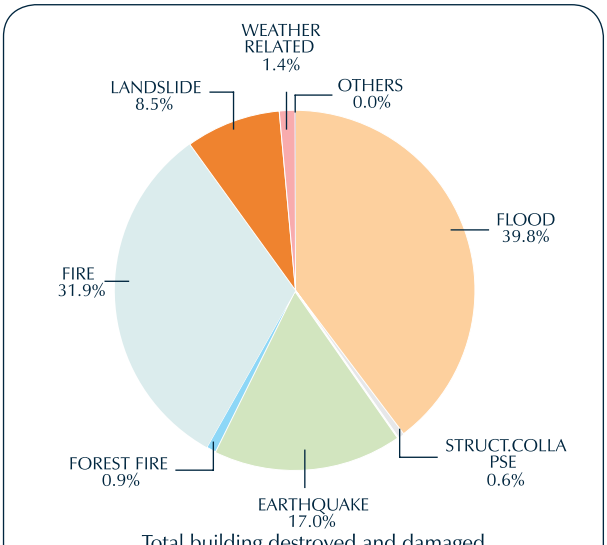
[18] Destroyed" means either total collapse or irreparable damage, while "damaged" means repairable damage, in most cases requiring outside financial support for the repair in Nepal.

[19] In Nepal, the disaster-death counts are done based on the number of officially confirmed death due to disaster after physically retrieving the dead body. Obviously, there could be many untraced or "officially" not reported dead bodies, which as per the tradition, need to be cremated at the earliest.

Table 24: Effect of natural disasters on buildings by disaster type 1971 – 2007

Event	Houses Destroyed	Houses Damaged	Total (Destroyed and Damag
Avalanche	27	1	28
Earthquakes	33708	55312	89020
Explosion	4	-	4
Fire	63243	1453	64696
Flood	78830	75274	154104
Forest Fire	1698	1	1699
Hailstorms	172	1570	1742
Landslides	16878	8573	25451
Rains	675	729	1404
Snowstorm	102	58	160
Storm	1017	479	1496
Strong-wind	493	3346	3839
Structural Collapse	1101	608	1709
Thunderstorm	297	206	503
Others	68	-	68
Total	198313	147610	345923

According to the data available, out of the total buildings damaged and destroyed, about 45 per cent of buildings were destroyed completely. The ratios of building destroyed and damaged could be used for planning shelter response. The ratio varies for different disasters. In case of flood, almost equal numbers are destroyed and damaged, while in earthquakes, the number of buildings damaged far outnumbers that of destroyed, and in Nepal the ratio is 1.6. Hailstorm appears to damage about 10 times more buildings than it destroys totally, and the ratio for strong winds is 1:7.



Total building destroyed and damaged

3.1.17 Annual time-series distribution of building destruction and damage

Annual time-series distribution of effect of disasters to buildings is shown in the Figure 21. This figure includes data also on earthquakes during the period of 1971-2007. Earthquakes are not annual events. Therefore, interpretation of annual time-series distribution of damage should be done with this consideration.

The graph shows that the years 1980, 1988 and 1993 and 1995-96 saw the most severe episodes of building damage and destruction. There were earthquake events in 1980 and 1988, and a severe flood in south-central Nepal in 1993. There were significant damage and destruction to buildings in 1995, 1996, 1998 and 2002 also. These years were characterized by high rainfalls and excessive occurrences of landslides.

Figure 21: Effect on buildings by different types of natural hazards

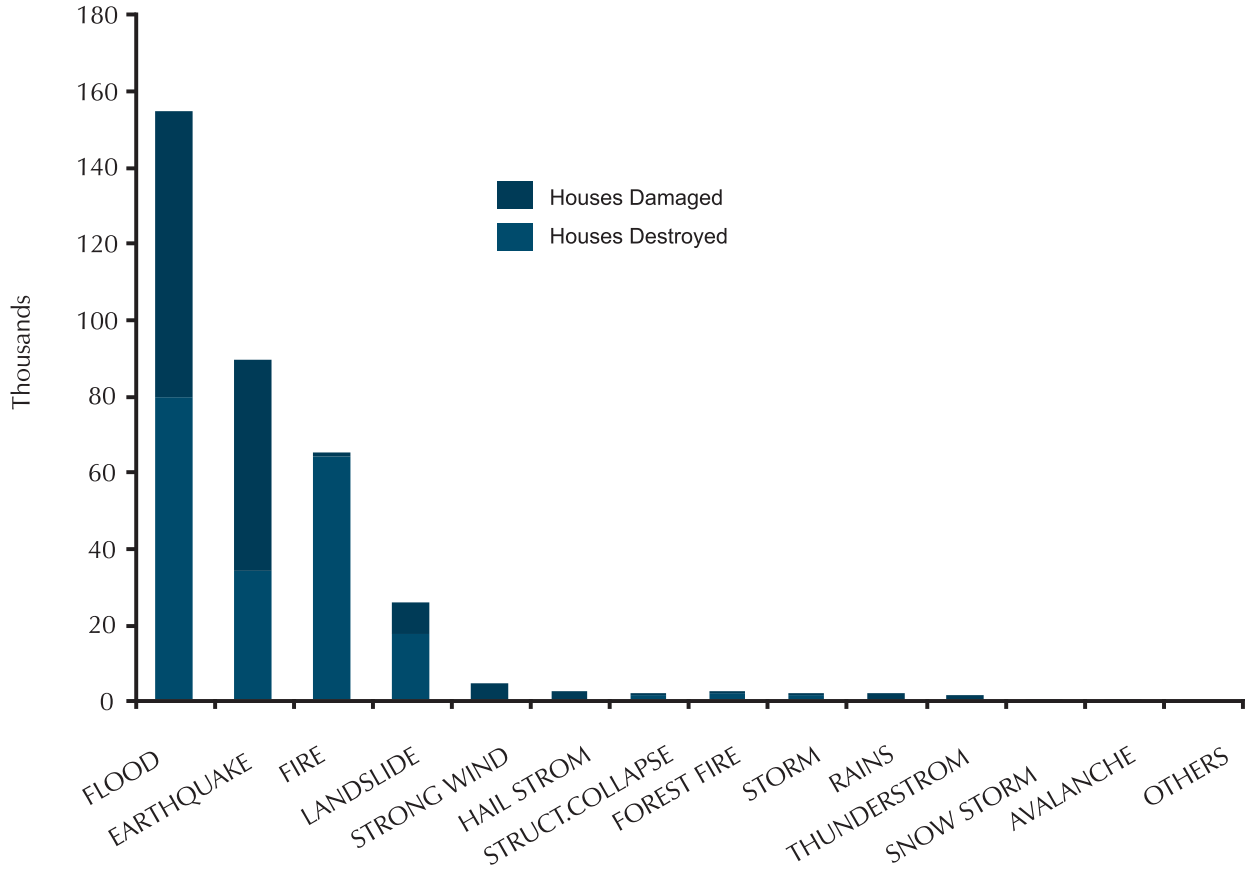
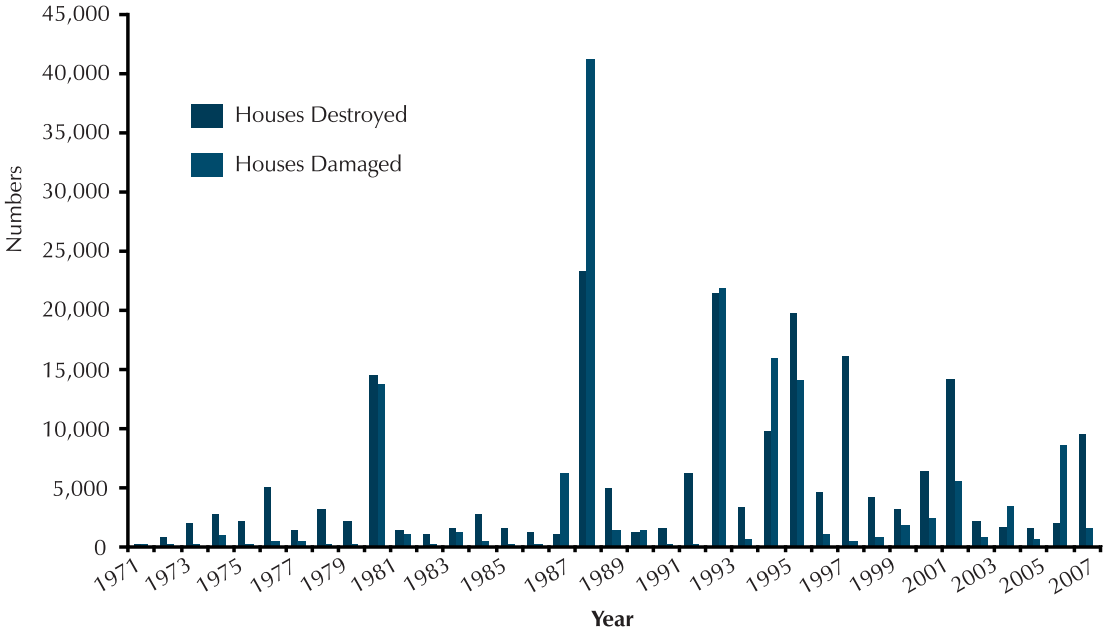


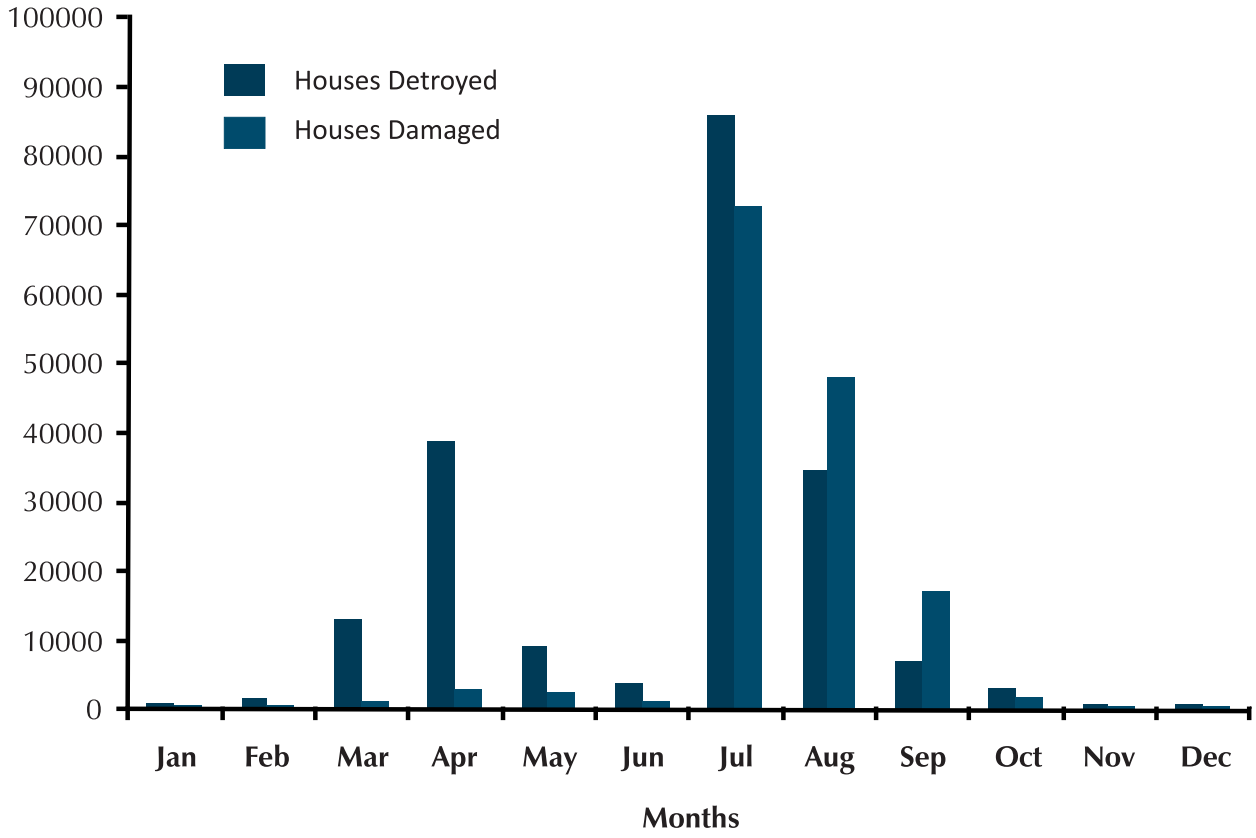
Figure 22:Annual time-series distribution of buildings damaged and destroyed



3.1.18 Seasonal distribution of building destruction and damage

Seasonality building damage follows the same trend as that for death, affected population, and injury. This is obvious because there is a strong seasonality of the major building-damaging hazards (flood, fire, and landslide). Although earthquake, the most building-damaging natural phenomena, does not have any seasonality, incidentally, both the two major earthquake events occurred during the monsoon season. However, even if the contribution of earthquake has not been deducted in the dataset used to derive the chart (Figure 23), July-September are always the months of highest building damage/destruction due to floods and landslides and April due to fire.

Figure 23: Seasonality of building damage due to natural disasters

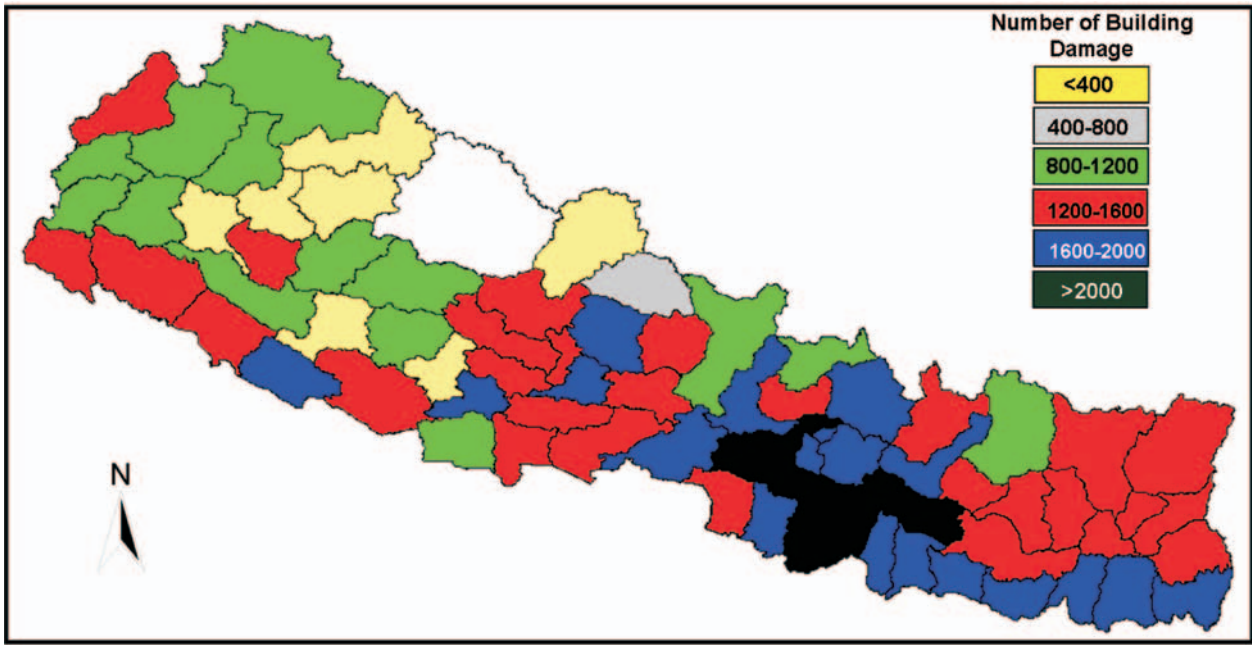


3.1.19 Spatial distribution of building destruction and damage

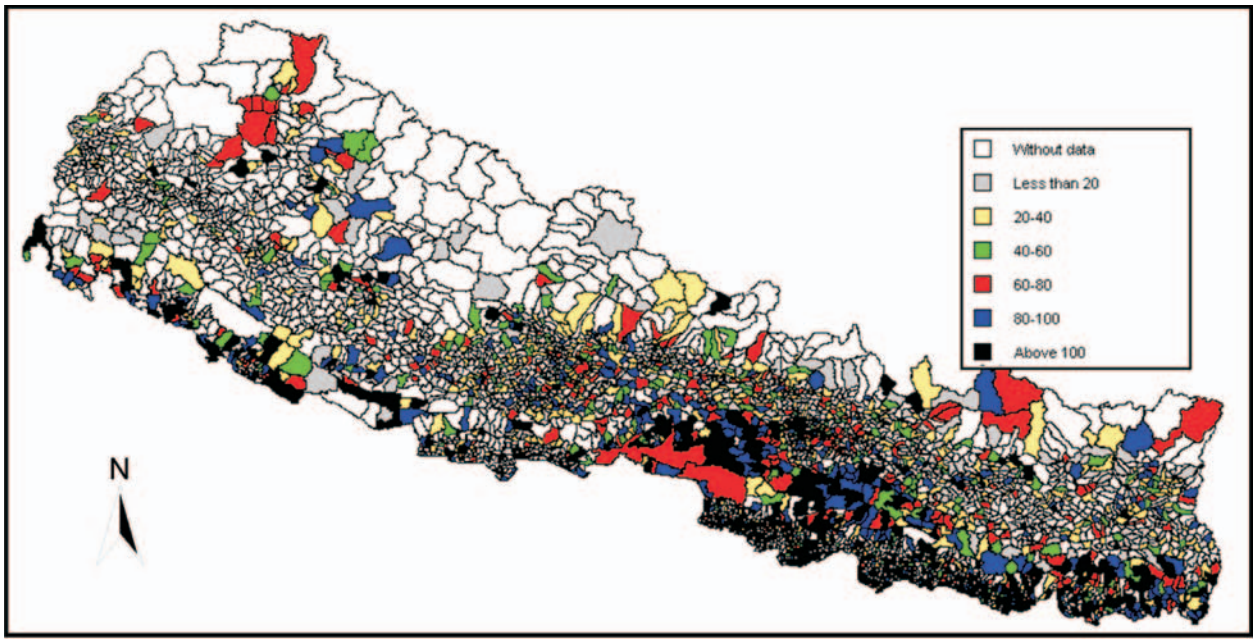
Both the maps (Map 13 and 14) on spatial distribution of building damage and destruction show that most of Nepal had had buildings damaged/destroyed due to different natural hazard disasters and relatively. The proportion of damage/destruction is greater in the districts in eastern half of Nepal (Western, Central and Eastern Development Regions) as compared to the Mid-western and Far-western Regions. A part of the contribution to the greater severity in the eastern part may be due to the impact of the 1988 earthquake on the general background of such destructions due to other hazards (flood, fire and landslide). The entire Terai region also shows higher scale of impact to the building because of the incidences of fire in the settlements.

Map 14 provides more details – the high Himalayan region shows generally lesser scale of building damage/destruction – the population density in the region is lower than the rest of the country. The map also shows that there are numerous VDCs without any data (reports) on building damage, and on the other hand, there are also pockets in all regions with high level of building damage. The latter perhaps indicate the damages due to landslide and debris flow prevalent in the Hills and the higher Mountain regions.

Map 13:Spatial distribution of building damage and destroyed across districts



Map 14:Spatial distribution of buildings damage and destroyed across VDC/Municipality



3.8 AGRICULTURE CROP LOSS DUE TO DISASTERS

Agriculture is the mode of vocation for more than 65 per cent of the total population[20] . In the Terai, the main agricultural region of Nepal, rice is the major cereal crop; other food crops include pulses, wheat, barley, oilseeds etc. In the valleys within Hills, rice is produced during the summer, and wheat, barley, oilseeds, potatoes, and vegetables are grown in the winter. Corn, wheat, and potatoes are raised at higher altitudes, and terraced hillsides are also used for agriculture. Large quantities of medicinal herbs, grown on the Himalayan slopes, are sold worldwide.

This sector is still in the process of modernisation. Due to lack of adequate irrigation facilities, most agriculture land depends on seasonal rainfall indicating the inherent vulnerability. Every year natural disasters like droughts, floods, hailstorm and heavy rains, and pest infestation of crops and livestock-epidemics severely impact the farming sector. Loss of livestock (cattle and goat) during 1971-2007 amounts to 800,000 which means per capita loss of 38 cattleheads. This is a huge loss!. The most severe impacts on livestock are due to fire, plagues (epidemics), and flood. Likewise, other natural disaster events like landslides, heavy rains and earthquakes also caused heavy losses.

3.1.20 Agriculture and crop loss by disaster types

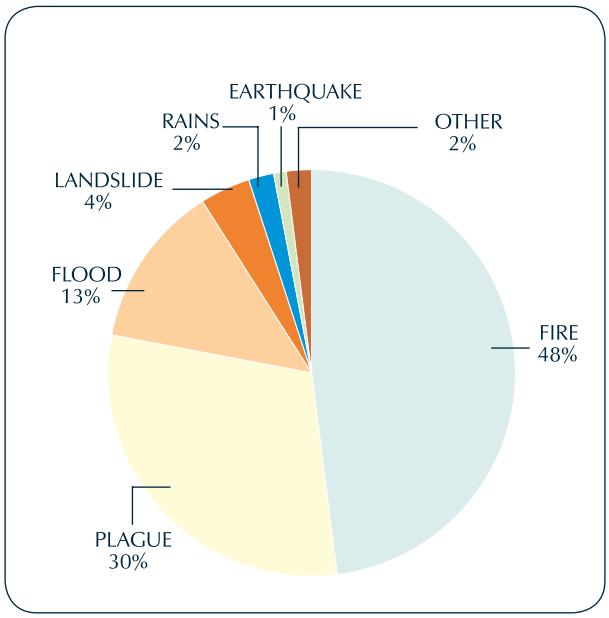
About 90 per cent of the crop or agricultural land loss is caused by meteorological events. Among various disasters, drought exerts the most severe impact on agriculture and crops/crop loss amounting to 39% of the impact. Because of wider influence area of draught, several districts are affected by draught in one event[30]. Floods and hailstorms are the next most damaging to crop damage/failure contributing to 23% and 14% respectively to the loss of agriculture land or crop (Table 25, Figure 24). Heavy rains contribute 6% of the total crop loss. Landslide and strong winds each contribute about 3% of total crop loss.

Table 25:Loss of agricultural land and crop by disaster types 1971 – 2007

Event	Loss of Agriculture Land and Crops (in ha.)
Drought	329,332
Flood	196,977
Hail Storm	117,518
Rains	54,895
Strong Wind	23,239
Landslide	21,794
Cold Waves	20,557
Others (Plague, Famine, Structural Collapse, Forest Epidemic, Snow Storm, Others, Fire, Storm, Thunderstorm, Avalanche)	83,336
Total (area in ha.)	847,648

[20] Statistical Information on Nepalese Agriculture 2002/2003, Government of Nepal (then HMG/N), Ministry of Agriculture and Co-operatives, Agri-business Promotion and Statistics Division, Singh Durbar, Kathmandu, Nepal

[21] Draught is a slow-onset disaster, caused in Nepal mainly by failure of monsoons. Timely summer monsoon is essential for crops such as rice, and winter monsoon is necessary for the cash crops such as oilseeds, lentils etc. Any significant delay in monsoonal precipitation causes on one hand damage to the seedlings, and untimely or undesired excessive rains that damage whatever crop stands. Failure of monsoons in consecutive years exacerbates the situation creating severe famine.



3.1.21 Annual time-series distribution of loss of agriculture/crop

Loss of agricultural land and crops in different years appears in Figure 25. This chart closely resembles Figure 14 on time-series distribution of population affected by disasters. The year 1992-93 stands out as the watershed – starting from here there is a dramatic change in the magnitude and frequency of losses. Erratic monsoon rains, floods, landslides and infestation appear to be the main reasons.

3.1.22 Seasonal distribution of agriculture and crop loss

Figure 26 shows two time periods of damage to crops and lands – the winter crop season and the summer crop season. The months of March and April are characterised by hailstorms and strong winds that damage standing winter crops and horticultural products for example damage to mango crop in its earlier period.

Figure 25:Annual distribution of loss of agriculture/crop

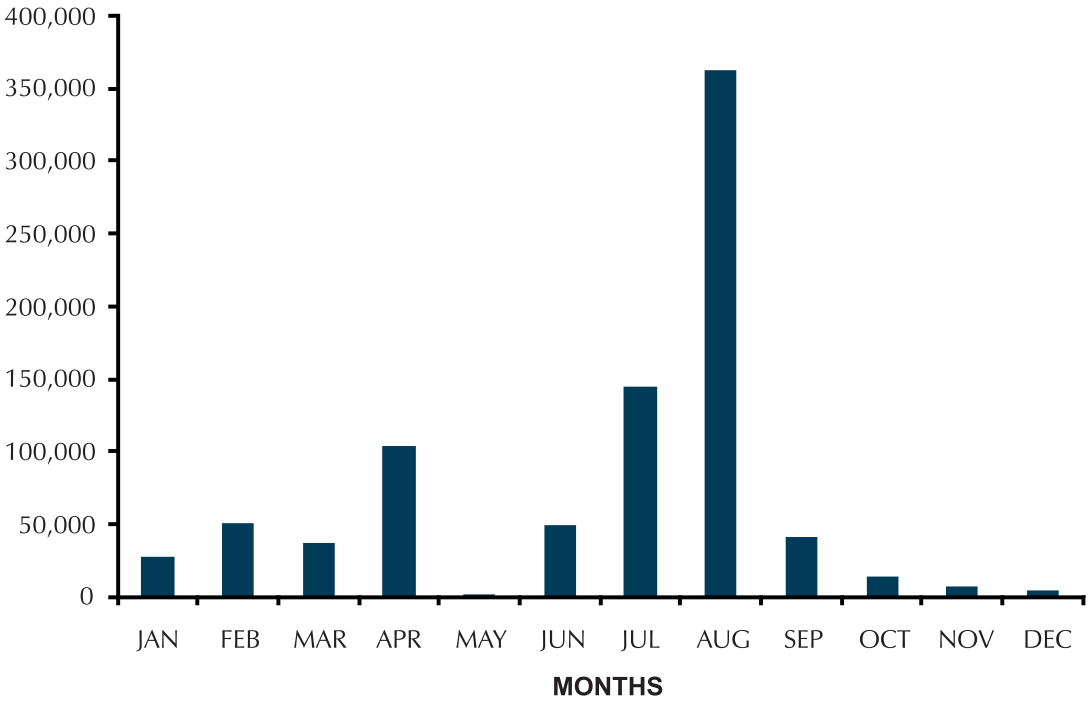
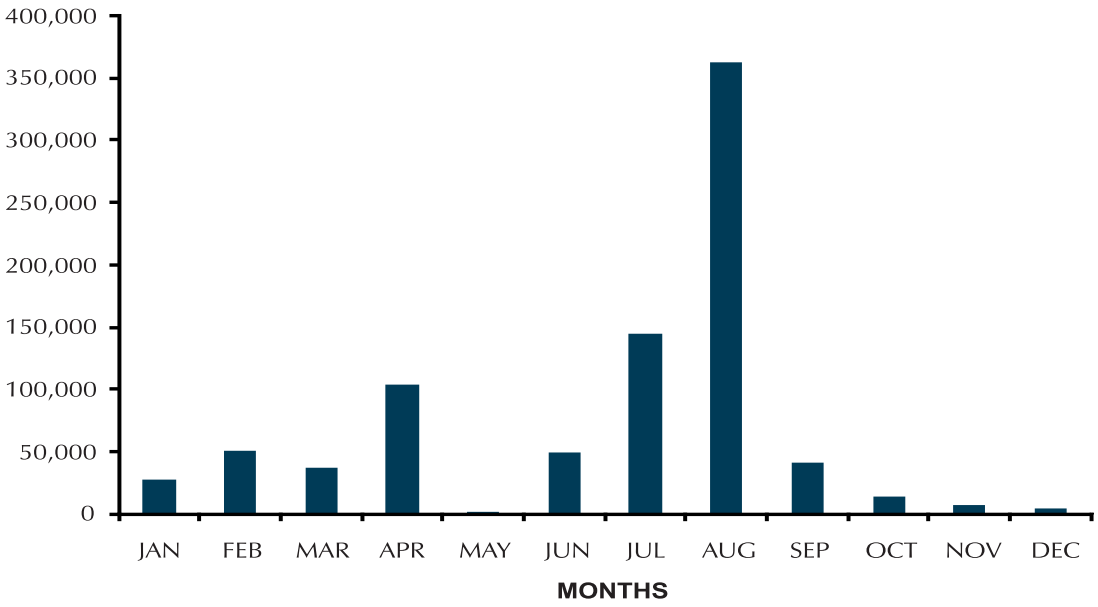


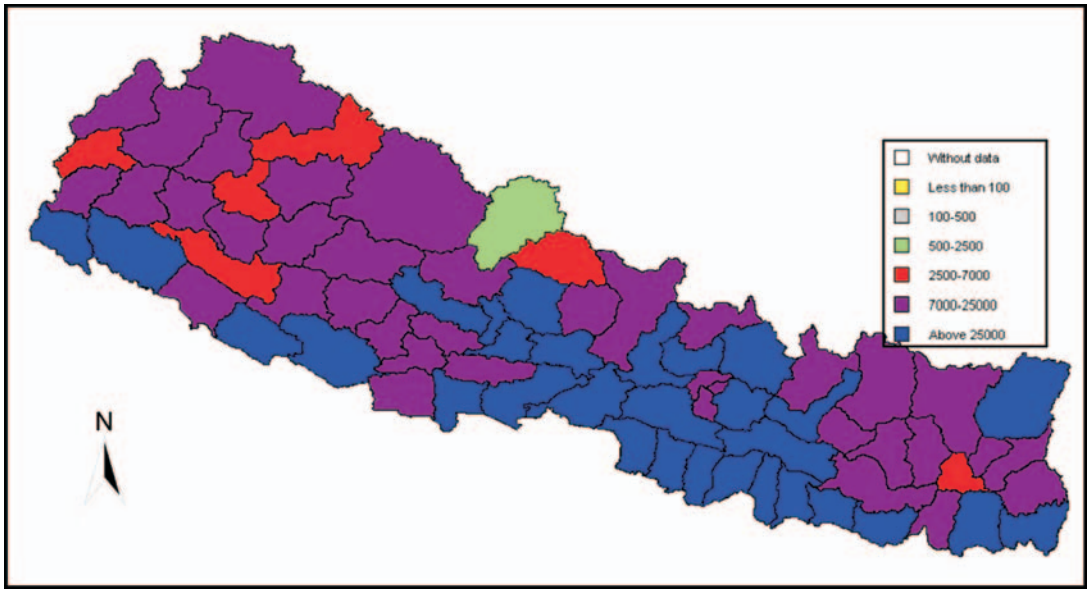
Figure 26: Seasonal distribution of agriculture/crop loss



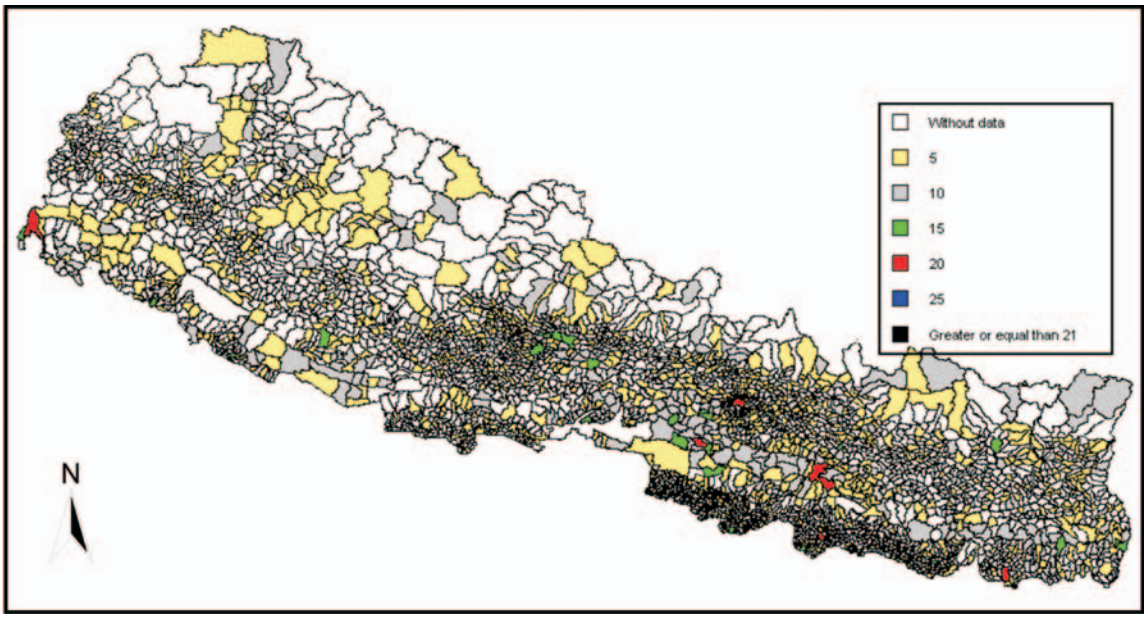
3.1.23 Spatial Distribution

Map 15 shows that agricultural damage is widespread throughout Nepal; only seven out of 75 districts show low or moderate damage of less than 2,500 ha of agricultural land or crop. The rest of the districts have each lost more than 7,000 ha of land or crop during the last 32 years. The problem is relatively acute in the remote areas of northern districts where transportation of food is difficult and expensive resulting in malnutrition of the population. The granary of Nepal – the Terai – is severely affected, and so are the intensively cultivated lands in the mid-Hills. The VDC level map shows that the problem is in a majority of VDC in the Terai, especially eastern Terai, and in the Hill region.

Map 15: Spatial distribution of loss to agriculture/crop (ha)



Map 16:Spatial distribution of losses of agricultural crop (ha) across VDCs



3.9 CONCLUSIONS

The disaster data-set for Nepal (Nepal DesInventar data) is an important and comprehensive source of information on historical natural disasters for the period 1971 – 2007. NSET has taken the responsibility of continually updating the database with an aim to install the system in relevant government institution when appropriate. The database provides information on disaster-related human deaths and injuries, as well as the impact and losses, by all forms of hazards Nepal faces. Further, the database records pertain not only to large disasters but also to smaller events including those without any human loss. Impact parameters are numbers of people killed, injured, affected and made homeless, number of building damaged and destroyed, infrastructure losses, etc.

Epidemics, fires, floods and landslides were most frequently occurring hazard events. The frequency as well as magnitude of the impact is seen growing with time, especially after 1992-93.

The DesInventar database has a total 15,388 disaster data-cards spread over the entire country. reflecting the extensiveness of disaster events for the period of 1971 – 2007. Fires were the most frequent disaster events among others accounting 25 per cent of disaster data cards (or number of disaster event records) followed by epidemics and floods (18 per cent each). Other frequently occurring events in terms of number of data cards are thunderstorms, hail storms etc. In terms of annual time series distribution of disasters the trend of disaster data-cards is increasing over the years steadily. There is a marked seasonality of disaster occurrence and also of their impacts. Summer monsoon month of July – September form the most important peak for high disaster occurrence and losses. A secondary peak covers March-April. Thus a clear link between the summer monsoonal rainfall period and Nepalese life is demonstrated also in terms of disaster impacts due to floods, epidemics and landslides etc. However, disaster events have taken place in all months.

There were about 5 million people affected by natural disasters during the last 37 years. The high proportion of affected people is by flood (68 per cent) followed by landslides (about 10 per cent) and epidemics (9 per cent). Draught followed by famine is another main cause affecting the large number of population, especially the least developed hill and mountain districts of Mid- and far-west Nepal. Terai districts and also some districts of mid-hills are the most hard-hit regions in Nepal.

In terms of lethality, epidemics stands out as the number one killer – 57% of the total 27,256 people killed is due to this disaster. Landslide (15 per cent), floods (11 per cent), and fire (4 per cent) are other killer disasters. Again, Terai and some hill districts show the highest number of disaster-deaths and injuries although this impact is also spread almost to all VDCs/municipalities of the country.

In terms of direct economic loss (reported and estimated), a total of NRs 531,959 million for the period of 1977–2003 was estimated (in year 2004 values) with an average of 16,120 million NRs per year (NSET 2005). The two most expensive individual events were the earthquake of 21 August 1988 (Udayapur earthquake) with its effect in Central and Eastern Development Region, and the 1993 floods of south-central Nepal with floods in Terai and flood/ landslides in the adjoining hills. The economic loss due to 1993 flood alone was estimated about NRs 4 billion, equivalent to US$ 55 million (MOHA 2005); this is equivalent to about 3 per cent of the country's average annual budget.

The most dramatic impact of natural disasters in economy can considered as the loss of buildings. A total 346,000 buildings was either destroyed or damaged: 45% of damaged buildings are due to floods, 26% due to earthquakes, and about 19% by fire. While the trend of building damage is increasing, the years 1980, 1988, 1993, 1995, 1998 and 2002 stand out among others. Large events of floods, landslides and earthquake characterise these years.

April, July and August are the top 3 months having highest records of buildings affected (damaged and/or destroyed).

Agriculture sector is severely impacted by meteorological disasters and crop/cattle infestation and epidemics. Drought is the disaster typology that claims about 39% of the losses followed by floods (23 per cent), and hailstorms (14 per cent).

Disaster impact to the agriculture sector is on the increase generally. However, since the 1990s the impact has risen dramatically. Visible reasons are the increase in the occurrence and intensities of damaging meteorological hazards, but there must be some other factors at play to introduce such dramatic increase in their characteristics.

4 HAZARD RISK AND DISASTER IMPACT

4.1 INTRODUCTION

The Chapter 3 provided an overall profile of historical disasters with analysis of various impact attributes viz. people affected, casualty, building damage and destruction and loss to agriculture etc. This chapter discusses the characteristics of the individual major hazards as well as the that of the resultant disasters in terms of their impact characteristics.

4.2 EARTHQUAKES

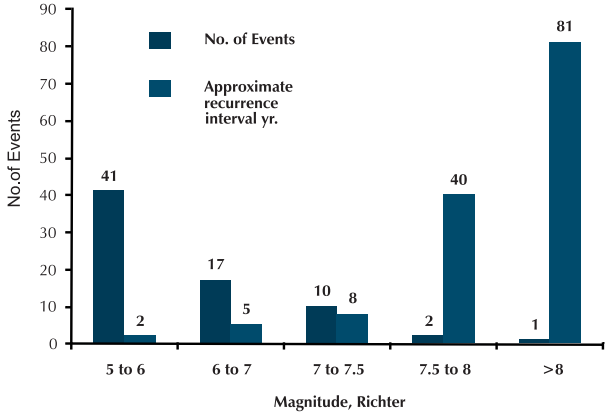
Figure 27 shows the distribution of earthquakes of magnitude 5 Richter or greater that took place within Nepal or adjoin region (within 100 km from Nepal boarder) during 1911 and 1991. Very high level of earthquake hazard is evident – parts of Nepal were subject to 71 earthquakes during 81 years, and that earthquakes of magnitudes 7-7.5 repeat themselves within the envelop every 10 years!

Based on the data available from the Department of Mines and Geology, CBS (1998) concludes that earthquakes of more than or equal to 5.0 on the Richter scale have occurred at least once every year in Nepal since 1987, with the exception of 1989 and 1992 when no such events were recorded.

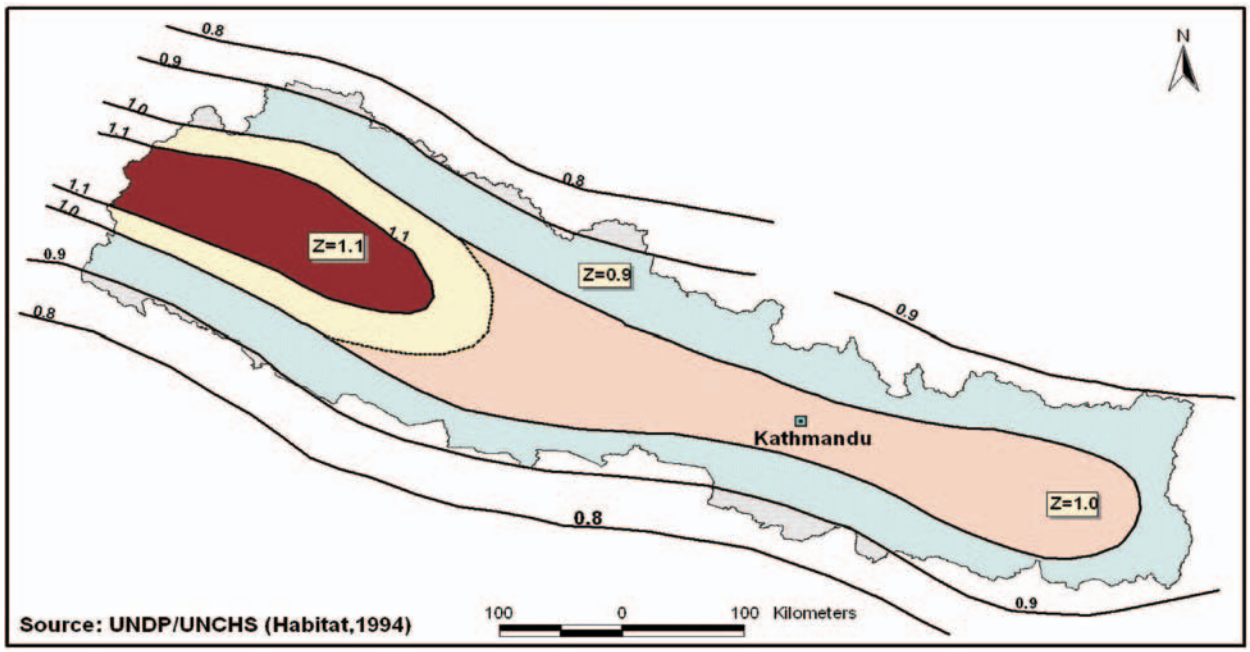
Map 17 shows the seismic zoning of Nepal. Z is the seismic zoning factor that divides the country into fives zones for the purpose of seismic design of buildings with the values ranging from 0.8 to 1.1. The difference of 0.3 for the value of Z is significant for design purposes. However, for the purpose of preparedness planning, the entire country should be considered as highly seismic area, and the difference 0.between the maximum Z = 1.1 and Minimum Z = 0.8 should be considered almost negligible especially considering the high level of structural and non-structural vulnerabilities of existing building stock in the country resulting in high levels of potential casualty.

There are 92 active faults have been identified in the tectonic provinces. Maximum magnitude of earthquakes that these active faults are able to generate have also been identified according to which the faults in the Higher Himalaya tectonic area can generate maximum magnitude of 7 to 7.5, those along the MCT – 7.5 to 7.6, the mid-mountains – 6.5 to 6.9, and the MBT – 7 to 8 earthquakes. Along HFF, the faults have the capacity to generate 6.5 to 7.5 earthquakes.

Figure 27:Magnitude – frequency plot for historical earthquakes (1911-1991) within Nepal and adjoining region (after UNDP/UNCHS (habitat), 1994)



Map 17:Seismic zoning of Nepal



4.1.1 Annual time-series distribution of earthquakes

The current disaster database of Nepal records 22 earthquakes with magnitudes ranging from 4.5 to 6.5 on the Richter scale. Earthquakes of smaller magnitudes or those without any visible impact (no death or deaths not reported, no significant loss of properties) have not been reported or recorded. The years of occurrence of these earthquakes are given in Table 26. Two major earthquakes stand out in terms of impact: the 1980 earthquake in far-western Nepal and another earthquake is 21 August 1988 earthquake of in eastern Nepal. Other earthquakes are of smaller impact.

While it may be interesting to look at the occurrences, it is not possible to conclude about the trend in the occurrence of earthquake.

4.1.2 Spatial distribution of historical earthquakes

Map 18 shows earthquake frequency by district between 1971 and 2007. The frequency is higher in far-western districts than in districts of eastern regions. Districts in far-western Nepal (Baitadi, Bajhang, Darchula) were severely affected by the 1980 earthquake in terms of casualties and damage to property, especially buildings. Similarly, districts in the Eastern Region (Dhankura, Ilam, Jhapa, Khotang, Morang, Panchthar, Sankhuwasabha, Saptari, Sindhuli, Sunsari, Tehrathum, Udayapur) were severely affected by the 1988 earthquake.

