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THE NEXUS BETWEEN NATURAL DISASTERS AND DEVELOPMENT: KEY POLICY ISSUES IN MEETING THE MILLENNIUM DEVELOPMENT GOALS AND POVERTY ALLEVIATION

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Inputs from various stakeholders during interactions at Advisory Committee meetings, and the workshop organized by the EPN Focal Unit have been incorporated in the report.

Foreword

Economic Policy Network (EPN) initiated in August 2004 is an undertaking of the Government of Nepal with an Asian Development Bank (ADB) Technical Assistance (TA) to develop and institutionalize an open, responsive and result oriented economic policy formulation process based on sound economic analysis and dialogues with the partnership of public and private sector, academia, and independent professionals, to support and consolidate the Government's economic policy reforms on poverty reduction strategy. The initial focus has been in the areas of macroeconomic management; trade, investment and employment; infrastructure development; and tourism, agriculture, and regional development through four thematic advisory committees chaired by the secretaries of the respective implementing ministries, and guided by a high-level steering committee. The present study is an outcome of the initiative under the Advisory Committee for Economic Policy on Infrastructure Development chaired by the Secretary of the Ministry of Physical Planning and Works.

This report has attempted to evaluate the economic impacts of natural disasters faced by Nepal in the past and their fiscal impacts vis-à-vis planned development efforts. The study suggests the proactive role of VDC in disaster reduction, the linkage between poverty and disaster and the importance of hazard mapping etc. The recommendations are the outcomes of consensus reached among major stakeholders through various consultations and the EPN workshop. I hope the findings and recommendations will be helpful for policy makers for future reforms.

I would like to thank Prof. Dr. Bishal N. Upreti for carrying out the study. I also thank all those who have provided inputs for the report during the interactions, the advisory committee meetings, and the EPN technical workshop held in Nepal Administrative Staff College, Jawalakhel, Lalitpur. The work of the advisory committee for Economic Policy on Infrastructure Development is to be commended for selecting the issue and for following through with the study. I would also like to appreciate the entire EPN team for their hard work. Last but not least, I would like to thank the ADB for supporting this initiative.

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BN Uprety

ACRONYMS

AAN	Action Aid Nepal
APF	Armed Police Force
CARE	Cooperation for American Relief Everywhere
CBO	Community Based Organization
CDAF	Central Disaster Aid Fund
CDRC	Central Disaster Relief Committee
CDO	Chief District Officer
CRED	Centre for Research on the Epidemiology of Disasters
DDC	District Development Committee
DDRC	District Disaster Relief Committee
DHM	Department of Hydrology and Meteorology
DHS	Department of Health Services
DMG	Department of Mines and Geology
DoF	Department of Forest
DoLIDAR	Department of Local Infrastructures and Agricultural Road
DOR	Department of Roads
DP-Net	Disaster Preparedness Network
DSCWM	Department of Soil Conservation and Watershed Management
DWIDP	Department of Water Induced Disaster Prevention
GO	Government Organization
GoN	Government of Nepal
GTZ	Technical cooperation of the Federal Republic of Germany
I/NGO	International/ non-governmental Organization
ICIMOD	International Centre for Integrated Mountain Development
JICA	Japan International Cooperation Agency
LDRC	Local Disaster Relief Committee
LSGA	Local Self Governance Act
LWS	Lutheran World Service
MDG	Millennium Development Goal
MoIC	Ministry of Information and communication
MoAC	Ministry of Agriculture and Cooperatives
MoD	Ministry of Defense
MoES	Ministry of Education and Sports
MoF	Ministry of Finance
MoFA	Ministry of Foreign Affairs
MoFSC	Ministry of Forest and Soil Conservation
MoH	Ministry of Health and Population
MoHA	Ministry of Home Affairs
MoLD	Ministry of Local Development
MoLJ	Ministry of Law and Justices
MoPPC	Ministry of Physical Planning and Construction
MoEST	Ministry of Environment and Science and Technology
MoWR	Ministry of Water Resources
MoWCSW	Ministry of Women, Children and Social Welfare
NA	Nepal Army
NCDM	Nepal Centre for Disaster Management
NP	Nepal Police
NPC	National Planning Commission
NRCS	Nepal Red Cross Society
NSET	National Society for Earthquake Technology Nepal
PMAF	Prime Minister's Aid Fund
RDRC	Regional Disaster Relief Committee

RTSC	Relief and Treatment Sub Committee
SCF	Save the Children Fund
SSRSC	Sub committee on Supply, Shelter and Rehabilitation
SWC	Social Welfare Council
SWG	Sectoral Working Groups
UMN	United Mission to Nepal
UN	United Nations
USAID	United States Agency for International Development
VDC	Village Development Committee
UNDP	United Nations Development Programme
WHO	World Health Organization

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Background

Nepal is a highly disaster prone country exposed to various types of natural disasters which is mainly due to its rugged and steep topography, extreme weather events and fragile geological conditions. In addition, Nepal's vulnerability to disasters is compounded by rapid population growth, and development of haphazard and unplanned settlements. Also, study shows that 90% of Nepalese people are constantly exposed to more than two disasters at any time. It is found that there are 1.06 reporting of natural disaster events per day on the average in Nepal. In the last 23 years, in an average per year about 938 persons lost their lives in Nepal. By landslide and floods alone the loss of lives are 303 per year. Nepal stands at 11th with respect to relative vulnerability to earthquake and 30th country with respect to flood. Nepal suffers a loss of hundreds of million rupees every year due to disasters. The data compiled by the Ministry of Home Affairs (MoHA), illustrates that in the last twenty three years (1983 – 2005), over 28 billion rupees were lost due to disasters, an average of nearly 1208 million rupees per year.

The most common natural disasters in Nepal are, landslides, debris flows, floods, earthquakes, snow avalanches, Glacial Lake Outburst Floods (GLOF), hailstorms, thunderbolts, cold waves, hot waves and epidemics. A significant proportion of GDP is lost every year due to natural disasters. The poor, marginalized and disadvantaged groups of peoples are the hardest hit by any natural calamities that occur in the country. The reason for the high number of loss of life and property in Nepal may be attributed to inadequate public awareness, lack or inadequacy in preparedness, weak governance practices, lacking coordination among inter-government agencies, inadequate financial resources, and lower level of technical knowledge and skill in mitigation of natural disasters.

With an HDI ranking of 136 (2005), Nepal is among the least developed countries in the world. Disaster, among others, is one attribution of poverty. Disasters create instant poverty through the loss of productive assets and lives, poverty accentuates natural hazards through encroachments in the high risk marginal areas. Hence poverty is both cause and consequence of disasters in countries with high vulnerability. Nepal has embarked on meeting the Millennium Development Goals (MDGs) and has demonstrated substantial progress in the first five years of the millennium. However, disaster risk reduction is essential for sustaining the achievements of all the MDGs since it provides a safety net for the hard earned development gains of the country. The primary challenge is how to reduce the massive vulnerability of the country to different types of hazards.