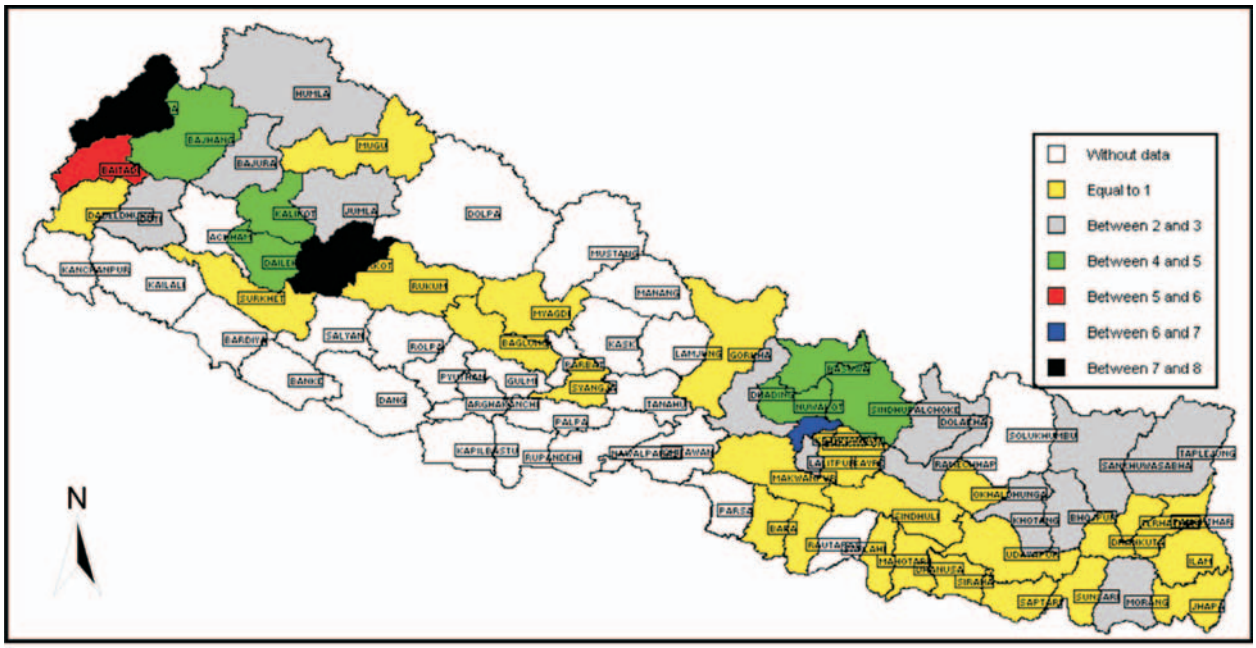
Actual spatial distribution of earthquakes is usually demonstrated by plotting the epicentres. In Nepal, the spatial distribution of earthquakes is strongly related to the tectonic provinces with the epicentres located

Table 26:Effect of earthquakes on people and buildings by year during 1971 – 2007

Year	Affected on people				Affect on housing	
	Number of data-cards	Deaths	Injured	Affected	Houses Destroyed	Houses Damaged
1974	2	-	-	-	1	-
1980	17	125	248	-	11604	13414
1988	31	744	6566	-	21744	41076
1993	11	1	11	2409	72	451
1994	1	-	12	623	84	287
1995	1	-	-	18	4	-
1997	18	-	1	1489	196	60
2001	4	2	-	-	3	-
2003	1	1	2	-	-	-
2006	2	-	-	-	-	-
2007	6	-	-	-	-	24
Total	94	873	6840	4539	33708	55312

Source: DesInventar Database of Nepal, NSET 2007

Map 18:Extent of earthquakes in Nepal – number of data cards by districts, 1971-2007



along the system of faults (such as HFF, MBT, and MCT) and also along the transverse (north-south trending) geological structures, such as those found along the Kaligandaki and Barun rivers. The far-western districts of Bajhang, Baitadi, and Darchula experience frequent earthquakes.

4.1.3 Casualties from earthquakes

Devastating earthquakes occurred in Nepal in 1255, 1810, 1833, 1866, 1934, 1980 and 1988. The Great Bihar-Nepal Earthquake of Jan 15, 1934 measured 8.4 Richter and shook Kathmandu with intensities of IX and X Modified Mercally Intensity scale (MMI) raising to the ground more than half of the existing buildings. It took a toll of over 8,500 lives. The 1988 Udaypur Earthquake (magnitude 6.6 Richter and maximum intensity of VIII MMI) affected 24 districts in central and eastern Nepal, claiming 744 lives and seriously injuring 6,566 persons.[22]

The DesInventar data on the impact of earthquakes in different districts is given in Table 27 and is also plotted on Map 19. The far-western and eastern districts were severely affected by the 1980 and 1988 earthquakes, particularly in the number of people killed, injured and affected.

Table 27:Impact of earthquakes in Nepal by districts 1971- 2007

District	Affect on People		Affect on Houses		
	Deaths	Injured	Destroyed	Damaged	Total
Baglung	0	0	1	0	1
Baitadi	22	237	1,269	1,967	3236
Bajhang	77	0	6,162	8,580	14742
Bajura	2	6	4	0	4
Bara	0	0	0	133	133
Bhaktapur	7	43	274	1,477	1751
Bhojpur	14	206	1,157	4,425	5582
Dadeldhura	0	0	0	120	120
Dailekh	0	0	4	6	10
Darchula	24	0	4,168	2,749	6917
Dhading	2	0	0	0	0
Dhankuta	93	878	3,308	5,268	8576
Dhanusa	2	28	375	306	681
Dolakha	2	19	268	933	1201
Doti	0	3	36	0	36
Gorkha	0	0	0	0	0
Humla	0	0	4	0	4
Ilam	73	441	443	2,842	3285
Jajarkot	0	12	138	287	425
Jhapa	4	30	14	89	103
Jumla	0	0	0	3	3
Kalikot	0	3	6	0	6
Kathmandu	1	17	11	254	265
Kavre	4	23	1,000	747	1747
Khotang	38	415	2,297	5,977	8274
Lalitpur	1	25	380	137	517
Mahotari	1	20	26	42	68
Makwanpur	0	2	2	11	13
Morang	32	374	214	883	1097
Mugu	0	0	0	6	6

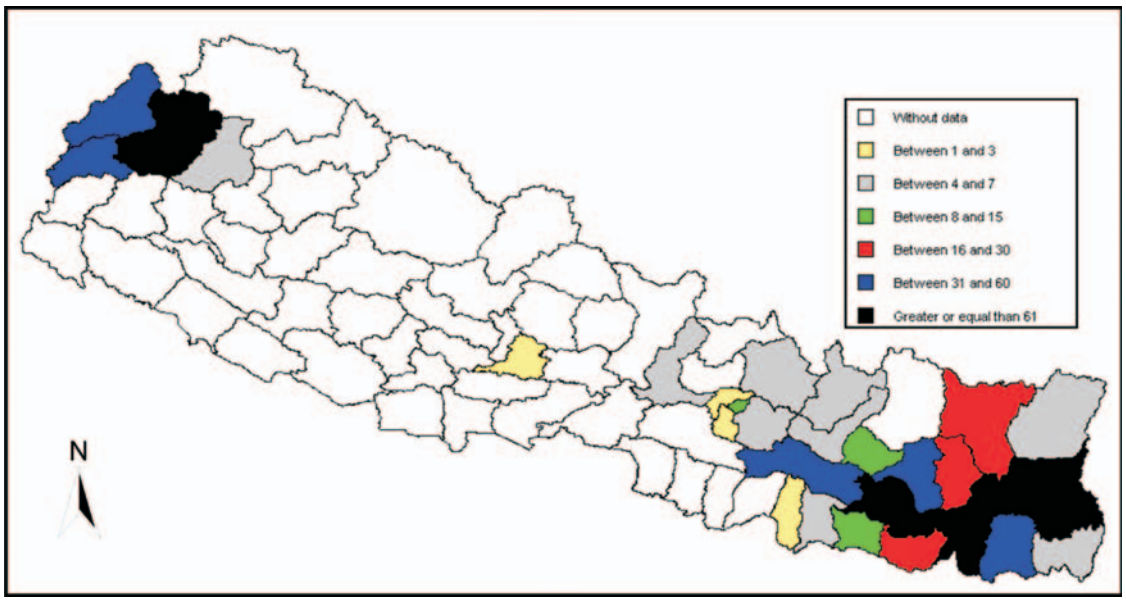
[22] The government publication Thapa, 1989, and ICIMOD, 2007:17 report only 721 deaths by the 1988 earthquake.

Table 27:Impact of earthquakes in Nepal by districts 1971- 2007 cont'd...

District	Affect on People		Affect on Houses		
	Deaths	Injured	Destroyed	Damaged	Total
Myagdi	0	0	0	0	0
Nuwakot	0	0	20	22	42
Okhaldhunga	8	136	944	1,194	2138
Panchthar	99	572	1,059	3,358	4417
Ramechhap	2	33	606	1,800	2406
Rasuwa	0	0	113	35	148
Rautahat	0	0	5	60	65
Rukum	0	0	17	425	442
Sankhuwasabha	19	47	672	1,497	2169
Saptari	13	125	1,230	91	1321
Sindhuli	32	242	1,670	1,177	2847
Sindhupalchoke	2	34	711	482	1193
Siraha	8	84	652	174	826
Sunsari	138	2,117	718	1,795	2513
Surkhet	0	0	0	8	8
Syangja	1	2	0	0	0
Taplejung	3	5	0	24	24
Terhathum	67	138	1,153	2,469	3622
Udayapur	82	523	2,577	3,459	6036
TOTAL	873	6,840	33,708	55,312	89,020

About 34,000 buildings were destroyed by earthquakes and 55,000 were damaged (Table 26) between 1971 and 2007. The estimated loss was about NRs 23 millions. Table 28 also provides other details of earthquake loss for the period of 1971 – 2007.

Map 19:District-wise distribution of deaths by earthquakes during 1971-2007



Map 19 shows that the eastern and the far-western parts of Nepal have suffered from earthquakes in this 37-year period. However, it does not mean that the hazard is less in other parts – they are just waiting for the next earthquake to strike. Figure 28 details earthquake casualties between 1980 and 2007 . The earthquakes of 1980 (Bajhang Earthquake) and 1988 (Udaypur Earthquake) stand out with the deaths and injuries caused. Figure 28 shows the number of deaths and injuries by the earthquakes recorded in the database during 1980-2003.

4.1.4 Building destruction and damage due to earthquakes

More than 89,000 buildings were destroyed or damaged by earthquakes between 1980 and 2007. Only two medium earthquakes (1980 and 1988) accounted for 78,000 destroyed/damaged buildings. That represents 88 per cent of all building damage.

This further suggests that earthquakes are unpredictable, sporadic events that are not amenable to trend analysis in a short span of 37 years. A large earthquake can completely change the disaster impact characteristics of a country.

The following maps depict the distribution of buildings destroyed and damaged by earthquakes. The impacts are conspicuously higher in the east and far-east, which again reflects the enormous impact of the 1980 and 1988 quakes.

Figure 28:Injury and death due to earthquakes during 1971-2007

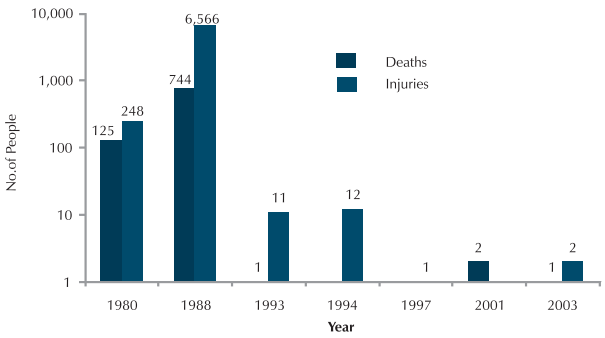
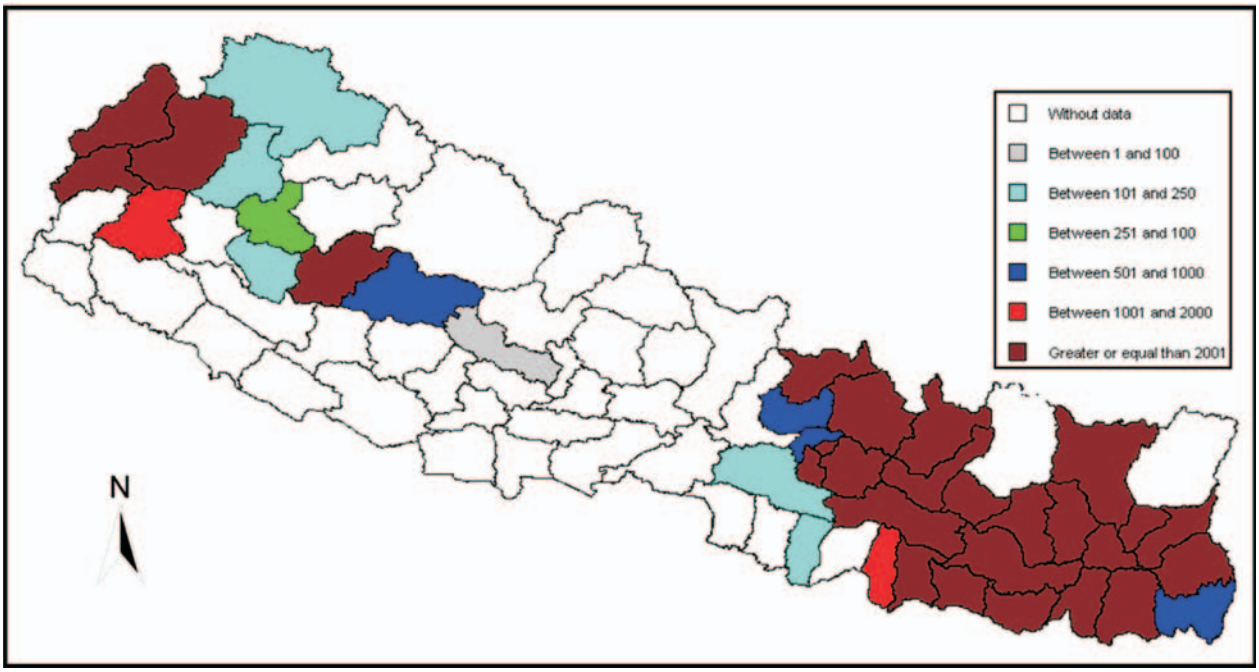


Table 28:Buildings damaged and destroyed by earthquakes in Nepal during 1971 – 2007

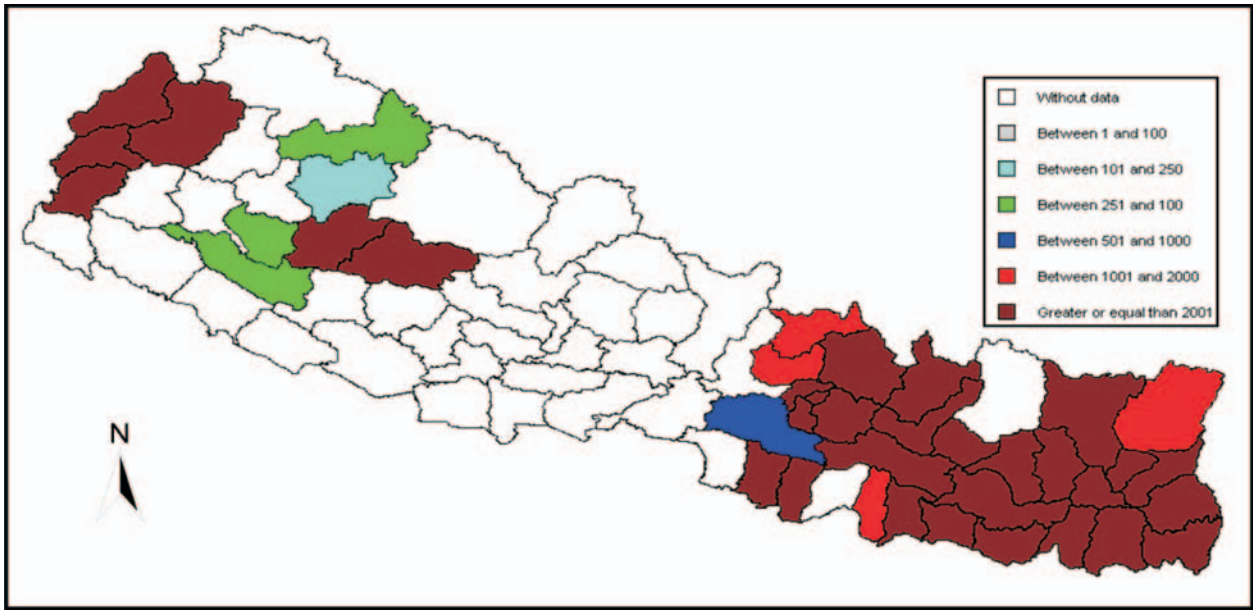
Year	Destroyed Houses	Damaged Houses	Grand Total
1974	1	0	1
1980	11,604	13,414	25,018
1988	21,744	41,076	62,820
1993	72	451	523
1994	84	287	371
1995	4	0	4
1997	196	60	256
2001	3	0	3
2007	0	24	24
Total	33,708	55,312	89,020

[23] No damaging earthquake occurred in Nepal during 1971-1979.

Map 20:Impact of earthquakes on buildings (destroyed houses) in Nepal during 1971-2007



Map 21: Impact of earthquakes on buildings (damaged houses) in Nepal during 1971-2007



EPIDEMICS

An epidemic is a widespread and severe outbreak of an infectious disease rapidly spreading among the population. Disease may spread from person to person, and/or through exposure of many people to a single source, such as water supply. An epidemic spreading in many countries, or even on a global scale, is called a pandemic.

During the period of 35 years, more than 2,500 epidemic events of diarrhoea, measles, typhoid, encephalitis or cholera have been reported. These have caused about 15,500 deaths and have affected over 300,000 people.

The following sections discuss the impacts of epidemics from the disaster database DesInventar for the period 1971-2007.

4.1.5 Annual time-series distribution of epidemics

The time-series of epidemics (Figure 29) shows that number of epidemic events has grown steadily since 1971, with wider outbreaks during the 1990s. 2005 and 2006 had fewer epidemics. However, the impact in terms of human deaths increased steadily until recent years. It is worrying that that the lethality (number of deaths per event) of epidemic events grew dramatically in the mid-1980s and in the 1990s, with a climax in 2001. The number of incidences has decreased since 2004, but their lethality still remains high. This suggests that while prevention of epidemics is important – and intensified efforts have positively influenced the picture through surveillance – emergency medical response still remains a huge task.

4.1.6 Seasonality of epidemics

Figure 30 shows that epidemics occur throughout the year, peaking from July to September. Epidemics are at their most lethal in these months. The seasonality of epidemics is correlated with floods and other hazards that occur in the monsoon months. It is clear that the worst floods are always accompanied by increases in epidemics.

Figure 29:Time-series distribution of epidemics

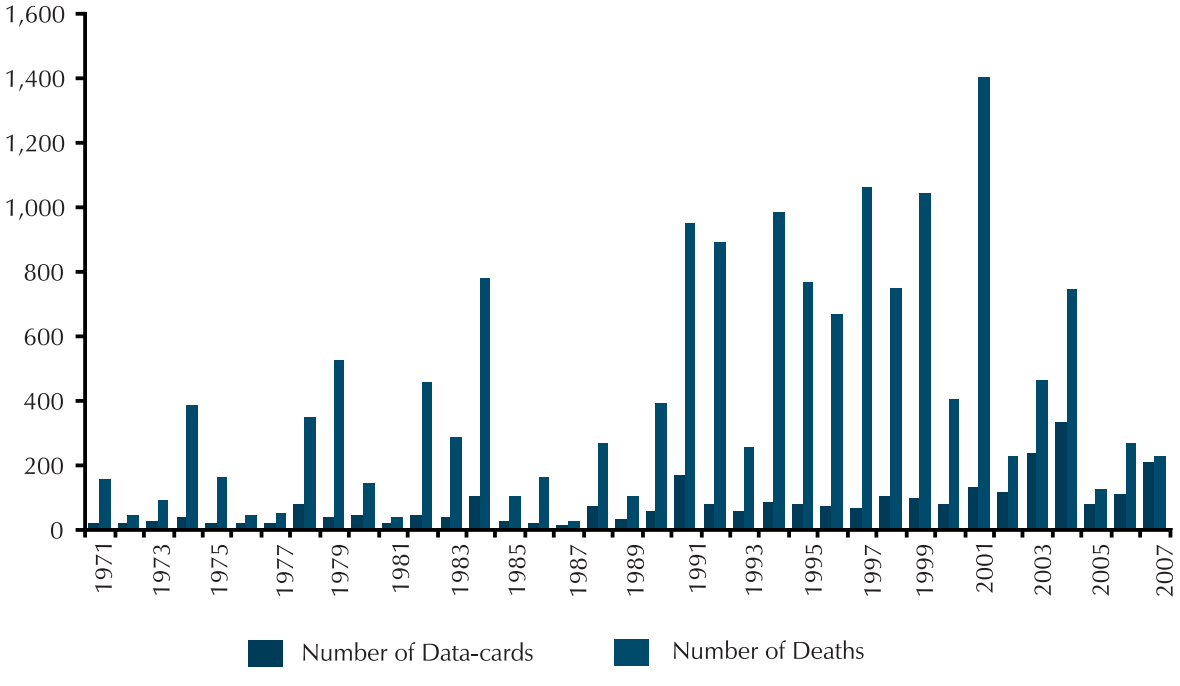
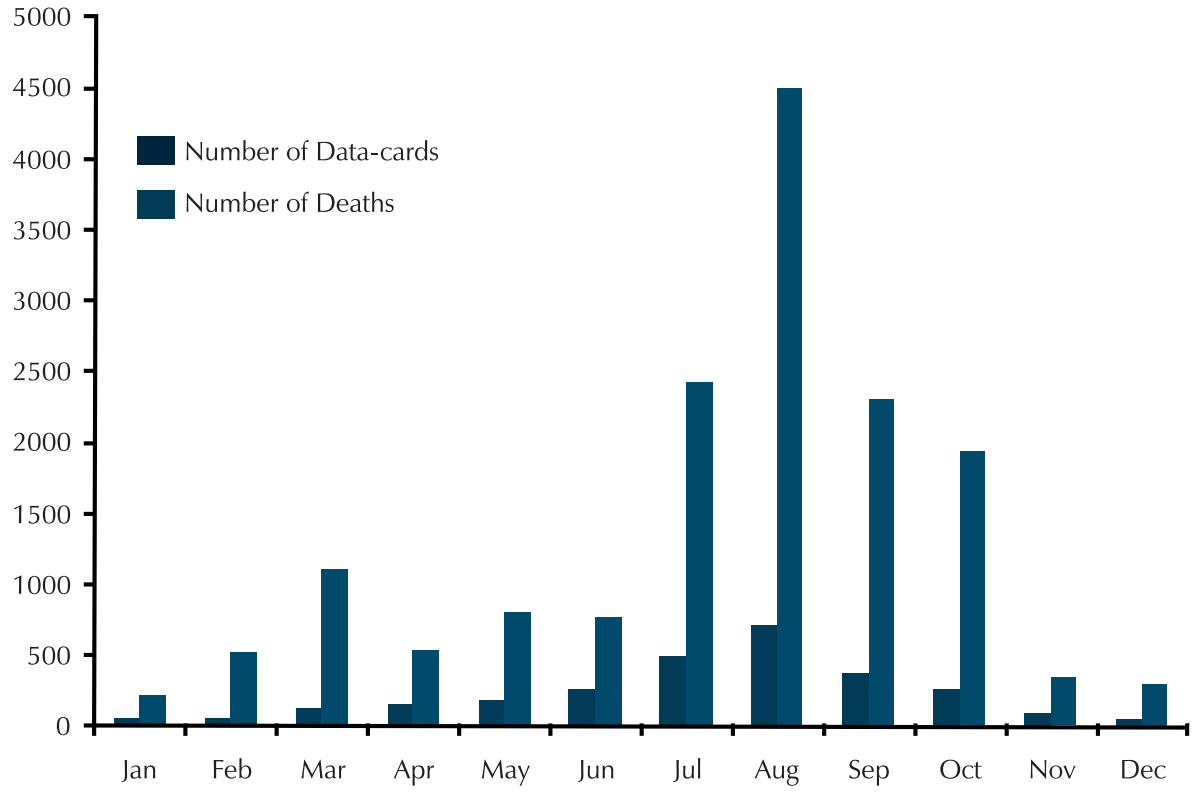


Figure 30:Seasonality of epidemics



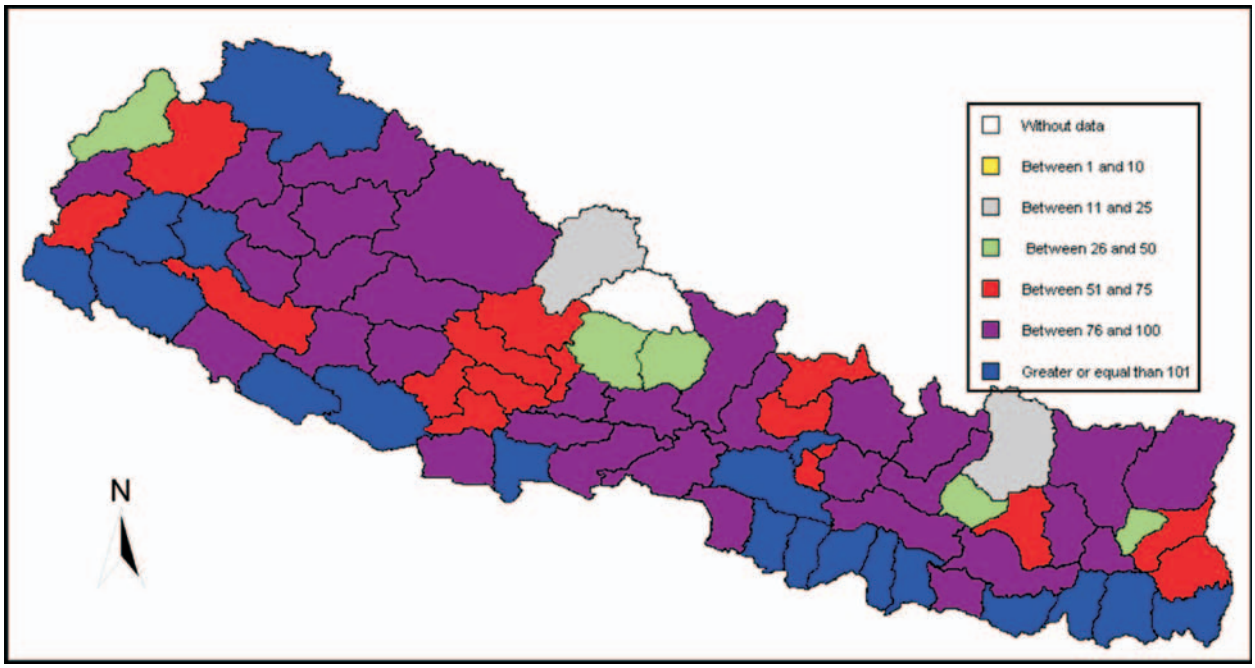
4.1.7 Spatial distribution, population affected and human loss from epidemics

Map 22 illustrates that epidemics occur in every district of Nepal. The Terai and some Hill and even the colder districts of higher Himalayan Mountains (e.g. Humla, Jumla and Mugu) have the most epidemics.

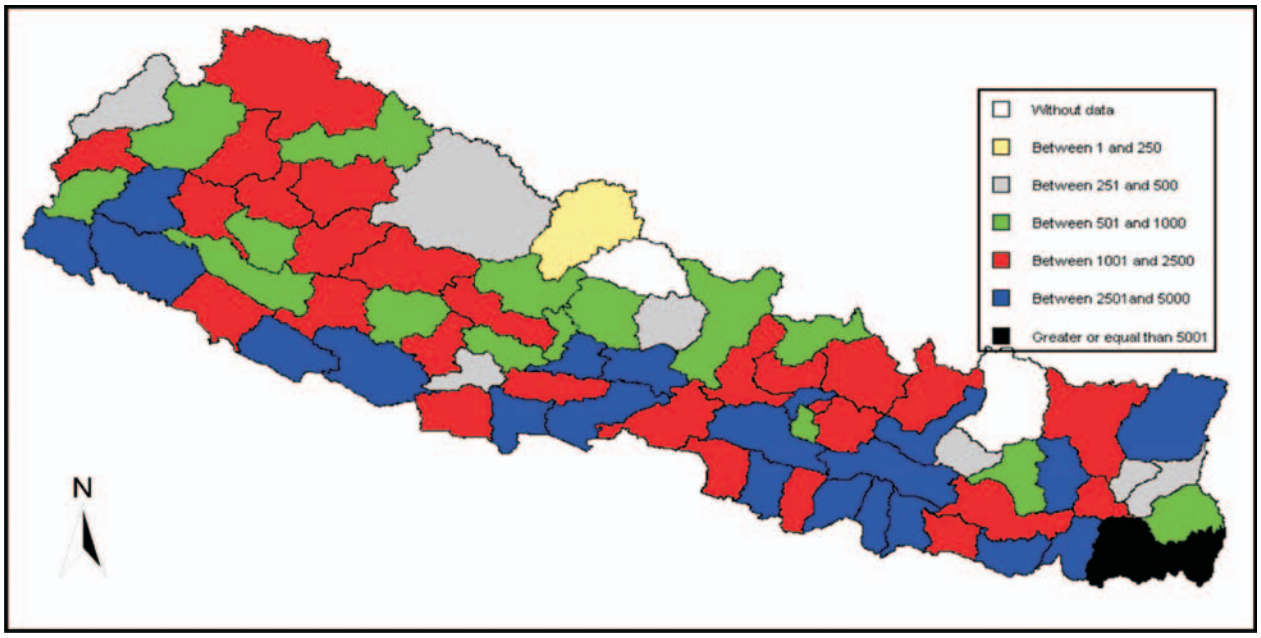
Maps 23 and 24 show how widely populations are affected and human lives lost to epidemics. There must be several factors that determine the extent of this hazard and the high mortality and morbidity rates. But it is obvious that the existing level of nutrition and the need to improve the organization of public health and hygiene is a challenge that demands urgent attention.

Map 25 shows lower values for the numbers of people 'injured' (see definition in Section 3.6.1 in Chapter 3) in the northern districts. Given that 'injury' means those affected including those hospitalised and discharged after treatment, the lack of medical services in these areas helps explain the high mortality rates.

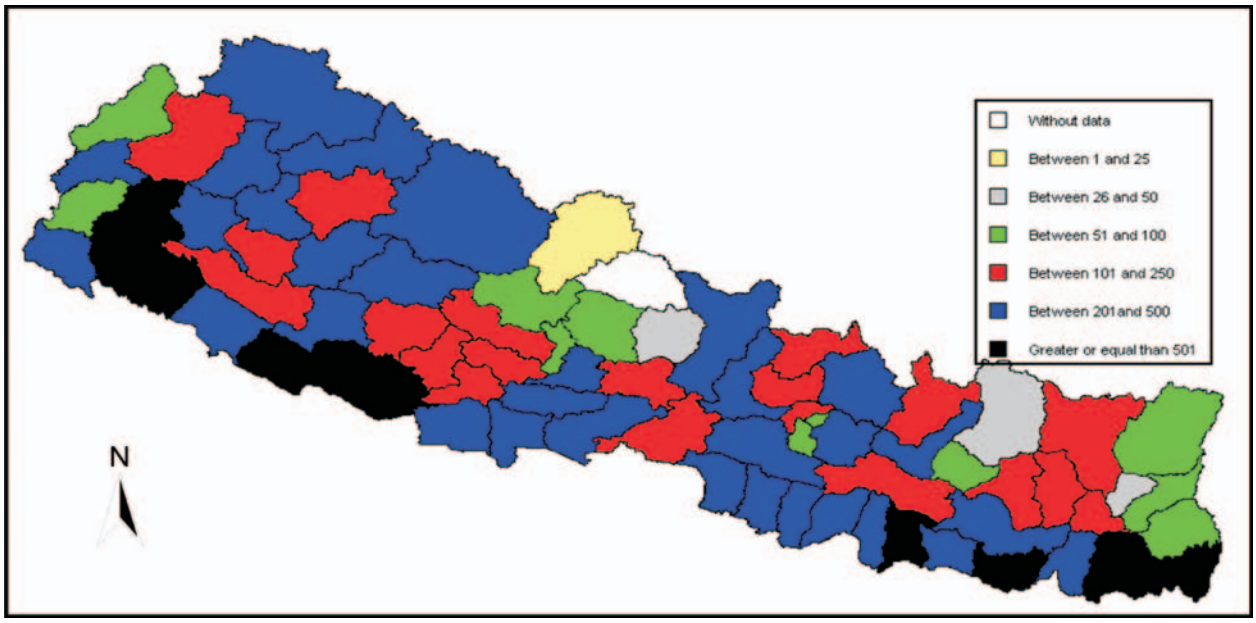
Map 22:Extent of epidemics in Nepal – number of data cards by district



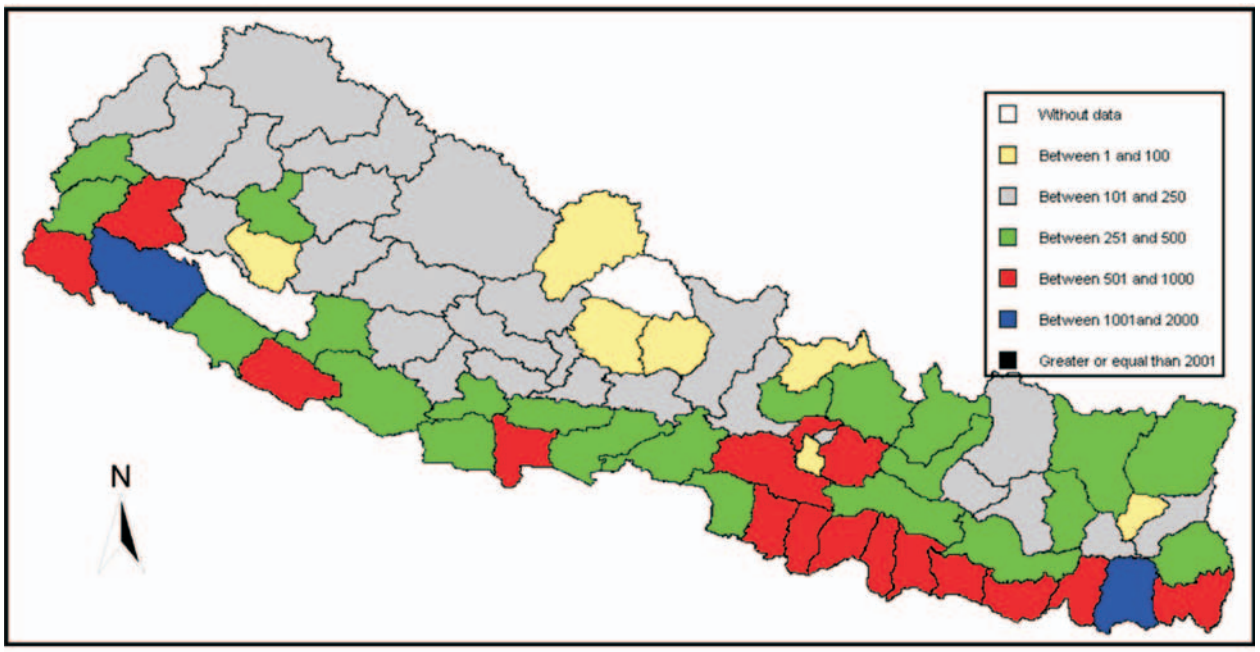
Map 23:Impact of epidemics on people – number of affected people (1971-2007)



Map 24:Impact of epidemics on human life (1971-2007)



Map 25:Impact of epidemics on populations - number of injured (infected)



4.4 FLOODS

The south-west monsoon is the main source of summer rains. The surface water finds its way through thousands of streams to the major rivers which flow abundantly in the summer months. Landslides triggered by intense, concentrated precipitation and cloud bursts deposit silt into the streams and rivers, adding to that of bursting temporary landslide dams.

Melting snow in the high Himalaya, especially in early summer, also contributes to flooding in the Hill and Mountain regions. Glacial tongues are melting more rapidly, with global warming as one of the causes, reducing the stability of natural moraine or ice-cored dams and also contributing to more silt entering the river system. All Himalayan rivers evacuate their debris-laden flow into the Terai. All of Nepal, then, except the glacier-free districts to the north of the Himalayan range, are prone to floods that cause intense damage and loss of lives, infrastructure and property, particularly during the monsoon season. Floods contaminate drinking water and destroy crops and fields. Epidemics, diseases and famines are hazards collateral to flooding.

During these 37 years, more than 2,500 floods have been reported. They have killed at least 3,000. They have affected more than 3,000,000 people and destroyed or damaged some 150,000 buildings (Annex D.1). Figure 31 shows high variations in the floods' frequency, extent and impact.

The following sections explore in details the impact attributes of floods in Nepal.

4.1.8 Annual time-series distribution of floods

Figure 31 plots the number of floods and the number of deaths attributable to flooding reported between 1971 and 2007. The average number of flood events in the country during the first two decades stood at around 10-25, with around 60 to 70 every 4-5 years. But in the 1990s, the number of floods almost doubled. Global warming is widely considered as the main culprit, but we must also look elsewhere. For example, the roles of deforestation, short- and long-term effects of extreme climatic events, changes in land use pattern, the contribution of construction of hill roads and hill irrigation canals should also be exmained.

4.1.9 Seasonality of floods

Figure 32 shows that July, August and September are the main months of flood disasters in Nepal. July is the peak month both for the number of flood incidences and the number of deaths from floods.

4.1.10 Spatial distribution of floods

The entire country suffers from floods. The Terai and some Hill districts show the highest incidence of floods. The eastern part of the country appears to fare slightly better than the west. Generally, the number of flood disasters becomes lesser as one goes higher in elevation.

4.1.11 People affected by floods

While the Terai is naturally the most affected region, the eastern Terai is affected much more than the west. The districts most affected are Sarlahi, Makwanpur, Sindhuli and Chitwan. The population affected by floods generally decreases from south to north.

Figure 31: Time-series distribution of floods

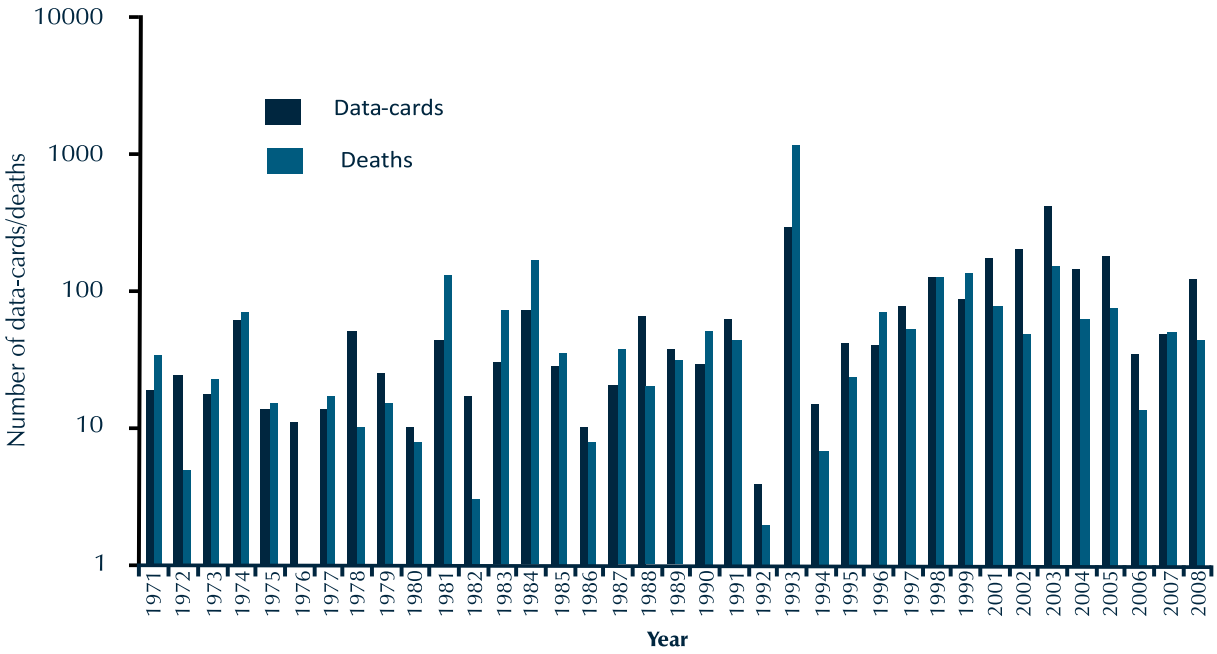
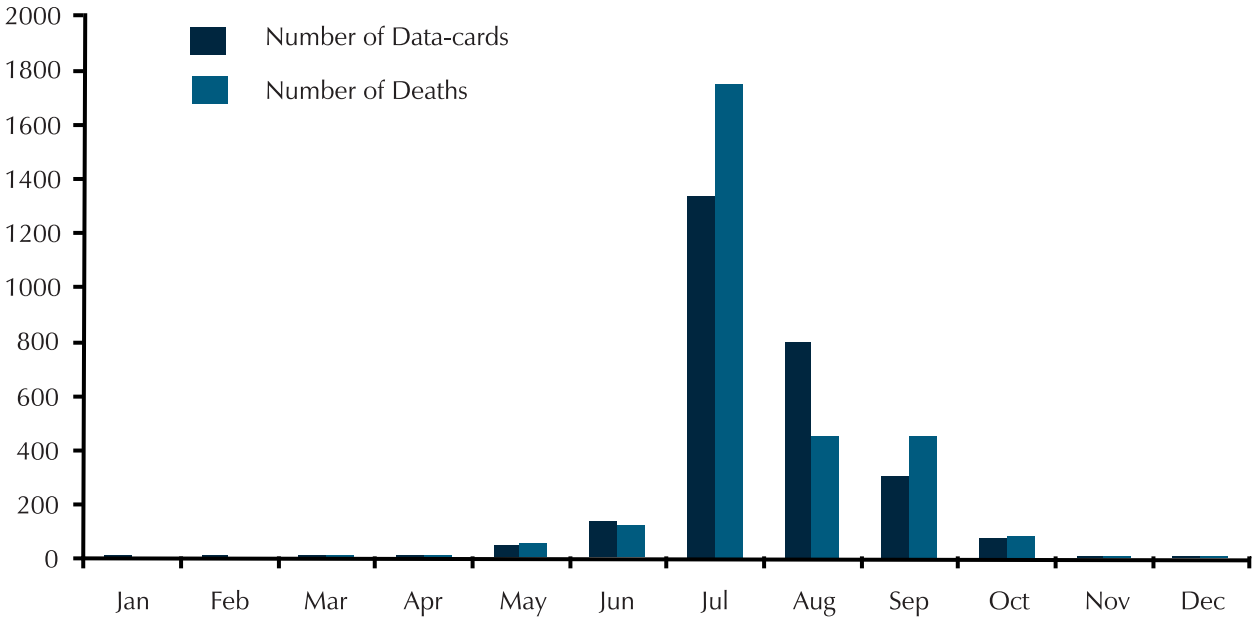
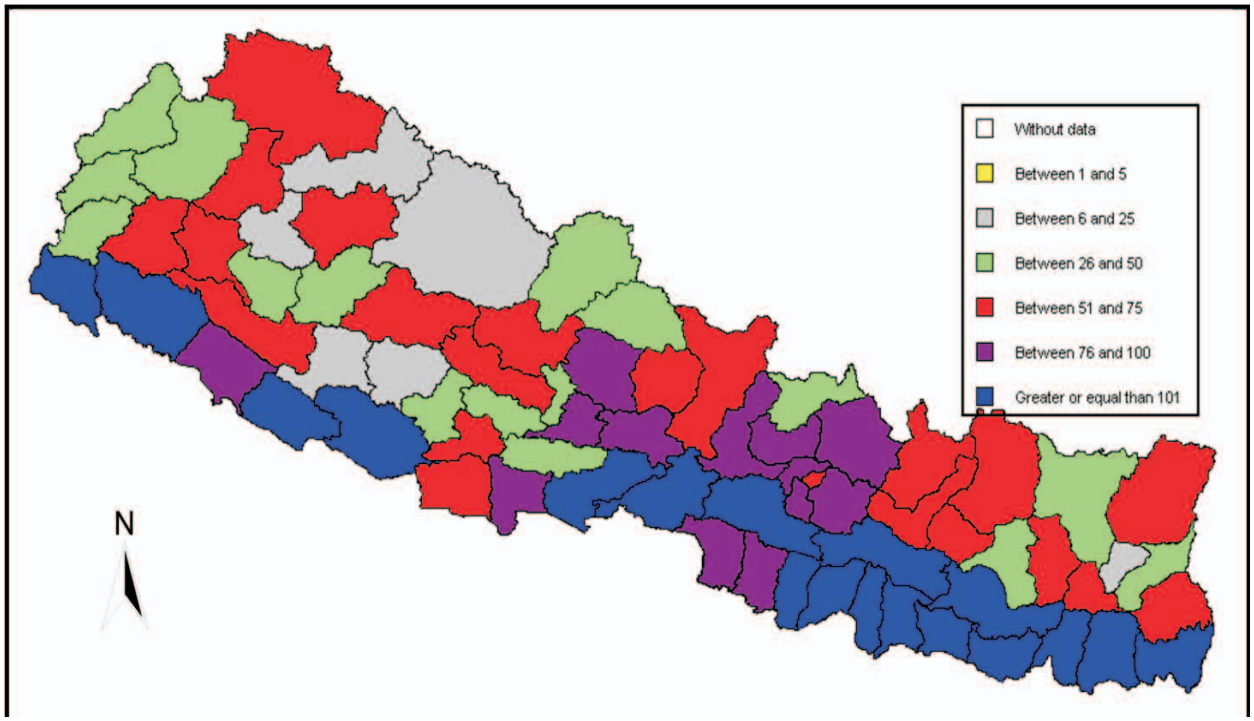


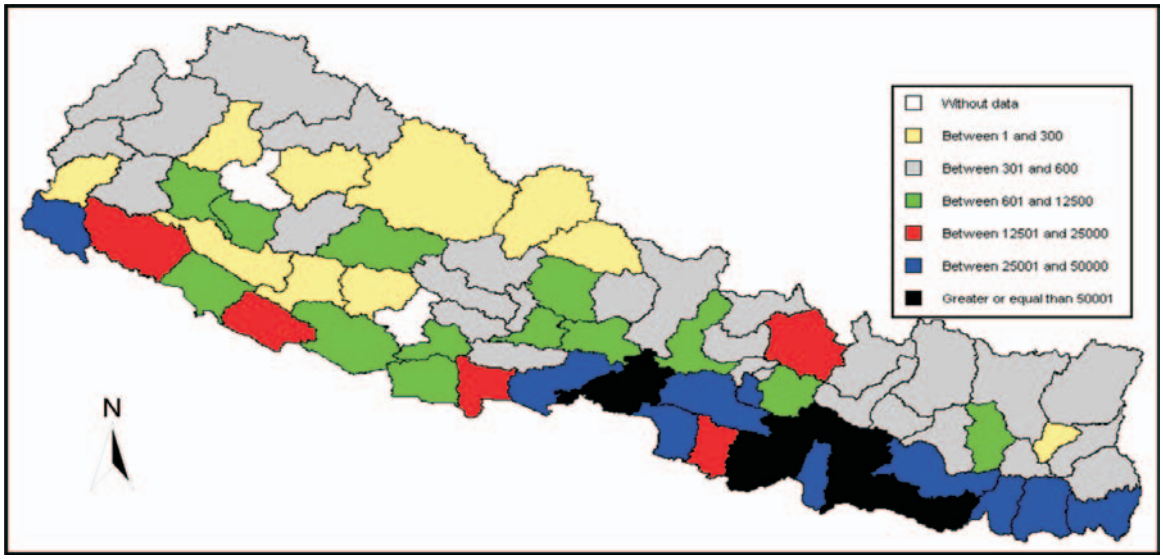
Figure 32: Seasonality of floods



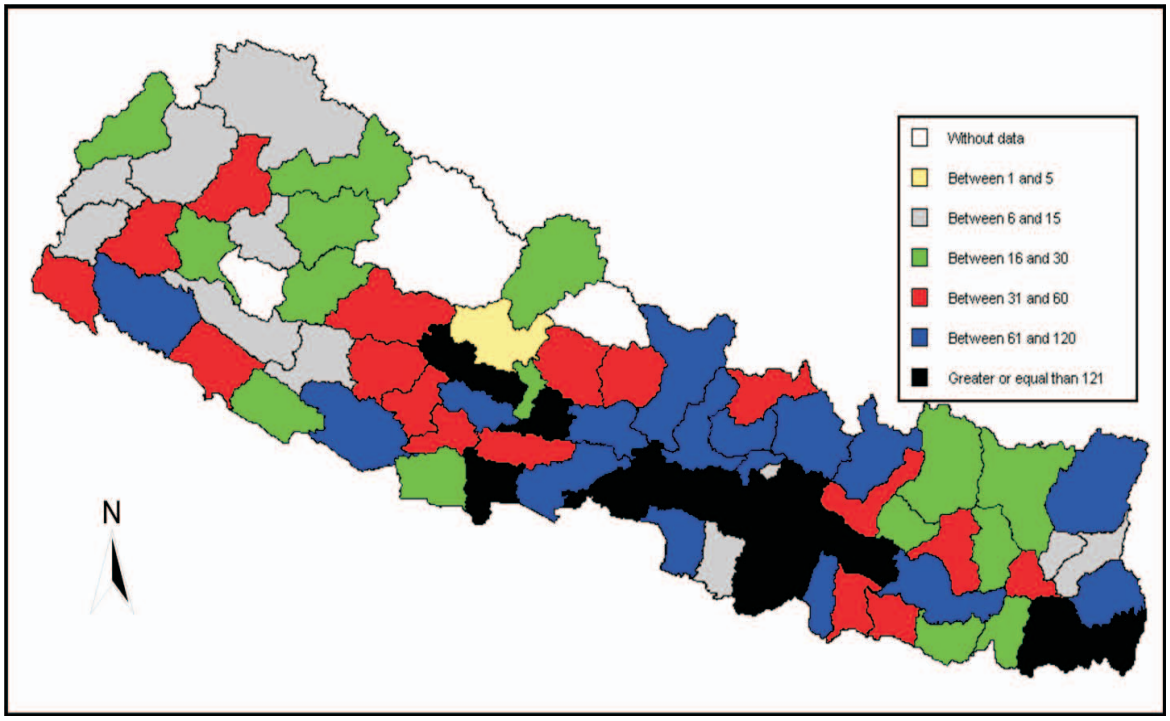
Map 26:Extent of flooding in Nepal by districts - number of data-cards



Map 27:mpact of flooding on people in Nepal – number of affected people by district



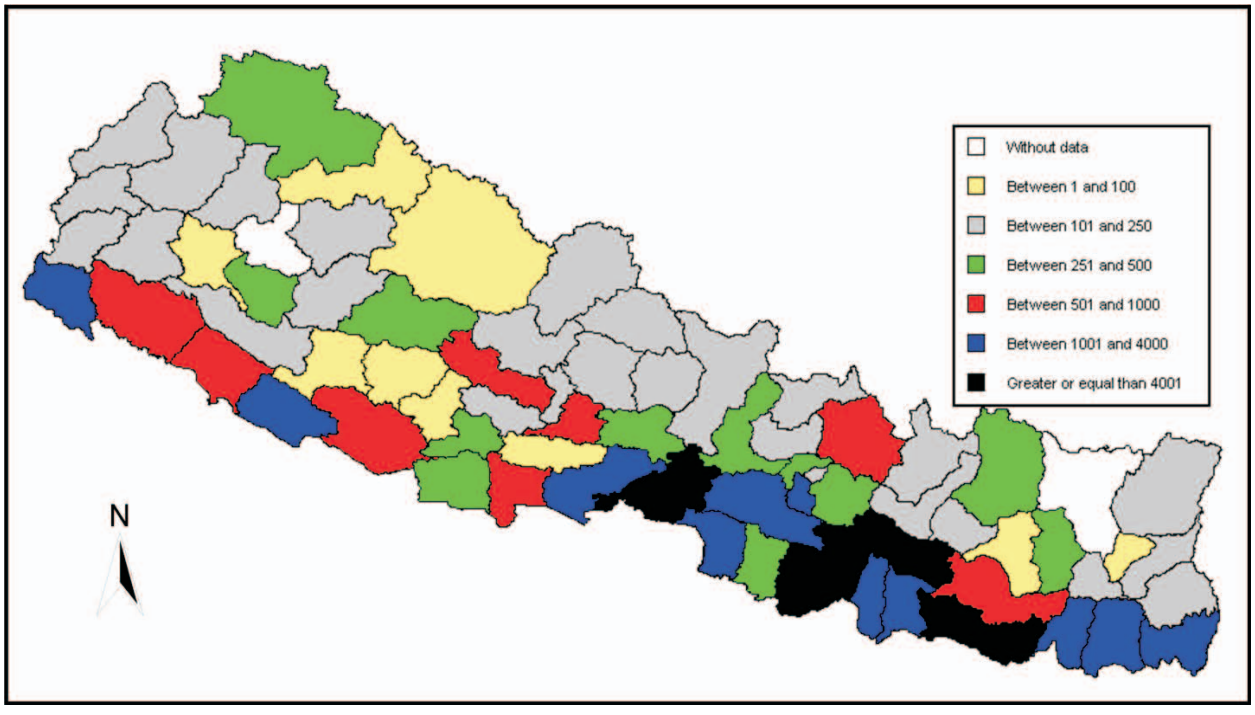
Map 28:Distribution of loss of life due to floods in Nepal



4.1.12 Buildings destroyed and damaged by floods

The pattern of building damaged by floods follows the same pattern as loss of life (compare Maps 28 and 29).

Map 29: Impact of flooding on buildings in Nepal – number of houses destroyed by district



4.1.13 CONCLUSION

Floods are an annual menace to people throughout the country. Floods in the hilly and mountainous regions, along high gradient slopes, are mostly debris-laden flows resulting from landslides, landslide dam failures, and glacier lakes outburst flooding. Floods along major rivers and in the Terai are sheet floods that inundate large territories after breaking through natural levees along banks, then damage land, standing crops, houses and other property.

The Terai bears the brunt of flooding, along with some mountain districts. The Eastern Terai experiences higher frequency and impact.

Flood disaster reduction is a major task. The country needs to develop a flood disaster reduction strategy to guide development. Appropriate programmes, such as flood forecasting and early warning and disaster communication in river basins, are needed.

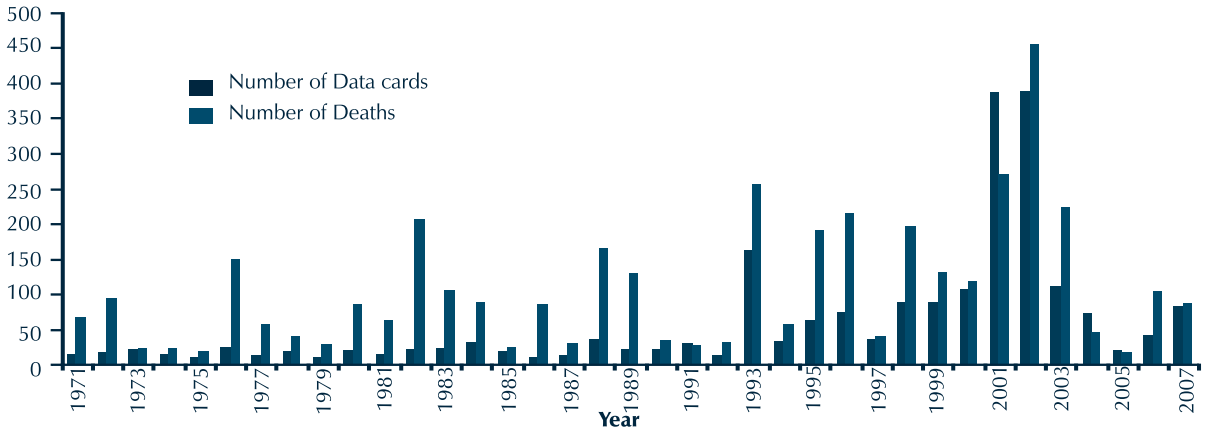
4.5 LANDSLIDES

Landslides are prevalent in the hills and mountains of Nepal. Steep gradients and the heavily fragmented surface rocks, along with an abundance of triggers (such as river erosion, glacial melting, saturation by snowmelt or heavy rains, seismic activity, excess weight from accumulation of rain or snow, and groundwater pressure acting to destabilize the slope) are present. Human impacts such as road construction (including the wide use of explosives), intensive deforestation, inappropriate agriculture and irrigation practices, overgrazing on slopes, quarrying for construction materials, and construction of infrastructure beyond the bearing capacities of the hill slopes as well as the removal of deep-rooted vegetation that binds the soil to bedrock are also intense.

4.1.14 Annual time-series distribution of landslides

Figure 33 plots annual landslide events and resulting deaths from 1971 to 2007. The trend is similar to that observed for flood – before 1992, the average number of landslide disasters reported ranged from 25 to 30, but after 1992 the average number of devastating landslides jumped to 60 to 70. Landslide related casualties used to number around 5-60, with the worst years recording around 100 deaths. Since 1993, however, there has been a sharp increase to around 150 in normal years, and about 200 in years with abnormally high numbers of landslides. There exists, then, a broad upward trend in the number of incidences and of deaths. Since 2003, the rates have declined.

Figure 33:Annual time series impact of landslides



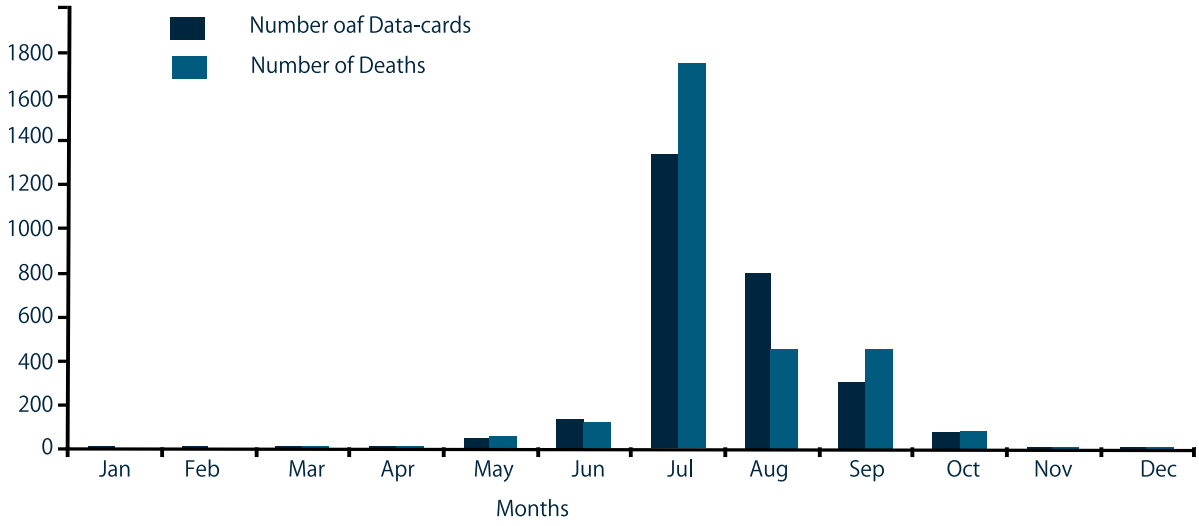
4.1.15 Seasonal Distribution

The seasonality of landslides and the number of lives they claim are similar to those of flood: the highest number happen in the monsoon months with a peak in July (Figure 34). Thus heavy rains, floods and landslides are interrelated.

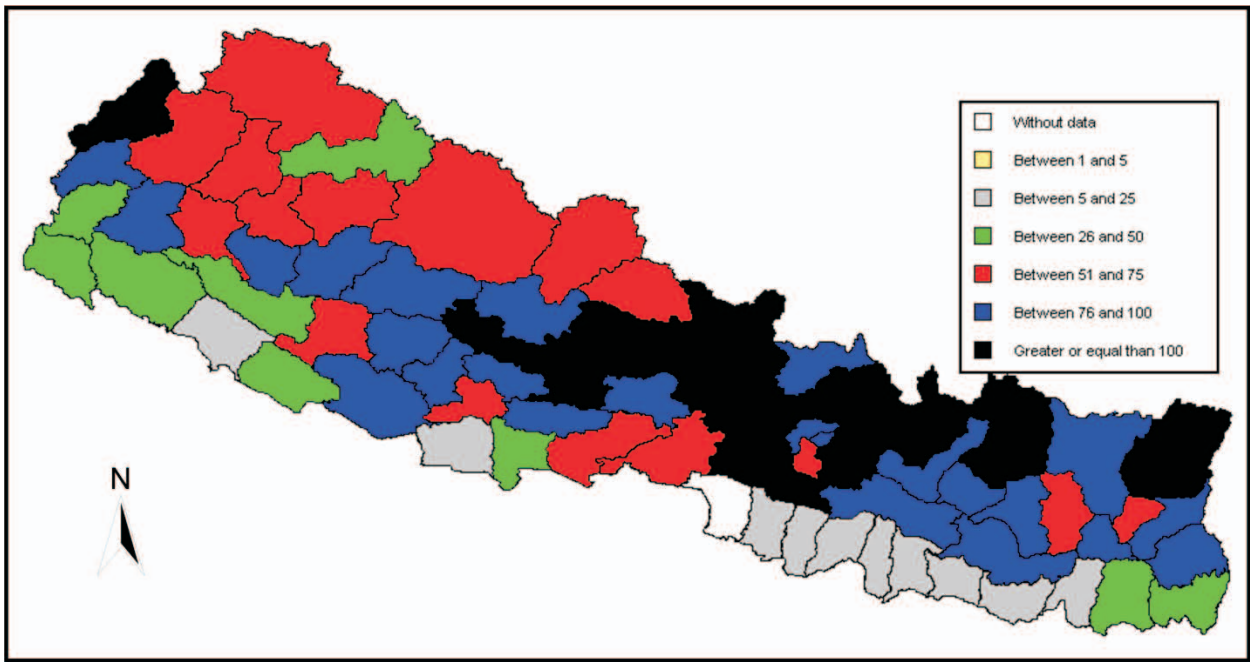
4.1.16 Spatial Distribution

Apart from the Terai, all hilly and mountainous parts of the country experience landslides. Snow and rock avalanches explain the high occurence in the mountainous northern districts , while the central and eastern regions have the highest number of landslides.

Figure 34:Seasonality of landslides in Nepal



Map 30:Extent of landslides (and avalanches) in Nepal – number of data cards by districts



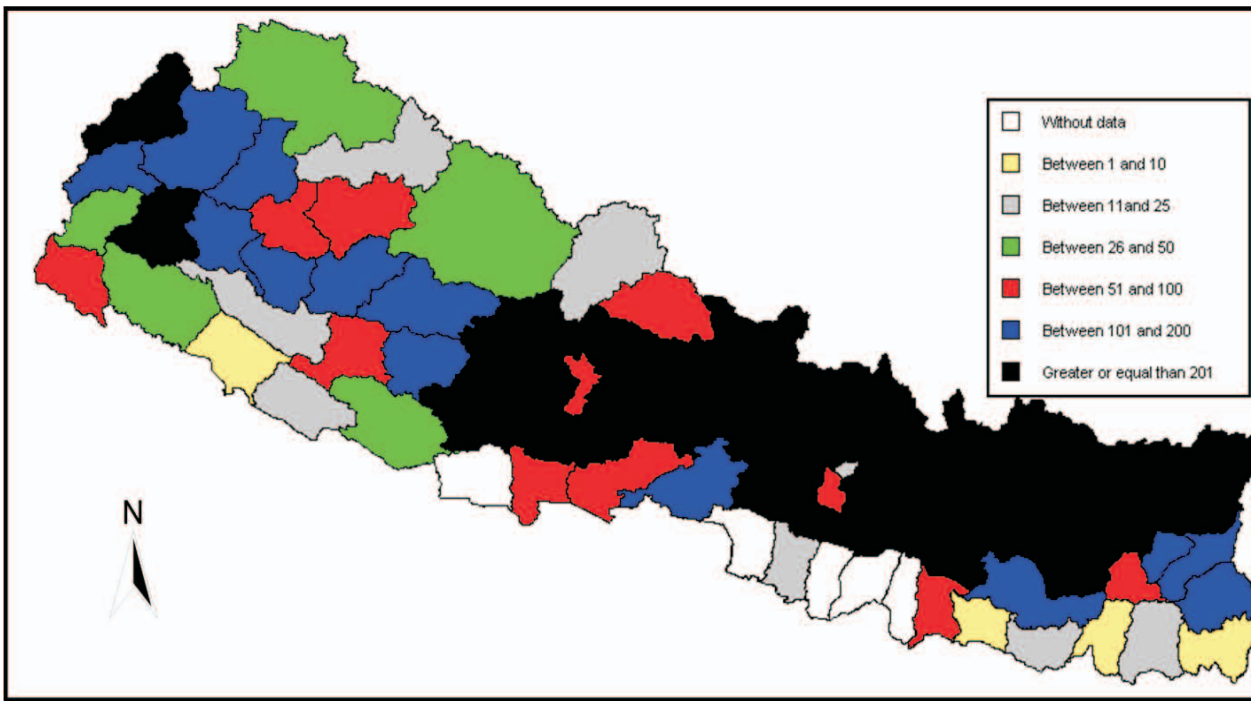
4.1.17 Human casualties and population affected

Apart from the Terai and western parts of the high Himalaya, the entire country shows almost uniform distribution of deaths due from landlsides and avalances (Map 31). There are roughly 100 people affected by lanslides for every one person killed – a relationship that is particularly strong in the eastern hills.

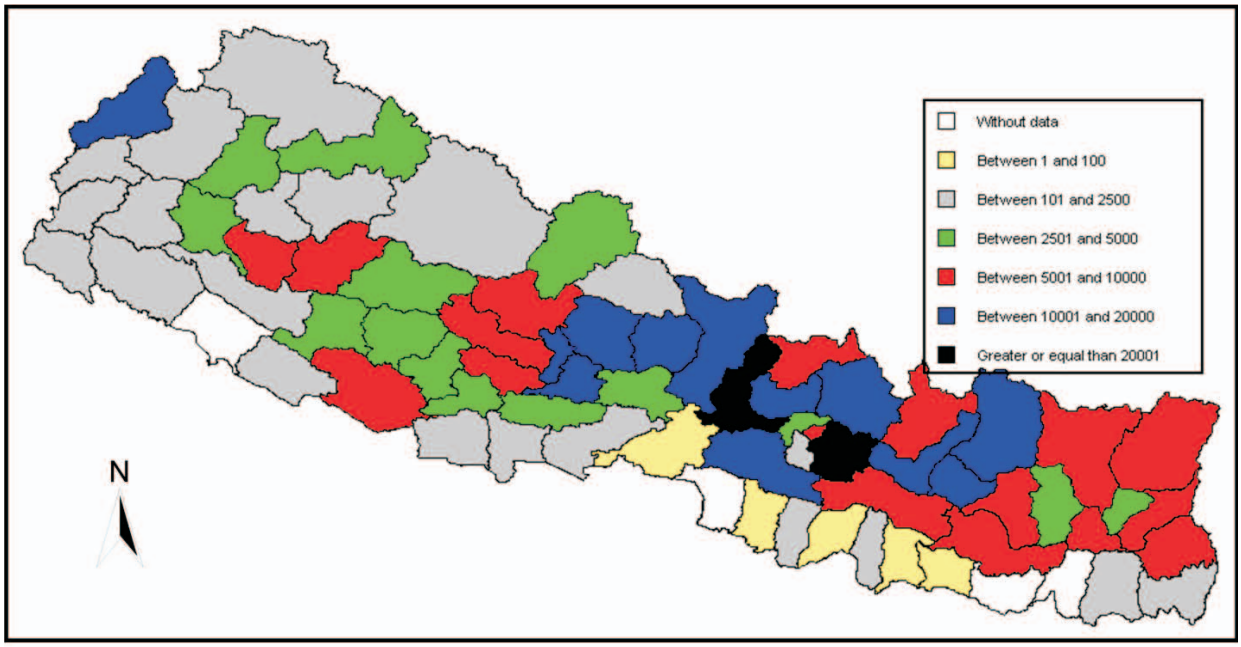
4.1.18 Building destruction and damage

The entire middle Hills and the eastern high Himalaya region experience the highest damage to buildings from landslides and avalanches.

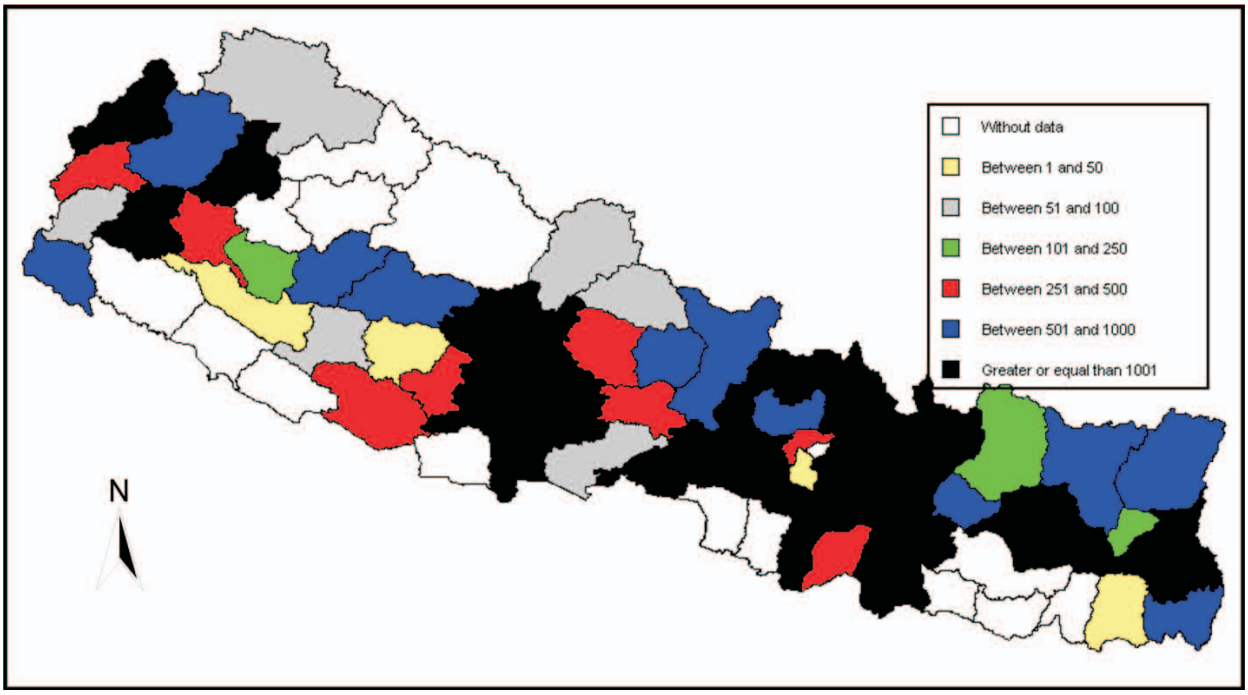
Map 31:Impact of landslides on human life in Nepa



Map 32:Impact of landslides on people – number of affected people by district



Map 33:Impact of landslides and avalanches on buildings in Nepal



4.6 FIRES

Fires in Nepal are of two types – settlement fire and forest fire. Most datacards pertain to fire in settlements. Together, they contribute to 26 per cent of all disasters events. With ever greater population densities, and an increasing use of synthetics products in households, fire hazards are likely to grow in urban areas. Forest fires are, for the most part, either started deliberately by humans to regenerate land and forest, or accidentally by shepards and cattle grazers.

The main cause of fires in Nepal is therefore anthropogenic – human negligence or deliberate burning. Sometimes forest fires affect neighbouring human settlements in certain wind conditions, especially in the Terai where thatched houses are common. Many villages are burned every year with loss of life, cattle and property.

4.1.19 Annual time-series distribution

The annual time series (Figure 35) of fire shows that there is slightly increasing trend in the number of fires every year. In 1976 and 1979, there were 5 to 18 times the average number of fires. Since 1989, the number of fire events has grown significantly to reach a peak in 1996, after which it has declined gradually.

4.1.20 Seasonal Distribution

The data show that more than 60 per cent of all recorded events of fires and forest fires occur during March, April and May, when the humidity and air temperature reach their highest. With the monsoon, the number of fires reduces significantly. In other seasons, especially during the winter, fires are largely due to human negligence. Winter, especially after harvesting forest grass (babio) sees people deliberately starting fires to increase the soil's fertility and thereby promoting the growth of grass used as livestock feed or for roofing thatch or to be made into rope.

Figure 35:Annual time-series distribution fire events

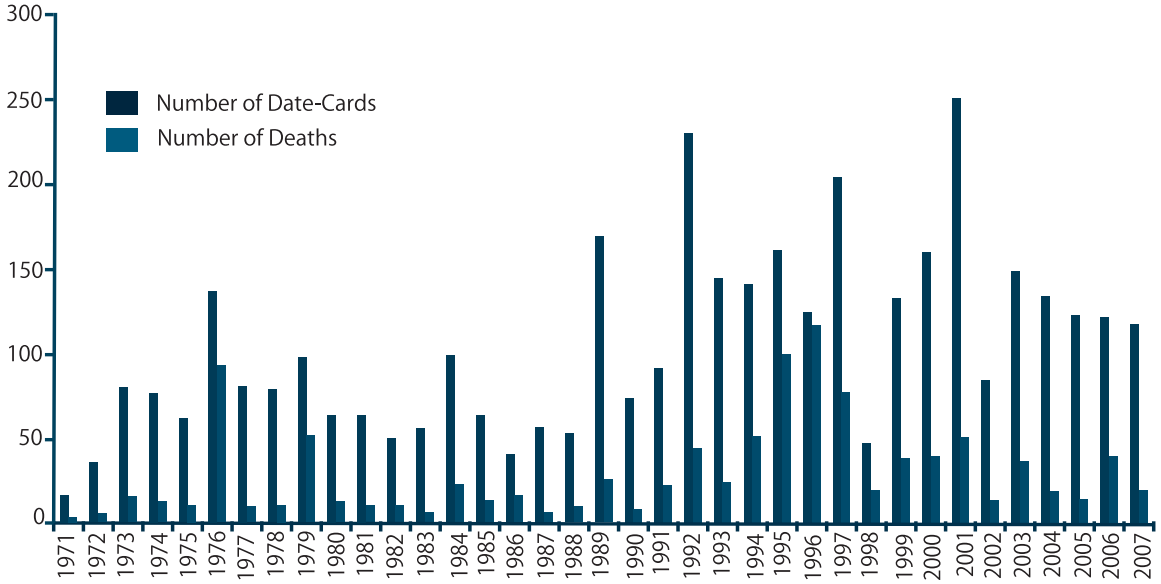
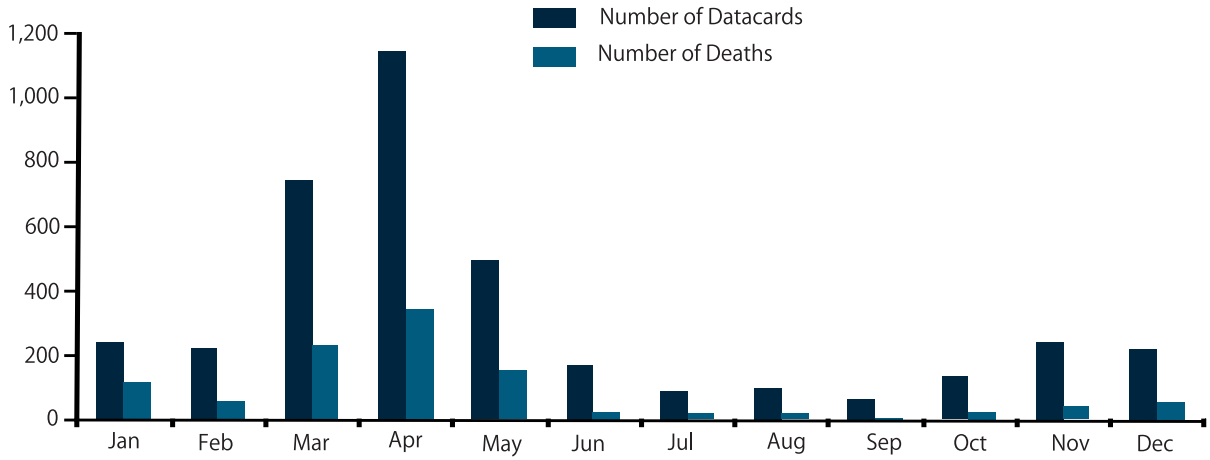


Figure 36:Seasonality of fire

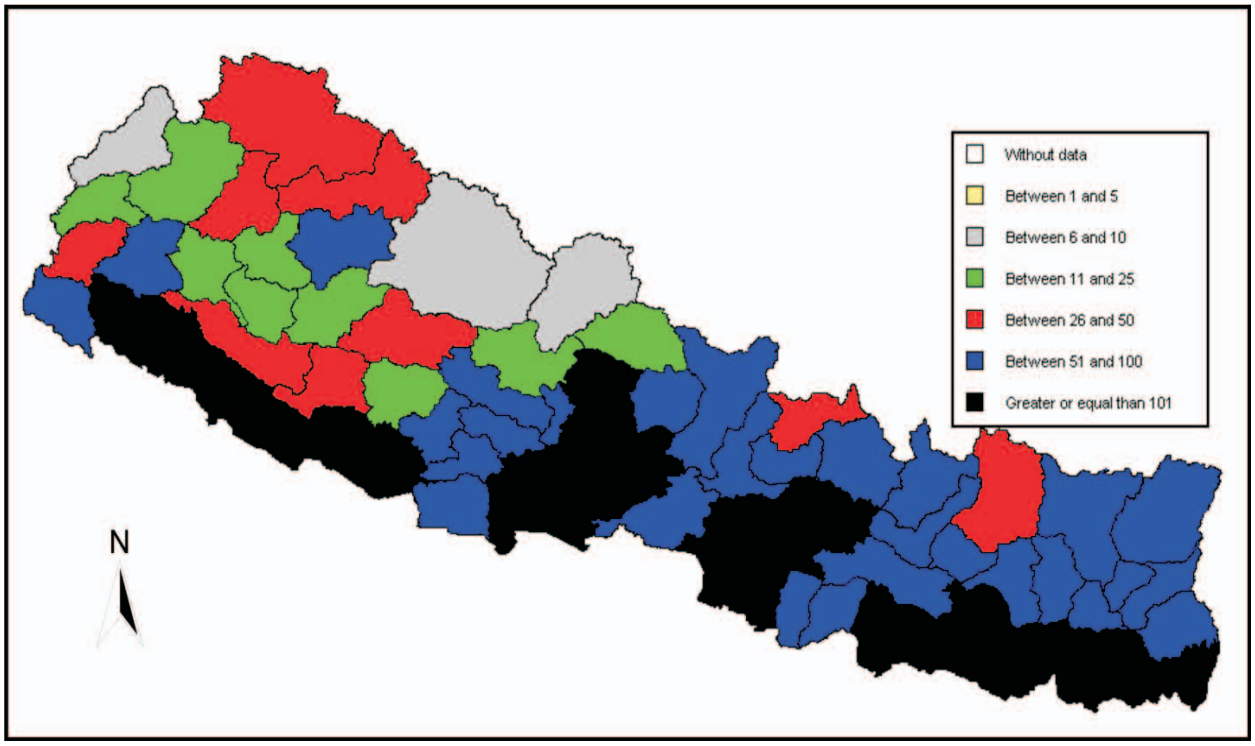


4.1.21 Spatial Distribution

Fires occur particularly in the Terai region when temperatures are high and strong winds contribute to the spread of fire.

The hills and mountains also experience fire. Fires are believed to have increased significantly in recent years in urban areas where small industries use plastic, polyester and polyvinyl as raw materials.

Map 34:Extent of fire in Nepal – number of data cards by district



4.1.22 Populations affected and loss of human life to fire

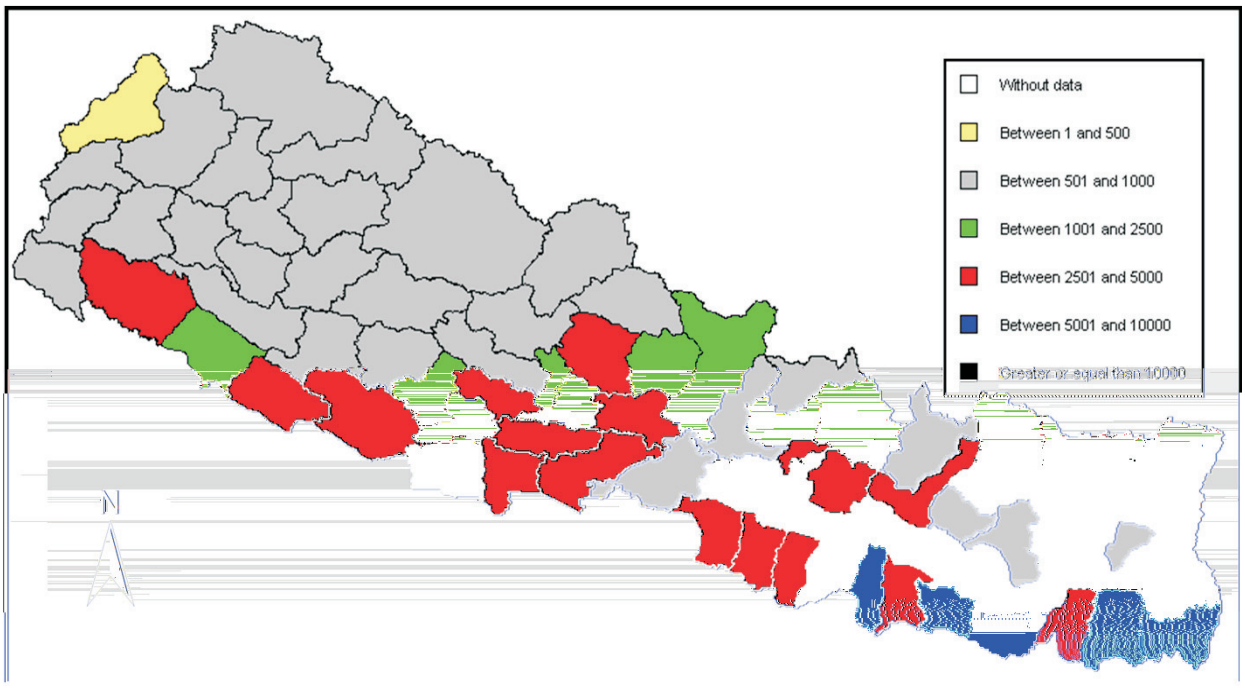
Map 35 shows the geographical distribution of populations affected by fire in the past 37 years – it is concentrated in the Terai and the eastern hills.

The higher number of deaths in the western hills appears to be due mainly to household/kitchen fires and perhaps also to fire spreading to adjacent forests. The same holds true also for the increase in damage caused to buildings. The increase in urban household fires is a recent phenomenon.

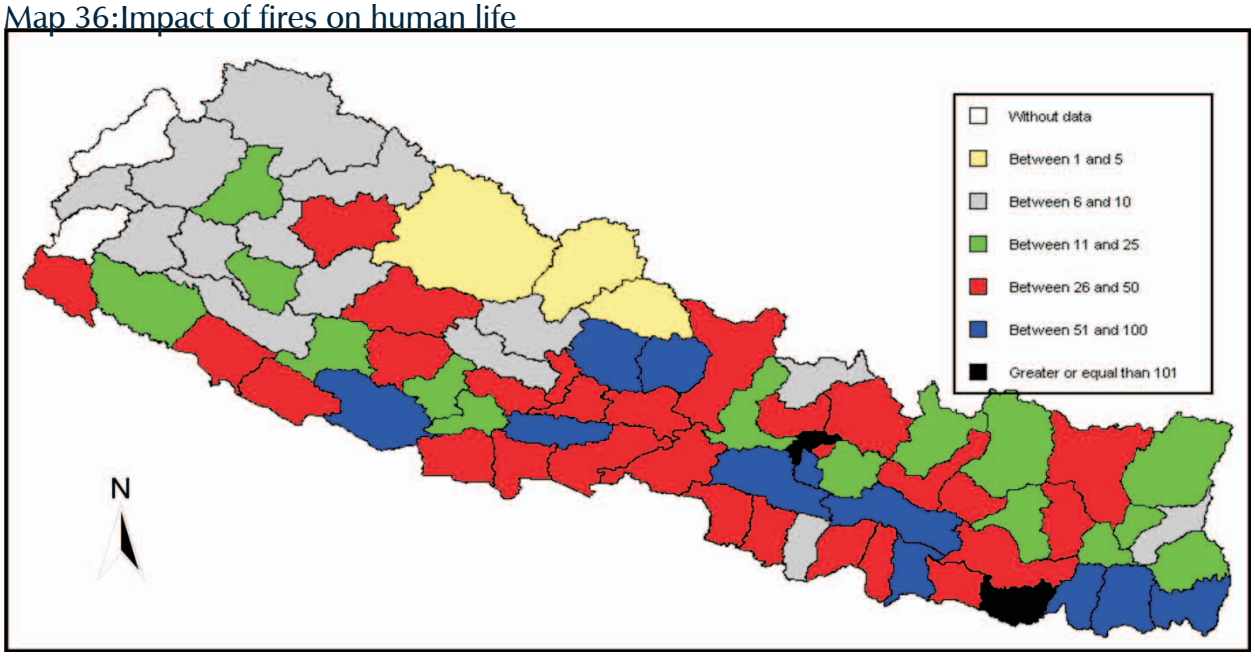
The dataset shows 3,880 fire events, with 1,108 deaths and 186 persons missing and a total affected population of 218,278 people (maps 35, 36 and 37). Over 63,000 buildings were destroyed and 1,453 houses were damaged. In 2004 and 2005 alone, about 40 people were killed, 1,600 people affected and over 2,000 buildings destroyed by fire.

Every year wildfires destroy considerable forest resources in Nepal. During the two years period, eight wildfire events were reported. Forest fires occur annually in all regions of Nepal. Forest fires are contributing to the degradation of biodiversity and reduction of wildlife, which affects the whole forest ecosystem. Indirectly, these events cause soil erosion and induce floods and landslides due to the destruction of vegetation.