Poverty alleviation is the overarching goal of the planned development initiatives of Government of Nepal. The Tenth Five Year Plan (2002 – 2007) has envisaged to reduce the poverty, unemployment, population growth as well as improving the basic need facilities of the people such as the supply of safe drinking water, electricity, food, health, housing facilities, etc. The development of the physical infrastructure including road connectivity to be completed to all 75 districts, extension of irrigation facilities, expanding communication facilities to the rural areas are also on the priority agenda of the government of Nepal.

Lack of proper policy and legal environment is the biggest impediment in disaster risk reduction. Absence of an apex body at the highest level that could provide the leadership by virtue of its mandate and legal bindings is seriously lacking in Nepal. Thus, improving on

the role of leadership and the creation of the National Disaster Risk Management Council and National Emergency Operations Centre, backed by appropriate legislative instrument, is the priority agenda for Nepal.

It is the great challenge to the nation to protect infrastructure and property from frequent landslide, floods and earthquakes. Each year flood, landslide, fire, epidemic, avalanche and various other natural and man made disasters cause the casualty of thousands of human lives and destruction of physical properties.

Considering the annual direct losses to lives, buildings, infrastructure, industry, and agriculture and the additional indirect losses in production, income-earning activities, employment and displacement, plus the cost of relief and recovery, disasters place a heavy burden on the already fragile economy of one of the world's poorest nations. Each large disaster can potentially set the country back several years in terms of development efforts. When scarce resources of time, energy, expertise, and funding are directed towards relief and recovery, they are diverted away from the overall development process. in recent years the planners of Nepal seems to have recognized the intimate links between poverty and development strategies. As a result, the need to mainstream disaster management and incorporate elements of risk reduction into development plans and poverty alleviation programmes are emphasized in the policy framework of Millennium Development Goals (MDGs) of the country.

Nepal is a multi-ethnic and unlit-linguistic country. There is a big gap between genders, castes, classes, and indigenous people. Due to the diverse and patriarchal-feudal social structure, there is a constraint in applying any kind of disaster management plan without first addressing these issues effectively. Reducing Disaster Risk for Development are of the followings: Mainstream disaster risk considerations into development, Mitigate loss of life in disasters and protect development gains, Reduction of disaster risks and sustainable human development agenda

Policy Recommendations

Except brief mentions about disaster management in the ninth and tenth five year plans, there is no comprehensive disaster risk reduction policy in Nepal. Therefore, a separate national policy on disaster risk reduction needs to be prepared after wider consultations with the stakeholders. This will help to bring the issues of disaster and development vis-a vis poverty alleviation in the agenda of general development plans of the country. Such a document will be an important instrument in attracting adequate national budget in the field of disaster risk reduction.

The Natural Calamity Relief Act 2039 B.S. (NCRA) was enacted in 1982 with minor revisions in 1989 and 1992. It is the main legal instrument in Nepal in the field of disaster management. NCRA has been helpful to improve the processes of handling the rescue and relief operations during emergencies through institutional arrangements, which used to be undertaken on an adhoc basis in the past. The Act has provisioned the establishment of Disaster Relief Committees at different levels from the centre to the VDC levels to deal with relief and rescue works. However, the Act is incomplete as it does not cover the complete cycles of the disaster risk reduction viz. pre-disaster, during-disaster and post disaster phases. Therefore, a new comprehensive Act covering all the disaster phases should be enacted as

soon as possible. This legal document will bring disaster risk reduction issues in the forefront and will help to ensure for a better risk management.

The Acts such as Local Self Governance Act, 2055 (1999), the Acts of Nepal Army, Nepal Police and the Armed Police Force need to be amended to complement the new Disaster Risk Reduction Act so as to give a clear mandate and responsibilities to the respective officials to work closely and effectively with the Ministry of Home Affairs (MoHA) and other partners during disasters, particularly in rescue and relief operations.

For mainstreaming the disaster risk reduction with development projects, a wide range of existing Acts also need to be amended. Particularly the acts of development related departments such as the departments of Roads, Irrigation, Water supply and sanitation, Water Induced Disaster Prevention, Mines and Geology, Hydrology and Meteorology, Forest, Soil Conservation and Watershed Management, Housing and Physical Planning etc as well as other agencies like Nepal Electricity Authority etc. have to be appropriately amended so that the infrastructures that are constructed are safe from disasters as well as the structures will not become the cause of disasters. Preparation of Disaster Impact Assessment guidelines will ensure to safeguard the negative impact of development on environment and people and vice-a versa.

Without the formulation of Rules and Regulations, provisions of an Act can not be fully and effectively implemented. Therefore, following the Disaster Risk Reduction Act, Rules and Regulations must be formulated and made available immediately.

Government of Nepal has repeatedly committed to establish a National Disaster Council (Authority) in front of national and international forums such as in the World Conference on Disaster Reduction in Kobe, Japan (2005) and Yokohama Conference, Japan (1994). The present institutional arrangement within the Ministry of Home Affairs seem to be not very effective to cover all the three cycles of disaster management and therefore, a more practical institutional restructuring is essential.

Due to the lack of Land Use Policy and Act, there is no legal provision to regulate the development and expansion of urban and rural settlements. There is absolute freedom to carry out development activities at the risk to many lives, environment and property. Similarly, without policy and the Act, disasters will be on the increase due to environmental degradation. Therefore, the Policy and Act relating to the land use practice must be available as soon as possible.

Nepal has very complex and widely varying types of geographical regions ranging from the low lying plains in the south which is prone to floods, to the high mountains having frequent disasters due to landslide, debris flow, flood etc. Earthquakes, on the other hand, can affect any part of the country from south to north and east to west. In order to effectively reduce disaster risk, hazard mapping is a prerequisite. The country has not yet started systematic hazard mapping of the vulnerable areas. Unless a policy is formulated, such mappings will not go ahead. There are at least three departments namely, Department of Mines and Geology, Water Induced Disaster Prevention and Department of Soil Conservation and Watershed management which have the manpower and expertise in hazard mapping. Government must prepare a policy to systematically prepare hazard maps of the country particularly the flood hazard map, landslide and debris flow hazard map and earthquake hazard zonation map reaching up to VDC and municipality levels.

Policy intervention for Inclusion and adequate coverage of women, children, poor, *dalits*, marginalized groups etc. in the disaster risk reduction cycles must receive priority. It is evident from many past disasters that the poor are the most vulnerable to disasters and lack adequate coping capacity. Reducing Poverty and meeting the Millennium Goals will be difficult to achieve if these group of peoples are not taken into mainstream of disaster management.

Systematic and complete data base on disaster events and their social and economic impacts are poorly maintained in Nepal. At least some data collection has been maintained and regularly published by the Ministry of Home Affairs and the Department of Water Induced Disaster Prevention since 1983. Nepal Red Cross Society also collects data on disasters. However, these data are mostly incomplete and no proper formats and procedures are in place for the estimation of loss of property. This has made the data and damage estimates not very reliable. The loss due to floods and landslides are grouped together though these two kinds of disaster events are of different nature. The loss and damage of infrastructures and public properties are not properly recorded and estimates of their loss in financial terms are not maintained. The respective departments do make surveys and the structures are rehabilitated or reconstructed, but the budget spent on such work is not easily available in these departments. This has rendered very difficult to estimate the actual amount of annual loss due to disasters. Therefore, a National Documentation Centre has to be established. Such a centre can be attached to any one of the appropriate government departments. At the same time, the ministries which deal with infrastructure development must be instructed to collect, analyze and publish data on all the losses to infrastructures due to disasters and budget spent on the rehabilitation of such structures under their respective ministries. Such reports must be submitted to the Planning commission and Finance Ministry annually. This database will also be provided to the proposed National Documentation Centre. Some departments such as Department of Roads, Irrigation and others need special annual budget to deal with the loss of infrastructures due to disasters instead of only allocating budget for regular maintenance.

Nepal suffers mainly from water induced disasters. In order to mitigate these disasters, a good long-term database and adequate number of hydro-meteorological stations is required. The presently installed hydro-meteorological stations in the country are insufficient. Also, necessary equipment and number of technical staff for weather forecasting is poor. Therefore, Department of Hydrology and Meteorology (DHM) has to be strengthened and modernized.

Awareness and capacity building are the key factors to reduce disaster risks in any country. In a country like Nepal having a low literacy rate and poor knowledge on scientific basis of disaster occurrence, increased awareness and capacity building to a wider section of the society will produce a highly positive result in preparedness (pre-disaster phase) and management of emergencies during disaster phase. Community-based Disaster Management (CBDM) Programme has become highly successful in Nepal and has been effective in reducing risks and has increased capacity of the community to deal with disasters. It has become a good tool in capacity building of the community to deal with disasters. Such programmes must be encouraged to be implemented widely in the country through various government and non-government programmes. The CBDM programmes may also be incorporated in other development projects such as in agriculture, forestry, micro credits

programmes and any other poverty reduction related projects etc to reach to the local communities country-wise.

Apart from the provisions of budget for rescue-relief operations, that too highly inadequate, at present budget allocation on specific disaster risk reduction programmes are almost non-existent. Budget must be allocated for hazard mapping, CBDM programmes, trainings on fist aid, rescue-relief and disaster management, building awareness, other specific preparedness programmes and research, etc. Apart form the yearly occurring disaster events, looking at the widely publicized imminent earthquake disaster in Nepal, allocation of budget for such activities is highly justified and essential.

Large scale disasters need large scale preparedness for medical facilities. Hospitals and other health facilities must be well prepared at all times for any large scale disasters. It is more important in case of an earthquake. Our hospitals are still ill equipped to deal with large disasters. Most hospital buildings are weak and vulnerable to earthquakes. Large scale trainings for doctors and paramedics, particularly in hospitals of big urban centres, are urgently needed.

Media of all types need to be mobilized for a better management and reducing disaster risks in the country. Appropriate government policies on media can help in this regard. The media can provide accurate information on disasters, make people aware about impending disasters, and encourage them for preparedness. They can maintain pressure on the government and other related agencies to keep disaster agenda alive at all times.

Within the last decades, the nexus between disaster, development and poverty has been widely recognized. They are interwoven in such a way that that one revolves round the other. For long, development was a lone runner neglecting the natural disaster factor; as a result poverty alleviation through development remained largely illusive. The new policies in Nepal therefore, must reflect the recognition of this nexus and development programmes and poverty alleviation issues should not be viewed in isolation.

Chapter 1

Natural Disasters in Nepal

1.1 Background

Nepal is a highly disaster prone country exposed to various types of natural disasters which is mainly due to its rugged and steep topography, extreme weather events and fragile geological conditions (Upreti 2001, 2005). Nepal's vulnerability to disasters is compounded by rapid population growth, and development of haphazard and unplanned settlements. The rural houses are almost entirely non-engineered and very weak, and majority of them are highly vulnerable to disasters such as earthquakes, landslides and floods. There is no land use policy enforced in Nepal and settlements are allowed to develop even in the most vulnerable sites. Settlements are growing even on the river beds and flood plains. The urban settlements too are highly vulnerable to disasters due to their locations, improper construction practices as the building codes have been implemented only very recently. The mechanism of enforcement of building codes remains to be very weak which will not encourage people to construct houses following the codes.

The most common natural disasters in Nepal are, landslides, debris flows, floods, earthquakes, snow avalanches, Glacial Lake Outburst Floods (GLOF), hailstorms, thunderbolts, cold waves, hot waves and epidemics.

A significant proportion of GDP is lost every year due to natural disasters. The poor, marginalized and disadvantaged group of people are the hardest hit by any natural calamities that occur in the country. Also, study shows that 90% of Nepalese people are constantly exposed to more than two disasters at any time. The reason for the high number of loss of life and property in Nepal may be attributed to inadequate public awareness, lack or inadequacy in preparedness, weak governance practices, lacking coordination among inter-government agencies, inadequate financial resources, and lower level of technical knowledge and skill in mitigation of natural disasters. Vulnerability due to disasters is enhanced by weak socioeconomic standing and limited resources, as poverty and vulnerability usually go hand in hand. Unstable social and economic conditions often drive spatial development patterns which usually lead to greater vulnerability. Environmental degradation and climate change too contribute to overall disaster vulnerability.

In the past a great many lives have been lost and economic impacts due to destruction and damage of infrastructures and other development projects are enormous. This has caused direct negative impact on planned development budget of the country. If Nepal has to meet the Millennium Development Goals (MDGs), it has to seriously work on reducing the risks from natural disasters. Several MDGs such as eradicating extreme poverty and hunger, achieving universal primary education, promoting gender equality, and ensuring environmental stability and partnerships for development all have close linkages to vulnerability to natural hazards. For example, the goal of improving the lives of millions of people living in high-risk areas by 2020, involves poverty eradication, proper land use planning and the improved understanding of vulnerability to disasters in densely populated areas. Under "Protecting our common environment" the Millennium Declaration resolves "to adopt in all our environmental action a new ethic of conservation and stewardship and, as first steps, resolves.....to intensify cooperation to reduce the number and effects of natural and man-made disasters".

1.2 Objectives

The main objectives for the study on "the Nexus between Natural Disasters and Development: Key policy issues in meeting the millennium development goals and poverty alleviation" were;

- To categorize natural disasters that Nepal is most vulnerable to on the basis of past episodes and their impacts on human lives and infrastructure;
- To evaluate the economic impacts of natural disasters faced by Nepal in the past and their fiscal impacts vis-à-vis planned development budgets;
- To review the government's organizational structure and strategy on disaster risk management, and identify weaknesses and policy gaps to effectively incorporate disaster risk management in the government's sustainable development agenda;
- To suggest policy reforms needed to mainstream the concept of disaster risk management in the government's annual and periodic development plans; and
- To suggest a policy-action matrix containing (a) constraints (policy, legal, institutional, administrative, and others if applicable); (b) recommended policy improvements; (c) activities; (d) indicators of achievement; (e) responsible agencies; and (f) timeframe (immediate, intermediate, and long-term).