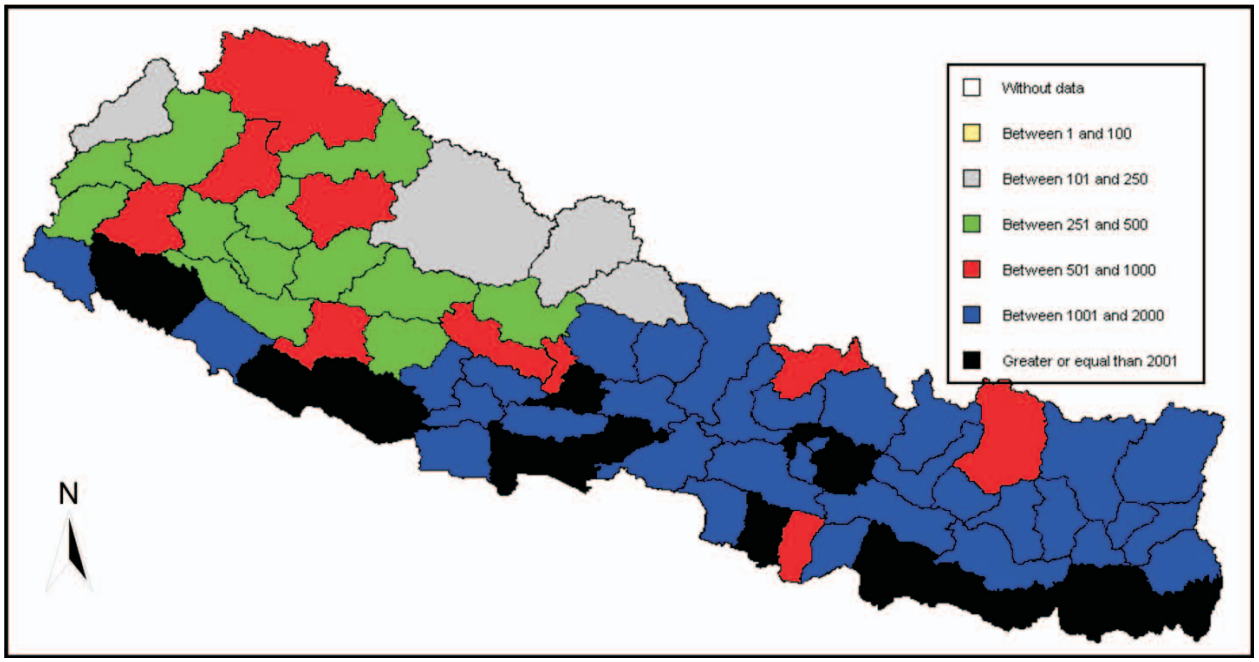
Map 35:Impact of fires (settlement and forest fires) on people – number of affected people by district



Map 36:Impact of fires on human life



Map 37: Impact of fires on buildings in Nepal

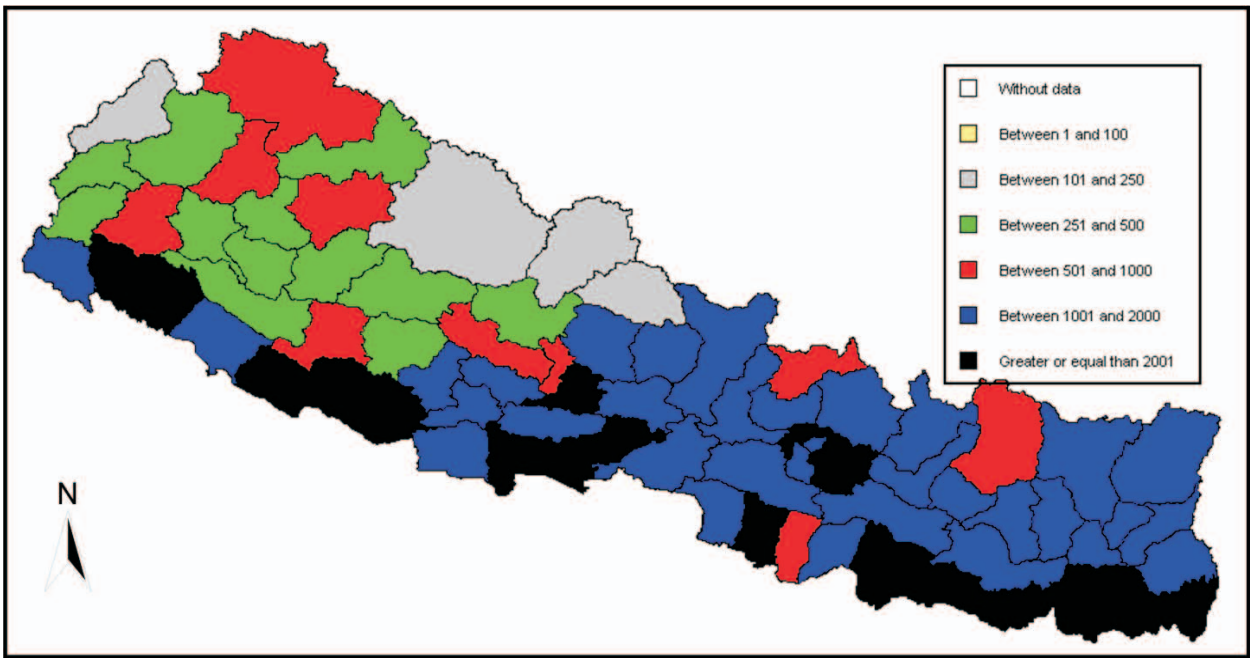


4.1.23 Loss of livestock to fire

A significant number of livestock is burned to death or rendered useless by fire every year. Map 38 shows that this is widespread in the Terai, mountains and in the higher Himalayan districts, excepting some districts, including Humala, Dolpa and Mustang. Fewre numbers are seen in the higher Himalayan districts of western Nepal. More than 100,000 cattle were burned to death in 2004-2005.

Loss of livestock is a huge problem for the livelihood and economy of rural Nepal. Cattle raising, goat farming and poultry rearing is important for the rural population of Nepal. For most rural women, poulty and goats are an important means to generate income.

Map 38:Impact of fires on livestock



4.7 OTHER HAZARDS

4.1.24 Glacier Lakes Outburst Floods (GLOF)

Global climatic change has had a significant impact on the high mountainous glacial environment. In recent decades, glacial melting have become increasingly visible, leading to the formation of large lakes or rapid enlargement of existing lakes. Due to an increase in the rate at which ice and snow melts, water in these lakes has been accumulating rapidly (Mool; 2001:7-8) and catastrophic discharges of water resulting primarily from breaks of moraine dams containing the waters. Earthquakes may also be a factor triggering dam breaks. Characterized by sudden releases of huge amounts of lake water, the glacier lakes outburst floods can rush downstream along the stream channel in the form of dangerous floods. This phenomenon has resulted in serious death tolls and destruction of valuable natural resources such as forests, farms and other downstream infrastructure.

Economic costs of GLOFs in Nepal

There are 2,315 glacial lakes in Nepal, of which 26 are potential dangerous (Mool 2001:7-8). However, very few studies on GLOFs in Nepal have been conducted.

A 1964 GLOF in China destroyed many kilometres of highway and swept 12 timber trucks 71 km away. An outburst of Zhangzangbo Lake in 1981 killed four people and damaged the China-Nepal Friendship Bridge in the northern border, seven other bridges, a hydropower plant, Arniko highway and 51 houses. The damage was estimated at US$3 million. The 1985 GLOF at Dig Tsho was triggered by a large avalanche. A hydroelectricity project, 14 bridges, 30 houses and farmlands worth US$4 million were destroyed. In 1998, the outburst of Tam Pokhari in Nepal killed two people, destroyed more than six bridges and washed away arable land. Losses worth over NRs150 million have been estimated. A high water level was observed even after 19 hours in the Koshi barrage near the Indo-Nepal border. The river reverted to its original flow only after three days (Dwivedi 2000).

There are about 159 glacier lakes in Koshi basin (Sharma 1998). Nearly 229 glacier lakes were identified in Tibet's Arun basin, of which 24 are potentially dangerous (Meon & Schwarz 1993). Since 1935 more than 16 GLOFs have been reported which either occurred or extended into Nepal.

The record of past disastrous GLOF events in Nepal is given in Table 29. Although GLOF events are not new in Nepal, they attracted the attention of the scientific community and government only after a disastrous occurred at Dig Tsho Glacier Lake on August 4, 1985 in the Langmoche Valley in Khumbu Region in Eastern Nepal. This GLOF caused serious damage to the nearly completed Namche Hydropower Project and washed away a large area of cultivated land, bridges and houses, including livestock and inhabitants. The effect on tourism was seen for many years. The flood waves lasted for about four hours and released six to 10 million cubic meters of water. Since then, Government of Nepal has considered GLOF events a threat to the development of water resources in Nepal and has given greater attention to GLOF studies (Shrestha and Shrestha 2005:8).

4.1.25 Severe weather conditions

Monsoonal rains are intense because of the geographic and orographic context. There is always one or more cloudburst episode in Nepal every year.

A storm is any disturbed state of the atmosphere, especially affecting its surface, and strongly implying severe weather conditions. It may be marked by strong wind, thunder and lightning, heavy precipitation, or wind transporting some substance through the atmosphere.

- A heavy fall of snow that lasts several hours is called a snow storm. Snow storms with a high liquid equivalent and breezy conditions can down tree limbs, cut off power, and paralyze transportation network over a large region.

- A thunderstorm is a type of storm that generates lightning and the attendant thunder. It is normally accompanied by heavy precipitation. Thunderstorms occur throughout the world, with the highest frequency in tropical regions. These storms occur when high levels of condensation form in a volume of unstable air that generates deep, rapid, upward motion in the atmosphere. The heat energy creates powerful rising air currents that swirl upwards to the tropopause. Cool descending air currents produce strong downdraughts below the storm. After the storm has spent its energy, the rising currents die away and downdraughts break up the cloud. Individual storm clouds can measure 2-10 km across.

- A type of storm that precipitates chunks of ice that aren't snow is called a hailstorm. Hailstorms can occur during regular thunder storms. While most of the hail that precipitates from the clouds is fairly small and virtually harmless, there have been cases of golf ball sized hail that causes much damage especially to the standing crops and and inflict injuries.

In Nepal, more than 90 per cent of all annual precipitation occurs during the monsoon season, when precipitation events exceeding more than 300 mm have been recorded in different parts of the country.

Table 29:Occurrence of GLOFs in Nepal cont'd...

S. No.	Date	Location	River System	Major River basin	Direct Cost (USD)	Dead	Injured	Displaced	Damage	Cause	Peak water level in affected area	Duration (hours)	Lag time (hours)	Afected Area(km2)	Volume of Water	Reference
1	450 years ago	Machhapuchre	Seti Khola	Narayani					Pokhara valley covered by 50-60m debris	Moraine Collapse						Galay(1985); Yamada(1998); ICIMOD/UNEP(2001)
2	01-Aug-1935	Tara_cho Lake, Boqu Basin, Tibet, China	Sun Koshi	Saptakosi					66,700m2 of wheat field. Livestock etc	Piping						"....."....
3	21-Sep-1964	Gelhaipco Lake, Gehaipu Arun Gully, Tibet, China	Saptakosi						Highway and 12 trucks	Glacier surge						"....."....
4	1964	Zhangzangbo	Sun Koshi	Saptakosi					No remarkable damage	Piping						"....."....
5	25-Aug-1964	Longda Lake, Tibet, China	Trishuli	Narayani					Not known	Not known						"....."....
6	1968	Ayaco Lake, Saptakosi Zongboxan Arun River, Tibet, China							Road, bridges	Not known						"....."....
7	1969	Ayaco	Arun	Saptakosi					Not known	Not known						"....."....
8	1970	Ayaco	Arun	Saptakosi					Not known	Not known						"....."....
9	03-Sep-1977	Nare	Dudh Koshi	Saptakosi					Mini hydropower plant	Moraine collapse						"....."....
10	23-Jun-1980	Nagma Pokhari, Kanchenjunga Area	Tamor	Saptakosi					Villages destroyed 71 km from source	Moraine collapse				75 km d/s		Watanable et al. (1998); ICIMOD/UNEP(2001)
11	11-Jul-1981	Zhangzangbo	Sun Koshi	Saptakosi	3*106				Hydropowerstation	Ice avalanche					19	Galay(1985); Yamada(1998); ICIMOD/UNEP(2001)
12	27-Aug-1982	Jinco, Yairuzanbo River Arun headwater, Tibet, China	Saptakosi						Livestock , Farmland	Glacier surge						
13	04-Aug-1982	Dig Tsho	Dudh Koshi	Spatakosi	1.5*106				Hydropower station, 14 bridges etc.	Ice avalanche	Upto 20m	2 to 5			6 to 10	Vuichard and Zimmerman(1986, 1987)

Table 29:Occurrence of GLOFs in Nepal cont'd...

S. No.	Date	Location	River System	Major River basin	Direct Cost (USD)	Dead	Injured	Displaced	Damage	Cause	Peak water level in affected area	Duration (hours)	Lag time (hours)	Afected Area(km2)	Volume of Water	Reference
14	12-Jul-1991	Chubung	Tama Koshi	Saptakosi					Houses farmland etc,	Moraine collapse					17.66	Galay(1985); Yamada(1998); ICIMOD/UNEP(2001)
15	03-Sep-1998	Tam Pokhari	Dush Koshi	Saptakosi	1.56*106	2			5 bridges, agricultural land	Ice avalanche						Dwivedi et al. (2000)
16	10-Jun-1940	Qbixiama, Rolwaling, Dolakha	Rolwaling Khola	Saptakosi					Detail unknown	Detail unknon						NEA(2004)
17	1947	Unknown Lake in Langtang Valley	Langtang Khola	Narayani					Cattle houses lost	Ice avalanche						NEA(2004)
18	16-Jul_1954	Sangwang Lake, Tibet	Nyangqu River	Saptakosi					Towns and cultivated fields seriously damaged	Ice avalanche						NEA(2004)
19	1985	Barun Khola	Arun	Saptakosi					Detail unknown	Moraine collapse						ICIMOD?UNEP(2001)
20	21-Oct-2000	Unnamed Lake above Tagnag informally known as Tagnag Tsho, Hinku Valley	Dudh Kosi	Saptakosi					Minimum damage	Ice avalanche						NEA(2004)
21		Barun Khola	Arun	Saptakosi					Detail unknown	Moraine collapse						ICIMOD?UNEP(2001)
22	Unknown	Chokama Cho	Dudh Kosi	Saptakosi					Detail unknown	Moraine collapse						……..”……
23	Unknown	Unnamed (Mustang)	Kali Gandaki	Saptakosi					Detail unknown	Moraine collapse						……..”……
24	Unknown	Unnamed (Mustang)	Kali Gandaki	Saptakosi					Detail unknown	Moraine collapse						……..”……
25	Unknown	Unnamed (Mugu Karnali)	Kali Gandaki	Saptakosi					Detail unknown	Moraine collapse						……..”……

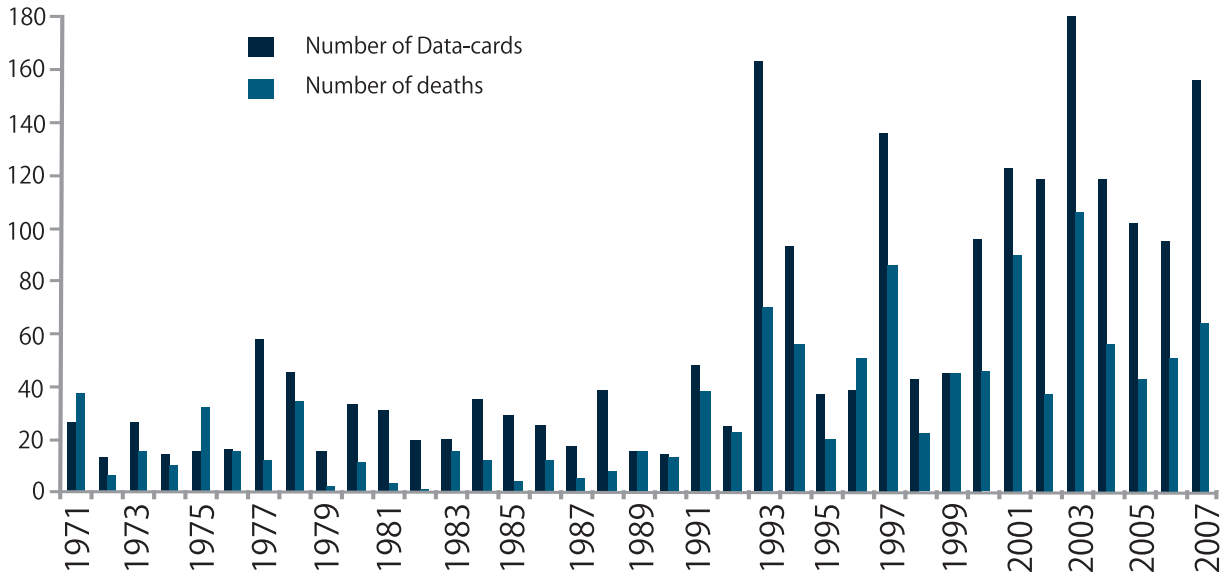
Thunderstorms dominate the weather during May to September. The most frequent disaster in March/April and October are hailstorms, which have a disastrous effect especially on agriculture. In winter, especially in December and January, the northern areas of Nepal suffer harsh snow storms.

Figure 37 provides a time-series of the occurrence of severe weather events and the resulting human deaths. A dramatic increase of disaster events in the early 1990s is very striking; this trend is similar to the trend of floods, and other events. A sudden increase in disasters is recorded in the 1990s may have scientific explanations, but may also be due to inproving collection of weather and disaster data since 1993.

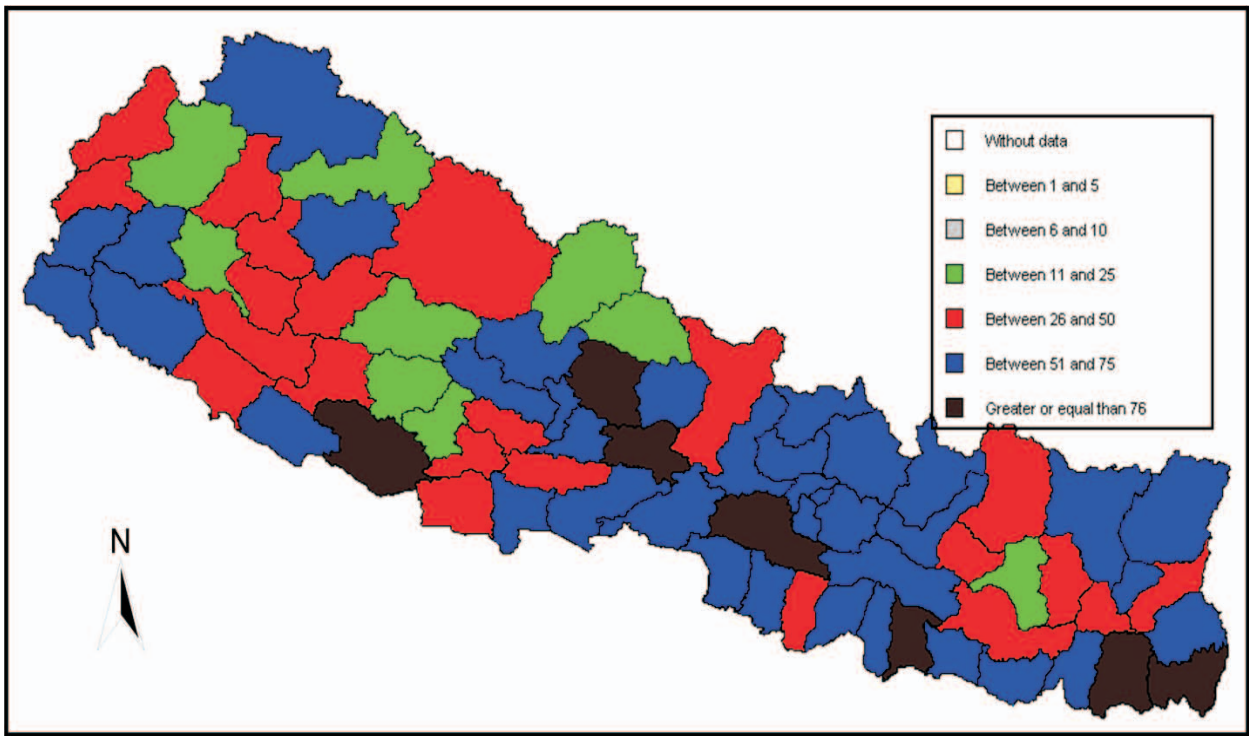
Between 1971 and 2007, some 2,000 severe weather events were reported, killing many people (more than 1,000) and affecting over 260,000. These disasters also inflicted heavy damage on crops, buildings and infrastructure. The deadliest events were thunderstorms, causing 65 per cent of all fatalities, with a concentration of events during the summer months.

Map 39 shows that the severe weather events of the past have been distributed throughout the country, as is the affected population (Map 40). Human casualties and damage and destruction of buildings (Map 41) are also widely distributed (Map 42).

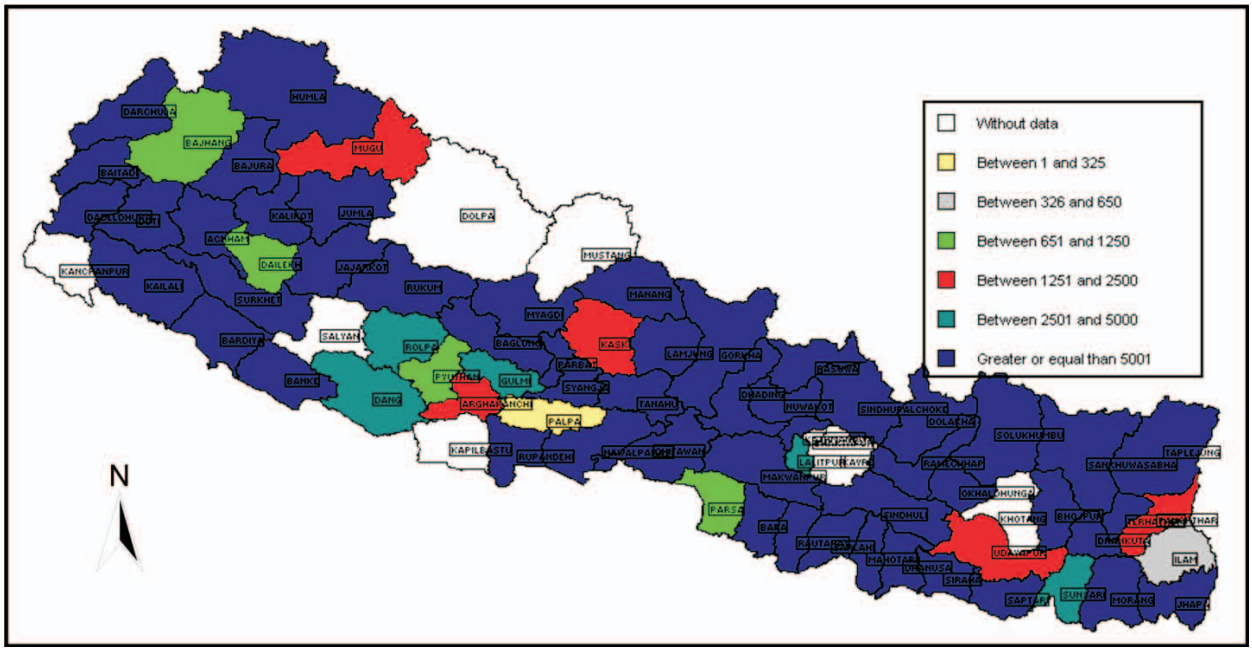
Figure 37:Timeline of severe weather events



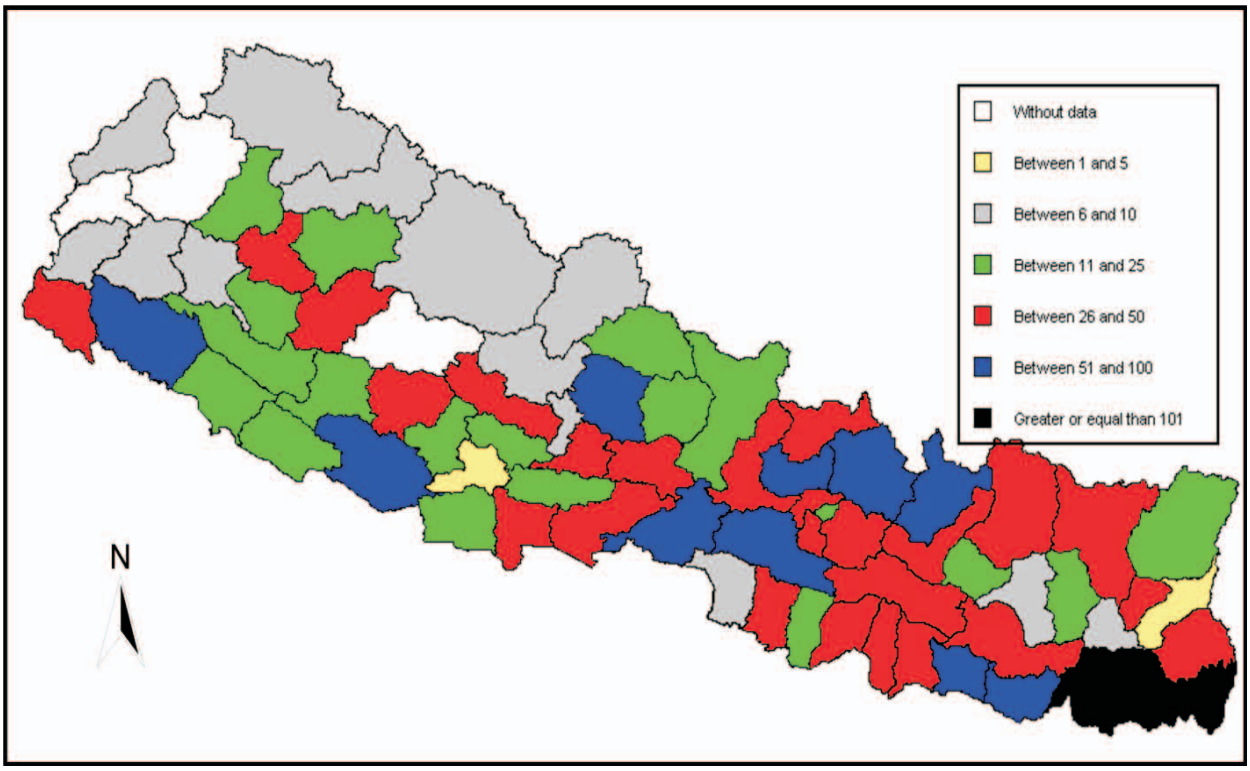
Map 39:Extent of severe weather conditions in Nepal – number of data cards by district



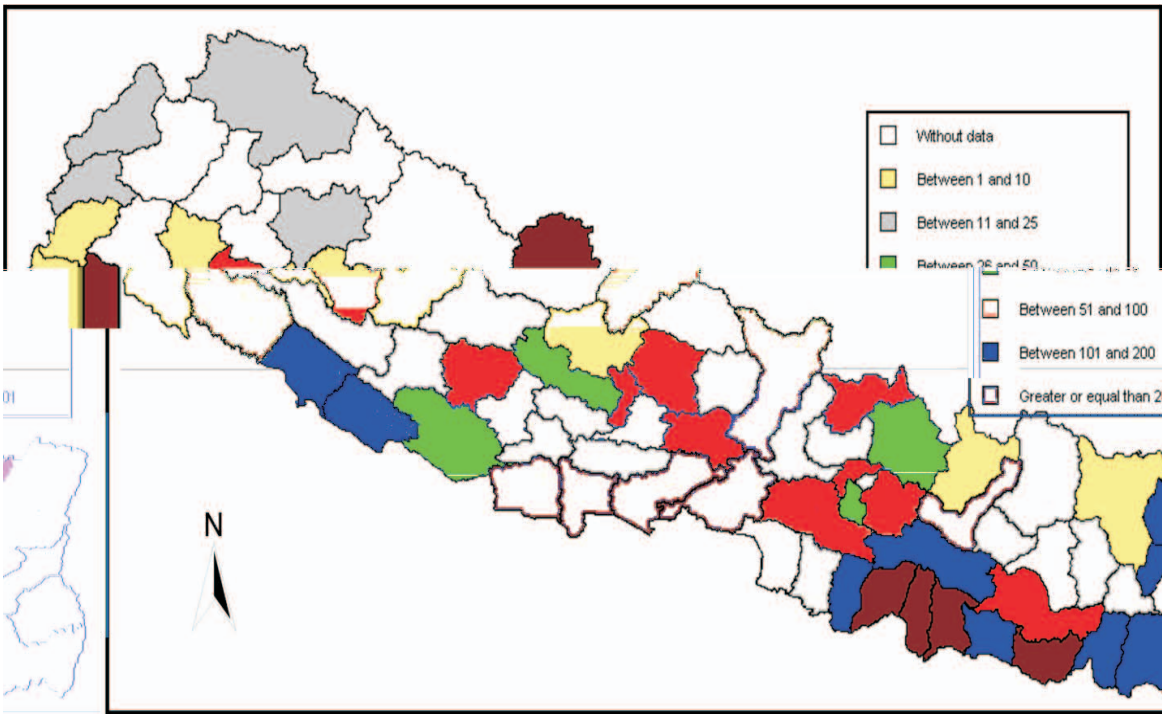
Map 40:Impact of severe weather events on people



Map 41:Impact of severe weather events on human life



Map 42:Impact of severe weather events on buildings



4.1.26 Drought

In this report, drought is defined as the lack of precipitation in an area/region with appreciable reduction in soil moisture, stream-flow and groundwater levels. Drought should generally be defined relative to a long-term average condition (e.g. precipitation, balance between precipitation and evapo-transpiration, etc.).

According to a UN climate report, the Himalayan glaciers that are the sources of Asia's biggest rivers such as Ganges, Indus, Brahmaputra and Yangtze, could disappear by 2035 as temperatures rise. Approximately 2.4 billion people live in the drainage basin of the Himalayan Rivers. Hence, droughts are a serious threat especially to India, China, Bangladesh and Nepal, because these rivers serve as drinking water supply and agricultural irrigation. These countries could experience floods followed by droughts in the coming decades.

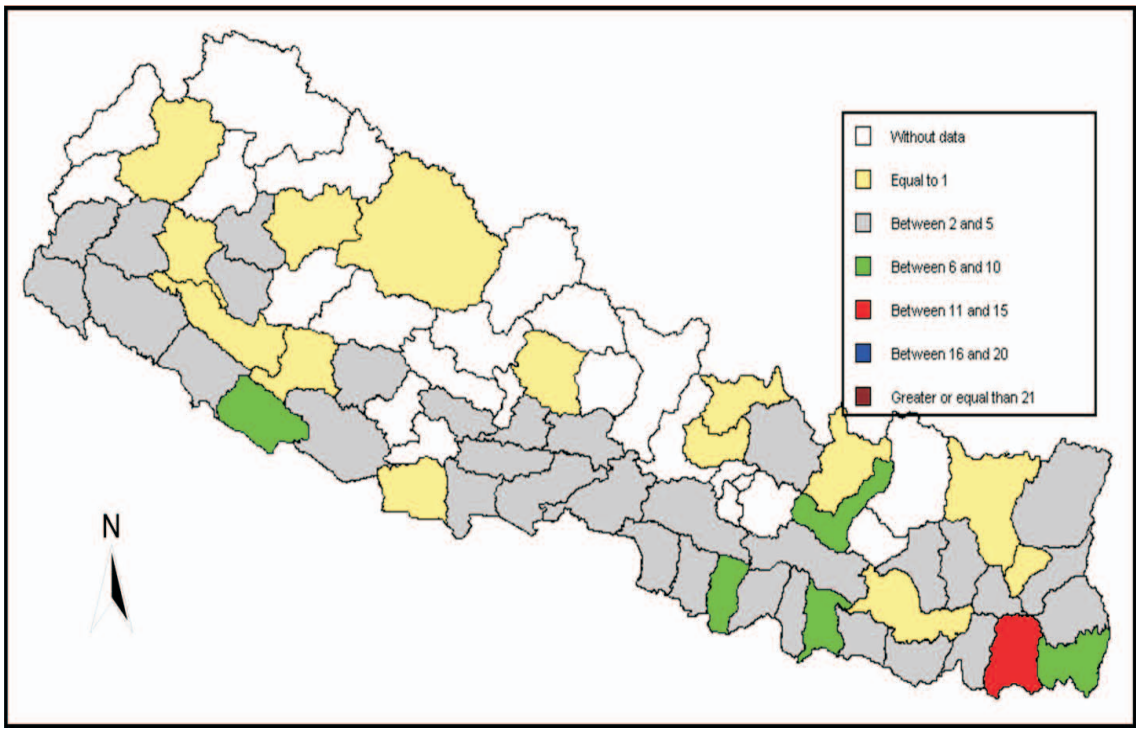
Periods of drought can have significant environmental, economic and social consequences. Besides fatalities, the most common consequences include:

- Death of livestock and loss of crops.
- Malnutrition, dehydration and related diseases.
- Famine due to lack of water for irrigation.
- Wildfires and desertification causing dust storms.
- Shortages of water for industrial users and reduced electricity (insufficient available coolant).
- Mass migration, resulting in internal displacement and international refugees.
- Social unrest and even war over natural resources, including water and food.

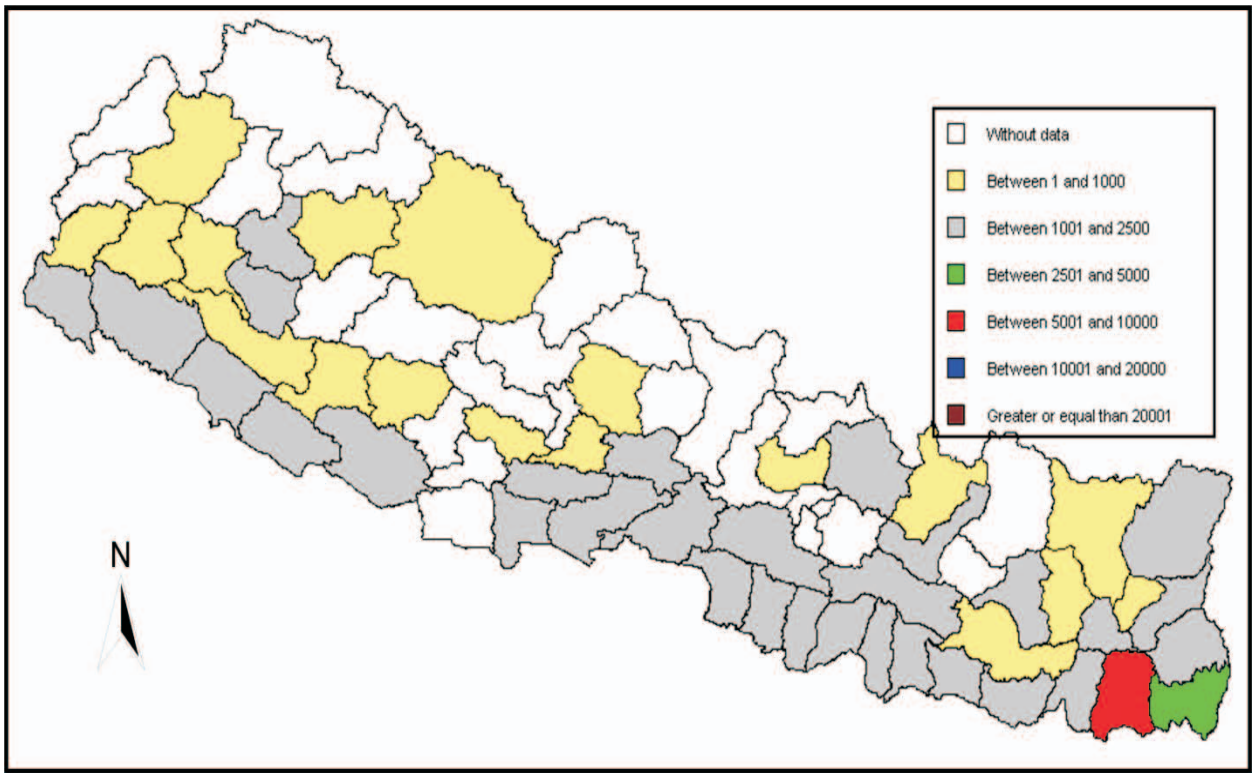
The effect varies according to vulnerability. For example, subsistence farmers are more likely to migrate during drought because they do not have alternative food sources. Areas with populations that depend on subsistence farming as a major food source are more vulnerable to drought-triggered famine.

During the period of 36 years, more than 150 disaster events were reported on drought affecting more than 330,000ha of agriculture land. The Terai and western Hills/Mountains are most affected by drought (Map 42). Map 43 shows the impact of drought– again the Terai is the worst impacted, along with some hilly/ mountainous districts.

Map 43:Extent of drought in Nepal - data cards by district (1971-2007)



Map 44:Impact of drought on agriculture in Nepal



4.1.27 Famine

A famine is a social and economic crisis that is typically accompanied by widespread malnutrition, starvation, epidemic and increased mortality. Although many famines coincide with national or regional shortages of food, famine has also occurred amid plenty or on account of acts of economic or military policy that have deprived certain populations of sufficient food to ensure survival. Historically, famines have occurred because of drought, crop failure and pestilence, and because of man-made causes such as war or misguided economic policies. The fundamental cause of famine is the exceeding of carrying capacity for a people of a given region to produce enough food. Famines can be exacerbated by poor governance or inadequate logistics for food distribution.

Because herding and agriculture allow for greater population, both in numbers and in density, the failure of a harvest or the change in conditions, such as drought, can create a situation whereby large numbers of people live where the carrying capacity of the land has dropped radically. Famine is then associated primarily with subsistence agriculture, that is, where most farming is aimed at producing enough food energy to survive.

Thousands of villagers in Nepal's remote mountainous districts are caught in the grips of an unprecedented famine, which could further worsen if the government fails to rush emergency food supplies. Unexpected storms and bad weather have destroyed seasonal crops of paddy, millet, wheat and maize leading to widespread hunger in remote mountain districts.

Famines are not as frequently reported as other natural disaster events in Nepal, but every year they have serious effects on people in the country. Lives are rarely lost by famine but the effect on people is high. Between 1971 and 2007, 19 famines are reported from the northern districts of the Central, Western and Mid-Western regions, such as Jumla, Humla, Rukum and Ramechhap. Most were caused by a loss of crops

from other natural events such as floods, landslides and hailstorms.

4.1.28 Cold wave

A cold wave is a weather phenomenon that is distinguished by noticeable cooling of the air, or the invasion of (very) cold air, over a large area. It can also be a prolonged period of excessively cold weather, which may be accompanied by high winds that cause excessive wind chills, leading to weather that seems even colder than it is. Cold waves can be preceded or accompanied by significant winter weather events, such as snow or ice storms.

Cold waves that are not considered cold in some parts of the world, but cause temperatures significantly below average for another area, can also be destructive, because plant and animal life might be less tolerant to such cold waves as they appear infrequently. For example, areas with subtropical or tropical climates may recognize unusual cold temperatures, perhaps barely-freezing, as a cold wave. The same winter temperatures associated with the norm for high latitudes would be catastrophic to winter crops in some mid latitudes that might be grown for wintertime consumption, or to such all-year tropical or subtropical crops as citrus fruits. Likewise, abnormal cold waves that penetrate into (sub-)tropical countries in which people do not customarily insulate houses or have reliable heating may cause hypothermia and even frostbite. In Nepal, those affected by cold waves have largely been in the sub-tropical Terai – not in the colder and higher Himalaya (Map 45). They have also caused death and injury to livestock and wildlife. If a cold wave is accompanied by heavy and persistent snow, grazing animals may be unable to reach needed food and die of hypothermia or starvation. Such cold waves can caused famines and result in numerous fatalities. November to February are the main cold wave months (Map 46).

In Nepal, cold waves have caused more than 250 fatalities in only 163 events during the 1971 to 2007 winters. Detailed analysis has shown that the 2004 cold waves (86 events) had the greatest impact, causing more than 50 per cent of all fatalities recorded. The areas mostly affected are the southern part of the country as they normally experience only cool winters (Map 46)

Map 45: Extent of cold waves in Nepal - data cards by district

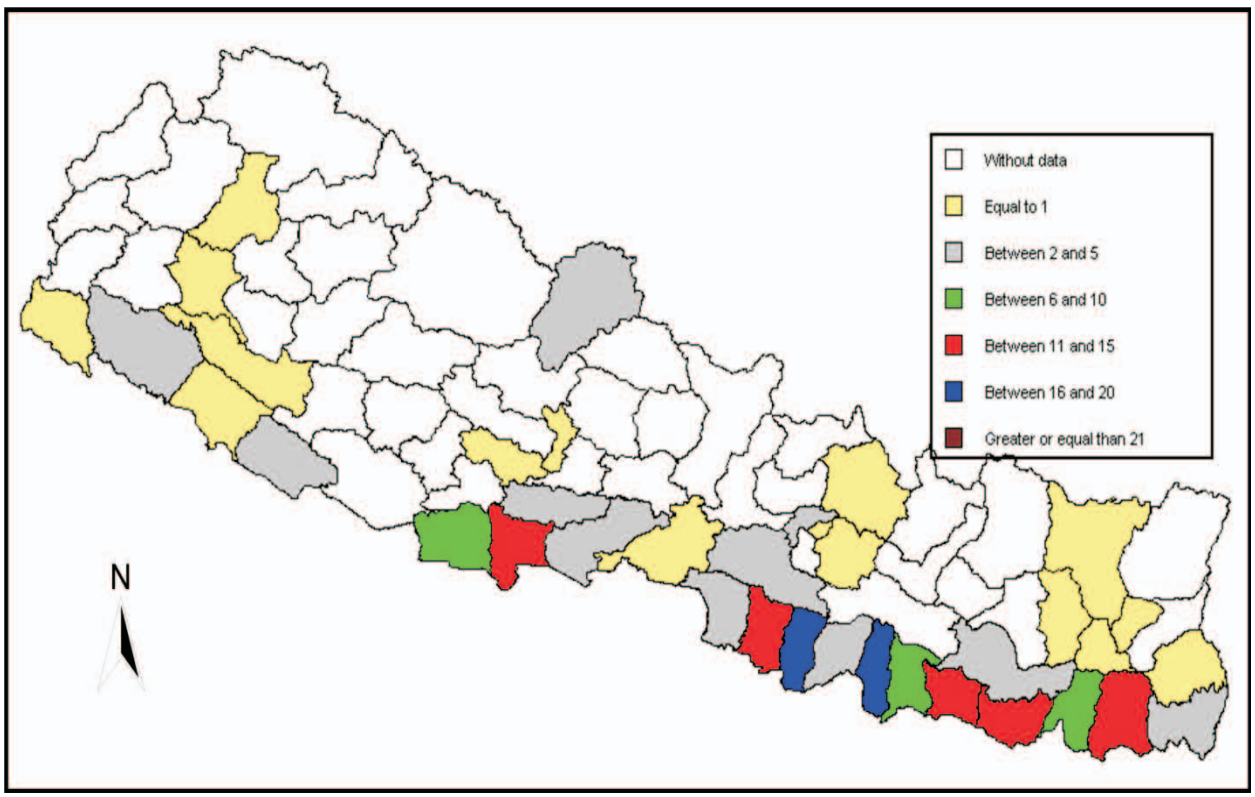
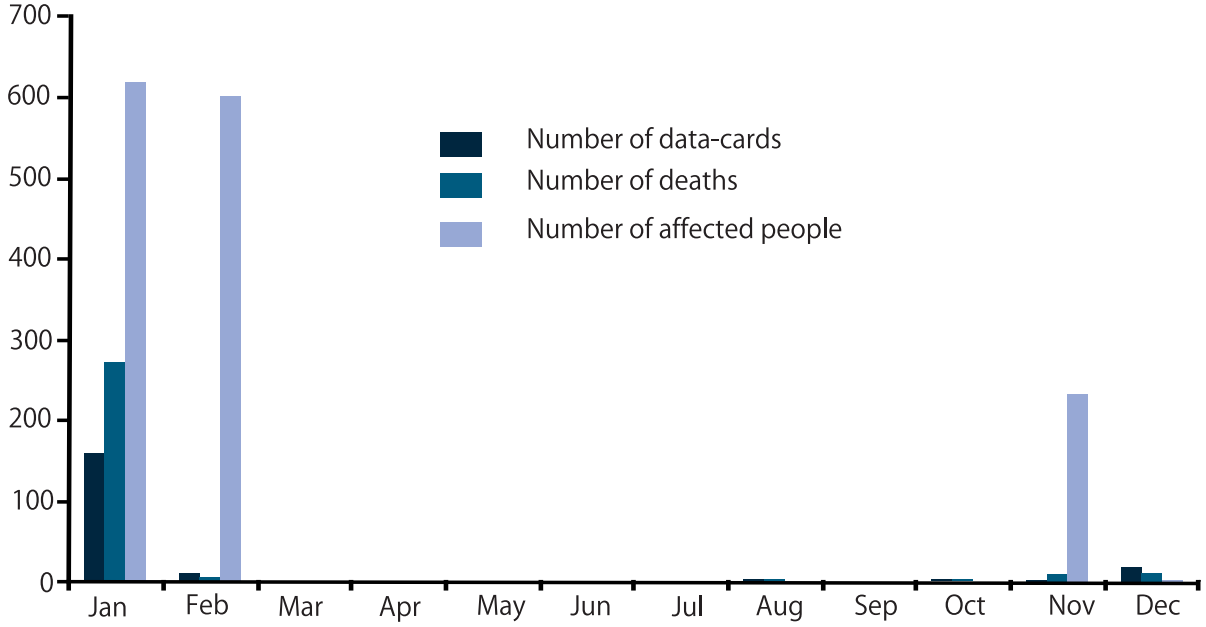
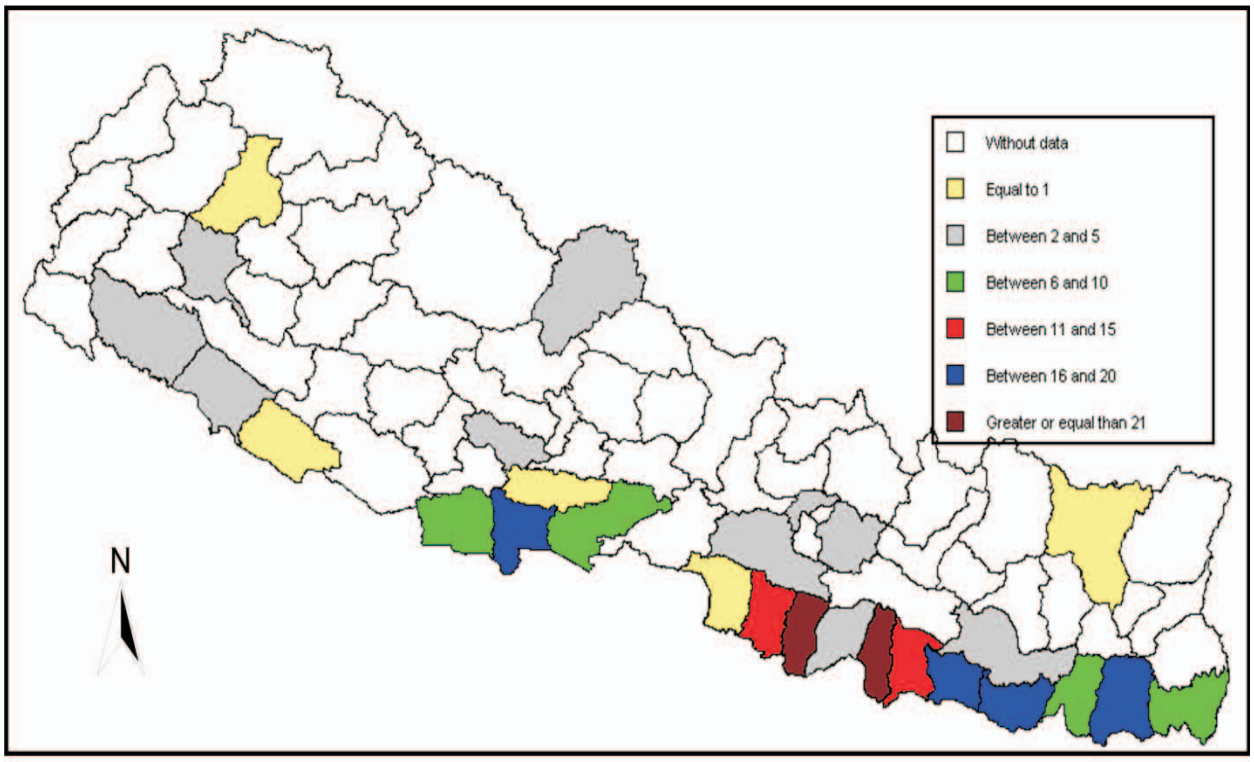


Figure 38: Timeline of severe weather events



Map 46: Impact of cold waves on human life



4.8 CONCLUSION

Earthquake, epidemics, flood, landslide, and fires are the major disaster risk hazards in Nepal. Other natural hazards include storm, heavy rains, glacier lakes outburst flood (GLOF), drought etc.