1.3 Methodology

The present report is essentially based on the desk study. However, visits were made to various relevant government and non-government organizations, INGOs for data collection and consultations. Website materials were also used widely.

The methods used are as follows;

- Collection and review of existing literatures,
- Detailed data collections were made through the published/unpublished books, booklets, articles, interviews and interaction with stakeholders from both public and private sectors. Discussions were made with senior officials of the Ministry of Home Affairs (MoHA) and other concerned Governmental and nongovernmental organizations/institutions,
- Data were analyzed in order to derive results and interpreted results are discussed in different subsection of the report. The Policy-action matrix was prepared based on the overall outcome of the desk study and interactions with stakeholders.

1.4 Limitation of the study

As the document is primarily based on available published and unpublished reports and literature and does not contain field research, the out put data and conclusions are, thus limited to the data gathered from secondary sources. Also, available data on disasters in Nepal are scanty. It was extremely difficult to get data on infrastructure damage/destruction and budget spent on their rehabilitation and reconstruction as none of the departments had these data systematically prepared and documented.

1.5 Natural Disasters Defined

Natural disasters include variety of natural phenomena adversely affecting people's life, society as a whole and its activity. Centre for Research on the Epidemiology of Disasters (CRED) defines disaster as: 'a situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance'. In order for a disaster to be entered in Emergency Events Database (EM-DAT) operated by CRED at least one of the following criteria has to be fulfilled: (i) 10 or more people reported killed (ii) 100 people reported affected (iii) a call for international assistance, and/ or declaration of a state of emergency. The reporting in the World Disaster Report (WDR) by International Federation of Red Cross and Red Crescent Societies is taken from the CRED database. According to the report, Killed means people confirmed dead, or missing and presumed dead whereas Affected means people requiring immediate assistance during a period of emergency, i.e. requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance. WDR divides disasters into natural and non-natural disasters. Natural disasters include: hydro-meteorological disasters (avalanches/ landslides, droughts/ famines, extreme temperatures, floods, forest/scrub fires, windstorms, and other such as insect infestation and waves/surges) and geophysical disasters (earthquakes, volcanic eruptions). Non-natural disasters can be industrial (chemical spill, collapse of industrial structures, explosion, fire, gas leak, poisoning, radiation), miscellaneous (collapse of domestic/non-industrial structures, explosion, fire) or transport (air, rail, road and water-borne accidents).

1.6 Types of Natural Disasters

Commonly known disasters include flood, landslide, earthquake, tsunami (a secondary effect of an earthquake in the coastal areas), volcanic eruption, drought, typhoon, etc. The first step of the classification of disasters should be the one that can cover all natural disasters according to the relationship of the triggers and/or processes of the disasters in what sphere of our planet is related with. Thus, *cosmogenic*, *climatogenic*, *hydrogenic*, *geogenic* and *biogenic* disasters can be identified (Yoshida 2005, **Table** 1.1).

The *cosmogenic disaster* is that caused or mostly related with phenomena in the cosmosphere. This includes meteorite impacts, ozone hole expansion, abnormal sunspot activity and so on. These disasters are of fairly large scale and can cause grave disasters that may even cause mass extinction of not only human beings but also many species of life on the globe. The *climatogenic disasters* are those related with climatic phenomena. They include abnormal climate such as too high and too low atmospheric temperatures, drought, extraordinary heavy precipitation, etc., which mostly cause regional crop failure and sometimes directly affect human lives even result in the death of many people in wide areas. Typhoon also causes much damage to human society often tied up with the *hydrogenic* phenomena. The extraordinary heavy precipitation is directly related to the *hydrogenic disasters* that are mentioned below.

The *hydrogenic disasters* are those caused by the phenomena in the hydrosphere. They are mostly related with the climatogenic and/or the *geogenic* processes. They include tsunami, flood, riverbank calving, debris flow, etc., affecting very large to small areas. The *geogenic disasters* are those caused by phenomena in the geosphere. They include earthquake, volcanism, landslide, etc., most of which are associated with *hydrogenic* phenomena, and are either regional or small area disasters. Earthquakes sometimes create *hydrogenic* disasters such as tsunamis, and some volcanism may drastically affect the global climate. *Biogenic*

disasters are those caused due to phenomena in the biosphere. They include extraordinary breeding of insects, animals, plants etc., and epidemic of disease such as smallpox, SARS, influenza etc., that directly affect people's health, and even cause death. Another important classification of natural disasters is the *anthropogenic* and non-anthropogenic disasters. Natural disasters are sometimes caused by human activity itself (**Table** 1.2), for example deforestation may cause flash floods and failure of man made structures such as construction of dams and reservoirs can bring disasters. Similarly the recent trend of climate change which is bringing many climatologic disasters such as floods, droughts etc are due to increased global temperature as a result of human activities. The high radiation due to ozone layer depletion is essentially an *anthropogenic* disaster.

1.7 World Disaster Scenario

The world-wide number of natural disasters as well as the number of corresponding casualties, injured and affected people, and economic loss is steadily on the rise. Over the past decade, the number of reported disasters has risen steadily from an averaged of 428 to 598 disasters (predominantly natural disasters) per year (source: WDR 2005). Among these, most disaster events occurred in countries of low human development (LHD). Disasters continue to affect more to the world's poorest and least developed countries.

Table 1.1: Principal Classification of Natural Disasters and their signature (Yoshida 2005)

Classification	Disasters	Areal extent	Anthropogenic/ non-anthropogenic	Other remarks
Cosmogenic Disasters	Meteorite impact	Very local to global	Non-anthropogenic	Caused mass extinction in the earth history
	Abnormal increase of sun spot	Global	Non-anthropogenic	Creates electronic communication problem
	Ozone hole expansion	Regional to global	Anthropogenic	Abnormal increase of ultraviolet ray causing health hazard
Climatogenic Disasters	Abnormal temperature	Local to regional	Non-anthropogenic/ anthropegenic	Too high or too low atmospheric temperature
	Drought	Local to regional	Non-anthropogenic	Relates to the crop failure
	Extraordinary dense precipitation	Local to regional	Non-anthropogenic	(1) Relates to the crop failure (2) Relates to the flood (below)
	Typhoon	Local to regional	Non-anthropogenic	Results in a variety of disasters
	Tornado	Very local	Non-anthropogenic	
Hydrogenic	Tsunami	Local to regional	Non-anthropogenic	Often associated with earthquake and large volcanic eruptions
	Flood	Very local to local	Non-anthropogenic	Caused by variety of phenomena
	Rise of sea/lake level	Very local to global	Non-anthropogenic and anthropogenic	Due to variety of causes (cf. Table 3)
	River bank calving	Very local to local	Non-anthropogenic and anthropogenic	Sometimes related with high precipitation