All hazards except earthquake, show a general increase of the rate of occurrence with every decade since 1970s. The decade of 1990-2000 shows a dramatic increase in disaster occurrence. The intensity of disaster impact also follows the same trend. Moreover, the decade of 1990s is conspicuous also in terms of impacts – parameters such as death and injury in this decade on an average is almost double the corresponding average values of the impact.

While disasters occurr throughout the year, two seasons, namely July-September and March- April., host concentrations of disasters events. Flood, landslide, heavy rains concentrate in the former season while fire, hailstorm are frequent in the drier months of March-April. Epidemic break out occurr throughout the year, but a marked peak is seen during the months of August. Earthquake don't follow seasons, although the argest event of 1988 took place during August.

Epidemics is widespread all over Nepal, even in the colder climate areas of the higher Himalayas. Terai region is conspicuous in terms of hosting hazard events and suffering the most in terms of casualty, injury and property damage. Several hilly and mountainous districts also show the same intensity of disaster impacts as the Terai. The impact generally gets lower as the districts get closure to the Higher Himalayas. The eastern part of the country is slightly better than the west in terms of deaths, and injury and population affected.

Building damage due to disasters is also the highest in the Terai and some hilly districts. The central and eastern Terai districts appear to have lost buildings the most.

VDC level impact maps show wide spread of disasters in the country. While there are many VDCs without any record of a particular hazard event, the same VDC appears to have suffered from another hazard. One can conclude that natural hazards have affected each and every household in Nepal directly or indirectly.

5 INTENSIVE & EXTENSIVE RISK PROFILE

5.1 INTRODUCTION

Large-scale disasters are always dramatic and attract immediate worldwide attention. The events and their impacts are incorporated into global databases. To such mega-disasters belong the Indian Ocean Tsunami (2004), Pakistan Earthquake (2005), Cyclone Sidr in Bangladesh (2007), and the China Earthquake (2008). These databases are used to develop disaster reduction policies that inform country-level assistance strategies. But there are many medium and smaller-scale disasters in every country that do not attract the same attention globally or, unfortunately, even nationally, although the cumulative impact of these small-scale disasters could be quite significant for any country or region. They remain unnoticed. But an affected family or a community would not be concerned about whether the disaster was large scale or small scale as defined by global databases – for the family, even a single death means the loss of two working hands, while damage to the house or land is a loss of livelihood assets. The family may consider migration as a coping strategy. Or it may just descend into despair and poverty.

For example, CRED 2008 lists 414 natural disasters globally for the year 2007. The impacts of these disasters were reported as 17,000 persons dead, more than 211 million affected, and a total loss of about US$75 billion in economic damages. But beyond these 'notable' disasters, there were also hundreds, perhaps thousand of events that have occurred in the last years which were not included in the statistics of international organizations (CRED 2008; Marulanda & Cardona 2006:3). ISDR 2007:27 concludes that "there are numerous frequently occurring small hazard events, which also reflect a greater extensiveness of risk associated with localized characteristics of disasters".

Nepal is no exception to this anachronism in its study of disasters. Between 1971 and 2007, the EM-DAT disaster database registers 68 events (Table 32) following the criteria set by CRED. In reality, Nepal suffered from a total of 15,388 natural disasters during the same period! Of course, not all these events were mega-disasters, but the accumulated impact of such small and medium scale disasters was very high. The effects of such insular and daily risk disasters can not be ignored.

In this chapter, a detailed analysis of the impacts of both the large scale disasters (Intensive Risk Disasters) and small-medium scale disasters (Extensive Risk Disasters) will contribute to improving our understanding of the country's disaster risk scenario. This also helps our understanding of the linkages between disasters and poverty, which is this study's central theme. Nepal's disaster database (Nepal DesInventar) for 1971 – 2007 is used for the analysis. To simplify analysis and to make the study regionally comparable, the data for only five major hazards are used: epidemics, earthquakes, floods, landslides and fire (including forest fire).

Defining intensive disaster risk is a difficult task. According to a United Nations publication (UN 2008:10), conceptually intensive risk can be understood as "… a scenario where significant concentrations of people and economic activities are exposed to severe, large-scale hazards, with major impacts in terms of mortality and economic loss". While this statement provides a conceptual definition of the term, demarcation of extensive risk disasters and extensive risk disaster is found to be country dependent. For a small country like Nepal, even a small landslide that destroys an irrigation canal serving a couple of hill terraces could be a large disaster. Equally, 20 people killed by a GLOF that destroys an entire trekking route appreciated by international tourists would be a serious blow to the economy of mountainous areas.

The present study faced the same problems as faced by Mabel and Omar, 2006, on the definition of the thresholds for small, medium and large disasters and the

methodological question – which impact parameters should be used to represent risk appropriately. We started plotting the three impact parameters (death, population affected and houses destroyed) for all disaster shocks during the 1971-2007 period and statistical analysis tools using mean standard deviation were used from which we arrive at the following criteria for intensive disaster risk: death >100 and/or population affected >1,000 and/or houses destroyed/ damaged >10,000.

Given the high level of disaster risk in the country, the use od such high threshold levels is natural. But to achieve comparability with similar international GAR studies in other countries, the present study has classified **intensive risk disasters as those fulfilling the criteria of at least 50 persons dead and/or at least 500 houses destroyed or damaged. All other disaster events have been grouped into extensive risk disasters.** 'Missing' persons have not been included in 'deaths'.

For example, the 1988 earthquake which caused more than 700 deaths and several thousand destroyed and damaged homes is considered an intensive risk disaster. Extensive risk disasters, meanwhile, are all the small and medium disasters of daily life that have been recorded in the DesInventar database. These are disaster events with no impacts much less than the above criteria, but their cumulative impact is significant at the local scale, and over the years, even at national or regional scale.

5.2 IMPACT OF ALL DISASTERS 1971 - 2007

Table 30 reproduces the figures for all disasters represented by the data-cards in the DesInventar database. There were a total of 15,388 disaster events (i.e. number of data cards), which is equivalent to an average of about 416 events per year, approximately 35 per month or 1.14 events daily.

Table 31 shows the impacts of disasters in terms of deaths, houses damaged/destroyed and population affected. Data on numbers as well as impacts shown in the Table contrasts significantly with those reported in the EMDAT databse (Table 32). For example, the number of disaster events and deaths registered in DesInventar are 15,388 and 27,256 respectively, whereas the figures for the two parameters are only 68 and 10,324 in the EM-DAT/CRED database.

Table 31 and Figure 39 show an increasing trend of disaster events and associated impacts.

Table 30:Number of disaster events in Nepal during 1971 – 2007

Period	Number of Data Cards	Average per year	% of Total
1971 - 1980	1,977	197.7	12.8
1981 - 1990	2,134	213.4	13.9
1991 - 2000	5,061	506.1	32.9
2001 - 2007	6,216	888.0	40.4
1971 - 2007	15,388	415.9	100.0

Source: Nepal DesInventar Database, NSET 2007

Table 31:Gross figures of effects by all disasters during 1971 – 2007

Period	1971 - 1980	1981 - 1990	1991 - 2000	2001 - 2007	1971 - 2007
Number of Data Cards	1,977	2,134	5,061	6,216	15,388
Deaths (in number)	3,470	5,355	11,989	6,442	27,256
Injured (in number)	2,316	15,101	6,840	29,925	54,182
Missing (in number)	794	321	456	1,424	2,995
Affected population (in No.)	171,812	123,006	3,055,167	1,576,577	4,926,562
Houses Destroyed/Damaged	49,381	91,994	145,297	59,251	345,923
Damages in crops (in Ha.)	82,162	31,308	481,125	253,052	847,647
Loss of Livestock (in No.)	19,088	15,341	61,552	640,000	735,981

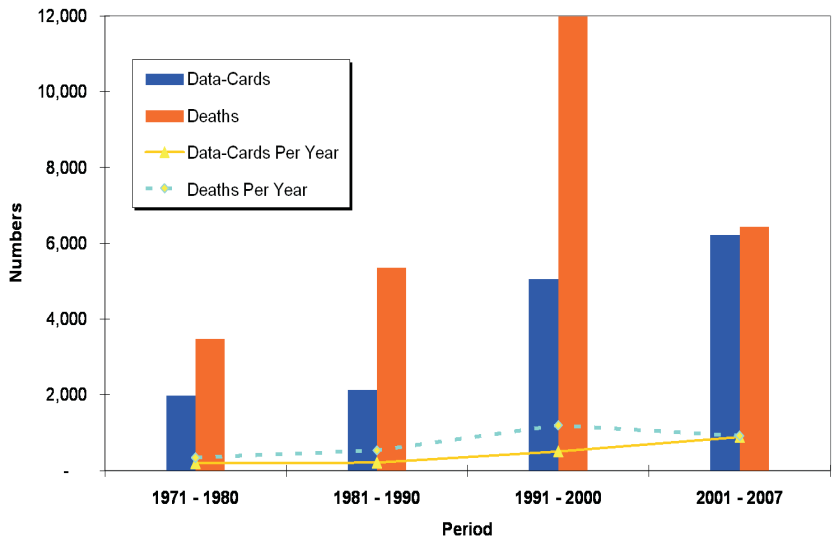
Source: DesInventar Database of Nepal, NSET 2007

Table 32:Human and economic losses due to large-scale natural disasters in Nepal according to CRED/EMDAT

Hazard Type	Disasters	# of Events	Killed	Total Affected	Damage in US $ (000s)
Drought	Drought	2	-	3,700,000	-
Earthquake (seismic activity)	Earthquake (ground shaking)	3	809	541,901	305,000
Epidemic	Bacterial Infectious Diseases	3	1,484	50,616	-
	Viral Infectious Diseases	9	995	4,669	-
Extreme temperature	Cold wave	2	108	200	-
	Heat wave	1	-	10	-
Flood	Unspecified	17	1,901	784,585	769,400
	Flash flood	4	2,566	714,650	200,000
	General flood	12	1,126	1,566,143	10,600
Mass movement wet	Avalanche	1	95	-	-
	Debris flow	1	106	-	-
	Landslide	9	976	367,618	-
Storm	Local storm	2	70	-	-
Wildfire	Forest fire	2	88	54,000	6,200
Total	68	10,324	7,784,392	1,291,200	

Created on: Aug-22-2008. - Data version: v12.07. Source: "EM-DAT: The OFDA/CRED International Disaster Database , www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium"

Figure 39:Trend of disaster occurrence and deaths over the period 1971-2007



5.3 INTENSIVE DISASTER RISK PROFILE

Table 32 provides interesting information on intensive risk disasters in Nepal between 1971 and 2007 in line with the defined criteria. Intensive risk disaster events constitute less than one per cent of all disaster events, but contribute to 23.55 per cent of total disaster deaths and 57 per cent of all buildings destroyed/damaged. It is clear that vulnerabilities are very high and demand urgent attention. They require an in-depth approach that takes due consideration of causes and effects. A focus only on intensive disasters would be totalling misleading especially if that is a key basis for formulating disaster reduction strategies and for planning coordinated approaches and initiatives for comprehensive risk mitigation.

The 1980 earthquake in western Nepal, the 1988 earthquake in eastern districts of the country, and the 1993 floods in different parts of the country are the most important intensive risk disasters in the DesInventar database. Major recent flood events in Nepal include the 1978 flood (in Tinau Basin – Rupandehi), the 1980 flood along the Koshi River (in Eastern Nepal), the 1985 cloudburst and outburst of the debris dam in the Tadi River Basin, the 1987 flood in the Sunkoshi Basin, and the 1989 flood due to cloudburst affecting the Central region – some areas of Chitwan and the Western region – the inner Terai, and Butwal and the Parasi areas ICIMOD (2007). The devastating flood that occurred on 18-20 July 1993 in the Central Region surpassed all the floods mentioned above in terms of its ferocity and the damage it caused. It brought heavy disruption of life and damage to property, made thousands of people homeless, and destroyed thousands of hectares of agricultural land and crops. Forty-four districts were affected. Some 1,336 people lost their lives. And about half a million people from 73,000 households were affected (Annex: D. 2).

Table 33:Impact of intensive risk disasters in Nepal during 1971-2007

Period	No. of Death due to Intensive risk disasters	Proportion of Death due to Intensive disasters to the total Disaster Deaths (%)	No. of Injury due to Intensive risk disasters	Proportion of Injury due due to Intensive disasters to the total Disaster Deaths (%)	No. of population affected due to Intensive risk disasters	Proportion of population affected due to Intensive disasters to the disasters Deaths (%)	No. of houses (Destroyed and Damaged) due to Intensive Risk Disaster	Proportion of building damage due to Intensive Disaster to total buildings damaged /destroyed by all disasters (%)	No. of Events	Proportion of Intensive risk disaster events to total disaster events (%)
1971-1980	915	3.36	324	0.60	56,565	1.15	29,080	8.41	17	0.11
1981-1990	1,498	5.50	6,682	12.33	4,504	0.09	73,280	21.18	15	0.10
1991-2000	3,181	11.67	531	0.98	1,378,345	27.98	72,900	21.07	60	0.39
2001-2007	824	3.02	1,028	1.90	20,972	0.43	21,402	6.19	17	0.11
1971-2007	6,418	23.55	8,565	15.81	1,460,386	29.64	196,662	56.85	109	0.71

Source: Nepal DesInventar Database, NSET, 2007

5.3.1 Loss of Life

About a quarter of all disaster-related deaths are due to intensive risk disasters (Figure 50, Table 33). Of the 6,418 intensive disaster deaths, epidemics contributes the most (66 per cent), followed by earthquakes (14 per cent) and floods (13 per cent). Landslides' share of mortality amounted to 6 per cent, and fire made up about 1 per cent.

Table 33 provides details on the contribution of 'intensive' events to all death-causing events of the particular hazard and also their contribution to all disaster mortality during 1971-2007.

That table also illustrates the relative contributions of intensive risk disasters from different hazards to the over impact of the particular hazard and also to total disaster-related mortality. It is seen that only 18.2 per cent of earthquakes were 'intensive', and they represent just 0.01 per cent of total disaster events but contribute to 99.5 per cent of all earthquake-deaths, and 3.19 per cent of the total disaster-related deaths in the country. Should any large magnitude earthquake occur again, the death figure would be very large, and would change the entire scenario of intensive risk disaster.

Similarly, 43 'intensive' events of epidemics (1.5 per cent of all disastrous incidences of epidemics or 0.28 per cent of all disaster events) contributed to 26.5 per cent of all epidemic related deaths and 15.31 per cent of the total disaster – deaths. About 1.5 per cent of flood events are 'intensive', but these events caused about a third of 'intensive' disaster deaths and contributed to more that 3 per cent of all disaster–related deaths since 1971. Large events (intensive) of epidemics, earthquakes and flood are Nepal's most lethal disasters.

5.3.2 People Affected

About 1.5 million people were affected between 1971 and 2007 by large-scale (intensive) disasters (Table 33). The number is strongly dependent on the type of hazard, earthquake being among them. But data on the 'population affected' parameter are not available for either the intensive earthquake events – the 1980 Bajhang earthquake in Far-Western Nepal, and the 1988 Udaypur earthquake.

Figure 41 shows the distribution of populations affected by intensive risk disasters (all hazards except earthquakes). Flood is the major hazard, followed by landslide. Fires and forest fires also significantly affected many livelihoods. Many villages are vulnerable to fire, because of the quality of their housing and the building materials used. Epidemics shows the lowest impact,

Figure 40:Distribution of mortality due to intensive risk disasters by hazard types

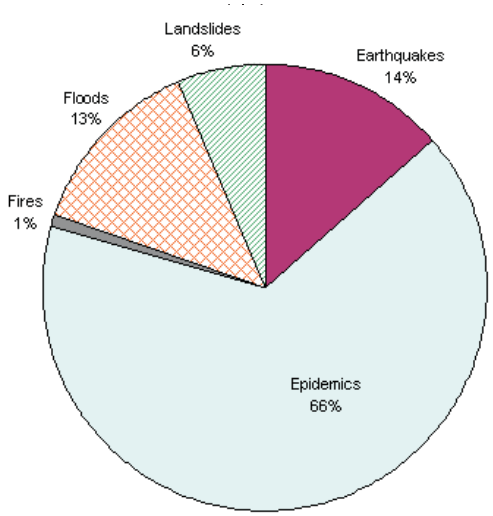


Figure 41:Population affected by different intensive risk disaster types

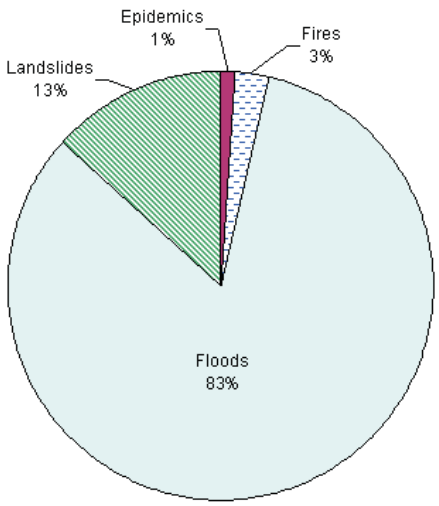


Table 34:Death and injury by intensive risk disasters due to different hazard types (1971 – 2007)

Hazard Disaster type	Disaster events			Deaths			Injury		
	Intensive Risk Disasters	Contribution of intensive risk disaster events to all events of respective hazard (%)	Contribution of intensive risk disaster events to Total number of disaster events (%)	Due to intensive risk disasters	Contribution of individual hazards to intensive risk disasters (%)	Contribution of intensive events to total disaster death by all events (%)	Due to intensive risk disasters	Contribution of individual hazards to intensive risk disasters (%)	Contribution of intensive events to total disaster death by all events (%)
Earthquakes	2	18.2	0.01	869	99.5	3.19	6,814	99.6	12.6
Epidemics	43	1.5	0.28	4,174	26.5	15.31	1,574	3.8	2.9
Fires	12	0.3	0.08	57	5.1	0.21	3	0.4	0.0
Floods	39	1.4	0.25	847	28.8	3.11	24	6.0	0.0
Landslides	10	0.5	0.06	401	10.1	1.47	53	5.1	0.1
Hailstorm	1	0.17	0.01	0	0	0	0	0	0
Heavy rain	2	1.1	0.01	70	97.2	0.26	97	80.2	0.2
Total	109	0.9	0.71	6,418	25.8	23.55	8,565	16.6	15.6

Source: Nepal DesInventar data, NSET 2007

Table 35:Population affected and houses destroyed/damaged by intensive risk disasters due to different hazard types (1971 – 2007)

Hazard Disaster type	Disaster events			Population Affected			Houses (Destroyed/Damaged)		
	Intensive Risk Disasters	Contribution of intensive risk disaster events to all events of respective hazard (%)	Contribution of intensive risk disaster events to Total number of disaster events (%)	Due to intensive risk disasters	Contribution of individual hazards to intensive risk disasters (%)	Contribution of intensive events to total disaster death by all events (%)	Due to intensive risk disasters	Contribution of individual hazards to intensive risk disasters (%)	Contribution of intensive events to total disaster death by all events (%)
Earthquakes	2	18.2	0.01	0	0	0	87,838	98.7	25.39
Epidemics	43	1.5	0.28	17403	3.78	0.35	0	0.0	0.00
Fires	12	0.3	0.08	36750	16.09	0.75	8,040	12.1	2.32
Floods	39	1.4	0.25	1209160	35.90	24.54	92,031	59.7	26.60
Landslides	10	0.5	0.06	194373	40.50	3.95	7,693	30.2	2.22
Hailstorm	1	0.17	0.01	0	0	0	560	2.2	0.16
Heavy rain	2	1.1	0.01	2700	4.32	9.91	500	35.6	0.14
Total	109	0.9	0.71	1460386	32.09	29.59	196,662	58.4	56.85

Source: Nepal DesInventar data, NSET 2007

among all intensive risk disasters although mortality from intensive epidemic events was very high.

Table 35 shows the data on populations affected by intensive events (all hazards except earthquakes, hailstorm and heavy rain). These hazard forms were not included, because their data are not registered in the database.

In the 1990s, a very large population of about 1.5 million people was affected by natural disasters. The decade records 60 large scale (intensive) disaster events.

5.3.3 Effects on Buildings

A total of 196,662 buildings – 57 per cent of all buildings damaged/destroyed in all disasters – were either destroyed or damaged between 1971 and 2007 by large-scale (intensive) disaster events. Earthquakes, floods, landslides and fires were the major hazards that caused heavy loss of building assets. Flood is the major hazardous disaster in loss of buildings. Of the total of disaster-related building damage, 45 per cent were damaged/destroyed by earthquakes (25.4 per cent were destroyed or damaged only in two disastrous earthquake events) in Nepal (Figure 43). Flood makes up 47 per cent followed by landslides at 4 per cent. Fire is important, but there are only one or two intensive impact events.

Intensive risk disasters significantly impact the national economy. Estimated economic losses are huge in years of intensive risk disasters (Figure 43). According to ICIMOD 2007:11, intensive disaster losses were very high in 1987, 1988, 1989 and 1993 - years with major disasters. Very high levels of human death, affected populations and loss of buildings were also recorded in these years. For example, the 1993 floods washed away several important bridges on the Prithvi and Tribhuvan highways (seven on the Prithvi Highway alone) isolating the Kathmandu Valley with the rest of the country by road for months. Another important economic loss was the closing of the Kulekhani 1 and 2 power stations because of damage to the penstock pipe. The Bagmati, Manusmara, and Rapti irrigation projects and several farmer-managed irrigation projects were either damaged or washed away by the torrential rains in these years. The total loss in terms of physical destruction due to the large disasters was estimated to be more than NRs5 billion (ICIMOD 2007).

Figure 42:Impact of intensive risk disasters on building damage and destroyed

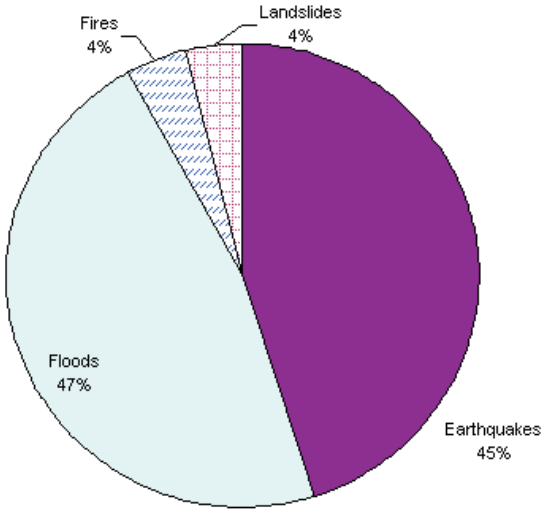
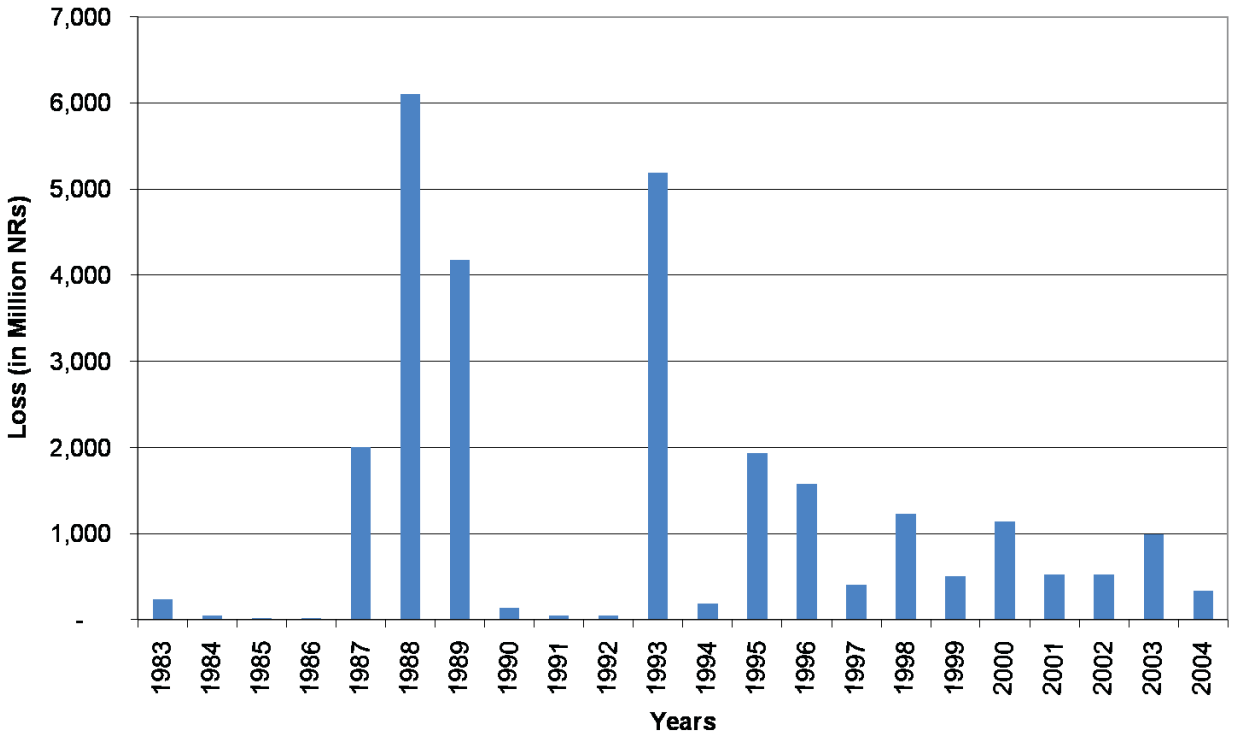


Figure 43:Total loss in terms of physical destruction by intensive risk disasters



5.4 EXTENSIVE RISK PROFILE

Disaster Risk Reduction, Global Review 2007 (UN 2008:25) defines extensive risk disaster as "…a scenario where smaller concentrations of people and economic activities are exposed to frequently occurring but highly localized hazard events, such as flash floods, landslides and wild fires, with relatively low intensity asset loss and livelihood disruption over extensive areas".

Using that definition and the threshold criteria for 'intensive' and 'extensive' disasters, the study isolated the intensive risk disasters and studied in detail their impact. This Section examines the nature and characteristics of extensive risk disasters.

The database shows a rapid growth in the number of small-scale natural disasters and the resultant disaster mortality in recent decades, indicating that extensive risk disasters are increasing throughout the country. However, these frequently occurring smaller-scale extensive disasters have been studied far less systematically than the intensive risk hotspots and large-scale disasters (UN 2008:25).

In this context, the current study examined the DesInventar database that has a resolution to the VDC/municipality level.

Two database sets were prepared for ixtensive and extensive disasters. The extensive disasters were also analyzed for their accumulated impact in comparison to the large events of disasters.

5.1.4 Impact of extensive disasters 1971-2007

A total of 15,223 extensive risk disaster events occurred during 1971-2007, and the frequency of such the local disaster events of small and medium impacts is on the increase generally (Table 36).

A comparison of the number and impact of extensive risk disasters with intensive risk disasters appears in Table 36 as the ratio of the two data sets. The total number of deaths from extensive disasters is, on average, 3.2 times that of intensive events –the ratio climbs to nearly seven times during 2001-2007. Similarly, the average ratio for injury, populations affected and houses destroyed are 5.3, 2.4 and 0.8 respectively. The period 2001-2007 is remarkable for these types of impacts; injuries are up to 28 times those of intensive risk disasters, and affected populations reaches 74 times. The analysis suggests that the impact of local, small-scale disasters is significant, and it is simply impossible to develop disaster reduction strategies without addressing extensive disasters. Concentration of national disaster risk reduction efforts only on large-scale disasters could even be detrimental, as it diverts attention from the root causes of vulnerabilities. These are better shown for different hazard types, with comprehensive national coverage by the analysis of extensive risk disasters.

Table 36:Decade-wise distribution of extensive disaster events

Period	No. of Data-card (Extensive disasters)	No. of Deaths	No. of Injuries	No. of Affected people	Total houses (Destroyed & Damag
1971-1980	1,944	2,555	1,992	115,247	20,301
1981-1990	2,089	3,857	8,419	118,502	18,714
1991-2000	4,993	8,808	6,309	1,676,822	72,397
2001-2007	6,197	5,618	28,897	1,555,605	37,849
1971-2007	15,223	20,838	45,617	3,466,176	149,261

Source: DesInventar Database, NSET 2007

Table 37:Ratio of extensive to intensive – number and impacts

Period	Ratio of Number of extensive / intensive events	Ratio of No. of Deaths by extensive / intensive disasters	Ratio of No. of Injured by extensive / intensive disasters	Ratio of No. of affected people by extensive / intensive disasters	Ratio of No. of houses destroyed destroyed/damaged by extensive / intensive disasters
1971-1980	114	2.8	6.1	2.0	0.7
1981-1990	139	2.6	1.3	26.3	0.3
1991-2000	83	2.8	11.9	1.2	1.0
2001-2007	365	6.8	28.1	74.2	1.8
1971-2007	140	3.2	5.3	2.4	0.8

Source: DesInventar Database, NSET 2007

5.1.5 People Affected by Hazards

More than 3 million people have been affected by local and recurrent small–medium hazards. To put that number into perspective, it amounts to about one tenth of the current population of Nepal. It is clear that these hazard events have affected all walks of Nepalese life.

5.1.6 Loss of Life

Table 38 shows that the lives lost to extensive disasters cumulatively is almost three times that of lives lost to large events. A total of 20,838 persons died in extensive disasters, against 6,418 deaths from intensive disasters (all hazards). This ratio was highest during 2001-2007 reaching 6.8.

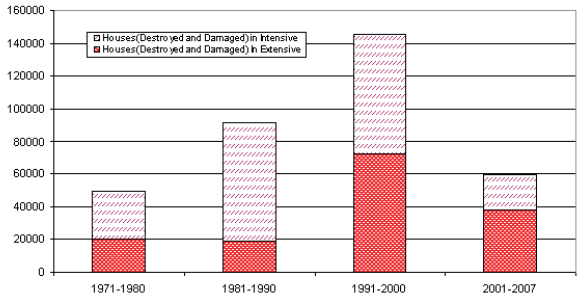
Table 38 shows the increasing trend of the number of deaths due to extensive disasters. Every decade records a significant increase in disaster-related mortality.

Table 38: Deaths due to intensive and extensive disaster events

Period	No. of Deaths		
	Intensive Disaster Events	Extensive Disaster Events	Total
1971-1980	915	2,555	3,470
1981-1990	1,498	3,857	5,355
1991-2000	3,181	8,808	11,989
2001-2007	824	5,618	6,442
1971-2007	6,418	20,838	27,256

Source: DesInventar Database, NSET 2007

Figure 45:Loss of buildings caused by intensive and extensive risk disasters by decade



5.1.7 Injury

The database shows that more than 45,000 people were injured by extensive impact hazards. This includes a large number of 'injured' in epidemics (Section 3.6.2). People injured by extensive disaster events usually do not get proper and sufficient post-disaster medical care due to a poor condition of public health services, especially in remote areas of the country, and hence have to rely on the family capacity. This poses a severe condition especially to the poor and marginalized because of their inability to spend for treatment. This is also a serious economic loss for the nation.

5.1.8 Effects on Buildings

The largest form of disaster, epidemics, does not affect buildings directly. Nonetheless, the impact of extensive disasters due to other hazards is significant – a total of 345,923 houses were damaged by extensive disasters. Table 39 shows that more than two-thirds of disaster-related building losses are due to extensive disasters. While floods are the largest destroyer over the years, the two earthquakes were the main intensive disasters and each destroyed a huge number of buildings. If the effects of these two intensive earthquake events are removed, the ratio of the buildings damaged by extensive and intensive events will grow significantly. It can be concluded, therefore, that buildings are generally destroyed by smaller disasters, but intensive earthquake events are the main contributors to building damage per event. Of course, the damage to buildings from an earthquake is largely influenced by the quake's magnitude.

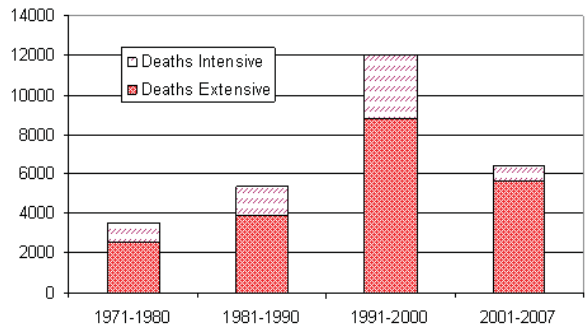
Figure 45 shows the loss of buildings by both intensive and extensive disasters. An increasing trend is apparent, especially for extensive disasters. The 1970s and 80s dominate loss of buildings in large scale disasters, while subsequent decades show that building losses are more attributable to small and medium size disasters.

Table 39:Buildings damaged/destroyed due to intensive and extensive disasters by Decade

Period	Houses (Damaged and Destroyed)			Ratio of Impacts due to Extensive over intensive
	Intensive	Extensive	Total	
1971-1980	29,080	20,301	49,381	0.70
1981-1990	73,280	18,714	91,994	0.26
1991-2000	72,900	72,397	145,297	0.99
2001-2007	21,402	37,849	59,251	1.77
1971-2007	196,662	149,261	345,923	0.76

Source: DesInventar Database, NSET 2007

Figure 44:Deaths caused by intensive and extensive risk disasters by decade



5.5 CONCLUSION

Earthquakes epidemics, floods, landslides and fires are the major disaster risk hazards in Nepal. Other natural hazards include storms, heavy rains, glacier lakes outburst flood (GLOF) and droughts.

All hazards, except earthquakes, show a general increase in the rate of occurrence in every decade since the 1970s. The 1990-2000 decade shows a particularly dramatic increase. The intensity of a disaster's impact reflects that trend. The 1990s was a bad decade for disasters, with deaths and injuries from disasters being almost twice the average of other decade.

While disasters occur throughout the year, two seasons (July-September and March-April) have the greates concentration of disasters. Floods, landslides and heavy rains are frequent in the former, while fires and hailstorms characterize the drier months of March-April. Epidemics occur throughout the year, but a marked peak is seen in August. Earthquakes are not seasonal, even if the major 1988 quake happened in August.

Building damage due to disasters is also the highest in the Terai and some hilly districts. The central and eastern Terai districts appear to have lost buildings the most.

A total of 15,388 disaster events killed 27,257 and injured 54,182 people between 1971 and 2007. This means on an average 1.14 disaster-related deaths daily. The number of injured is about twice as much. The direct monetary loss for the period 1971-2003 is estimated (at 2004 values) as NRs 531, 959 million (NSET, 2005) meaning an annual loss of NRs 16,120 million (c. US$200 million). This is a huge and unaffordable loss for Nepal. Disaster risk reduction should, therefore, be solidly ingrained into the economic development process. This detailed analysis of disaster occurrence and impact was possible only with a scientific database that was developed locally. In international reporting on disasters, many of the local disaster events are not considered and hence the picture portrayed is never entirely accurate.

Of the total number of disaster occurrence, only 109 events or 0.71 per cent of events were large intensive risk disasters. The rest were small and medium-sized events with local impacts. Cumulatively, though, these small and medium-sized disaster events kill more than three times more people, injure about 5.3 times more people, and affect more than 2.4 times the population than large events. The impacts of extensive risk disasters reveal the inherent vulnerabilities of Nepalese life much more precisely than intensive risk disaster events - even if they are more dramatic and able to attract wide attention. Consideration of small and medium disastersis essential to gaining a proper understanding of the economic and social meaning of natural disasters.

6 ANALYSIS OF THE RELATIONSHIP BETWEEN POVERTY AND DISASTERS[24]

Author: Saurav Dev Bhatta, University of Illinois at Chicago and Open Learning Exchange Nepal (sdbhatta@uic.edu, saurav@olenepal.org)

6.1 INTRODUCTION

The earlier chapters have provided an overview of the poverty situation in Nepal, plus a detailed profile of hazards and their physical impacts. This chapter explores the relationship between hazard shocks and poverty through a quantitative analysis of available poverty and disaster datasets. From a policy perspective, it would be particularly interesting to explore the relationship between hazard risk and poverty. However, data on risk per se are not available in the Nepali context. We therefore focus instead on disaster shocks associated with specific types of hazards and on the physical impacts of disasters.

As discussed in Chapter 1, there is potentially a two-way relationship between poverty and hazards. Hazards can bring death, injury, property loss, natural resource loss and destruction of community infrastructure. These impacts can negatively affect household income and consumption not only by reducing their income generating potential and disrupting income generating activities but also by depleting the consumption goods in their possession. On the other hand, poor households are often pushed by market forces to live in hazard prone areas, and tend to adopt livelihood strategies that degrade the environment and increase the risk of natural hazards. In other words, poverty can increase the likelihood of suffering hazard losses. Thus there are two key hypotheses of interest in this analysis:

1. Natural hazards contribute to poverty, and

2. Poverty is likely to increase losses from hazard events.

To test these hypotheses rigorously, it is necessary to not only look at how the two variables are related to each other, but also to account for other factors that might affect poverty and hazards. For example, apart from hazards, there are many household and location related factors that can affect poverty. So a rigorous analysis of the impact of hazards on poverty must account for the influence of these other factors as well. Similarly, investigating how poverty affects the likelihood of households to suffer hazard loses requires us to account for other factors that can affect hazard losses.

In practice, however, it is not possible to control for all other factors in estimating the impact of hazards on poverty or vice versa. While the analyses in this chapter explore the relationship between hazards and poverty, they do not make any claims about causal impacts of hazards on poverty, or vice versa. Because of the unavailability of data on the determinants of hazards other than poverty, the testing of the second hypothesis will be limited to looking at simple correlations between these two variables. The first hypothesis will be tested by using multiple regression techniques to look at the relationship between disaster shocks and poverty while accounting for a host of other determinants of poverty. Therefore, this report focuses primarily on hypothesis 1.

The discussion below begins with an overview of the data and indicators used in analyzing the relationship between poverty and disasters. It then systematically analyzes this relationship using data at different levels of aggregation. Starting with a simple correlation analysis based on aggregate district level data, it proceeds to progressively refine the analysis by utilizing ilaka level and household level disaggregated data. The household level analysis itself is refined by moving from cross section data (data collected at one point in time, namely, 2003/04) to panel data (data for same households at two points in time—1995/96 and 2003/04).

[25] Typically, an experimental research design is required to perform rigorous impact analyses. In the case of natural hazards, it is sometimes possible to obtain data from what are termed natural experiments where some households in a given hazard risk area experience disasters while others do not.

[26] Nepal is divided into 75 administrative districts. Each district consists of a collection of Village Development Committes (VDCs) and municipalities. An ilaka conisists of one to nine VDCs/ municipalities. There are altogether 3914 VDCs, 58 municipalities, and 976 ilakas in the country.

6.2 DATA SOURCES AND CHARACTERISTICS

Data sets and constraints

The analysis relies primarily on three categories of data: (i) household level poverty related data, (ii) *ilaka* level poverty related data, and (ii) VDC level disaster related data.

The Nepal Living Standard Surveys (NLSS) from 1995/96 and 2003/04 are the main sources for poverty related household level data. The 1995/1996 round of this survey (NLSS I) includes a nationally representative cross-section sample of 3,373 urban and rural households. The second round (NLSS II) includes a different nationally representative cross-section sample of 3,912 households along with a panel component consisting of a sub-sample of 962 households from NLSS I. This is the first and only national level household living standard panel survey that has been conducted in Nepal (CBS 2005). These household level datasets have information not only on household living standards, but also on a variety of variables that can be considered determinants of poverty. We will mainly use the NLSS II (2003/04) cross-section data and the 1995/96-2003/04 panel data.

The *ilaka* level data have been obtained from the study *Small Area Estimation of Poverty, Caloric Intake and Malnutrition* (CBS and WFP 2006). This dataset includes estimates of poverty and nutritional status indicators derived from a combination of the NLSS II data, the 2001 Nepal Demographic and Health Survey data (MoHP 2002), and the 2001 Population Census data (CBS 2002). These estimates are available for 963 of the 976 *ilaka* s in the country.

The hazard related data used in this study are drawn from the Nepal DesInventar database. This database includes data on 26 different types of disaster events at the VDC level. Note that while this database includes 14 different indicators of disaster impact, it does not include information on hazard-specific exposure.

Indicators of poverty and disasters

We use household per capita expenditure as the relevant measure of welfare in our analyses. Although household per capita income could also be used to measure welfare, per capita expenditure better captures the consumption smoothing behaviour of households and is also less susceptible to measurement errors. Hence, our poverty measures will be based on household level per capita expenditure data.

The poverty status of a household in any particular year is determined by comparing its per capita expenditure with a year-specific poverty line derived by the Nepal Central Bureau of Statistics using the Cost-of-Basic-Needs (CBN) approach. The CBS methodology takes into account differences in cost of living in different areas of the country by dividing the nation into six regions and deriving price indices for each region. Expressed in terms of 1995/96 prices in one of these six regions - rural eastern Terai - the CBN poverty lines for NLSS I and NLSS II are Rs. 4655 and Rs. 4749 per year, respectively. To measure poverty for an area or population group, we use the poverty headcount (P0), poverty gap (P1) and poverty squared gap (P2) indices discussed in Chapter 2.

As discussed in the earlier chapters, the most important hazard events in the Nepali context include fires, epidemics, floods, landslides and earthquakes. We therefore focus on these events. We use the total number of people affected (which includes deaths, people missing, and people injured) and the total number of houses affected (which includes houses damaged and houses destroyed) as indicators of hazard impacts. Population-normalized values of these indicators are used in our analysis.

[27]These surveys were done by the National Central Bureau of Statistics (CBS).

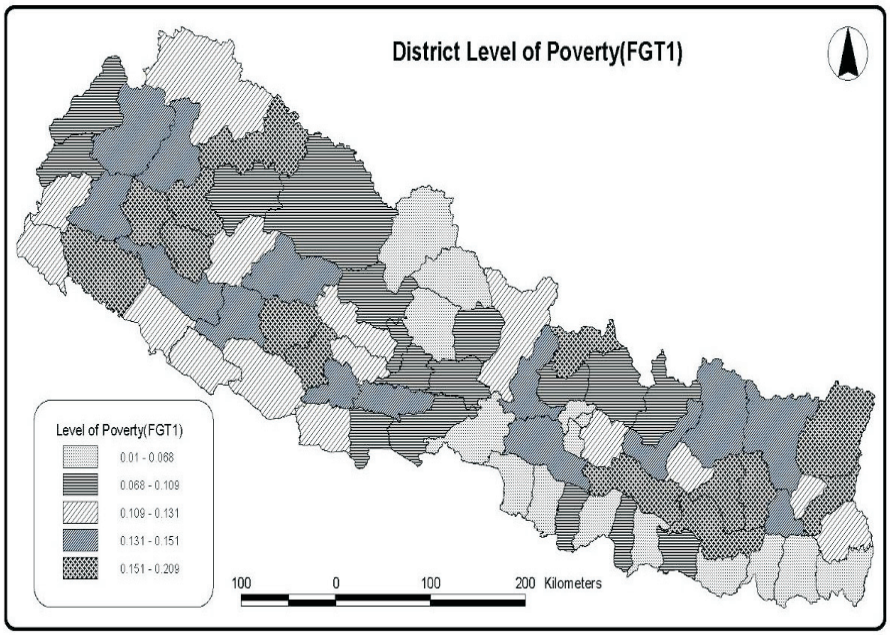
6.3 PRELIMINARY EVIDENCE ON THE TWO WAY RELATIONSHIP BETWEEN POVERTY AND HAZARDS BASED ON DISTRICT LEVEL DATA

As a first step in analyzing the relationship between poverty and hazards, we look at the correlations among different hazard impact indicators and indicators of welfare and depravation using aggregate district level data. The results of the correlation analysis are presented in Table 40. The correlation coefficients in the top left quadrant of the table show that the various measures of depravation (P0, P1, P2, and HPI) are positively and significantly associated with each other. And as might be expected, they are negatively correlated with the three indicators of well-being (HDI, life expectancy and adult literacy rate).

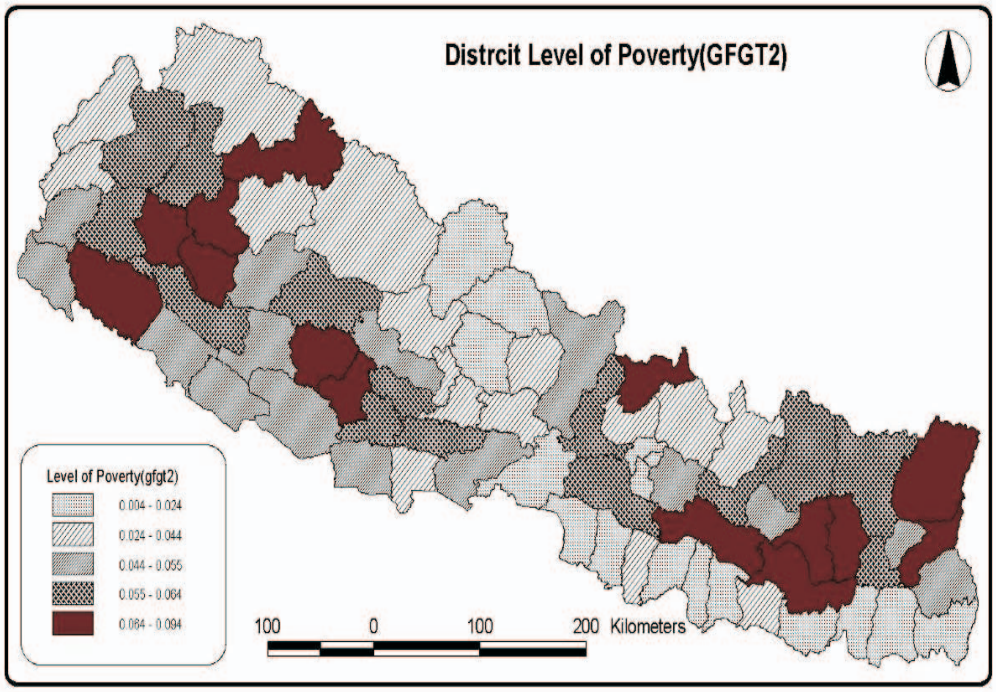
Among the disaster indicators listed in Table 40, two represent disasters that occurred between 1995 and 2003 while the remaining two are for disasters that occurred during the 2003-2007 period. There is no evidence of any statistically significant relationship between P0 in 2003/04 and the number of people or houses affected during the preceding eight years. Neither is there evidence that past disasters are related to future HPI, HDI, and life expectancy. Surprisingly, however, P1 and P2 are lower in districts where more people and houses were affected by disasters in the past and vice versa.

The correlations between the three FGT poverty measures (P0, P1 and P2) for 2003/04 and the two disaster indicators for the 2003 to 2007 period are positive suggesting that higher poverty is associated with higher future disaster risk. However, these relationships are not statistically significant. In fact none of the poverty related indicators show a statistically significant association with disaster indicators for 2003-2007.

Map 47: Relationship between disasters (1995-03) and poverty rate (2003) across districts



Map 48: Relationship between disasters (2003-07) and poverty rate (2003)



The lack of evidence of a relationship between poverty rate and disaster impact in Table 41 could be a result of the highly aggregate nature of district level data. Districts are relatively large administrative geographical units. Not only do disasters seldom affect whole districts, but many hazard events can cross district boundaries. Hence, it is more relevant to perform a correlation analysis using data from smaller geographical units.

Table 41 presents correlations between depravation indicators and disaster indicators based on ilaka level data. The table includes aggregate indicators for the impacts of all disasters as well as separate indicators for fires, epidemics, floods, landslides and earthquakes. The first 12 hazard indicators represent disaster shocks during the period 1995-2003 while the remaining 12 cover the period 2003-2007. Thus, in each column, the first 12 correlation coefficients show the relationship between deprivation indicators for 2003/2004 and disasters that occurred in the preceding eight years. Similarly, the last 12 coefficients show the relationship between deprivation indicators for 2003/04 and disasters that occurred in the following four years. The six indicators of depravation are for 2003/2004.

Column (a) shows how ilaka level poverty rate is correlated with each of the 24 disaster indicators. As shown by negative signs of the first and eighth coefficients in this column, there is a negative relationship between past disasters and poverty rate. In particular, note that the relationship between total number people affected by all disasters and poverty rate is statistically significant at the 5% level. This evidence suggests that higher disaster areas have lower poverty rates. A similar relationship is observed when the poverty gap and poverty severity measures are uses as indicators of poverty. This apparently counter-intuitive finding is consistent with the findings based on district level data presented in Table 41.

When the aggregate disaster events are unbundled into the five categories—fires, epidemics, floods, landslides and earthquakes—only floods and epidemics show a

Table 40:Correlations between district level poverty indicators and aggregate disaster indicators

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	Poverty rate (P0)[a]	1										
(2)	Poverty gap (P1)[a]	0.9874*	1									
(3)	Poverty severity (P2)[a]	0.9708*	0.9964*	1								
(4)	Human Development Index (HDI)[b]	-0.5826*	-0.4835*	-0.4264*	1							
(5)	Human Poverty Index (HPI)[b]	0.5717*	0.4764*	0.4204*	-0.9067*	1						
(6)	Life expectancyb	-0.3582*	-0.2954*	-0.2577*	0.8231*	-0.6324*	1					
(7)	Adult literacy rateb	-0.4922*	-0.3848*	-0.3241*	0.8875*	-0.9435*	0.5521*	1				
(8)	Number of houses affected by all disasters, 1995-2003	-0.2257	-0.2706*	-0.2903*	-0.0008	-0.0717	0.1389	-0.0743	1			
(9)	Number of people affected by all disasters, 1995-2003	-0.2089	-0.2761*	-0.3077*	-0.1625	0.1401	-0.0369	-0.2588*	0.4156*	1		
(10)	Number of houses affected by all disasters, 2003-2007	0.0594	0.0378	0.0239	-0.0311	-0.0103	0.0288	-0.0517	0.1121	-0.005	1	
(11)	Number of people affected	0.0743	0.0636	0.0587	-0.0819	0.1216	0.0783	-0.1562	0.1389	0.0884	-0.039	1

Note: "*" denotes significant at the 5% level; number of observations = 75; disaster indicators are per 1000 people
afor2003/04; bfor 2001

Source: consultant's analyses

statistically significant relationship with the poverty indicators. Consistent with the earlier findings using bundled aggregate disaster indicators, areas affected by floods have lower poverty rates. On the other hand, on average, poverty rates are higher where more people have been affected by epidemics. The relationship between epidemics and poverty, however, is not as strong as the relationship between floods and poverty indicators. It is therefore possible that the negative relationship between bundled aggregate disaster indicators and poverty is a result of the dominant role played by floods.

None of the three poverty measures in 2003/04 has a statistically significant association with the disaster indicators for the 2003-07 period. Thus this dataset does not provide reliable evidence on the influence of poverty on the likelihood of future disasters.

It is interesting to note that there are a number of positive and statistically significant coefficients associated with the nutritional deprivation indicators shown in columns (d), (e), and (f). As shown by the coefficients associated with disaster indicators (1) and (7), areas with larger numbers of people and houses affected by past disasters in general suffer more from wasting and low weights. In particular, the prevalence of wasting and low weight is greater in areas affected by floods in the past. Similarly epidemics and landslides are associated with higher prevalence of stunting. The figures also suggest that while there is no statistically significant correlation between the three poverty measures and future disasters, higher prevalence of wasting in 2003/04 is associated with greater number of people affected by disasters between 2003 and 2007. In other words, we find some evidence of a two way relationship between depravation and hazards when we look at indicators of nutritional status.

Table 41:Correlations between Ilaka-level poverty indicators and aggregate disaster indicators

	Disaster indicator	Poverty rate (P0) (a)	Poverty gap (P1) (b)	Poverty severity (P2) (c)	Stunting (d)	Under weight (e)	Wasting (f)
(1)	Number of houses affected by all disasters, 1995-2003	-0.0185	-0.0279	-0.031	-0.0139	0.0608	0.1039*
(2)	Number of houses affected by fires 1995-2003	0.0089	0.0073	0.0075	-0.0112	0.0028	0.0001
(3)	Number of houses affected by epidemics 1995-2003	---	---	---	---	---	---
(4)	Number of houses affected by floods 1995-2003	-0.0665*	-0.0869*	-0.0958*	-0.0472	0.1505*	0.2748*
(5)	Number of houses affected by landslides 1995-2003	0.0272	0.0412	0.0485	0.0723*	-0.0837*	-0.1469*
(6)	Number of houses affected by earthquakes 1995-2003	0.0182	0.0153	0.0143	0.0077	0.0058	-0.02
(7)	Number of people affected by all disasters 1995-2003	-0.0856*	-0.1015*	-0.1084*	0.0161	0.1088*	0.1959*
(8)	Number of people affected by fires 1995-2003	-0.0254	-0.028	-0.0289	-0.0136	0.0452	0.055
(9)	Number of people affected by epidemics 1995-2003	0.0877*	0.0856*	0.0822*	0.1064*	0.0478	-0.0532
(10)	Number of people affected by floods 1995-2003	-0.1071*	-0.1233*	-0.1298*	-0.0185	0.1128*	0.2358*
(11)	Number of people affected by landslides 1995-2003	0.0341	0.0348	0.0341	0.0923*	-0.0362	-0.1194*
(12)	Number of people affected by earthquakes 1995-2003	0.0431	0.0445	0.0441	0.049	-0.008	-0.0355
(13)	Number of houses affected by all disasters, 2003-2007	0.0246	0.0195	0.0162	-0.0044	0.0246	0.0273
(14)	Number of houses affected by fires 2003-2007	-0.0081	-0.0145	-0.0175	-0.0505	0.0815*	0.1307*
(15)	Number of houses affected by epidemics 2003-2007	---	---	---	---	---	---
(16)	Number of houses affected by floods 2003-2007	0.0276	0.0261	0.0243	-0.0111	-0.0149	0.0016

Table 41:Correlations between Ilaka-level poverty indicators and aggregate disaster indicators

	Disaster indicator	Poverty rate (P0) (a)	Poverty gap (P1) (b)	Poverty severity (P2) (c)	Stunting (d)	Under weight (e)	Wasting (f)
(17)	Number of houses affected by landslides 2003-2007	0.0608	0.0602	0.0585	0.0658*	0.0168	-0.0505
(18)	Number of houses affected by earthquakes 2003-2007	---	---	---	---	---	---
(19)	Number of people affected by all disasters, 2003-2007	-0.0361	-0.0408	-0.0416	-0.024	0.0287	0.0643*
(20)	Number of people affected by fires 2003-2007	-0.0283	-0.0279	-0.0272	-0.0067	-0.0189	-0.0166
(21)	Number of people affected by epidemics 2003-2007	0.0108	0.0175	0.0218	0.0032	-0.0182	-0.0351
(22)	Number of people affected by floods 2003-2007	-0.0442	-0.0531	-0.0563	-0.0303	0.0447	0.0976*
(23)	Number of people affected by landslides 2003-2007	0.0128	0.014	0.013	0.0198	0.015	-0.0237
(24)	Number of people affected by earthquakes 2003-2007	0.0112	0.0102	0.0096	-0.0179	-0.0377	-0.0243

*significant at the 5% level; number of observations = 963; the disaster indicators are per 1000 people
Note: the three nutritional status indicators represents the percentage of children below the age of 5 suffering from malnutrition

Source: consultant's analyses

6.4 ANALYSIS OF THE EFFECTS OF HAZARDS ON POVERTY USING ILAKA-LEVEL DATA

The correlation coefficients presented in Table 42 show bivariate relationships between poverty and disaster indicators without considering the influence of other factors that might affect poverty. In order to better understand how ilaka-level poverty might be influenced by disaster impacts, it is useful to analyze the association between poverty measures and disaster indicators within a multiple regression framework that controls for the influence of other potential determinants of poverty. The regression model used in this analysis is given by Equation (6.1):

$$P0_t = \beta_0 + \sum_i \beta_i D_{i,t-1-t} + \sum_j \gamma_j X_{j,t} + \varepsilon_t$$

where $P0_t$ is ilaka poverty rate in 2003/04, $D_{i,t-1-t}$ denotes the occurrence of disaster shocks of type i between 1995 and 2003, and ε_t is a random error term. The other determinants of poverty (i.e., the control variables) are represented by the $X_{j,t}$ variables.

The descriptive statistics for the variables used in the regression are presented in Table 42. Observe that the among the five disaster shocks, earthquakes are by far quite rare. Only 0.2% of the *ilakas* in the dataset were impacted by earthquakes between 1995 and 2003, and all of these were located in rural areas. On the other hand, between 30% and 35% of the *ilakas* experienced epidemics, floods and landslides during this period. A much larger percentage of urban *ilakas* (62%) were affected by epidemics compared to rural *ilakas* (28%).

Table 43 presents the regression results for the above model. The five disaster shocks are the key variables of interest in the regression. The control variables included in the model represent *ilaka* wealth characteristics, demographic characteristics, and location characteristics. These control variables represent some of the common determinants of poverty found in the literature.

Regression (1) shows the findings for the nation as a whole. As shown by the adjusted R2 value of .419, the model fits the data fairly well. More specifically approximately 42% of the variation in *ilaka*-level poverty rate is explained by variations in the explanatory variables included in the model. Observe that both wealth indicators (percentage of permanent houses and average agricultural land holding) and all four demographic variables (average household size, percentage of female headed households, and percentage of households with members outside the country) have statistically significant relationships with poverty rate. The positive coefficients on the two indicators of wealth suggest that, on average, poverty rate is lower in areas with more asset holdings. As might be expected, ilaka poverty rate is higher in areas with larger household size, larger percentage of old and young, and larger percentage of households with members residing outside the country. Note, however, that the percentage of female headed households is negatively associated with poverty rate. As an explanation for this surprising finding, Pernnushi (1999) argues that a different result can be observed when economies of scale in household consumption are taken into account. Another possible explanation could be that females are more truthful in revealing their consumption expenditures during surveys which results in female headed households registering higher per capita expenditures on average. The relationship between poverty and location characteristics observed in this regression is consistent with the discussion in Chapter 2. Ilaka poverty rate is higher in the mid and far western regions than in the eastern region (the reference region). And ilaka poverty rate in urban areas is lower than the poverty rate in rural areas.

Among the five types of disaster shocks, fires and earthquakes do not have a statistically significant association with poverty rate in regression (1). Poverty rates are higher in areas that experienced epidemics and landslides between 1995 and 2003. On the other hand, there is a negative association between flood occurrence and poverty rate. The finding for rural areas (regression 2) and urban areas (regression 3) are qualitatively similar to those discussed above. However, the relationships between individual shocks and poverty rate are not statistically significant in the case of urban *ilakas*.

Table 42:Means and standard deviations of variables used in the ilaka regression

Variable name	National (1)		Rural (2)		Urban (3)	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Dependent variable						
Poverty rate (P0), 2003/04	0.375	(0.154)	0.387	(0.149)	0.194	(0.116)
Disaster shocks						
Fire, 1995-2003	0.170	(0.376)	0.165	(0.371)	0.259	(0.442)
Epidemic, 1995-2003	0.303	(0.460)	0.283	(0.451)	0.621	(0.489)
Flood, 1995-2003	0.323	(0.468)	0.317	(0.466)	0.414	(0.497)
Landslide, 1995-2003	0.349	(0.477)	0.345	(0.476)	0.414	(0.497)
Earthquake, 1995-2003	0.002	(0.046)	0.002	(0.047)	0.000	(0.000)
Wealth characteristics						
% of permanent houses	33.857	(28.860)	32.285	(28.532)	58.387	(22.243)
Average agricultural land holding (ha)	0.733	(0.368)	0.737	(0.364)	0.684	(0.429)
Demographic characteristics						
Average household size	5.773	(1.449)	5.604	(0.649)	8.420	(4.603)
% of people below 15 and above 59 years of age	39.216	(6.358)	39.759	(5.279)	30.741	(12.751)
% of female headed households	2.912	(1.892)	2.875	(1.896)	3.487	(1.746)
% of HHs with members outside the country	13.749	(12.445)	14.039	(12.630)	9.227	(7.866)
Location characteristics						
Central region	0.283	(0.451)	0.280	(0.449)	0.345	(0.479)
Western region	0.222	(0.416)	0.223	(0.417)	0.207	(0.409)
Mid western region	0.160	(0.367)	0.164	(0.370)	0.103	(0.307)
Far western region	0.107	(0.309)	0.107	(0.310)	0.103	(0.307)
Urban ilaka	0.060	(0.238)				

Source: consultant's analysis

Table 43:Relationship between ilaka level poverty measures (2003/04) and disaster shocks (1995-03)

Explanatory variables	(1) Nation	(2) Rural	(3) Urban
Fire, 1995-2003	-0.0070	-0.0035	-0.0198
	(-0.673)	(-0.326)	(-1.082)
Epidemic, 1995-2003	0.0256	0.0235	0.0066
	(2.967)***	(2.658)***	(0.406)
Flood, 1995-2003	-0.0399	-0.0388	-0.0111
	(-4.603)***	(-4.376)***	(-0.667)
Landslide, 1995-2003	0.0593	0.0615	0.0201
	(6.758)***	(6.848)***	(1.114)
Earthquake, 1995-2003	0.0559	0.0372	
	(0.662)	(0.443)	
% of permanent houses	-0.0018	-0.0017	-0.0029
	(-10.106)***	(-9.374)***	(-6.507)***
Average agricultural land holding (ha)	-0.0305	-0.0552	-0.0281
	(-2.392)**	(-4.100)***	(-1.027)
Average household size	0.0239	0.1282	0.0022
	(4.482)***	(8.046)***	(0.603)
% of people below 15 and above 59 years of age	0.0101	0.0210	0.0028
	(7.080)***	(10.002)***	(2.158)**
% of female headed households	-0.0520	-0.0499	-0.0582
	(-11.839)***	(-10.660)***	(-6.612)***
% of HHs with members outside the country	0.0067	0.0067	0.0090
	(11.712)***	(11.460)***	(5.355)***
Central region	-0.0197	-0.0245	-0.0251
	(-1.593)	(-1.936)*	(-0.927)
Western region	0.0053	-0.0102	-0.0122
	(0.369)	(-0.672)	(-0.460)
Mid western region	0.0880	0.0956	0.0366
	(6.365)***	(6.788)***	(1.312)
Far western region	0.1149	0.1104	0.0230
	(6.233)***	(5.783)***	(0.606)
Urban ilaka	-0.0597		
	(-2.965)***		
Constant	-0.0485	-1.0524	0.4014
	(-0.601)	(-6.470)***	(4.853)***
Adjusted R2	0.419	0.388	0.869
Number of Cases	963	905	58

Dependent variable: poverty rate (P0), 2003/04
The five disaster indicators are dummy variables (1= event occurred, and 0= event did not occur)
* significant at 10%; ** significant at 5%; *** significant at 1%; t-statistics in parentheses

6.5 ANALYSIS OF THE EFFECTS OF HAZARDS ON POVERTY USING HOUSEHOLD LEVEL CROSS-SECTION DATA

The analyses in the preceding two sections were based on aggregate poverty rates for spatial units—namely districts and *ilakas*. One limitation of such spatially aggregated data is that, although poverty is a household phenomenon, all households within a given spatial unit are assigned the same welfare status. Thus information on welfare variations among households is not properly captured. We now analyze the relationship between poverty and disaster shock using household level living standards data for 2003/04 from the Nepal Living Standards Survey and VDC level disaster data for the years 1995 to 2003 from the Nepal DesInventar database. Ideally, we would like to include information on the disaster experience of individual households. This information, however, is not available.

The FGT poverty measures for 2003/04 presented in Chapter 2 are reproduced in Table 44. The table shows P0, P1 and P2 for the nation as well as for rural and urban areas separately. A disaggregated version of Table 44 is presented in Table 45 to show how these poverty measures differ for high and low disaster areas.

In this analysis, the cut-off point for distinguishing between high and low disaster areas is defined as the median number of people affected by disasters in VDCs that experienced disasters during the period 1995-2003. Thus, a high disaster area is a VDC where the total number of people affected by disasters is greater than this cut-off value.

The statistics in Table 45 show that, in the nation as a whole, poverty rate (P0) is actually lower in high disaster areas, a finding that is consistent with the *ilaka* -level correlation findings presented in Table 41. This finding based on aggregate disaster data could change when we perform the analysis using unbundled disaster events. The poverty gap and squared poverty

Table 44:FGT poverty measures for 2003/04 based on NLSS II

Area	Poverty rate (P0)	Poverty gap (P1)	Squared poverty gap (P2)
Nepal	30.9	7.5	2.7
Urban	9.6	2.2	0.7
Rural	34.6	8.5	3.1

Source: CBS (2006); consultant's analyses

Table 45:Poverty measures in low and high disaster areas, 2003/04

	Poverty rate (P0)		Poverty Gap (P1)		Squared Poverty Gap (P2)	
	Low disaster	High disaster	Low disaster	High disaster	Low disaster	High disaster
Nepal	31.3	29.4	7.5	7.8	2.6	2.9
Rural	34.7	34.4	8.3	9.3	2.9	3.5
Urban	5.0	15.2	1.0	3.6	0.3	1.2

Source: consultant's analysis

gap indicators, however, are marginally higher in high disaster areas. Similar results can be observed in rural areas as well. In the case of urban areas, however, all three poverty measures show greater poverty in high disaster areas.

We will now analyze the relationship between unbundled disaster shocks and poverty by looking at the change in predicted poverty rate estimated with and without disaster shocks. Based on Dercon (2005), this analysis first involves estimating a multiple regression equation for the determinants of household per capita expenditure using the NLSS 2003/04 cross section data. The estimated parameters are used to predict the per capita expenditure for each household with and without disaster shocks. The predicted poverty rates with and without shocks are estimated using these predicted household per capita consumption values. The regression model for the determinants of per capita expenditures is represented by Equation (6.2):

$$Pcexp_t = \beta_0 + \sum_i \beta_i D_{i,t-1-t} + \sum_j \gamma_j X_{j,t} + \varepsilon_t$$

where $Pcexp_t$ is household per capita expenditure in 2003/04, and the other variables are similar to those in Equation (6.1).

Descriptive statistics for the variables used in the above regression model are presented in Table 46. The percentage distribution of affected and non-affected households for the five shock categories is similar to the distribution observed for *ilakas* in Table 42. These statistics indicate that in terms of the percentage of households affected, the most common disaster shocks are floods, epidemics and landslides. Very few households in the sample were affected by earthquakes during the period of interest.

Taking advantage of the richness of the NLSS dataset, we have now included a number of new poverty determinants not available in the *ilaka*-level regressions. In particular, note that this regression model incorporates new control variables for household ethnicity, human capital, employment status, household wealth and community characteristics.

The Central Bureau of Statistics lists 101 caste/ethnic groups in Nepal (CBS 2004). For the purpose of this analysis, these ethnic groups have been grouped into five broad categories: the privileged group comprising primarily of the Brahmans, Chettris and Newars; the supposedly "untouchable" castes or Dalits; people of Terai origin or the Madheshis, the marginalized non-caste ethnic groups or Janajatis; and others. Four dummy variables are used to represent these five broad categories. Along with the location related variables, these ethnicity variables help to account for the influence of socio-economic exclusion on monetary poverty.

The level of a household's human capital is captured by two variables representing the percentage of adults with different levels of education. We use home value, aggregate value of agricultural land and value of livestock owned as indicators of household wealth. One of the important community characteristics included here is the intensity of violent conflict in Nepal, proxied by the total number of Maoist and Government killings at the district level between 1996 and 2003. In terms of the number of casualties, the civil war in Nepal can be considered one of the highest intensity internal conflicts in the world (Murshed and Gates, 2005). Data on the number of district level killings have been obtained from the Nepali non-governmental human rights organization Informal Sector Service Centre (INSEC) (INSEC 2005). District level literacy rate is the second community characteristic included in the model.

The regression results for the nation and for rural and urban areas are presented in Table 47. The national level regression (regression 1) shows that the relationship between poverty and the demographic variables in this model is consistent with the findings based on ilaka data discussed earlier. Larger household size and higher percentage of dependent household members (old and young) are associated with lower per capita expenditure. On the other hand, female headed households have, on average, higher per capita expenditures. Among the different ethnic groups, Dalits and Hill Janajatis have significantly lower per capita expenditures compared to the reference ethnic group comprising of Brahmans, Chettris, and Newars. This finding supports the discussion in Chapter 2 on the marginalized status of Dalits and Janajatis.

The statistically significant positive coefficient on the percentage of adults with secondary level education

Table 46:Means and standard deviations of variables used in the per capita expenditure regressions

	National (1)		Rural (2)		Urban (3)	
Variable name	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Real per capita expenditure (Rs.) 21103	(28273)		9746	(13753)	7765	(7521)
Fire, 1995-2003 0.613	(0.487)		0.141	(0.348)	0.049	(0.216)
Epidemic, 1995-2003	0.240	(0.427)	0.127	(0.334)	0.823	(0.382)
Flood, 1995-2003	0.265	(0.441)	0.181	(0.385)	0.687	(0.464)
Landslide, 1995-2003	0.226	(0.418)	0.153	(0.360)	0.593	(0.491)
Earthquake, 1995-2003	0.002	(0.047)	0.003	(0.052)	0.000	(0.000)
Household size	5.27	(2.58)	5.36	(2.61)	4.82	(2.35)
HH head is female	0.196	(0.397)	0.197	(0.398)	0.191	(0.393)
% of HH members below 15 and above 59 years of age	0.455	(0.240)	0.473	(0.234)	0.360	(0.250)
Ethnicity: Dalit	0.080	(0.271)	0.085	(0.280)	0.051	(0.220)
Ethnicity: Madheshi	0.137	(0.344)	0.156	(0.363)	0.044	(0.205)
Ethnicity: Hill Janajati	0.208	(0.406)	0.220	(0.414)	0.147	(0.354)
Ethnicity: Others	0.213	(0.409)	0.214	(0.410)	0.210	(0.407)
% of adults with primary level education	14.89	(22.89)	15.07	(22.84)	13.98	(23.16)
% of adults with secondary level education	18.85	(25.40)	17.32	(24.25)	26.53	(29.40)
% of adults who are unemployed	2.94	(11.58)	2.30	(9.99)	6.25	(17.28)
% of adults working for wages in agriculture	7.57	(21.63)	8.80	(23.12)	1.13	(7.99)
% of adults self employed in agriculture	55.01	(39.01)	61.69	(36.62)	20.49	(32.09)
Household received remittance	0.319	(0.466)	0.332	(0.471)	0.250	(0.433)
Value of home including plot (Rs. 0000000)Central region	1.34	(3.78)	0.72	(1.29)	4.50	(8.20)
Western region	0.356	(0.479)	0.325	(0.469)	0.516	(0.500)
Mid western region	0.208	(0.406)	0.216	(0.411)	0.171	(0.377)
Far western region	0.119	(0.324)	0.131	(0.337)	0.062	(0.241)
HH is in urban area	0.069	(0.253)	0.075	(0.263)	0.041	(0.199)
	0.165	(0.371)	0.000	(0.000)	1.000	(0.000)

Table 47:Determinants of per capita expenditure using NLSS II cross-section data, 2003/04

Explanatory variables	National (1)	Rural (2)	Urban (3)
Fire, 1995-2003	0.0814	0.0126	0.0562
	(1.435)	(0.157)	(0.897)
Epidemic, 1995-2003	-0.0362	-0.0339	0.0660
	(-0.697)	(-0.595)	(0.960)
Flood, 1995-2003	0.0797	0.0594	0.0344
	(2.189)**	(1.528)	(0.592)
Landslide, 1995-2003	-0.0720	-0.0788	-0.0976
	(-1.797)*	(-1.770)*	(-1.373)
Earthquake, 1995-2003	0.0287	0.0385	
	(0.545)	(0.730)	
Household size	-0.0446	-0.0458	-0.0663
	(-4.571)***	(-5.206)***	(-8.143)***
HH head is female	0.0364	0.0365	0.0934
	(1.224)	(1.134)	(1.889)*
% of HH members below 15 and above 59 years of age	-0.4812	-0.3927	-0.5915
	(-9.378)***	(-7.486)***	(-6.237)***
Ethnicity: Dalit	-0.2577	-0.1800	-0.2684
	(-6.255)***	(-4.523)***	(-3.381)***
Ethnicity: Madheshi	-0.0342	-0.0194	-0.3863
	(-0.709)	(-0.409)	(-3.144)***
Ethnicity: Hill Janajati	-0.2656	-0.2221	-0.2533
	(-6.605)***	(-5.538)***	(-4.576)***
Ethnicity: Others	-0.1152	-0.0490	-0.2690
	(-3.060)***	(-1.242)	(-3.686)***
% of adults with primary level education	-0.0005	0.0002	-0.0041
	(-1.161)	(0.464)	(-4.789)***
% of adults with secondary level education	0.0026	0.0032	0.0009
	(6.139)***	(6.780)***	(1.306)
% of adults who are unemployed	0.0008	0.0011	-0.0024
	(0.991)	(1.229)	(-1.719)*
% of adults working for wages in agriculture	-0.0052	-0.0037	-0.0101
	(-10.093)***	(-7.310)***	(-6.278)***
% of adults self employed in agriculture	-0.0031	-0.0019	-0.0046
	(-7.894)***	(-4.586)***	(-5.692)***

Table 47:Determinants of per capita expenditure using NLSS II cross-section data, 2003/04

Explanatory variables	National (1)	Rural (2)	Urban (3)
Household received	0.0791	0.0543	0.1229
remittance	(3.666)***	(2.353)**	(2.562)**
Value of home including	0.0501	0.1530	0.0429
plot (Rs. 000000)	(5.921)***	(9.308)***	(6.952)***
Value of agricultural land	0.0139	0.0167	-0.0004
owned (Rs. 000000)	(2.147)**	(4.157)***	(-0.057)
Value of livestock	0.0033	0.0025	0.0028
owned (Rs. 000)	(4.132)***	(3.720)***	(1.814)*
No. of insurgency-related	-0.0002	-0.0002	0.0012
killings in district, 1996-2003	(-1.500)	(-1.516)	(1.821)*
Distict adult literacy rate (%)	0.0063	0.0025	0.0130
	(3.491)***	(1.416)	(3.166)***
Central region	0.1091	0.0634	0.0899
	(2.634)***	(1.452)	(1.269)
Western region	0.0738	0.0190	0.2479
	(1.339)	(0.327)	(2.336)**
Mid western region	-0.0182	-0.0338	-0.1465
	(-0.259)	(-0.508)	(-0.920)
Far western region	-0.1049	-0.1099	-0.1140
	(-1.761)*	(-1.887)*	(-0.622)
HH is in urban area	0.1935		
	(3.036)***		
Constant	9.0750	9.0448	9.2650
	(78.858)***	(76.582)***	(34.709)***
Adjusted R2	0.560	0.477	0.650
Number of Cases	3912	2748	1152

Dependent variable: natural log of per capita expenditure; all monetary values in 1995/96 rupees
* significant at 10%; ** significant at 5%; *** significant at 1%; t-statistics in parentheses

shows that households with more well educated members have higher per capita expenditures. Interestingly, however, the relationship between household per capita expenditure and the percentages of adults with only a primary education is negative, suggesting that limited formal education might be more of a liability than an asset.

Among the three variables representing the household's employment status, unemployment is not significantly related to per capita expenditure. However, as might be expected, per capita expenditure is lower for households that have larger percentages of adults engaged in the low paying agricultural sector. On the other hand, households that receive remittances from abroad have higher incomes.

All three indicators of wealth show a statistically significant positive relationship with per capita expenditure. Thus per capita expenditure is higher for households with higher levels of wealth as represented by home value, agricultural land value and livestock value. As for district-level characteristics, households in districts with more human capital have higher per capita expenditure. On the other hand, per capita expenditure is lower for households in districts that experienced higher level of insurgency-related violence between 1996 and 2003. This last relationship, however, is not statistically significant. The final set of coefficients shows that households in urban areas have higher per capita expenditures as do households in the Central region, the region that includes the nation's capital. The economic status of households in the far western region is lower than that of other regions.

The signs on the coefficients for the five disaster shocks are consistent with the results observed for the ilaka regressions. Household affected by epidemics and landslides have lower per capita expenditures on average. And floods are associated with higher household per capita expenditures. Note that only landslide and flood shocks have a statistically significant relationship with per capita expenditure.

The results from the separate regressions for rural and urban areas are qualitatively similar to those for the nation. However, none of the disaster shocks has a statistically significant relationship with per capita expenditure in urban areas.

Using the regression results in Table 47, we can estimate the predicted values of household per capita expenditure ($\widehat{Pcexp}_t$) as follows:

$$\widehat{Pcexp}_t = \hat{\beta}_0 + \sum_i \hat{\beta}_i D_{i,t-1-t} + \sum_j \hat{\gamma}_j X_{j,t}$$

where $\hat{\beta}_0, \hat{\beta}_i$, and $\hat{\gamma}_j$ are regression parameter estimates. Predicted household per capita expenditures in the absence of shocks are obtained by setting the disaster shock variables $D_{i,t-1}$ to zero in Equation (6.3). These predicted per capita expenditure values are used to compute poverty measures in the absence of shocks.

Table 48 presents observed poverty measures as well as predicted poverty measures with and without shocks based on Equation (6.3). Overall, the impact of shocks on predicted poverty rate is very small. For example, at the national level, the predicted poverty rate in the absence of any disaster is 22.87% compared to the overall predicted poverty rate of 23.10%. Among the different shocks, landslides have the largest positive impact on all three poverty measures. The second largest increase in poverty is associated with epidemics.

Table 48: Relationship between disaster shocks (1995-03) and poverty (2003/04)

	Poverty rate (P0)	Poverty Gap (P1)	Squared Poverty Gap (P2)
Observed poverty	30.85	7.54	2.69
Predicted poverty	23.10	3.23	0.72
Predicted poverty--no fires	23.19	3.23	0.72
Predicted poverty--no epidemics	22.36	3.10	0.69
Predicted poverty--no floods	24.55	3.49	0.80
Predicted poverty--no landslides	22.13	2.99	0.66
Predicted poverty--no earthquakes23.12	3.23	0.72	
Predicted poverty--no disasters	22.87	3.12	0.69

Source: consultant's analyses

6.6ANALYSIS OF THE EFFECTS OF HAZARDS ON POVERTY USING HOUSEHOLD LEVEL PANEL DATA

One major shortcoming of the above analysis based on NLSS cross section household data is that the regressions used to relate shocks with poverty do not account for the initial economic status of the households. Panel household data, on the other hand, allow us to estimate the influence of shocks on poverty more rigorously by enabling the tracking of individual household wellbeing both before and after the occurrence of shocks.

Table 49 presents poverty estimates for the two waves of the NLSS panel survey. While these estimates are somewhat different from those based on the NLSS I and II cross-section data (see Table 5), they too show that there was a substantial decline in poverty between the two survey years, especially in urban areas. Table 49 also presents poverty estimates for high and low disaster areas separately. High disaster areas have lower poverty rates in 1995/96 as well as in 2003/04, a finding that is consistent with the results based on NLSS II cross-section data.

We will now look at the economic mobility of individual households between the two survey years using the poverty transition matrix presented in Table 50. According to this table, 47% of the households were non-poor in both years while 19% of the households were poor in 1995/96 as well as in 2003/04. Thus 66% of the 962 households in the panel did not change their poverty status between the two years, a fact captured by the immobility index value of 0.66. The dependence of poverty status in 2003/04 on the status in 1995/96 (and vice versa) is also confirmed by the high Chi-squared value, which allows us to reject the null hypothesis of independence between the two years at the 1% significance level. It is, therefore, important to account for the initial economic status of individual households when analyzing the relationship between household per capita expenditure and disaster shocks.

Table 50 also shows that a total of 128 households (13%) which were not poor in 1995/96 became poor

Table 49:Poverty measures for 1995/96 and 2003/04 based on NLSS panel data

	Poverty measures, 1995/96			Poverty measures, 2003/04			% change in poverty measures		
Location	P0	P1	P2	P0	P1	P2	1995/96-2003/04		
Rural areas	40.3	11.4	4.4	32.5	7.2	2.4	-9.3	-6.8	-5.5
Urban areas	33.2	11.3	4.7	25.2	5.8	1.7	-4.2	-8.9	-3.9
Low disaster areas	40.0	11.2	4.3	32.2	7.2	2.4	-9.6	-6.1	-4.4
High disaster areas	39.3	12.1	5.0	31.6	6.9	2.3	-9.7	-3.0	-4.8
Nepal	39.9	11.4	4.5	32.0	7.1	2.4	-9.6	-7.6	-6.8
Note: P0=poverty rate, P1=poverty gap and P1=squared poverty gap									

Source: consultant's analysis

Table 50:Transition matrix in and out of poverty, 1995/96-2003/04

		2003/04 (NLSS II)		
		Non-poor	Poor	Total
1995/96 (NLSS I)	Non-poor	453	128	581
		(47.1)	(13.3)	(60.4)
	Poor	201	180	381
		(20.9)	(18.7)	(39.6)
	Total	654	308	962
		(68.0)	(32.0)	(100.0)

Note: Top number is cell frequency and number in parentheses is cell percentage
Immobility index = .658; chi2(1) = 66.997; P-value < .001

in 2003/04. On the other hand, 21% of the households escaped poverty during this period. Thus altogether 32% of the panel households either stayed poor or fell into poverty between 1995/96 and 2003/2004. The remaining 68% of the households either maintained their non-poor status or escaped poverty. These poverty transition categories are summarized in Table 51.

One way to analyze the association between poverty and disaster shocks is by using a regression model that relates the occurrence of shocks to the probability of being in one of the two poverty transition categories shown in Table 51. Here, we use the following Probit model to perform the analysis:

$$\Pr(Y_h = 1|D, X) = \Phi\left(\beta_0 + \sum_i \beta_i D_{i,t-1-t} + \sum_j \gamma_j X_{j,t-1}\right) \quad (6.4)$$

where $Y_h = 1$ if the household stayed poor or fell into poverty and $Y_h = 0$ otherwise. The right hand side variables are similar to those in Equation (6.2) and $\Phi(\cdot)$ represents the cumulative normal density

[28] The immobility index is the sum of the cell frequencies on the main diagonal of the transition matrix divided by the total number of households in the panel.

Table 51:Distribution of households across poverty transition categories, 1995/96-2003/04

Poverty transition category	Total households	% households
Remained non-poor or escaped poverty between 1995/96 and 2003/04	654	68
Stayed poor or fell into poverty between 1995/96 and 2003/04	308	32
Total	962	100

function. The Probit regression results are presented in Table 6.13. The table also shows the mean values of the various explanatory variables used in the regression.

Observe that among the different household demographic variables in the model, the coefficients on only ethnicity has a statistically significant association with the dependent variable. On average, compared to Brahman-Chettri-Newar households, a Dalit household has a 20% higher probability of either remaining poor or falling into poverty. Similarly, the probability of remaining poor or falling into poverty is 12% higher for Janajati households. These results provide further evidence on the marginalized status of Dalits and Janajatis.

While both human capital variables are negatively related to the probability of being poor in 2003/04, only the coefficient on the per centage of adults with secondary level education is statistically significant. In other words, the probability of remaining poor or falling into poverty is lower for well educated households. On the other hand, there is evidence that this probability is higher for households with larger per centages of adults engaged in agriculture. The coefficients on all three indicators of household wealth are negative and statistically significant, suggesting that higher levels of wealth are associated with lower probability of falling into or remaining in poverty. District level adult literacy rate has a statistically significant negative association with the probability of being poor in 2003/04. And households located in the far western region have a 19% higher probability of being poor in 2003/04 compared to households from the eastern region. These findings are consistent with the earlier findings based on NLSS II cross section data.

The results in Table 52 do not provide evidence of any statistically significant relationship between disaster shocks[29] and household poverty transition. Note that we do not present results for urban and rural areas separately in Table 52. This is because the small sample size for urban areas (178 households) coupled with the use of VDC level disaster data (instead of household level data) has resulted in inadequate variation in disaster indicators across households.

The above analysis used a binary choice variable—poverty transition status—as the dependent variable in the regression model. A second approach to analyzing the relationship between poverty and disaster shocks using panel data involves estimating a multiple regression equation where the dependent variable is the change in household consumption between 1995/96 and 2003/04. We use the following regression model to estimate the relationship:

$$Pcexp_t = \alpha_0 + \alpha_1 Pcexp_{t-1} + \sum_i \beta_i D_{i,t-1-t} + \sum_j \gamma_j X_{j,t-1} + \varepsilon_t \quad (6.5)$$

where $Pcexp$ denotes household per capita expenditure and represents a random error term. Note that this model includes the per capita expenditure

[29]None of the VDCs in the panel dataset experienced earthquakes between 1995 and 2003. Hence earthquake shock does not appear in Table 6.13.

[30]Note: A more restrictive version of this model uses $(Pcexp_t - Pcexp_{t-1})$ as the dependent variable and does not include $Pcexp_{t-1}$ among the explanatory variables. The estimated regression coefficients in this model, however, are identical to those estimated using Equation (6.5).

Table 52:Determinants of poverty transitions, 1995/96-2003/04

	Marginal effect	z-score	p-value	Mean
Fire, 1995-2003	0.0183	0.410	0.680	0.079
Epidemic, 1995-2003	0.0147	0.190	0.848	0.220
Flood, 1995-2003	0.0607	0.980	0.326	0.191
Landslide, 1995-2003	-0.0468	-1.020	0.309	0.118
HH size, 1995/96	-0.0044	-0.490	0.623	6.451
HH head is female§, 1995/96	-0.0738	-1.380	0.167	0.094
% of HH members below 16 and above 59 years of age, 1995/96	0.1039	1.290	0.196	0.489
Ethnicity: Dalit§, 1995/96	0.1917	2.310	0.021**	0.087
Ethnicity: Madheshi§, 1995/96	0.0320	0.440	0.658	0.199
Ethnicity: Hill Janajati§, 1995/96	0.1180	1.850	0.064*	0.132
Ethnicity: Others§, 1995/96	0.1096	1.580	0.115	0.220
% of adults with primary level education, 1995/96	-0.0008	-0.720	0.470	11.934
% of adults with secondary level education, 1995/96	-0.0028	-3.080	0.002***	16.311
% of adults who are unemployed, 1995/96	-0.0006	-0.410	0.685	3.805
% of adults working for wages in agriculture, 1995/96	0.0012	1.220	0.223	11.382
% of adults self employed in agriculture, 1995/96	0.0016	2.630	0.009***	59.330
Received remittance§, 1995/96	-0.0132	-0.310	0.753	0.225
Value of home including plot (Rs. 000000), 1995/96	-0.1441	-2.060	0.039**	0.521
Value of agricultural land owned (Rs. 000000), 1995/96	-0.0342	-2.250	0.025**	1.629
Value of livestock owned (Rs. 000), 1995/96	-0.0026	-2.050	0.041**	17.857
No. of insurgency-related killings in district, 1996-03	0.0001	0.460	0.644	78.342
Distict adult literacy rate (%), 1995/96	-0.0047	-2.240	0.025**	46.149
Central region§	-0.0125	-0.200	0.840	0.343
Western region§	0.0240	0.450	0.650	0.125
Far western region§	0.1933	2.380	0.017**	0.061
HH is in urban area§	0.1164	1.070	0.284	0.068
Pseudo R2	0.1727			
Number of Cases	962			
Dependent variable: poverty transition category (0 = Remained non-poor or escaped poverty; 1 = Stayed poor or fell into poverty)				
§ Marginal effect is for discrete change of dummy variable from 0 to 1 * significant at 10%; ** significant at 5%; *** significant at 1%				

Source: consultant's analysis

for the initial year among the explanatory variables. The coefficients associated with $D_{i,t-1-t}$ show the relationship between disaster shock and change in per capita expenditure between the two survey years.[30] The regression results are presented in Table 53.