Geogenic Disasters	Earthquake	Local to regional	Non-anthropogenic and anthropogenic	Sometimes associated with the hydrogenic tsunami disaster, flood etc
	Volcanism	Local to regional	Non-anthropogenic	Often associated with the climatogenic disasters
	Landslide	Very local to local	Non-anthropogenic and anthropogenic	Often related with the hydrogenic phenomena
	Rock fall	Very local	Non-anthropogenic and anthropogenic	Often related with the hydrogenic phenomena
Combined geogenic/hydrogenic Disasters	Debris flow	Very local	Non-anthropogenic and anthropogenic	Related with temporal high precipitation
Biogenic Disasters	Extraordinary breeding livings and plants	Local to regional	Mostly non-anthropogenic, but sometimes anthropogenic	Sometimes related with the climatogenic phenomena Breeding of virus, bacteria, insects, birds, animals etc.
	Epidemic of disease	Local, regional to global	Mostly non-anthropogenic, but sometimes anthropogenic	Sometimes related with the climatogenic phenomena

Table 1.2: Examples of anthropogenic disasters (Yoshida 2005)

Principal Classification	Disasters	Reason
Cosmogenic and climatogenic Natural Disasters	Increase of ultraviolet ray	Enlargement of ozone hole due to excessive release of harmful gases etc
	Global rise of atmospheric temperature	Drastic increase of atmospheric CO2 due to consumption of fossil energy (greenhouse effect)
	Global rise of sea level/tsunami	(1) Rise of global atmospheric temperature due to the anthropogenic greenhouse effect (as above) (2) Collapse of continental shelf ice due to sea level change caused by the anthropogenic greenhouse effect
Hydrogenic and/or Geogenic Natural Disasters	Flood	(1) Wrong river training (2) Collapse of an artificial dam (3) Wrong adjustment of water gate of a dam
	Landslide	(1) Wrong construction of a slope cut (2) Wrong protection of a slope
Biogenic Disasters	Epidemic of disease	(1) Intentional spread of virus (e.g., war) (2) Transportation/travel of people
	Extraordinary breeding of plants/livings	Anthropogenic breaking harmonic system of biosphere
Pure Anthropogenic Disasters	Mass killing of people	Wars in the history of mankind
	Destruction of a city by bombing	e.g., atomic bombing on Hiroshima by US army
	diminishing of various plant species by use of harmful chemicals	e.g., use of chemicals by US army on Vietnam
	Firing of a village/forest	(1) Forest fire by people (2) Attack by people (e.g. Eizan attack by Nobunaga in 16th century in Japan).

Natural disasters are of diverse origin, in most parts of the world they are omnipotent and can occur at any time, any where, and with varying intensity. A single disaster may affect people within a small geographical location involving a few tens of people or it may be of wider dimension affecting a very large population living thousands of kilometres apart, sometimes even involving different continents. When it affects such a large number of people in widely separated areas, the disaster assumes an international scale and requires coordination, cooperation, and large scale international efforts towards rescue, relief and rehabilitation. The great tsunami disaster of December 2004 and the South Asian (Pakistan-India) earthquake of October, 2005 can be taken as the examples how one single disaster can affect tens to hundreds of thousands of people in so widely separated areas. Earthquakes, Tsunamis, cyclones can cause devastation in few minutes to hours and can cause loss of great number of lives, and property worth of millions to billions of dollars. In recent years, epidemics have become another potent disaster which can kill large number of people in short time if uncontrolled. The threat by SAARS and the Bird flue can be taken as the recent examples. Draught is a slowly affecting natural disaster that can causes loss of great number of lives as has been seen recently in Africa and North Korea.

The last century saw a tremendous growth of population in the world which crossed over six billion. Since last few decades, a huge population of the world has started living in large urban centres and mega-cities with extremely high concentration of people per square kilometres, and the trend is ever growing. At the same time, more and more num number of infrastructures are added which have also increased the vulnerability of people. Due to population pressure, more people are forced to live in vulnerable and marginal areas than any time before such as living in flood-plains, near active volcanoes, on steep mountain slopes, river fans and flood-prone delta areas, etc. These factors have compounded in bringing enlarged effects of any disaster causing higher number of deaths and greater loss of property than in the past. All these ultimately reduce the pace or negate the development activities of a country.

According to the World Disaster Report 2005 (WDR 2005), over the past decade (1995-2004), the number of reported disasters in the world has risen from 419 to 719 disasters with an average of 598 disasters per year for the decade. With 719 reported disasters, 2004 was the third worst year of the decade, with Asia remaining the most frequently hit continent. In the last two decades, more than 1.5 million people have been killed by natural disasters (UNDP 2004).

Also, the average annual number of disasters reported during 2000-2004 was 55 per cent higher than during 1995-1999. Similarly disasters during 2000-2004 affected one-third more people than during 1995-1999. Over this period, the numbers of people affected by disasters in countries of LHD doubled. World-wide the number of reported disasters (all types) during the 1995-2004 decade was 3,199 with 320 disasters per year in an average. The total number of reported earthquake disasters between 1995-2004 was 279 which is approximately 28 earthquake disasters per year Similarly, the total number of reported flood disasters during the same period was 1210 (average: 121 flood disasters per year).

The total number of people reported affected during the decade of 1995-2004 was 2.53 billion, with average of 253 million/year. Whereas during the previous decade (1985-1994) the number was only 1.73 billion with an average of 173 million/year. World-wide number of people reported killed by disasters during 1985-1994 was 0.64 million and during 1995-2004 the number was 0.90 million (**Fig**. 1.1).