The results are qualitatively similar to those in Table 52 and 47. As might be expected, the national level regression shows that households with higher per capita expenditures in 1995/96 have higher per capita expenditure in 2003/04 as well. Among the household demographic variables, ethnicity again has a statistically significant association with per capita expenditure. Dalit households have significantly lower per capita expenditures compared to the Brahman-Chettri-Newar reference group. And households with larger percentages of adults with secondary level education and located in districts with higher literacy rates have higher per capita expenditures in 2003/04.

Consistent with earlier evidence, greater engagement in agriculture is associated with lower per capita expenditure and all three wealth indicators show a positive and statistically significant association with economic welfare. Similarly, households located in the far western region have lower per capita expenditures compared to households from the eastern region.

The findings for rural areas are largely similar to the finding discussed above. One interesting difference in the rural areas is that the intensity of violent conflict has a statistically significant association with per capita expenditure. We suspect that this outcome is related to the fact that the Maoist insurgency was primarily a rural phenomenon. We do not present any regression for urban areas because of the data problems discussed earlier.

In both regressions, none of the hazard shock variables have a statistically significant association with household per capita expenditure.

Table 53:Determinants of change in per capita expenditure, 1995/96-2003/04

	(1) National		(2) Rural	
	Coeff.	t-stat)	Coeff.	(t-stat)
Fire, 1995-2003	-0.0076	(-0.075)	0.0919	(1.314)
Epidemic, 1995-2003	0.0291	(0.239)	0.0177	(0.149)
Flood, 1995-2003	-0.0650	(-0.859)	-0.0793	(-1.025)
Landslide, 1995-2003	0.0422	(0.541)	-0.0353	(-0.449)
Log of real per capita expenditure, 1995/96	0.3357	(6.216)***	0.2682	(4.578)***
HH size	-0.0045	(-0.545)	-0.0098	(-1.186)
HH head is female	0.1024	(1.311)	0.0994	(1.243)
% of HH members below 16 and above 59 years of age	0.0592	(0.653)	0.0807	(0.848)
Ethnicity: Dalit	-0.1649	(-2.137)**	-0.1669	(-2.080)**
Ethnicity: Madheshi	0.0199	(0.275)	0.0322	(0.438)
Ethnicity: Hill Janajati	-0.0184	(-0.272)	-0.0147	(-0.216)
Ethnicity: Others	-0.0627	(-0.975)	-0.0662	(-1.001)
% of adults with primary level education	0.0013	(1.126)	0.0022	(1.839)*
% of adults with secondary level education	0.0034	(4.096)***	0.0038	(4.610)***
% of adults who are unemployed	0.0002	(0.192)	0.0006	(0.616)
% of adults working for wages in agriculture	-0.0026	(-2.586)**	-0.0026	(-2.521)**
% of adults self employed in agriculture	-0.0026	(-3.727)***	-0.0027	(-3.871)***
Received remittance	0.0589	(1.134)	0.0846	(1.607)
Value of home including plot (Rs. 000000)	0.0622	(4.881)***	0.1094	(2.447)**
Value of agricultural land owned (Rs. 000000)	0.0097	(5.668)***	0.0085	(5.472)***
Value of livestock owned (Rs. 000)	0.0025	(2.257)**	0.0026	(2.217)**
No. of insurgency-related killings in district, 1996-2003	-0.0003	(-1.596)	-0.0003	(-1.824)*
District adult literacy rate (%)	0.0054	(2.154)**	0.0033	(1.223)
Central region	-0.0718	(-0.898)	-0.0972	(-1.199)
Western region	-0.0346	(-0.465)	-0.0618	(-0.813)
Mid western region	0.0306	(0.346)	-0.0198	(-0.227)
Far western region	-0.1492	(-1.674)*	-0.1889	(-2.121)**
HH is in urban area	0.0369	(0.237)		
Constant	5.7411	(11.645)***	6.4387	(12.352)***
Adjusted R2	0.429		0.373	
Number of Cases	962		784	

Dependent variable: natural log of per capita expenditure in 2003/04; all monetary values in 1995/96 rupees

All household level explanatory variables are for 1995/96.

* significant at 10%; ** significant at 5%; *** significant at 1%; t-statistics in parentheses

6.7 CONCLUSION

Summary of findings

This chapter has analyzed the two way relationship between poverty and natural hazards in Nepal using district, *ilaka* and household level data. Qualitative evidence from case studies from around the world suggests that natural hazards contribute to poverty. Do quantitative data tell us the same story in the case of Nepal? This was the primary question addressed in this chapter. At the same time, the chapter also briefly investigated whether poverty tends to increase the likelihood of hazard loss or damage as argued by some researchers (Fuente et al. 2008; Holloway 2007).

A correlation analysis using district level data could not provide evidence of any clear relationship between poverty rate and aggregate disaster indicators. Interestingly, however, it suggested a negative association between past hazards events and future poverty gap and squared poverty gap measures. However, there was no significant association between past poverty measures and future hazard indicators. The highly aggregate nature of district level data could be partly responsible for the absence of significant correlations between the different variables.

Using *ilaka* level data and separate indicators for the five hazard events of interest, we found that areas with more people affected by epidemics in the past have higher poverty measures. On the other hand, areas affected more by floods have lower poverty rates, a finding that requires further investigation. A study by International Center for Integrated Mountain Development (ICMOD) suggests that households learn to adjust to recurrent floods, and often the richest households manage to turn change into opportunity (Denkens 2007). This could be a potential explanation behind the observed relationship. Another explanation is that since the poorest segments of society are landless, floods primarily affect households that are better off. The strong negative relationship between floods and poverty tends to dominate the relationship between bundled aggregate disaster indicators and poverty measures. As for how poverty influences the likelihood of future hazard loss, the *ilaka* level data too failed to provide any reliable evidence on the relationship between these two variables. However, there was some evidence of a link between depravation and future hazard loss when indicators of nutritional status were used in the analysis.

Further analysis of *ilaka* level data using multiple regression models also provided evidence of a positive association between poverty rate and epidemics and negative association between poverty rate and floods. This analysis also indicated that poverty rates are higher in areas that experienced landslides in the past. In addition, the *ilaka* regressions confirmed the role of other determinants of poverty found in the literature, namely location, wealth, and demographic composition of the areas under consideration. They showed that *ilakas* located in rural areas and in the mid and far western regions of the country had higher poverty rates providing further evidence of the negative impact of location-based exclusion on economic well being. As might be expected, *ilakas* with higher levels of wealth were found to have lower poverty rates, while ilakas with higher dependency ratios and larger households had higher poverty rates. Interestingly, poverty rate was found to be lower in *ilakas* with larger percentages of female headed households.

The results based on household level cross-section data were consistent with the results observed for the *ilaka* regressions. Households affected by epidemics and landslides have lower per capita expenditures on average while floods are associated with higher household per capita expenditures. Our analysis reveals that predicted values for P0, P1 and P2 increase by 4.8%, 7.8% and 9.3% respectively as a result of landslides. Similarly, epidemics increase the predicted poverty rate by 3.3%, and P1 and P2 by 4.1% and 5.3% respectively.

The household level cross section data also provided information on the relationship between economic wellbeing and a number of potential poverty determinants not included in the *ilaka* level analysis. In particular, the household level analysis suggested that ethnicity-based social exclusion is also a determinant of monetary poverty. The ethnic group suffering the most from social exclusion—the Dalits—had a significantly

lower per capita expenditure than the most privileged group comprising of Brahmans, Chettris and Newars. This analysis also showed that while households receiving remittances are economically better off, households who rely more on the agricultural sector for their livelihoods tend to have lower per capita expenditures.

While the analysis of panel household data too provided evidence of statistically significant relationships between a number of poverty determinants and poverty, it failed to show any significant association between hazards and poverty. The absence of a statistically significant association between hazards and poverty is probably related to the use of VDC level disaster data in our analysis. Like poverty, the experience of disasters is a household phenomenon. When a VDC experiences a disaster, not all households in the VDC are necessarily affected by the hazard event. However, using disaster data is at the VDC level assigns the same disaster indicator value to all households belonging to a given VDC. As a result, the variation in disaster experience across households is not fully captured by VDC level disaster data. Thus the loss of information in the VDC level disaster data coupled with the small size of the NLSS panel sample could have masked the true relationship between poverty and disaster shocks.

Coping with disasters

The above findings have provided evidence that specific types of hazards, namely epidemics and landslides, are associated with higher poverty. Thus steps taken by households to cope with disasters related to these hazard events can also help to reduce poverty. Within the context of Nepal, consumption smoothing through the use of credits is a key approach used by poor households to cope with poverty and disasters.

According to CBS (2006), 69 per cent of all households took out loans during 2003/04. Borrowing was more prevalent in rural areas (73 per cent) and among the poorest quintiles (74 per cent), indicating that use of credit is central to the livelihood strategies of poor households. While some of the loans taken out by the poor are for business purposes as well, most loans are primarily used for smoothing consumption.

Informal credit sources, in particular relatives, are by far the most important source of funds for most households. The CBS (2006) study indicates that around 55 per cent of the loans come from relatives, 26 per cent come from money lenders and 15 per cent come from banks. However, the average size of the loans from formal credit sources is much larger. The reach and importance of the formal sector actually declined between 1995/96 and 2003/04, largely because of the closing of banks during the Maoist insurgency.

Among the formal credit sources, there are a number of micro credit programmes in Nepal that are specifically targeted towards the poor. One of the main sectors targeted by micro credit programmes is the livestock sector. This is also a sector that faces high risk of loss in times of disasters. Loans taken out for consumption are inadequate for handling livestock and other asset losses in post-disaster situations. Provision of livestock insurance can be of big help to farmers in managing the risks associated with their livestock. Unfortunately, livestock insurance in Nepal is very limited both in terms of scope and reach. The largest livestock insurance programme is that provided by Deposit and Credit Guarantee Corporation (DCGE), which now has 358 branches in 74 of the 75 districts of the country (Mathema 2008). However, the total number of farmers and livestock covered by the insurance programme in 2006 were only 5,060 and 5,200, respectively.

The importance of micro insurance in helping poor households to cope with disasters has been widely discussed in the literature and in policy circles around the world. Livestock insurance, asset/property insurance, livelihood and work security insurance and life insurance are some of the traditional insurance schemes that have been tried in different countries. Some researchers have also proposed the use of index-based insurance where a household can collect

insurance payments on the basis of the intensity of the hazard in the community as a whole irrespective of whether or not that household suffered losses (Meschler et al. 2007). In the case of Nepal, however, affordable insurance is not available for the poor apart from limited livestock insurance and some life insurance schemes (which are usually not affordable by the poorest households).

The ability of households, individuals and communities to cope with disasters and poverty also depends on the general level of social protection in the country as a whole. In Nepal, the total expenditure on Social Protection is only around 2 per cent of GDP, which places it among the countries with the lowest level o social protection (Bhatta and Sharma 2005). And less than 50 per cent of this amount goes to the poor. Hence, most poor households need to rely on their own resources to recover from disasters and poverty.

Need for further research

The discussion in this chapter points to a need for further research on the two-way relationship between poverty and hazards using more disaggregated data. More specifically, it suggests that if we want to gain a better understanding of how disasters affect poverty in the context of Nepal, it will be necessary to utilize data from a living standards survey that includes questions on hazard experience. We would, therefore, recommend that UNDP work closely with the Central Bureau of Statistics to ensure the inclusion of a hazard module in the next round of household surveys conducted by CBS. Hazard data at the household level would also be useful for studying how poverty affects the likelihood of hazard losses.

7 Policy and Strategy Review

In this Chapter, we review the policies and strategies on poverty reduction and disaster risk management. We have concentrated mainly on those policies in the Tenth Development Plan (2002-2007) and the subsequent 3-years Interim Plan (2007/2008-2009/2010) that the country unanimously adopted after the changes in the political outlook and structure in 2008.

This Chapter also captures and reviews the country's efforts in disaster risk management in recent years, and explores achievements in terms of improvements in policy and the legal environment for mainstreaming disaster risk reduction into development. Both the Tenth Plan and the Interim Plan have recognized the need for disaster risk management by allocating sections of the plan to aspects of disaster reduction and preparedness; and also by incorporating risk reduction in other development sectors such as infrastructure development, health, and governance, although not specifically articulating the need to mainstream disaster risk reduction

The prevailing international scenario that stimulates improvement of the policy environment for such mainstreaming and also the recent favourable strategy changes that the bilateral agencies are in the process of implementation are also discussed.

7.1 POVERTY REDUCTION

7.1.1 The Tenth Development Plan

The Tenth Development Plan (2002-2007) approached poverty reduction by dividing the genesis of poverty in Nepal into income poverty, human poverty and social exclusion, and devising programmes and indicators accordingly. The Plan continued implementation of programme to provide financial and social security against risks caused by natural disaster and social and economic activities. As a result, overall poverty and human development indices have significantly improved: the results of Nepal Living Standard Survey (NLSS) indicated lowering of the proportion of population below the poverty line to 31 per cent from 42 per cent in the preceding eight years. Increased wage rate in the agricultural and non-agricultural sectors, increasing urbanization and the resulting increase in proportion of active human resources in the population and significant inflow of remittances are found to be the reasons for the positive changes. However, during the same period the Gini-coefficient increased from 0.34 in 1995/1996 to 0.41 in 2003/2004 indicating that the gap between the rich and the poor has increased further. Further, there is a wide variation in the incidence of poverty in different parts of the country – 3 per cent in Kathmandu, 13 per cent in other urban areas, and 45 per cent in Mid-Western Development Region (CBS, 2005A). Inequality among economic groups is severe; caste and ethnicity are significant factors influencing poverty (DFID and World Bank, 2006). The root causes of high variation in poverty in Nepal are thus economic factors, social exclusion of women, disadvantaged ethnic and caste groups, powerlessness, and risks, which mainly derive from socio-economic and natural characteristics, and atypical location of the country (Tiwari, 2006).

In absolute terms, however, Nepal still remains as the country with the least HDI in South Asia, and Nepal is placed at the 138th position in the global human index although according to the Human Development Report of 2006, the human development index of Nepal has increased from 0.513 in the earlier year to 0.527.

Food security reserve bank has been promoted under SAARC economic cooperation.

PRSP aimed at mainstreaming trade with poverty reduction, making trade growth responsive to poverty reduction.

Inequality in the distribution of wealth and opportunity and widespread social disparity was perhaps the root cause in part of the 12-years long People's Movement that culminated in the political changes in the country.

Millennium Development Goals (MDGs) Progress Report, 2007, has shown that the MDGs, except in primary education and HIV/AIDS, can be achieved by 2015 provided that the economy becomes reform-oriented and the achievements made during the last few years could be continued.

7.1.2 Poverty Reduction and the Three-Year Interim Plan (2007/2008-2009/2010)

The Three-Year Interim Plan (2007/2008-2009/2010) *seeks to target the root cause of poverty by emphasizing on increasing public expenditure to assist relief and generate employment as well as on peace building, reconstruction, rehabilitation, reintegration, inclusion, and revitalization of the economy. Similarly, the Plan gives special attention to women, dalits (traditionally disadvantaged and economically deprived so called lower caste), indigenous groups, Madhesi community, the poor, inhabitants of Karnali area and people of remote areas who had been exclude from the country's economic, social and regional development process. …. By giving continuity to reforms and incomplete projects initiated in the Tenth Plan, policies and programmes focussing on the needs and desires of the common people.*

The Three-year Interim Plan document addresses the poverty reduction strategy by providing a logical continuation of the efforts and achievements of Tenth Plan. Lessons learned have been considered and emphasis has gradually shifted to addressing the need to take the agenda to the household level and to the communities, with special consideration of efforts for

status uplifting of the marginalized population that were still beyond the reach of the poverty reduction programmes. The following sub-section elucidates this.

7.1.3 Overall Poverty Reduction Strategies of the Interim Plan

The main elements in the strategies are:

- Special emphasis on relief, reconstruction and reintegration
- Employment-oriented, pro-poor an broad-based economic growth,
- Promote good-governance and effective service delivery
- Increase investment in physical infrastructures
- Emphasis on social development
- Adopt an inclusive development process and carry out targeted programmes

7.1.4 Major Policies of the Interim Plan Addressing Issues of Poverty Reduction

The following policy instruments are considered:

Poverty Studies and formulation/modification of policies: Economic and social policies to commensurate with scientific study of poverty for achieving social justice, economic growth and equity. Contribution of subsistence households to the national economy shall be recognized and respected with due consideration of the problems arising out of the diverse geographic conditions.

Agriculture as the basis of economic development and making other sectors Agriculture-friendly: Modernization of the agriculture practices to make it main basis of development with other sectors to augment the efforts in agriculture sector by adapting policies of other sectors agriculture-friendly.

Enhanced participation of women and proportional representation: Women and population belonging to Adibasi Janajatis, Madhesis, Dalits, the deprived groups, people with disabilities, and people of backward and remote areas including freed Kamaiyas (bonded labourers) will be brought into formal and informal decision-making process, and making them specific targets for involvement into the development process including development and implementation of specific programmes on education, capacity building, food security and nutrition programmes, and empowerment.

Employment Generation: Gearing economic activities to enhance formal and informal sector employment, national capital formation, promotion of economic equality and economic development contribution will be favoured.

Reconstruction and rehabilitation of damaged or demolished physical infrastructures: Emphasis on rehabilitation and re-integration of, and immediate relief for the individuals, families and communities affected by the conflict, provision of relief to the affected including waiving of interests on credits for small farmers and small cottage entrepreneurs affected by natural disasters and conflicts. Reconstruction in areas affected by political conflict is to be seen as an opportunity for employment of the affected.

Capacity Building, training, education and Awareness: Special emphasis will be laid on quality, employment-oriented, vocational and technical education, within the access of the common people, especially of women and those marginalized hitherto, with a right-based approach. Self-employment programmes such as Rural Youth Self-employment programmes to be promoted. Government budget and involvement will be enhanced in literacy campaigns and informal education. Community in food crisis areas, including those in remote and under-developed areas such as Karnali areas will get special focus.

Employment, Self-employment and Income Generation: Opportunities will be provided for self employment and employment for youths, particularly those affected by the conflict. In addition, remittances will be directed towards the productive sectors by making foreign employment well managed.

Participatory Policy for Sustainable Development: Such policy will cover all sectors such as health, forestry, agriculture, disaster management, food security and supplies, education, infrastructure reconstruction, shelter etc.. Special and concrete objective–oriented programmes are to be launched.

Involvement of Private Sector, NGOs and Community Groups: The partnership and complementary role

of the central and local government, NGOs, co-operatives, private sector and community groups has been recognized, especially in terms of utilizing the human resources available in NGO and private sector. NGOs considered as drivers and partners of development, and the need to enhance their capacity acknowledged. The Plan envisions developing a policy study on the potentials of contribution of the private sector and NGOs in the health sector, and establishment of a separate unit to monitor and facilitate the work with NGOs.

Abolishing Discrimination: Religion, language, culture and caste-based discrimination is to be abolished completely. Special arrangements will be made for the protection, promotion and development of the languages and cultures of all the castes and Janajatis (indigenous ethnic groups).

Good Governance: Corruption and red-tape in the government will be abolished and transparency and good governance will be enhanced. For this, existing mechanisms will be strengthened with necessary changes.

Regularization of Supply system: will be regularized for making the essential goods and services for the people easily available and affordable. Inflation will be controlled with monitoring.

Implementation of these policies creates an appropriate environment for addressing the root causes of poverty of Nepal. These policies are also conducive to reducing social, economic and physical vulnerabilities that ultimately contain hazard events from developing into a disaster.

7.1.5 Major Strategies of the Interim Plan Addressing Issues of Poverty Reduction

The following stipulations in the Interim Plan directly or indirectly address the issues of Poverty Reduction as well as Disaster Risk Reduction and Disaster Preparedness.

Quantitative Targets

- Reduce the proportion of the population living below the poverty line from the existing level of 31 per cent to 24 per cent.
- Increase the employment growth rate from the present rate of 3 per cent to 3.5 per cent over the plan period.

Strategies

Create new employment opportunities - by attracting private sector investments in cottage and small-scale industries as well as in the medium scale agro-based industries. The strategy envisages creation of additional employment opportunities by attracting foreign direct investment on the basis of comparative advantage, in the mega hydroelectricity projects, highways, irrigation, tourism, services (education and health), financial sector and bio-diversity promotion and development projects. Construction of rural roads, drinking water, and irrigation projects in the rural areas, as well as through reconstruction programmes in conflict affected areas are envisioned as avenues for creating additional employment, at least for a short period. Production oriented employment will be promoted to reduce unemployment and underemployment. Integrated development of skills, capital and market will be done in order to promote self-employment to the unemployed women and men in the informal and unorganized sectors. Priority will be accorded to industries, professions and programmes based on labour-intensive technology, to generate employment opportunities in the rural areas.

Employment Information Centre' will be established to help the educated unemployed youths get employed, by disseminating information.

Self-employment will be promoted by generating records of the entrepreneurs who want to get involved in self-employment and by giving them necessary training about the promotion of self employment, through the private sector. The economic growth strategy based on inclusion will be made favourable towards poverty alleviation.

Micro-credit programmes are emphasized as yet another avenue for income generation of Dalits, low income women, people with disability, Adibasi Janajatis, Madhesis, and the marginalized people. Access of farmers to institutional agriculture credits will be ensured, with concessional interest rates awarded to poor and the excluded. Co-operatives will

be effectively mobilized by availing wholesale credit to them through commercial banks for rural credit including agriculture and microfinance.

Implement inclusive, targeted and special area specific programmes: these are to be based on both geographic region and social groups in different sector areas.

Training, Technical Back-up Services and Soft Loan to the Youth: Youths, especially of poor and disadvantaged groups will be targeted for income oriented, skill development training with flow of soft loans.

Cooperatives: Promotion of cooperatives for encouraging commercialization of subsistence production system by increasing productive use of small savings, general skills and limited land.

Information Management & Monitoring: This includes establishment of Information Systems on crops production, food security and food needs and supplies, hazard and risks, and effective dissemination of information to stakeholders and communities. Information management system will disintegrate data for gender and social inclusion.

Gender and Social Inclusion: Suggestions and advices will be included at every level from programme formulation to evaluation process on the issues of social inclusion and gender sensitivity. Women and poor farmers below the poverty line will be encouraged to get involved in high value agri-business. Staffs will be evaluated on the basis of the progress made against those targets

All agriculture related policies, sector-specific policies, plan and programmes and all the documents of public interest related to agriculture will be tested for their gender and social inclusion dimensions

Disaggregated information management systems will be developed for gender and social inclusion

Creation of Poverty Reduction and Disaster Risk Reduction Funds

Forest Conservation and Development Fund will be established which will comprise of 10 per cent of the total revenue from the sale 196 of forest products, and 5 per cent of buying price from the buyer. The fund will be used for sustainable forest management and poverty reduction

An Emergency Natural Disaster Relief Fund will be established in the departmental level for immediately addressing natural disasters such as floods and landslides.

Programmes in all sectors, especially local and district level programmes, will ensure stakeholders participation at all stages from programme design, acceptance, implantation ad monitoring. Stakeholders will be oriented on criteria and indicators for ensuring sustainability.

7.2 DISASTER RISK MANAGEMENT

7.2.1 Background

Nepal undertook embarked on a continuous process of improvement and updating of national policies on disaster risk management since in 1982 when the Natural Calamity (Relief) Act was promulgated. Naturally for the time, the Act focused on provisions of immediate response and relief to the affected population by formulating standard norms and also creating institutions such as the Central Disaster Relief Committee (CDRC) and District Disaster Relief Committee. The Act underwent three modifications especially after the Udaypur Earthquake of 1988 and accommodated some elements of preparedness and mitigation.

Following the devastating floods in south-central Nepal in 1993, Government of Nepal in cooperation with UNDP Country Office created working groups on Health, Agriculture & Food, and Logistics and prepared corresponding manuals with the aim of providing structured response to disaster. The Health Working Group subsequently was transformed into Disaster Health Working Group (DHWG) which helped a) prepare Disaster Preparedness and Emergency Response National Plan, and b) played instrumental role in facilitating seismic vulnerability assessment of 19 major hospitals of the country together with the publication of a Guideline for Structural, Non-structural and Functional vulnerabilities of Hospitals.

Nepal participated actively in the process of the International Decade for Natural Disaster Reduction (1990-1999) – in 1994 the National Action Plan (NAP) for Disaster Management was created through a series of five participatory workshops on Preparedness and presented the NAP to the UN World Conference of Disaster Management in 1994 in Yokohama. NAP was subsequently modified and accepted in principle by the government in 1996. Although the NAP could not be included as a mandatory policy, several of its priority programprogrammes were implemented, in part or full, by the related government agencies. NAP positively influenced and helped accelerate disaster risk management activities in the country, especially by triggering involvement of NGO and communities in the process.

Growing disaster awareness, including those by the IDNDR process, allowed Nepal to actively participate in international disaster-related forums, become member of the Asian Disaster Reduction Centre (ADRC), and open doors for implementation of national programprogrammes by different stakeholders in the country.

The Second World Conference on Disaster Reduction (WCDR) and its resolution – the Hyogo Framework for Action 2005-2015 (HFA) became yet another milestone in Nepal efforts for disaster risk reduction. Process is almost complete for the creation of a national platform for DRR, and Disaster Risk Management focal desks have been established at key ministries to develop, implement and monitor action plans for DRR and emergency response planning and capacity development within the jurisdiction of the respective ministries. This will greatly facilitate implementation of the DRR strategies envisioned in the Interim Plan.

1.1.1 Disaster Risk Management in the Interim Plan

The Plan devotes three sections, namely, general disaster (risk) management, water-induced (hydrologic hazards) disaster prevention and DRM in Urban Development, mainly in improving seismic performance of existing and new building structures by the implementation of the building code. Furthermore, the Plan has considered aspects of DRM in other sectors such a health, education, agriculture, forestry, by incorporating DRM activities into the respective sectors.

The following priority programprogramme strategies have been stipulated.

- Disaster Risk Assessment and Mapping
- Formulation and Implementation of the National Strategy for Disaster Risk Management (NSDRM). A draft NSDRM is under the process of being accepted and endorsed by the government. Some of the elements of NSDRM are already under implementation under a joint GoN –UNDP Nepal

under a DEPECHO-funded programprogramme.
- Disaster Awareness programprogrammes
- Capacity Building for DRR, Medical First Response and Collapsed Structure Search & Rescue
- Study and research programprogramme
- Pre-positioning of relief and rescue materials
- Enhancing Capacities of local government and communities in landslide prevention, and control of river bank and soil erosion.

The following strategies have been stipulated for risk reduction in urban sector.
- ImplementationofHealthyCityProgramProgramme in 12 municipalities
- Preparation of digital base maps of 30 municipalities
- Preparation of detail digital land use map of urbanizing VDCs of Kathmandu Valley
- Repair and renovation of government and community buildings
- Repair of about 1000 buildings, and renovation of 15 historic palaces and monuments
- BuildingretrofittingprogramprogrammeRetrofitting of 12 buildings following Building Code
- To update and implement the Building Code and byelaws in the government and private sectors as well.
- Measures to economize and safeguard against earthquake and other disasters will be taken in the construction of all types of buildings in the government and private sectors.
- Information dissemination on the use of available technology will be carried out and local architecture will be followed. Research will be carried out on environment-friendly materials, skills, and appropriate technological development.
- The National Building Code under the Building Law will be updated and implemented.
- Building construction code and bylaws would have been updated and implemented in the government and private sectors as well.
- Capacity development and promotion of national consultants and contractors involved in building construction would have been achieved.
- Appropriate building construction technology and materials would have been developed and utilized.

1.1.2 National Strategy for Disaster Risk Management

The draft National Strategy for Disaster Risk Management (NSDRM), prepared in 2007, still awaits acceptance and implementation by the government. The strongest point of NSDRM is the participatory process of its creation through a series of formal and informal discussions, both technical and policy-related, interviews and SWOT analysis and brain-storming among high level government officials of key agencies and representatives of international agencies and UN system, community representatives, NGO/INGO working in DRM. It thus embodies the consensus of all main disaster-actors and institutions directly or indirectly related with aspects of disaster risk reduction in Nepal.

Main elements of NSDRM are:

a. Definition of a new institutional structure with a national commission on disaster risk management (NCDRM) and a National Authority for Disaster Risk Management (NADRM). NSDRM cascades down through districts and municipalities to the village level, with horizontal linkage and communication with development and governance agencies at national, district, municipal and village levels.

b. The NSDRM provides a comprehensive road map the country should follow in the next decade or two in aspects of disaster risk management. The format of the road map follows the Hyogo Frameworks for Action 2005-2015 (HFA) to which Nepal has expressed her total commitments in international conferences and other forums.

c. Priority strategies and programprogramme directions included in NSDRM are of three types, namely, i) sector-specific, and ii) cross sectoral. The third group of priority listing belongs actually to the cross-cutting themes and approaches.

Annex E provides the listing of the priority strategies included in NSDRM.

The sector-specific strategies are focused on addressing the identified gaps in particular sectors. They are

divided into the five Priorities for Action. The following sectors have been considered:

- Agriculture and Food security
- Health
- Education
- Shelter, Infrastructure and Physical Planning
- Livelihood Protection
- Water and Sanitation
- Information, Communication, Coordination and Logistics
- Search and Rescue, and Damage and Needs Assessment

NSDRM will also guide formulation of the appropriate legislation. A parallel process for developing a new Disaster Risk Management Act has been underway anda draft Act has been prepared. The draft Act is proposed to replace the current Natural Calamity (Relief) Act 1982. The draft needs to be made commensurate with the stipulations of NSDRM in order to augment its implementation. Therefore, promulgation, implementation and follow-up of the NSDRM is the most important task of today for Nepal.

While the National government is the ultimate responsible agency for implementing the Strategy, the latter envisages decentralization of authority as well as responsibilities. Implementation of the Strategy foresees significant responsibilities and contribution from all stakeholders – central and local government agencies and institutions; civil society, including NGOs, volunteer groups and the CBOs; the academia and private sector; the UN system; and other external development partners. Integration of DRR into the development process and promotion of international and regional cooperation in DRM is the agreed approach for implementing the Strategy.

7.3 THE JOINING UP OF POVERTY REDUCTION AND DRM APPROACHES

The description in the above section shows that the poverty reduction strategy being implemented in Nepal has matured in terms of understanding and efforts to address the root causes of poverty. The Three-Year Interim Plan, which bases itself on these understanding including those stipulated in sector-specific plans such as the National Agriculture Policy, National Water Plan, National Health Policy and the Nepal Environmental Policy and Action Plan, etc., has stipulated strategies that consider such required elements as coping strategies at household and community levels with specific focus on marginalized and disadvantaged population, assets and consumption smoothing, livelihood diversification, strengthening social safety nets etc. Similarly, both the Tenth Plan and the Interim Plan have specifically considered aspects of disaster risk management including incorporation of DRR into sector-specific strategies, albeit based on consideration of the need to address possible hazard impact on development infrastructure and processes.

On the other hand, strategies for disaster risk management also reflect the ground realities and the need to incorporate social, economic, cultural and human aspects into the DRR agenda and consequently advocating multi-stakeholders participation, community-based approaches, respect of indigenous knowledge and age-old disaster coping strategies and practices.

However, all these efforts both in poverty reduction and in DRR, are being made on ad hoc basis, there are no structured and organized linkage and merger between the two series of efforts. Specialists and policy instruments of poverty reduction work independent which is reflected in lack of organized DRR strategies. For example, Nepal's MDGs does not mention DRM. Similarly, DRM specialists and institutions are only started coming out of the box and from the hangover of being overly dependence on science and technology and have started considering the human

aspects – social, economic, cultural, aspects of DRM. The interface of DRR with poverty reduction is not in their active mind set so far.

Other main hindrance to this process is the lack of awareness on the need of such merger of the two strategies at all levels. Political personnel yet not convinced on the benefits of DRR and are focussed on emergency response. Government officials are busy with the myriad problems of conflicting priorities to provide basic education, health, infrastructure etc because of lack of institutionalization of the concept and the process. There is much to do to bring in corporate sector into DRR processes so that they find benefits of DRR as an instrument of poverty reduction. Capacity building and awareness is necessary at all levels.

Perhaps the best platform for such inter-linkage between poverty reduction and DRR/DRM could be provided by the implementation of NSDRM. Adoption by the government of the NSDRM and its implementation will greatly accelerate such merger.

7.4 EMERGING STRATEGIES OF INTERNATIONAL DEVELOPMENT PARTNERS

One of the important aspects of both poverty reduction and disaster risk management efforts in Nepal is the support of international development partners - bilateral and multi-lateral. There is a perceptible changes in development support strategies of the partners and Nepal has not only to understand such emerging trends but also gear herself to accommodate with such changes.

The Japan Government, through the Japan International Cooperation Agency (JICA), is one of the largest donors for the development process in Nepal. Recent changes in the JICA strategy calls for emphasis on: a) community-based disster risk management approaches, b) working with national/local NGOS as partners in JICA programmes, and c) incorporation of disaster risk reduction initiatives into development projects rather than implementing DRR as stand-alone projects (verbal communication by JICA Study Mission, September 2008, Kathmandu).

A scoping study on links between disaster risk reduction, poverty and development by the UK Department of International Development (DFID, 2004?) makes the following core recommendation – " … DFID and the wider community of bilateral donors should establish and implement time-bound strategies for incorporating the reduction of risk from disasters as a central concern of development policy and programmeming as well as of humanitarian work, and for promoting and supporting a risk reduction agenda amongst their various development partners globally".

Another study "Linking Poverty Reduction and Disaster Risk Management" by German Technical Cooperation Agency (GTZ), in association with the German Committee for Disaster Reduction (DKKV) and the University of Bayreuth (GTZ, 2005) recommends " integration (of DRR efforts into PRSPs)", emphasizes "strengthening capacities and responsibilities at all decision-making levels", and advises beneficiary national governments to "integrate disaster concerns into the formulation, implementation, and budgeting of Poverty Reduction Strategies, and Integrate poverty concerns into the national action plans for disaster risk management ……".

The above-mentioned integration of the two approaches is being adopted by the donor countries, therefore, Nepal should consider these trends and prepare suitable national strategies accordingly.

Again, establishment of the National Commission for Disaster Risk Management (NCDRM) and under it, the National Authority for Disaster Risk Management (NADRM), and implementation of the NSDRM would provide the basis for the formulation and articulation of suitable strategies for international cooperation in national development efforts.

8 CONCLUSIONS & NEXT STEPS

8.1 CONCLUSIONS

The following are the main conclusions of the study.

1. Nepal faces a multitude of hazards: fires, floods, landslides, epidemics, and thunder/hail storms are the most frequent. In terms of casualties, epidemics are the most lethal hazard followed by landslides, flooding and fire. Earthquakes are not frequent, but even medium-sized earthquakes have inflicted huge number of deaths and injury. Earthquakes also destroy significant numbers of buildings – the total number of buildings destroyed by the two major earthquakes is second only to those damaged/destroyed by all flood events. In terms of population affected, flood occupies the highest position – 68 per cent of the population affected by disasters over the past three decades have been affected by floods. There were about 5 million people affected by devastating natural hazard events in the past three decades. This figure does not include the population affected by earthquakes, because earthquake-affected population have not been recorded in the past.

2. Disaster data for the past three decades show an increasing trend of occurrence, intensity as well as mortality and injury from natural hazards. Natural hazards and the resulting disasters are inflicting growing losses to the national economy - annual direct loss due to disasters is estimated approximately at NRs16,120 million.

3. Nepal suffers 1.14 deaths and twice as many injuries per day from natural disaster events. And on average, Nepal loses 26 buildings to different forms of disasters. The direct monetary loss for the period 1971-2003 is estimated (at 2004 values) to be NRs531,959 million (NSET, 2005), giving an annual loss of NRs16,120 million (c. US$200 million). This is a huge and unaffordable loss for Nepal. Disaster risk reduction should, therefore, be solidly ingrained into the economic development process.

4. Following the criteria adopted by GAR to distinguish intensive disaster from extensive disasters, the present study also adopted classification of intensive risk disasters as the one with ≥50 deaths and/or ≥ 500 buildings destroyed by a single event. Accordingly, 109 of the total 15,388 disaster events are intensive and the rest are the small and medium sized local events. Thus less than 1 per cent the disasters are intensive, and they account for about 25 per cent of deaths, 16 per cent of total injuries, 30 per cent of all disaster-affected population, and more than half of all buildings destroyed/damaged by disasters. While there is a considerable concentration of impact due to smaller number of intensive events, cumulatively, these small and medium-sized disaster events kill more than three times more people, injure about 5.3 times more persons, and affect more than 2.4 times the population that due to the large events. Thus, the impact of extensive risk disasters reveals the inherent vulnerabilities of Nepalese life much more precisely than intensive risk disasters - even if they are more dramatic and attention-grabbing. Without considering the small and medium disasters, it is impossible to understand fully the economic and social meaning of natural disasters.

5. Disaster reports at the national level are much more detailed than those at the global level. Only a local database such as the DesInventar databse can allow such detailed analysis of disaster occurrence and impacts. In international reporting on disasters, many local disaster events are not recorded and the picture portrayed at the global level is therefore not necessarily appropriate for developing national strategies on disaster risk reduction.

6. Poverty has declined in Nepal over the years, but remains widespread. Nepal is one of the poorest countries in South Asia. There is a wide variation in monetary poverty between urban and rural areas and across geographical regions. Similar disparity in variation of poverty is evidenced by non-monetary indicators of welfare such as health outcomes, human poverty indices and subjective poverty rates. There is a visible gender gap: women get lower social, education and health outcomes.

7. Certain segments of the population have been excluded from mainstream economic and social processes by causative factors such as location, gender, ethnicity, and economic status. Excluded groups include the poor, women, Madheshis,

disadvantaged ethnic minorities and residents of rural areas and remote western regions.

8. A correlation analysis using district level data on poverty and disaster impact could not provide evidence of clear relationship between poverty rate and aggregate disaster indicators.

9. Similar analysis using ilaka level data and separate indicators for five hazard types (epidemics, fire, flood, drought, and earthquake) indicated that areas with more people affected by epidemics in the past had higher poverty measures. However, areas affected by higher levels of flood disasters are found to have lower poverty rates. Similar results were obtained when the data were subject to multiple regression analysis – a positive association between poverty rate and epidemics and a negative association between poverty rate and floods were found. Thus epidemics and landslides are associated with higher poverty while flood appears to be positively influencing decrease of poverty! This could be controversial statement! Although, several arguments have been put forward to substantiate such findings, it seems that the results could have been influenced by the lack of condideration of the impacts in terms of value of lost human lives, the indirect losses, and the difference in the flood impact in the hills/mountains and the flat plain of the Terai where vast areas are inundated as compared to a flood in the mountains.

8.2 RECOMMENDATIONS

The study used secondary data on disasters and life standard survey. There were various limitations on the use of such data, especially for analyzing the relationship between poverty rates and disaster occurrence. The existing data on poverty as well as on disaster were not collected for analysis and there was locational mis-match between the two data sets. Moreover, no field visits were conducted to verify the outcomes. We strongly recommend a more detailed field survey and investigation for detailing and verifying the outcome.

There is need for further research on the two-way relationship between poverty and hazards using more disaggregated data. If we want to gain a better understanding of how disasters affect poverty in the context of Nepal, it will be necessary to utilize data from a living standards survey that includes questions on hazard experience. It is recommended to work closely with the Central Bureau of Statistics to ensure the inclusion of a hazard module in the next round of household surveys conducted by CBS. Hazard data at the household level would also be useful for studying how poverty affects the likelihood of hazard losses.

More specifically, it is recommended to develop a specific research framework to study the relationship between poverty and disaster impacts. Obviously, both the system of disaster information management and the researches on poverty should consider the need of such relational study and hence the study/research design should be mutually consultative in future.

For this, as well as for mainstreaming DRR into the development process, government and research institutions should encourage and facilitate dialogue and deliberation among specialists of DRR and poverty reduction planning and implementation. Likewise, closer integration DRR and poverty reduction initiatives should be a part of the wider goal of mainstreaming DRR into development.

The recently approved National Strategy for Disaster Risk Management needs to be implemented at the earliest as it provides the required institutional, policy and legal environment for such integration as well as for considering cross-cutting issues by the two approaches congruently.

International partners of progress in Nepal should assist the country by incorporating the concept of integrating DRR and poverty reduction initiatives, especially into the PRSP processes. Lack of awareness and capacities is a hindrance – therefore capacity enhancement should be one of the strategies included in the bilateral or multilateral assistance programmes.

Monitoring of disaster and poverty rate reduction should be continued with joint work in overlapping areas.

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METHODOLOGICAL ANNEX

Annex A: Relationship between poverty and hazards

A.1 Measuring poverty

The poverty status of a household in any particular year is determined by comparing its per capita expenditure with a year-specific poverty line. In this report, we use poverty lines derived by the Nepal Central Bureau of Statistics (CBS) using the Cost-of-Basic-Needs (CBN) approach. And we use the Forster-Greer-Thorbecke family of poverty measures to estimate poverty for geographical areas of interest. Details about the poverty lines and poverty measures used in our analyses are presented below.

Poverty lines

The methodology used by CBS divided the nation into six regions and derived a poverty line for each region for each of the two NLSS years (1995/96 and 2003/04). The first step in this derivation was the estimation of the 1995/96 CBN poverty line for rural eastern Terai. Once this poverty line was derived, regional and region-specific inter-temporal price indices were used to adjust for cost-of-living differences among regions and estimate the region-specific CBN poverty lines for each year. The five step approach to deriving the 1995/96 CBN poverty line for rural eastern Terai is as follows (CBS 2005):

1. Determination of a nutritional norm: The nutritional norm for an "average" Nepal household was determined to be 2,124 kcal / day.

2. Determination of a food basket: A food basket of 37 food items that yielded the required 2,124 kcal identified.

3. Estimation of cost of food basket: The cost of this basket in rural eastern Terai was determined to be Rs. 3,114 per year per person.

4. Determination of expenditure on non-food items: The average non-food expenditure per person (for an individual whose food consumption is close to the food poverty line) was estimated at Rs. 1,540.

5. Determination of the poverty line: Adding the non-food expense to the cost of the food basket

Table A.1:CBN Poverty Lines in Current Prices per Person per Year (1995/96 and 2003/04)

	Poverty line for 1995/96 (Rs.)			Poverty line for 2003/04 (Rs.)		
Region	Food	Non-Food	Total	Food	Non -food	Total
Kathmandu	4,033	2,643	6,676	6,722	4,335	11,057
Other urban	3,539	1,913	5,452	4,919	2,982	7,901
Rural Western Hill	3,813	1,590	5,403	5,613	3,289	8,902
Rural Eastern Hill	3,946	1,788	5,734	5,311	2,759	8,070
Rural Western Terai	2,950	1,224	4,173	4,308	3,110	7,418
Rural Eastern Terai	3,114	1,541	4,655	4,323	1,756	6,079

Source: CBS (2005)

yielded a CBN poverty line of Rs. 4,655 in rural eastern Terai prices.

The estimated region-specific CBN poverty lines are presented in Table A2.1.

Poverty indices

In order to measure poverty in a specified area, we use the poverty headcount, poverty gap and poverty squared gap indices from the FGT (Foster, Greer, Thorbecke) family of poverty measures. These indices can be represented by the equation below:

Where N is total population, n is total poor population, □ is a measure of the sensitivity of the index to poverty, z is the poverty line, and Yh is the actual income for poor individuals.

When □ is set equal to 0, is simply the headcount index or poverty rate. When □ is set equal to 1, is the poverty gap index, and when □ is set equal to 2, is the squared poverty gap index. Note that P1 shows "how far below the poverty line the poor are on average as a proportion of that line" (CBS 2005: 3), while P2 not only looks at the depth of poverty but also gives more weight to the poorest of the poor, thereby reflecting the severity of poverty and inequality among the poor.

A2.2 Data sources and data gaps

We use the following data in our analyses:

1. The Nepal Living Standards Survey household level poverty related data from the Central Bureau of Statistics (CBS 2005): CBS has conducted two rounds of the NLSS survey, the first in 1995/96 and the second in 2003/2004. The NLSS datasets include cross section data for 1995/96 and 2003/04 and a panel dataset for 1995/96-2003/04. We primarily use the NLSS II (2003/04) cross section data and the NLSS panel data. The NLSS II dataset includes a nationally representative sample of 3912 households. The panel dataset includes 962 households in the sample.

2. District level human development related data from UNDP (UNDP 2007): This dataset includes district level estimates of the three FGT poverty measures for 2003/04 as well as different indicators of human development and depravation for 2001.

3. Ilaka level poverty related data from study "Small Area Etimation of Poverty, Caloric Intake and Malnutrition" (CBS and WFP 2006): This dataset includes estimates of poverty and nutritional status indicators derived from a combination of the NLSS II data, the 2001 Nepal Demographic and Health Survey data (MoHP 2002), and the 2001 Population Census data (CBS 2002). The poverty and nutritional status indicators are available for 963 of the 976 ilaka s in the country.

4. Disaster related data from the Nepal DesInventar database: This database includes data on 26 different types of disaster events at the village development committee level. It uses 14 different indicators to represent disaster impact. Information on hazard-specific exposure, however, is not avialable.

Others: District level data on the intensity of violent conflict between 1996 (start of the Maoist insurgency) and 2003 (year when NLSS II was conducted). Data on the number of district level killings have been obtained from the Nepali non-governmental human rights organization Informal Sector Service Centre (INSEC) (INSEC 2005).

From the perspective of analyzing the relationship between poverty and hazards, the most glaring data gap is the absence of household-specific data on disaster experience. Hence, in this report we have used areas-specific (VDC level) disaster data. Using disaster data at the VDC level assigns the same disaster indicator value to all households belonging to a given VDC even though some of the households might not have been impacted by the hazard. Another data gap is the absence of information on the determinants of hazards such as rainfall and other climatic conditions. We have not been able to analyze how poverty affects the likelihood of disaster losses because of this data limitation

ANNEX B: DATA ANNEX - POVERTY RELATED DATA

Table B.1:HDI trends in South Asia, 1975-2005

Country	1975	1980	1985	1990	1995	2000	2005
Nepal	0.301	0.338	0.38	0.427	0.469	0.502	0.534
India	0.419	0.45	0.487	0.521	0.551	0.578	0.619
Bangladesh	0.347	0.365	0.392	0.422	0.453	0.511	0.547
Sri Lanka	0.619	0.656	0.683	0.702	0.721	0.731	0.743
Pakistan	0.367	0.394	0.427	0.467	0.497	0.516	0.551

Source: UNDP (2007)

Table B.2:GDP per capita trends in South Asia, 1975-2005

Country	1975	1980	1985	1990	1995	2000	2006
Nepal	116	128	154	190	203	225	323
India	158	267	301	374	382	453	822
Bangladesh	246	204	215	267	300	338	397
Sri Lanka	281	273	377	472	718	844	1356
Pakistan	160	286	329	371	495	536	798

Source: UNDP (2007)

Table B.3:District level poverty-related data, 2001

District	P0 (poverty rate)	P1 (poverty gap)	P2 (squared poverty gap)	Population	Household size	Life expectancy (years)	Adult literacy (%)	HDI	HPI
TAPLEJUNG	0.518	0.17	0.075	134698	5.44	61.94	47.3	0.467	38.4
PANCHTHAR	0.525	0.17	0.074	202056	5.42	64.51	50	0.484	42.1
ILAM	0.397	0.121	0.051	282806	5.18	64.73	61.5	0.521	33.7
JHAPA	0.134	0.031	0.011	688109	5.01	58.49	62.2	0.494	29.2
MORANG	0.172	0.041	0.015	843220	5.02	67.28	52.3	0.531	34.4
SUNSARI	0.212	0.052	0.019	625633	5.2	61.86	56.2	0.5	32.2
DHANKUTA	0.46	0.144	0.062	166479	5.11	64.9	58.6	0.507	34.4
TERHATHUM	0.425	0.13	0.055	113111	5.47	67.78	54	0.523	40.9
SANKHUWASABHA	0.487	0.151	0.064	159203	5.17	63.78	47.5	0.481	43.5
BHOJPUR	0.525	0.168	0.073	203018	5.14	64.64	46.8	0.472	43.6
SOLUKHUMBU	0.463	0.141	0.059	107686	4.97	65.94	39	0.479	45.8
OKHALDHUNGA	0.427	0.128	0.053	156702	5.2	69.39	41.7	0.481	46
KHOTANG	0.535	0.175	0.077	231385	5.4	61.37	43.1	0.442	42.8
UDAYAPUR	0.508	0.161	0.069	287689	5.58	68.03	47.3	0.488	40
SAPTARI	0.28	0.068	0.024	570282	5.64	63.13	44	0.453	40.2
SIRAHA	0.29	0.07	0.025	572399	5.72	63.38	34.8	0.427	47.1
DHANUSA	0.269	0.063	0.022	671364	5.72	62.04	44.7	0.449	41.4
MAHOTARI	0.291	0.069	0.024	553481	5.87	63.2	30.1	0.407	50.6
SARLAHI	0.264	0.061	0.021	635701	5.72	62.95	30.3	0.408	49.8
SINDHULI	0.603	0.209	0.094	279821	5.74	66.05	42.3	0.469	48.3
RAMECHHAP	0.48	0.148	0.063	212408	5.26	65.16	31.2	0.434	53.4
DOLAKHA	0.336	0.092	0.036	204229	4.73	63.5	42.2	0.45	44
SINDHUPALCHOKE	0.37	0.102	0.04	305857	5.06	60.02	31	0.414	51.1
KAVRE	0.351	0.111	0.048	385672	5.47	69.33	56.1	0.543	33.5
LALITPUR	0.101	0.028	0.011	337785	4.9	67.1	66.9	0.588	25
BHAKTAPUR	0.087	0.02	0.007	225461	5.47	71.33	64	0.595	29.9
KATHMANDU	0.044	0.01	0.004	1081845	4.6	69.53	73.5	0.652	25.8
NUWAKOT	0.374	0.109	0.044	288478	5.43	63.57	42.5	0.463	43.8
RASUWA	0.509	0.162	0.069	44731	5.14	54.75	25.4	0.394	54.5
DHADING	0.433	0.133	0.056	338658	5.4	58.55	34.3	0.41	47.7
MAKWANPUR	0.43	0.141	0.062	392604	5.52	55.75	58	0.479	35.3
RAUTAHAT	0.302	0.071	0.025	545132	6.18	63.51	28.1	0.409	51
BARA	0.269	0.063	0.022	559135	6.38	60.72	36.7	0.465	45.5
PARSA	0.235	0.055	0.019	497219	6.26	60.71	37.8	0.448	44.4
CHITAWAN	0.119	0.029	0.011	472048	5.08	58.78	65.4	0.518	31.9
GORKHA	0.382	0.112	0.046	288134	4.89	60.5	44.9	0.454	41.7
LAMJUNG	0.315	0.091	0.037	177149	4.85	64.41	49.2	0.492	37.5
TANAHU	0.346	0.105	0.044	315237	5.01	68.79	54.4	0.524	42
SYANGJA	0.351	0.105	0.044	317320	4.9	67.71	57.5	0.535	35.3
KASKI	0.111	0.029	0.012	380527	4.47	70.76	66.8	0.593	24.9
MANANG	0.212	0.051	0.018	9587	5.4	57.03	52.2	0.502	37.9
MUSTANG	0.258	0.064	0.023	14981	4.62	57.03	47.8	0.482	41.5
MYAGDI	0.348	0.098	0.039	114447	4.68	66.62	48.9	0.498	40.3
PARBAT	0.341	0.1	0.041	157826	4.82	65.76	51.2	0.504	35.5
BAGLUNG	0.402	0.12	0.05	268937	5.02	63.54	55	0.492	35.7
GULMI	0.425	0.131	0.056	296654	5.01	64.82	50.5	0.467	39.4
PALPA	0.429	0.135	0.058	268558	5.38	59.64	60.7	0.486	33

District	P0 (poverty rate)	P1 (poverty gap)	P2 (squared poverty gap)	Population	Household size	Life expectancy (years)	Adult literacy (%)	HDI	HPI
NAWALPARASI	0.363	0.109	0.045	562870	5.72	63.68	46.9	0.482	40.2
RUPANDEHI	0.3	0.084	0.034	708419	6.01	68.27	62.2	0.546	29.2
KAPILBASTU	0.401	0.115	0.046	481976	6.61	62.53	35.8	0.437	48.5
ARGHAKHANCHI	0.441	0.137	0.059	208391	5.1	62.54	47.7	0.471	40.5
PYUTHAN	0.515	0.164	0.071	212484	5.29	61.69	37.8	0.416	47.9
ROLPA	0.587	0.184	0.078	210004	5.45	58.05	31.1	0.384	53.1
RUKUM	0.491	0.143	0.058	188438	5.62	56.79	30	0.386	53.7
SALYAN	0.455	0.133	0.054	213500	5.61	56.79	40.5	0.399	48.2
DANG	0.429	0.127	0.052	462380	5.6	50.57	52.1	0.409	41.4
BANKE	0.412	0.124	0.051	385840	5.74	60.38	53.4	0.479	34.4
BARDIYA	0.449	0.128	0.051	382649	6.42	60.81	39.4	0.429	43.2
SURKHET	0.47	0.147	0.062	288527	5.34	62.69	56.3	0.486	44.6
DAILEKH	0.516	0.159	0.067	225201	5.47	55.83	39.9	0.381	52.5
JAJARKOT	0.441	0.124	0.049	134868	5.59	51.9	28.1	0.343	57.2
DOLPA	0.397	0.105	0.04	29545	5.08	52.52	29	0.371	61.9
JUMLA	0.344	0.086	0.031	89427	5.64	50.82	26.6	0.348	56.8
KALIKOT	0.568	0.18	0.076	105580	5.71	46.67	33.2	0.322	58.9
MUGU	0.51	0.155	0.065	43937	5.32	44.07	24.1	0.304	61.1
HUMLA	0.415	0.111	0.042	40595	5.84	58.37	19.6	0.367	63.8
BAJURA	0.482	0.148	0.063	108781	5.34	45.67	27.1	0.31	56.4
BAJHANG	0.473	0.143	0.06	167026	5.84	49.69	29.1	0.331	59.9
ACHHAM	0.516	0.16	0.068	231285	5.26	55.18	25.8	0.35	59.2
DOTI	0.464	0.143	0.061	207066	5.68	58.39	35.4	0.402	53.4
KAILALI	0.504	0.155	0.065	616697	6.53	58.39	46.5	0.442	39.5
KANCHANPUR	0.424	0.128	0.054	377899	6.28	57.39	53.6	0.463	35.2
DADELDHURA	0.403	0.119	0.049	126162	5.74	56.62	43.4	0.434	46.2
BAITADI	0.368	0.101	0.04	234418	5.8	52.31	44.9	0.391	48.7
DARCHULA	0.377	0.109	0.044	121996	5.8	56.43	41.5	0.424	45.4

ANNEX C: DESINVENTAR DATABASE SPECIFICATIONS

Table C.1:Definition of Terms used

Terms	Definition
DesInventar	It is an instrument of systems (an information system), for homogeneous storing, analysis and spatial-temporal graphical representation of the disasters.
Natural Disasters	According to the Natural Disaster Relief Act (NDRA), 1982 A.D. Natural Disaster means earthquake, fire, storm, flood, landslide, heavy rain, drought, famine, epidemic and other similar natural disaster. It also includes the industrial incident or accident caused by explosions of poisoning and any other kinds of disaster.
Event	Event is quite different from disasters. Event is defined as any social-natural phenomena that can be considered as a threat to life, properties and infrastructures. An event can cause as many disasters as there are geographical units vulnerable to it (LARED, 1994) Pertinent natural disaster events relevant to Nepalese context were defined through meetings among the project team and the professionals of different institutions who were the participants of DesInventar training previously. It was found during the definition of disaster events that all events enlisted by the "DesInventar" development team are not relevant to Nepalese context. So, some adaptation was done in the system to suit the local condition. Followings are major events identified in the context of Nepal for the current project: Earthquake, Fire, Storm, Flood, Landslide, Heavy rain, Famine, Drought, Epidemic, Sedimentation, Glacier Lake Outburst Flood (GLOF), Avalanches, Snow Storm, Hail Storm, Thunder Storm, Frost, Leak, Forest Fire, Explosion, Plague, Panic, Pollution, Structural Collapse, Boat Capsize, Cold wave, Heat, Wave, Accident and Strong Wind
Data Card Number	A serial number of natural disaster recorded in the data collection format for a particular geographical location. Data card numbers are initiated by last two figures of the respective years. For example: 23rd data card for the year 1971 is recorded as 71023. The dada card number does not reflect the number of events because single event may be reported from different affected area. For example: a single earthquake may affect different areas and many data cards can be created for each affected area to the level of maximum geographical location of Municipalities/VDCs if information is available.
Cause	Cause is an activity that promotes to occur an event. Event may also act as the cause for another event. For example: Heavy rain, is an event with lots of damage, may promote flood.
Magnitude	The magnitude shows the scale of event like earthquake Richter scale, rainfall, wind speed etc. This alphanumeric field is used to enter international magnitude values for seism, volcanic eruption, tsunami, and hurricane-tropical storm
Dead	It corresponds to the number of people who died due to direct cause, whether immediately or time after the disaster.
Injured	It corresponds to the number of persons with bodily injuries. If the cause is plague or epidemic, the sick people are included under this category (as identified injured).
Victims	Number of people whose individual or collective property and/or services have suffered serious damage directly associated to the event. For example, partial or total destruction

Terms	Definition
	of homes and property; loss of crops and/or warehouses etc. This group also includes evacuees or resettled people, whether temporarily or not. If the information is available by family, the number of people must be estimated based on indicators available.
People Missing	It corresponds to the number of persons whose whereabouts as from the effects of the disaster are unknown. It includes people presumed dead without physical evidence. Data on dead and missing persons are mutually exclusive; therefore, avoid grouping them.
Affected People	It corresponds to the number of people who suffer indirect or secondary effects associated to a disaster. These persons, different from "victims", suffer the impact of secondary effects of disasters for reasons such as deficiencies in the provision of public services, the hampering of trade and work, isolation, or their mental health may be affected. If the information is available by family, the number of people must be estimated based on indicators available.
Relief	Any relief work to be carried out in the area affected or likely to be affected by the natural disaster in order to remove the grief and inconvenience caused to the people, to rehabilitate the victims of the natural disaster, to protect the public property and life and property of the people, to control and prevent the natural disaster and to make advance preparation thereof.
Evacuees	Evacuees refer to number of people temporarily evacuated from their homes. If the information is available by family, the number of people must be estimated based on indicators available.
Building Destroyed	This refers to buildings that have collapsed, or have been swept, submerged or damaged in such a manner that they are not habitable.
Building Damaged	This refers to buildings that suffered minor damage other than structural or architectural, and continue to be habitable, although requiring basic repairs and cleaning.
Data-card number	Data card number is a serial number of natural disaster recorded in the data collection format for a particular geographical location for the current project. Data card numbers are initiated by last two figures of the respective years. For example: 23rd data card for the year 1971 is recorded as 71023. The dada card number does not reflect the number of events because single event may be reported from different affected area. For example: a single earthquake may affect different areas and many data cards can be created for each affected area to the level of maximum geographical location of Municipalities/VDCs if information is available.

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Table C.2:Grouping of Disaster Type as used in Nepal DesInventar Database

Disaster Group	Disaster Type	Description
Epidemiological	Epidemics	A relatively slow-onset short term (days, weeks, months maximum) event, when a biological disease attacks many individuals in a same community, such as cholera, typhoid, bubonic plague and others.
	Plague	Proliferation of insects and rodents (rats, fleas, locusts and others), that host dangerous micro-organisms, which have fatal effects on communities, agriculture or cattle.
Geological		EarthquakeA sudden, transient motion or trembling of the earth's crust, resulting from the waves in the earth caused by faulting of the rocks or by volcanic activity.
`	Landslide	All mass movements other than surface erosion of a hillside. This even includes events caused by precipitation of earth, setting, horizontal land thrust, mass movement, displacement, subsidence, collapse of caves or mines, rock falls, (slow or quick) detachment of soil masses or rocks on watersheds or hillsides. This event includes report of "fault" in hillside slopes or along, roads, canels and excavations.
Human Induced	Boat Capsize Explosion Fire Panic	Overturning of a boat in the river or in lakes due to natural phenomenon.
	Pollution	Concentration of polluting substances in the air, water or soils, at levels harmful to human health, crops and or animal species.
	Structural	(can be included in effects if triggered by a Collapsenatural phenomenon) Damages or collapse of any type of structure for reasons such as excess weight in public places, bridges and others. This event includes damage that, although not taking the structures to the point of collapse, does make them unusable. These events are usually reported as "faults (in the sense of "structural defect"). Damages in structures caused by natural phenomena are reported as an effect of these phenomena.
	Accident	Limited to accidents induced by natural phenomena, such as landslides, earthquakes, hurricanes, rain and other natural hazards.
Weather Related		
	Avalanche Cold wave	Swift sliding of loosened ice and/or snow masses.

Disaster Group	Disaster Type	Description
	Drought	Usually dry season, without rain or with rain deficit. As a whole, these are long periods (months, years, and even decades) typical in limited continental areas or on regional scales.
	Famine	
	Flood	Violent water flow in a watershed or along the river stream, some times reported as (sudden, swift) overflowing or as torrent. They can be caused by rain, dam bursting or abundant landslides on a watershed or basin.Forest fireThe event includes all open-air fires in forest areas,natural and artificial forests, etc. caused by natural or human phenomenon.
	Hail storm	Precipitation of hail that is frozen raindrops, which fall violently in the form of hard pellets and not as snowflakes.
	Heat wave	Rise of atmospheric average temperature well above the averages of a region, with effects on human populations, crops, properties and services.
	Rains	Precipitation that is persistent or torrential, and exceeding the rainfall averages and or duration of a specific region. Rain includes terms such as downpour, cloudburst, heavy shower, deluge, persistent drizzle and or squalls (caused due to differential land and water body pressure conditions.
	Snow storm	
	Storm	Rain accompanied by strong winds and/or electric discharge (lightning). It is referred to as thunderstorm when, there is a concentration of atmospheric static discharges (lightning) with effects on people, cattle, domestic properties, infrastructure (like causing blackouts), and industries.
	Strong wind	
	Thunder storm	
Others	Biological	Destruction of biological species for known or unknown reasons. These events may be associated to pollution or drastic changes in environmental parameters.
	Others	
	GLOF (Glacier Lake Outburst Floods)	A glacier lake outburst flood (GLOF), can occur when a lake contained by a glacier or a terminal moraine dam fails. This can happen due to erosion, a buildup of water pressure, an avalanche of rock or heavy snow, an earthquake or cryoseism, or if a large enough portion of a glacier breaks off and massively displaces the waters in a glacial lake at its base. (source – wiki)

Table D.1:Number of deaths and other losses due to natural disasters 1971– 2007

Event	Data-cards	Deaths	Missing	Victims	Affected	Houses Destroyed	Houses Damaged
ACCIDENT	97	112	3	-	5	-	-
AVALANCHE	90	217	33	-	1,012	27	1
BIOLOGICAL	12	-	-	-	-	-	-
BOAT CAPSIZE	103	240	421	-	354	-	-
COLD WAVE	192	298	-	-	1,453	-	-
DROUGHT	152	-	-	-	1,512	-	-
EARTHQUAKE	94	873	-	-	4,539	33,708	55,312
EPIDEMIC	2,791	15,730	-	4,582	460,902	-	-
EXPLOSION	40	32	-	-	19	4	-
FAMINE	20	2	-	-	83,902	-	-
FIRE	3,880	1,101	186	-	218,278	63,243	1,453
FLOOD	2,720	2,936	578	-	3,367,974	78,830	75,274
FOREST FIRE	98	24	403	-	10,178	1,698	1
HAIL STORM	597	57	2	-	197,843	172	1,570
HEAT WAVE	31	25	-	210	261	-	-
LANDSLIDE	2,184	3,987	517	-	479,972	16,878	8,573
OTHER	97	77	11	-	11,982	68	-
PANIC	2	85	-	-	-	-	-
PLAGUE	326	11	-	-	50	-	-
POLLUTION	12	-	-	-	1,000	-	-
RAINS	187	82	3	-	62,431	675	729
SNOW STORM	174	69	828	-	7,600	102	58
STORM	109	50	2	-	1,817	1,017	479
STRONG WIND	292	140	-	-	6,161	493	3,346
STRUCT.COLLAPSE	324	340	7	-	1,508	1,101	608
THUNDERSTORM	764	768	1	-	5,809	297	206
TOTAL	15,388	27,256	2,995	4,792	4,926,562	198,313	147,610

ANNEX D: DESINVENTAR DATABASE OF NEPAL (NEPAL DESINVENTAR)

Table D.2:Major intensive disaster events and their impact on population and houses in Nepal (1971 – 2007)

SN	Primary	Year and Month of Occurrence	Affected	Districts	Deaths	Injury	Missing	AffectedHouses
1	FIRE	1975/05	Mahotari	-	-	-	26,670	109
2	EPIDEMIC	1979/08	Dhanusa, Mahottari	120	-	-	1,000	-
3	FLOOD	1979/08	Rautahat	-	-	-	50,000	500
4	EARTHQUAK	1980/07	Darchula, Bajhang, Baitadi,	123	236	-	-	24,826
5	FLOOD	1981/09	Rupandehi, Palpa	40	-	105	39,500	127
6	FLOOD	1983/08	Siraha	-	-	-	-	1,000
7	EARTHQUAK	1988/08	Sunsari, Dhankuta, Panchthar, Bhaktapur, Morang, Terathum, Sankhuwasabha, Sindhuli, Ramechhap, Kavre, Udayapur, Bhojpur, Okhaldhunga, Khotang, Khotang, Ilam, Saptari,	744	6,312	-	-	57,764
8	FLOOD	1990/08	Rautahat	-	-	-	-	1,300
9	EPIDEMIC	1991/06	Baitadi, Darchula	142	-	-	960	-
10	FOREST FIRE	1992/04	Saptari	2	-	-	9,180	1,500
11	EPIDEMIC	1992/07	Mugu, Jumla, Doti, Achham	328	-	-	803	-
12	FLOOD	1993/07	Makwanpur	99	-	-	9,040	1,032
13	FLOOD	1993/07	Chitawan, Bara	42	-	-	149,840	977
14	FLOOD	1993/07	Sarlahi	496	-	-	12,903	2,480
15	EPIDEMIC	2001/03	Rasuwa	101	-	-	-	-
16	EPIDEMIC	2001/10	Saptari	397	-	-	-	-
17	FLOOD	2002/07	Rautahat, Mahottari	-	-	-	163,177	1,339
18	LANDSLIDE	1976/06	Kaski	75	6	-	1,065	8
19	LANDSLIDE	1980/09	Arghakanc	32	27	-	1,100	34
20	FLOOD	1987/09	Rautahat	3	-	-	-	5,876
21	FLOOD	1989/09	Saptari	4	-	-	-	1,000
22	FLOOD	1993/07	Sarlahi, Rautahat, Dhanusa	159	-	-	24,285	3,468
23	EPIDEMIC	1994/01	Mahotari, Dhanusa, Sarlahi	123	242	-	32	-
24	EPIDEMIC	1994/08	Jajarkot, Bajura	122	16	-	-	-
25	EPIDEMIC	1994/09	Kailali, Gorkha, Palpa, Nawalparasi, Tanahun, Parbat	142	-	-	125,000	-
26	FLOOD	1995/07	Mahotari, Dhanusa	2	3	-	492,429	11,792
27	FLOOD	1995/07	Bardiya	6	-	-	18,194	1,768

Table D.2:Major intensive disaster events and their impact on population and houses in Nepal (1971 – 2007)

SN	Primary	Year and Month of Occurrence	Affected	Districts	Deaths	Injury	Missing	AffectedHouses
28	LANDSLIDE	1995/07	Rautahat, Sarlahi	-	-	-	110,480	4,659
29	FIRE	1996/04	Banke	-	-	-	8,965	1,290
30	FLOOD	1996/07	Saptari, Morang, Siraha, Sunsari, Udaypur	15	1	-	360,815	17,774
31	EPIDEMIC	1996/08	Dailekh, Bajhang, Jumla	119	227	-	1,674	-
32	EPIDEMIC	1997/09	Kailali, Banke, Dailekh, Makwanpur	779	331	-	6,751	-
33	FLOOD	1998/07	Sunsari, Saptari, Sarlahi, Kapilbastu	8	20	-	100,236	9,446
34	EPIDEMIC	1999/03	Jumla, Kalikot, Dolpa	423	-	-	71	-
35	EPIDEMIC	2000/09	Kailali, Doti, Makwanpur	372	1,041	-	647	50
36	FLOOD	2003/07	Bara, Parsa	-	-	-	80,000	35
37	FLOOD	2004/07	Mahotari, Sarlahi	-	-	-	200,000	-
38	FLOOD	2006/09	Bardiya	-	-	-	-	8,315
39	FLOOD	2007/09	Nawalparasi	-	-	-	-	1,200
Total				5,018	8,462	105	1,994,817	159,669

Source: Calculated from Nepal DesInventar Data.

For Detail in calculations: see Appendix <<00>>

* official records of government are different than this, 721 deaths were recorded according to govt. records (Thapa 1989).

Table D.3: Number of houses damaged and destroyed by year 1971 – 2007

Year	Houses Destroyed	Houses Damaged	Total
1971	156	142	298
1972	771	86	857
1973	1957	160	2117
1974	2615	859	3474
1975	2051	36	2087
1976	4957	448	5405
1977	1347	462	1809
1978	3132	75	3207
1979	2061	68	2129
1980	14348	13650	27998
1981	1246	1004	2250
1982	1039	37	1076
1983	1384	1207	2591
1984	2568	485	3053
1985	1475	63	1538
1986	1160	21	1181
1987	1041	6115	7156
1988	23202	41182	64384
1989	4813	1377	6190
1990	1209	1366	2575
1991	1392	202	1594
1992	6225	79	6304
1993	21249	21673	42922
1994	3175	517	3692
1995	9685	15898	25583
1996	19638	13923	33561
1997	4549	1046	5595
1998	15978	477	16455
1999	4046	697	4743
2000	3038	1810	4848
2001	6308	2350	8658
2002	14059	5479	19538
2003	1974	761	2735
2004	1641	3339	4980
2005	1449	539	1988
2006	1920	8512	10432
2007	9455	1465	10920
Total	**198313**	**147610**	**345923**

Table D.4: Number of Deaths by district and disaster event in Nepal 1971 – 2007

Event/District	ACCIDENT	AVALANCHE	BIOLOGICAL	BOAT CAPSIZE	COLD WAVE	DROUGHT	BIOLOGICAL	EARTHQUAKE	EPIDEMIC	EXPLOSION	FIRE	FLOOD	FOREST FIRE	
Achham	-	-	-	-	2	-	-	554	-	-	4	9	-	
Arghakanchi	-	-	-	-	-	-	-	42	-	-	9	11		
Baglung			-				-	194		-	5	79	-	
Baitadi							22	248			2	3		
Bajhang	2					0	77	114		0	5	2	0	
Bajura			0			1	2	342			9	14		
Banke	1			7	1	0		944			20	6		
Bara	1				14	0	0	149	0		17	5	0	
Bardiya	4			3	2	0		148			15	11		
Bhaktapur	1		0		0		7	20	0		11	2		
Bhojpur	1			4	0	0	14	93		0	12	9	0	
Chitawan	6			9	0	0		122			15	204	0	
Dadeldhura						0	0	36			0	3		
Dailekh						0	0	361	1	0	6	0		
Dang	1		0	4		0		368	3		26	31	0	
Darchula			3				24	101			0	7		
Dhading	4		0				2	117			9	35	4	
Dhankuta	1			11	0	0	93	65			7	20	0	
Dhanusa	5			0	16	0	2	528	0		47	16	0	
Dolakha	2					0	2	67			7	44	3	
Dolpa			21				0	281		0	1	0	5	
Doti	1			2		0	0	657		0	2	13		
Gorkha	2	11		1			0	298	0		13	24	0	
Gulmi	1			0	2	0		101			16	23	0	
Humla			2		0		0	351	4	0	2	4		
Ilam	1				0	0	73	59			7	28	0	
Jajarkot					0		0	410			4	7		
Jhapa	2			0	7	0	4	355			44	62	0	
Jumla			9			0	0	338	2	0	14	9	1	
Kailali	3		0	1	2	0		903	1		7	23		
Kalikot	1			0		0	0	537			2	4		
Kanchanpur	4			4	0	0		197	1		13	14	0	
Kapilbastu	3			15	8	0		200			15	9		
Kaski			17		20		0	21	1		24	15		
Kathmandu	9			2	3		1	38	11		65	32	0	
Kavre	4		0	0	2		4	78			10	62	0	
Khotang	4			2		0	38	30	0	0	9	12		
Lalitpur	4						1	29	0		35	67	0	
Lamjung								28			46	15	0	
Mahotari	2				55	0	1	304			16	24	0	
Makwanpur	2	1	0		2	0	0	305	1	0	24	262	0	
Manang			52									1	0	

	HAIL STORM	HEAT WAVE	LANDSLIDE	OTHER	PANIC	PLAGUE	POLLUTION	RAINS	SNOW STORM	STORM	STRONG WIND	STRUCT COLLAPSE	THUNDER STORM	Grand Total
	-	-	43	-	-	-	-	-	-				4	616
	-		70	2				2		-	1	7	-	144
	2	126	1		-		-	1	-	0	1		8	1417
	0		31			0		0	0		0	6		312
	0		44	2					0		0		0	246
	1		40	0					3	0	0	2	5	419
	0	1	3			0		0		3	3	2	2	993
	0	2	2	0		0		1		0	3	1	14	209
	0	2	1	2		0					0	0	7	195
	0		4	1		0		0	0	0	0	14	7	67
	0		65	0		0		0		0		5	6	209
	3	1	28	3		0	0	0		7	2		14	414
	0		10	1				0	0	1	0		2	53
	0		48	6		0		27	0			8	6	463
	0		8	1		0		0		0	0	4	29	475
	0		54	0		0			0	2		1	0	192
	0	0	216	7		0		1	0	0	1	2	19	417
	0		16	2		0		0	0	0	0	0	3	218
	0	3	20	0		0		2		2	4	0	12	657
	0		116			0		0	1		0	45	25	312
			7	4		0			1		3		1	324
	1		88	2		0		1	1		0	1	2	771
	0		61			0		0	1	0	2		4	417
	1		113			0		0	0		1	5	5	268
	0		7	1		0		0	2	0		0	0	373
	0		49	1		0			1	1	2		9	231
	0		30			0		4	10		1	1	7	474
	2	0	1	2		0	0	0		6	20	1	57	563
	3		13			0		0	2		2	2	2	397
	10	1	7	1		0		0		6	10	0	8	983
	0		18			0		0	14		0		2	578
	1	2	12			0		0		4	3		11	266
	0	6	0			0		0			2	2	7	267
	13		193	1		0		0	0	0	1	17	30	353
	0		68	3	70	0	0	4	0	0	5	63	6	380
	0		97			0		0	0	1		21	16	295
	0		155			0		0		0	0	0	2	252
	0		20			0		0		1		26	14	197
	0		55	1				0	2	0	0	2	4	153
	0	0	0	5		0		0		0	0	1	14	422
	0		293			0	0	1	0	0	2	10	34	937
				19					0	6				78

Table D.4: Number of Deaths by district and disaster event in Nepal 1971 – 2007 cont'd...

Event/District	ACCIDENT	AVALANCHE	BIOLOGICAL	BOAT CAPSIZE	COLD WAVE	DROUGHT	BIOLOGICAL	EARTHQUAKE	EPIDEMIC	EXPLOSION	FIRE	FLOOD	FOREST FIRE	
Morang	2	2		2	26	0	32	524	1		47	89		
Mugu			0				0	301		0	3	8	2	
Mustang			15			5			2			1	10	
Myagdi	1	6					0	49			2	1	0	
Nawalparasi	0			31	7	0		130			19	26	1	
Nuwakot			1			0	0	66			12	36	0	
Okhaldhunga					10		8	68			12	7	0	
Palpa	2			3	1	0		160			22	13	0	
Panchthar			2		1		0	99	17	2		5	3	
Parbat			0		3	0		40			11	9	1	
Parsa	0			2	1	0		181		0	20	23		
Pyuthan								136			10	11		
Ramechhap					4	0	2	97		2	11	14		
Rasuwa			7			0	0	272			4	11	0	
Rautahat	2			6	54	0	0	414			5	152	0	
Rolpa					0		0	136			12	14		
Rukum		1			2		0	279		0	13	20		
Rupandehi					14	22	0	340	1		13	77	0	
Salyan	7					0		144			9	2		
Sankhuwasabha	2	2		5	1	0	19	82			19	9		
Saptari	5			3	23	0	13	645			78	7	2	
Sarlahi					3	4	0	\243			16	710		
Sindhuli	2			0		0	32	78	0		24	225	0	
Sindhupalchoke	1			2	0	0	2	291			14	31	3	
Siraha	1		0		26	0	8	267	0		16	14		
Solukhumbu	1	57						4			8	9		
Sunsari	9			33	6	0	138	209	0		32	6	0	
Surkhet				13	0	0	0	81	1		3	2		
Syangja	1		0	12		0	1	122			17	61	0	
Tanahu	3			6		0		70			12	43	0	
Taplejung	1	8	0			0	3	26		0	8	30	1	
Terhathum						0	0	67	11	2		9	3	
Udayapur					0	5	0	82	112		18	40	1	
Grand Total	**112**	**217**	**0**	**240**	**298**	**0**	**873**	**15730**	**32**	**2**	**1101**	**2936**	**24**	

HAIL STORM	HEAT WAVE	LANDSLIDE	OTHER	PANIC	PLAGUE	POLLUTION	RAINS	SNOW STORM	STORM	STRONG WIND	STRUCT COLLAPSE	THUNDER STORM	Grand Total
0	0	5	3		0		0	0	0	15	0	49	797
0		2	0		11			0				4	331
	0		4						0		2	0	39
0		153	1		0			0	0	0		4	217
0	1	14	5	15	0		0	4	0	3	9	5	270
1		97			0	0	0			8	3	32	256
1		88			0				0	0		8	202
0		63			0		0			1	22	8	295
	0		49	1				1	1	0	1	0	182
0		19			0		0	0		0	2	3	88
0	0				0		0		0	0	0	5	232
		75	1		0					3	1	7	244
1		64			0		0		0	0	1	16	212
0		59	1		0		0	0		3		13	370
1	1	0			0		0	3		1	4	3	646
0		44			0			2			0	16	224
0		22	2		0		0				2	0	341
4	1	12			0	0	0		0	1	5	6	496
0	0	20			0		0			0	4	10	196
0		79	1				0	0	1	0	1	11	232
3	1	4	1		0		0		2	1	2	20	810
0		0	1		0		0		2	4	5	7	995
0		67			0		0		0	0	4	15	447
0		268	0		0		4	1	3	3	8	25	656
0		1	1		0		1		2	0	1	23	361
2		58			0			11	0		4	6	160
0	3	1	2		0	0	15		5	20	3	27	509
0		2	1		0		0	0	0	2	1	5	111
3		151	2				5		0	0	0	8	383
1	0	78	1		0		13		1	0	0	13	241
3		181	0		0		0	0		0	2	5	268
0	0		21			0		0	2		1	0	9125
0		35	4		0		0			4	5	7	313
57	**25**	**3987**	**77**	**85**	**11**	**0**	**82**	**69**	**50**	**140**	**340**	**768**	**27256**

Table D.5: Number of deaths due to disaster events by year (1971 – 2007)

Event/ Year	ACCIDENT	AVALANCHE	BIOLOGICAL	BOAT CAPSIZE	COLD	WAVE	DROUGHT	EPIDEMIC	EXPLOSION	FAMINE	FIRE	FLOOD	FOREST FIRE	HAIL STORM	
1971	-	-	-		7	-	-	-	153	-	-	4	34	-	
1972			15		4				42			6	5		
1973			7		20				92	1		16	23	-	
1974			3		-	1	-	-	383			13	71	-	
1975			0		14				158			11	15		
1976					2		0		41			93	0		
1977			1		3		0		47	1		10	17	3	
1978			3		4		0		349	0		11	10	0	
1979			8		10				522			52	15	0	
1980			10		20		0	125	144	2		13	8	0	
1981			4		3		0		34			11	130		
1982			7				0		454			11	3	1	
1983					5		0		282			7	72		
1984			3		8				775	2		23	167	0	
1985							0		104			14	35		
1986									160			17	8		
1987					17				25			7	38		
1988			2		11			744	266	5		10	20		
1989			18		25				104	1		26	31		
1990			6			3			388			9	52		
1991			8		6				948	0		23	45	0	
1992					0		0		891			45	2	6	
1993					7	0	0	1	253			25	1169		
1994			2		4		0	0	985			52	7	0	
1995			43		0	9	0	0	766			100	24	1	
1996			7		9				665		2	117	73		
1997			14					0	1058			78	54		
1998			6			12			748	1		20	131		
1999			1		0				1044		0	39	139	0	
2000					6	4	0		403	3	0	40	79	0	
2001			0		12	0	0	2	1400	2	0	52	49	5	
2002			0		0		0		223			14	158		
2003			1		0	63	0	1	462	0		37	64	0	
2004	24		0	0	1	113	0		744	3	0	20	77	7	
2005	9		19	0	30	17	0		123	7	0	15	14	1	
2006	33		6		1	36	0	0	267		0	40	52	0	
2007	46		23		11	40	0	0	227	4	0	20	45	0	
Grand Total	**112**		**217**	**0**	**240**	**298**	**0**	**873**	**15730**	**32**	**2**	**1101**	**2936**	**24**	

	HEAT WAVE	LANDSLIDE	OTHER	PANIC	PLAGUE	POLLUTION	RAINS	SNOW STORM	STORM	STRONG WIND	STRUCTURAL	COLLAPSE	THUNDER STORM	Grand Total
	1	-	68	-	-	-	-	27		1		10	8	313
	3	0	94			-		-	-	3		1	-	173
	1		23			-		-	2	-	6	17	6	214
			24			-		-			1	2	9	507
	21		19			0				2	4	14	5	263
	2		149			0		0		4	0	4	9	304
	5		57			0		0	0	0	0	11	7	162
	2		39			0		2	4	4	2	21	20	471
	0		29			0		0		0	0	2	2	640
	0	0	85			0		0		8	0	5	3	423
	0		62					0	0	0	0	11	3	258
	1		206			0		0		0	0	0		683
	3		106			0		1			0	5	11	492
	0		89			0		0			4	12	8	1091
	1	0	25			0		0			2	47	1	229
	0		86			0		0			11	6	1	289
	0		30			0		0	2		2	0	1	122
	0		165		70	0		0		0	2	26	6	1327
	0		130			0			2	1		2	12	352
	0		35			0				0	0	6	13	512
	1	0	27			0		0	0		9	2	28	1097
			31			0		0	2		4		17	998
	1		256			0		0	0	1	17	31	51	1812
	0		57			0			0	1	1	12	54	1175
	0		190			0		0	5		1	5	14	1158
			215			0			2		15	8	34	1147
	0	0	40			0		4	5	4	1	1	72	1331
	0	11	197			0		5		0		6	17	1154
	0	1	131			0		5			13	9	27	1409
	0		118			0	0	13	0	9	3	9	21	708
	1		270		15	0		16	0	6	2	5	65	1902
	3	1	455			0		0	0	0	3	11	31	899
	6	3	223	0		0	0	2	3	3	25	11	67	971
	1	2	47	5		0	0	0	32	0	1	6	22	1105
	1	4	17	8		11		1	3	0	3	15	35	333
	2	1	104	4		0		6	0	1	0	1	42	596
	1	2	88	60		0	0	0	7	2	8	6	46	636
	57	**25**	**3987**	**77**	**85**	**11**	**0**	**82**	**69**	**50**	**140**	**340**	**768**	**27256**

ANNEX E: PRIORITY STRATEGIES RECOMMENDED BY THE NSDRM DRAFT

Priority Action 1:	**Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation**
Strategic Activity 1:	Establish the institutional system for DRM
Strategic Activity 2:	Formulation/modification and enactment of policies, rules, regulations for incorporation of comprehensive disaster risk management concepts
Strategic Activity 3:	Mainstream DRR into national development
Strategic Activity 4:	Integrate DRR and preparedness for better response in the development plans, programmes and regular activities of local development institutions (DDCs, VDCs and Municipalities etc.)
Strategic Activity 5:	Prepare and gradually implement various policies and protocols, standards, guidelines, hazard-specific Standard Operating Procedures (SOPs), hazard-specific special national programmes for DRR
Strategic Activity 6:	Establish a network of Emergency Operation Centres (EOCs) – one at the central level and others at the district and municipality levels
Strategic Activity 7:	Allocate resources and develop sustainable funding mechanisms
Priority Action 2:	**Identify, assess and monitor disaster risks and enhance early warning**
Strategic Activity 8:	Assess the disaster risks due to different natural hazards and vulnerabilities at different levels and different scales; and develop a system to periodically update and make it publicly available
Strategic Activity 9:	Establish and institutionalize an authentic, open and GIS-based Disaster Information Management System (DIMS) at the central, district and municipal levels to cover all disaster-related information
Strategic Activity 10:	Establish a national system of hazard/risk monitoring and early warning to specific hazards
Strategic Activity 11:	Prepare land use maps focusing on urban and urbanizing areas, and develop a system for periodically updating and using it for land use planning
Priority Action 3:	Better knowledge management for building a culture of safety
Strategic Activity 12:	Develop/modify the National Policy on education and implement it so that it gives recognition to schools as important centres for propagating disaster awareness.
Strategic Activity 13:	Implement disaster education
Strategic Activity 14:	**Develop curricula on DRR training for different target groups and implement training programmes for all stakeholders**
Strategic Activity 15:	Develop and implement a comprehensive national programme for disaster awareness
Strategic Activity 16:	Develop plans, programmes and facilitate for use of mass communication media for dissemination of information on disaster risk and risk reduction
Strategic Activity 17:	Develop/strengthen and encourage awareness raising programmes on DRM at the local level
Strategic Activity 18:	Encourage and support NGOs, CBOs and other stakeholders for developing and implementing awareness-raising programmes on disaster risk reduction and preparedness
Priority Action 4:	**Reducing the underlying risk factors**
Strategic Activity 19:	Integrate disaster risk reduction consideration into infrastructure development

	planning and implementation
Strategic Activity 20:	Assess, protect and strengthen critical public facilities and physical infrastructures
Strategic Activity 21:	Develop and implement, on a priority basis, special DRR programmes for the most vulnerable segments of the society – the marginalized and Dalit groups; women;the handicapped; disadvantaged groups, children and the elderly
Strategic Activity 22:	Incorporate disaster risk reduction measures into post-disaster recovery and rehabilitation processes
Strategic Activity 23:	Develop and promote alternative and innovative financial instruments for addressing disaster risk reduction
Priority Action 5:	**Enhance preparedness for effective response**
Strategic Activity 24:	Develop and enact National Integrated Disaster Response System
Strategic Activity 25:	Develop and implement emergency response and preparedness plan, including setting up a system of emergency operation centres throughout the country
Strategic Activity 26:	Establish and/or strengthen warehousing and pre-positioning capacities at strategic locations (centre, district, municipality and villages) for storing food, medicines, other relief supplies and rescue tools and equipment
Strategic Activity 27:	Establish a robust communication system that can be used during emergency situations as well as during preparedness phase
Strategic Activity 28:	Establish an efficient transport and logistics management mechanism
Strategic Activity 29:	Enhance emergency response capacities of communities at the VDC level

United Nations Development Programme
Post Office Box 107
Pulchowk
Kathmandu, Nepal

tel. 977-1-5523200
email. registry.np@undp.org
website. http://www.undp.org.np