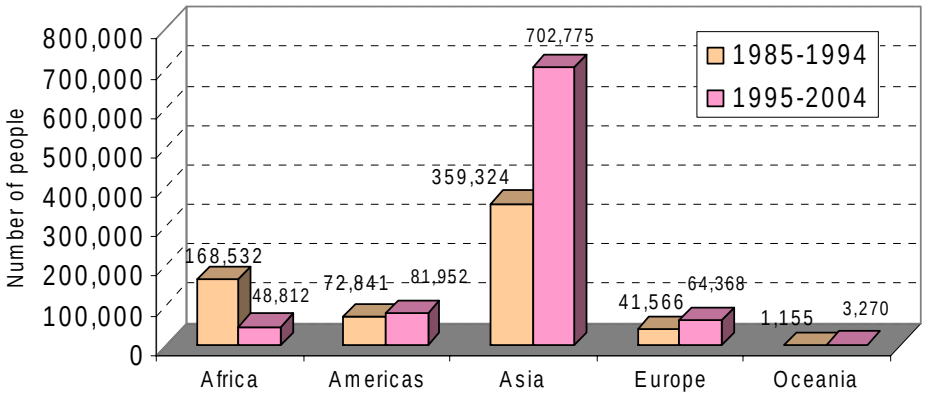


***Fig**. 1.1: Total number of people reported killed around the world, 1985-1994, 1995-2004 (Data Source: WDR 2005).*

1.8 Asian Disaster Scenario and South Asian Disasters

The geographical and geological set up of South Asia has made it the most disaster prone region in the world. The main types of natural disasters (hydro-*meteorogenic* and *geogenic* disasters) in South Asia are flood, drought / famines, cyclone, glacial lake outburst flood (GLOF), cold waves, earthquake, tsunami, landslide, debris flow etc. Among them earthquakes, floods and cyclones are the most common disasters in the region. The entire Himalaya-Karakorum region spanning from Myanmar in the east to Afghanistan in the west is highly prone to earthquakes. History shows that this region is hit by many large earthquakes and have killed hundreds of thousands of people, the last being the October 2005 South Asian earthquake. The strong monsoon rain that dominates over South Asia brings to the plains of Ganga, Brahmaputra and Indus rivers (Indo-Gangetic plain) great annual floods affecting millions of people every year. The same monsoon rain in the fragile Himalaya-Karakorum region causes numerous annual disasters due to landslides, debris flows and floods. The coasts of India, Bangladesh and Sri Lanka are cyclone prone areas and every year a great number of cyclones visit their coasts bringing large size disasters. The December 2004 tsunami disaster, a secondary effect of a large submarine earthquake near Indonesian coast has been an eye opener for the whole world how a tsunami can travel thousands of kilometres and still posses force to affect such a wide area from Indonesia to Somalia and can kill hundreds of thousands of people within hours.

Asia is the most populous as well as the most hazardous continent in the world. Strikingly, the data from the last decade (1995-2004) reveals that out of the total number of world occurrence of natural disasters, nearly 41% occur in Asia. Similarly, out of the total number of deaths and affected people by disasters in the world, nearly 78% of deaths and 91% affected people respectively are from Asia. Further, even within Asian context, South Asia has very high proportion of deaths and affected people due to disasters (72% deaths during the 1985-1994 decade). Also according to the WDR-2005, an average of 250 million people per year was affected by disasters over the decade- over 90 per cent of them in Asia. The Indian Ocean tsunami in December, 2004 left at least 224,495 people dead accounting for 90 percent of the year's death toll, and affected 2.4 million people. In the same year, 69 million people in Bangladesh and India and nearly 42 million people in China were affected by disasters (WDR 2005).

South Asia and China together make up a very large proportion of the population of the world. This region of Asia is also equally very hazard prone. The Main types of Natural Disaster in South Asia (mainly *Hydro-meteorogenic* and *geogenic* disasters) are Flood, Drought / Famines, Cyclone, Landslide and debris flow, Glacial Lake Outburst Flood (GLOF), Earthquake, Tsunami, Cold waves etc. Among the total number of deaths and affected people of Asia in general, a majority comes from South Asia including China. During the 1985-1994 decade the **t**otal number of people reported killed by disasters in South Asia & China was 258,397 where as during the 1995-2004 decade this number was only 171,905, which means that if we take the average of the last 20 years about 21,000 people die every year in South Asia and China alone due to natural disasters (**Fig**. 1.2).

1.9 Natural Disasters in Nepal

Nepal faces varieties of hazards, which combined with its growing population with low level of awareness and having difficult and remote terrains without accessibility result in very high degree of risk. Nepal, according to the recent study by UNDP/BCPR (UNDP 2004) stands at 11th and 30th country with respect to relative vulnerability to earthquake and flood respectively. Nepal ranks third highest with 42 deaths per million among the regional countries (**Table** 1.3). Nepal also ranks first in terms of number of people affected vs. killed. Another study ranks Kathmandu Valley as the at-risk city in the world with respect to earthquake. A wide range of physiographical, geological, ecological, meteorological and demographic factors contribute to the disaster vulnerability of the country (Upreti 2005). The earthquakes of 1934, 1980, 1988, the flood of July, 1993 (**Fig**. 1.3), and the recent landslides of August, 2002 and fire of 2002 were the most devastating natural disaster which not only caused heavy losses of human lives and physical assets but also adversely affected the development process of the country as a whole.

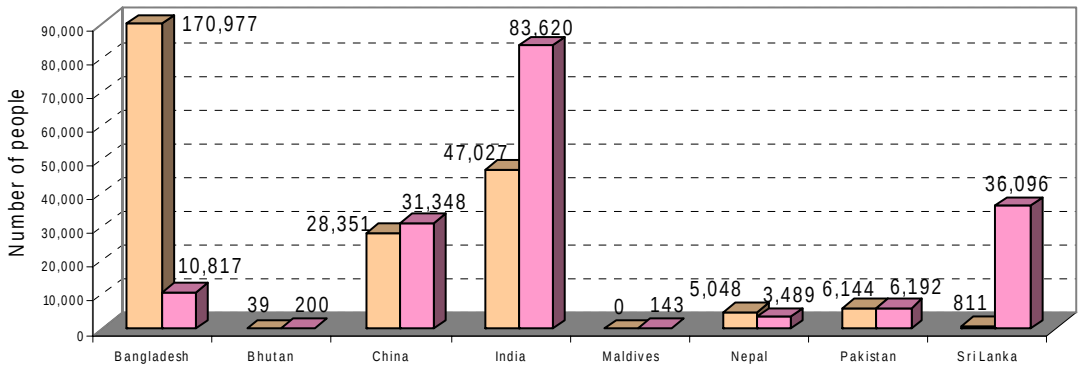


***Fig**. 1.2: Total number of people reported killed in south Asia and China 1985-1994, 1995-2004 (Data Source: WDR 2005).*

Table 1.3: Disaster Risk Index for South Asian countries (1985-2004, Data Source, WDR, 2005)

Name of country	Population in Millions (Estimated. 2005)	Total number of people reported affected	Number of people reported affected per year	Total number of people reported killed	Number of people reported killed per year	Affected vs. total killed	Deaths per million/ year
		1985-2004		**1985-2004**		**1985-2004**	
Sri Lanka	19.7	11,860,055	593,003	36,907	1,845	1:321	94
Bangladesh	144.2	301,972,932	15,098,647	181,794	9,090	1:1661	63
Nepal	**25.4**	**2,874,468**	**143,723**	**21,438**	**1,072**	**1:133**	**42**
Afghanistan	29.9	7,508,799	375,440	12,643	632	1:593	21
China	1,304	1,967,066,194	98,353,310	341,832	17,092	1:5754	13
Bhutan	1.0	66,600	3,330	239	12	1:278	12
India	1,103.6	124,5281,292	62,264,065	130,647	6,532	1:9531	6
Pakistan	162.4	30,207,447	1,510,372	12,336	617	1:2448	4
Maldives	0.3	51,463	2,573	143	7	1:360	2

It can be seen that over the last 23 years in an average every year about 938 persons lost their lives in Nepal. Due to landslide and floods alone the loss of lives are 303 persons per year. Even, these numbers must be on the higher side as there are numerous cases where the disasters are unreported due to remoteness of the areas. A significant proportion of GDP is lost every year due to natural disasters. The common natural disasters that frequently occur in Nepal are briefly described as under.

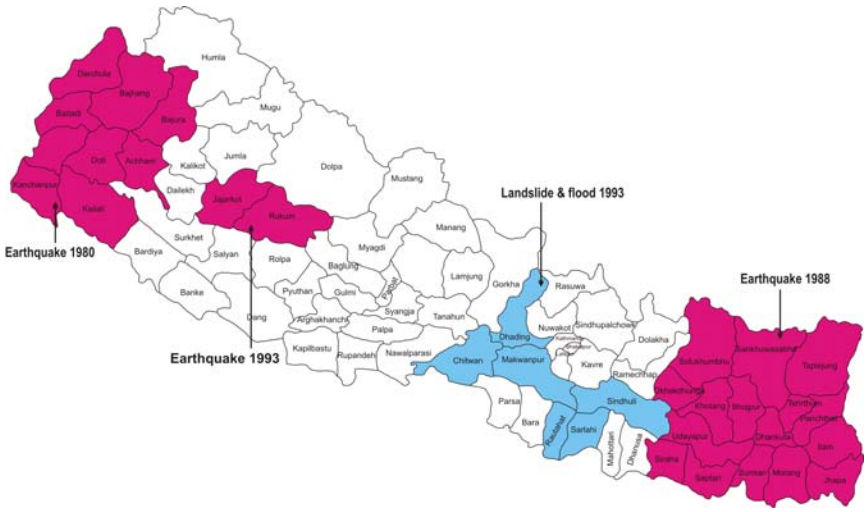


***Fig**. 1.3: Geographic distribution of recent major disasters in Nepal (Source: DRMP 2005)*

1.9.1 Landslides and Debris Flows

Landslides and debris flows are the most common natural hazards in Nepal and cause disasters every year that bring hundreds of fatalities and loss of property worth hundreds of millions of rupees. In the last two decades nearly one third of all deaths due to natural disasters came from landslides and floods. In the entire region of the hilly terrain of Nepal, landslides and debris flows are so pervasive that in one way or the other almost every individual is affected by these hazards. Majority of landslides and debris flows occur in mid-

to late monsoon time when the ground is fully saturated with water. Many estimates of damage by these phenomena only take into account of the direct loss of life and property, but if we convert the cost of labour spent by farmers over the entire country on the maintenance of the damaged agriculture land every year and the loss of crops, the amount of loss is staggering.

Although the disaster data provided by the Ministry of Home Affairs group landslides and flood together, it is estimated that the majority of the reported deaths and damage to property is caused by landslides and debris flows. A debris flow is a process in which gravel, boulders and rocks, mixed with clay and water, move rapidly, almost like a liquid, down a slope. Debris flows can travel for long distance under favourable slope conditions and water content. The hill slopes in the Himalaya are invariably covered with thick colluvium and deeply weathered rocks producing soil layers of many meters thick. Under favourable conditions, particularly during the extreme weather events when there is sustained rain for some days and the 24 hour precipitation is very high exceeding few hundreds of millimetres, debris flows are triggered. Due to ignorance, many settlements and infrastructures are located on the path of probable debris flows. In the past many such debris flows have killed large number of people and destroyed properties.

1.9.2 Floods

The data collected by Ministry of Home Affairs does not give the number of loss of lives and property due to landslides and floods separately but is clubbed together. Therefore, it is difficult to estimate correctly the effect of the flood disaster alone in Nepal. However, large-scale floods occur mostly in Terai and affect a great number of people every year. The areas immediately south of the mountain front (Churia range) called Bhabhar zone is prone to flood by the ephemeral rivers which frequently change their course and the bed levels are rising very fast flooding large areas during the monsoon. On the other hand, there is another kind of flood problem in the southern part of Terai where the dams and embankment along many rivers constructed across the border in the south is creating impounding of monsoon flood water within the Nepalese border creating a severe flood situation every year. These areas have become serious and regular flood prone localities in Nepal needing rescue and relief activities every year. Also, floods are common along the major river valleys in the mountain areas on the banks of which loss due to washout of agriculture land and villages are not uncommon.

1.9.3 Glacial Lake Outburst Floods (GLOF)

Over the last fifty years or so, global warming has resulted in the gradual decline of glacier coverage in the world. As a result mountain glaciers such as in the Himalaya are receding at an alarming rate. These retreating glaciers have produce lakes at their leading edge, and the sizes are increasing day by day. The sudden burst of these lakes is called the Glacial Lake Outburst Floods (GLOF). The enormous amount of water that is released from the lake, similar to the event of a man-made dam burst, will produce unprecedented floods with very high level of water causing tremendous destruction along its course.

It is estimated that there exist over 2,300 glacial lakes in Nepal out of which many of them are potentially dangerous (Mool et al. 2001, **Fig**. 1.4). There have been many GLOF events in Nepal in the past which have caused many deaths and destroyed and damaged various infrastructures. The Nare Glacier (Everest area), Dig Tsho (Everest area) the Tam Pokhari

(Dudh Koshi Basin, eastern Nepal), the Chubung (Tamakoshi Basin) GLOFs that occurred in 1977, 1985, in 1998 and 1991 respectively are some of the examples. The Zhangzangbo-Cho GLOF of 1981 whose origin was in Tibet at the headwater of Bhotekoshi-Sunkoshi River, caused heavy infrastructure damage in Nepal. Most of the large river valleys are the sites of intense agriculture, hydropower projects and have other economic activities. A large number of towns and villages are situated along the valleys. GLOF can be very dangerous and can destroy these towns, villages and infrastructures resulting to a loss of great number of lives and property.

There are two recent Glacial-lake outburst floods (GLOFs) in the Mount Everest region of Nepal that has been fairly well studied. The 1977 (ice-cored moraine dams failed below the Nare Glacier) and 1985 (moraine-dammed lake located below the Langmoche Glacier, Dig Tsho) GLOFs were very powerful and modified channels and valleys by eroding, transporting, and depositing large quantities of

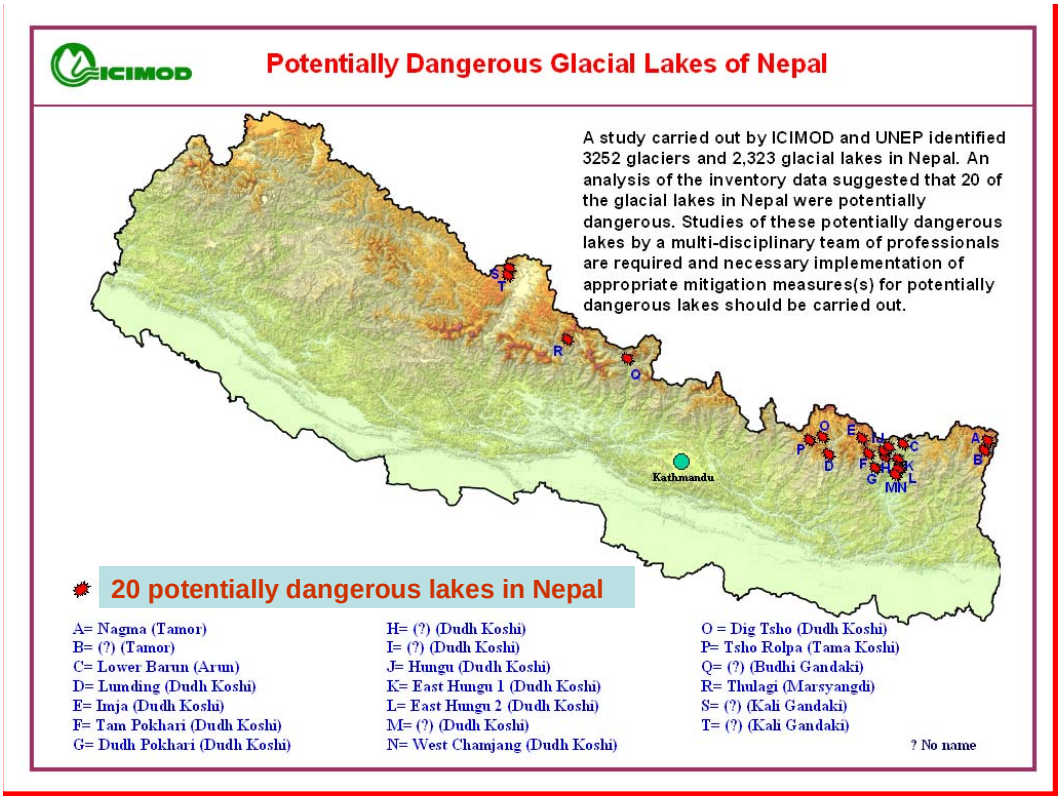


***Fig**. 1.4: Potentially dangerous Glacial Lakes of Nepal (Mool et al. 2001)*

sediment for tens of kilometres along their flood routes. The peak discharge of the 1977 GLOF at 8.6 km from the breached moraine was approximately 1900 m^3/s. At 7.1 km downstream from the breached moraine, the 1985 GLOF discharge was estimated at 2350 m^3/s.

1.9.4 Earthquake

Nepal lies within the highly seismic belt of the Himalayan Arc (**Fig**. 1.5). Nepal has experienced large earthquakes measuring over 8.0 in Richer Scale in the past centuries killing thousands of people, the last two being the 1833 Kathmandu earthquake and the 1934 Nepal-

Bihar Earthquake. The 1980 Bajhang earthquake and 1988 eastern Nepal earthquake which also killed hundreds of people are more recent ones but having much lower earthquake magnitude. The earthquake epicentre map of Nepal from 1994-2005 (DMG 2006) is shown in **figure** 1.6 and the seismic risk map of Nepal is shown in **figure** 1.7**.**

Records of earthquakes in Nepal since 1255 indicate that Nepal was hit by over 16 major earthquakes (the last major earthquake was that of 1988). However, the records may not be complete, and the data on loss of life and property may also be not very accurate due to lack of reliable data. Out of these, the 1833 (magnitude 7.7) and 1934 (magnitude 8.3) earthquakes that occurred at an interval of 100 years were better recorded and were found to be most disastrous. Particularly the effect was severe in the Kathmandu valley. Statistically, the earthquake occurrence data of the last century shows that in an average Nepal was hit by a big earthquake in every 12 years. A record of Historic earthquakes and their impacts is given in **table** 1.4.

Recent studies have shown that Nepal is under a great threat by an impending very large earthquake which may occur any time in future and may be with magnitude over 8.0 on Richer scale (Bilham 2001). It is like Nepal sitting on a time bomb. The loss due to this disaster may push Nepal's development into some decades back ward, and it will take a long time to recover from the ordeal of this disaster. When this earthquake occurs, a conservative estimate shows that Kathmandu, the capital of Nepal alone will have over 40,000 deaths, 90,000 injuries and 60-70 % of the houses heavily damaged. The Kathmandu valley with its three principal cities- Kathmandu, Patan and Bhaktapur and with a total of nearly 2.5 million population lies in a old lake deposit of over 600 m thickness at places (**Fig**. 1.8a,b). Most houses in the valley have been made without following any standard building code. Very weak buildings, both new and old alike, dominate all over the valley

A comprehensive study of building loss estimation due to earthquake in Lalitpur District of Kathmandu valley by using a generalized soil profile model, earthquake intensity and liquefaction susceptibility maps (**Fig**. 1.9a,b) of Lalitpur city area were made (Guragain 2004). These maps were produced after analysing the borehole data at different places in Kathmandu valley. According to susceptibility map, most of the Lalitpur area lies in the moderate susceptibility class whereas some areas near the river floodplain are located in the high susceptibility class. The JICA study (2002) for the whole of Kathmandu valley estimated building damage from 16.8% to 50.1%. Whereas for the same type of earthquakes in Lalitpur district this study shows 26% to 56% damage (Guragain 2004).

Table 1.4: Some records of death and damage from historic Earthquakes in Nepal

Year (A.D.)	Deaths	Damages
1255	One third of the population of Kathmandu was affected. Many deaths	A lot of damages to residential buildings and temples
1260	Many people died, Famine after the earthquake	A lot of damages to residential buildings and temples
1408	Many people died	A lot of damages to temples, residential buildings, fissures developed in the ground
1681	Many people died	A lot of damages to residential buildings
1767	No record of deaths	No record of damage
1810	Some people died, many lives were lost particularly in Bhaktapur	A lot of damages to buildings and temples
1823	No record of deaths	Some damage to houses
1833	Estimated magnitude 7.7, 414 people died in the vicinity of the Kathmandu valley	Nearly 4040 houses destroyed in Kathmandu, Bhaktapur, and Patan in the valley and adjoining Banepa and a total of 18,000 buildings damaged in the whole country.
1834	No good record available	Many buildings collapsed
1837	No good record available	No damage in Nepal recorded but greatly affected Patna and other parts of Bihar, India.
1869	No good record available	No good record available
1897	No good record available	No good record available
1917 (1918?)	No record deaths	No record on damage
1934	Estimated Magnitude 8.3 (epicentre, eastern Nepal). 8519 people died out of which 4296 died in Kathmandu valley alone	Over 200,000 buildings and temples etc damaged out of which nearly 81 thousand completely destroyed in the country. Max Intensity X. 55,000 building affected in Kathmandu (12,397 completely destroyed).
1936	No good record available	No good record available
1954	No good record available	No good record available
1966	24 people died	1,300 houses collapsed
1980	Magnitude 6.5 (epicentre far western Nepal). 103 people died	12, 817 buildings completely destroyed, 2,500 houses collapsed
1988	Magnitude 6.5 (epicentre in SE Nepal). 721 people died	66,382 buildings collapsed or seriously damaged.
1993	Epicenter near Jajarkot	40 % of the buildings were estimated to be affected.

(source: UNDP/UNCHS 1993, Pandey and Molnar, 1988, Bilham et al. 1995)

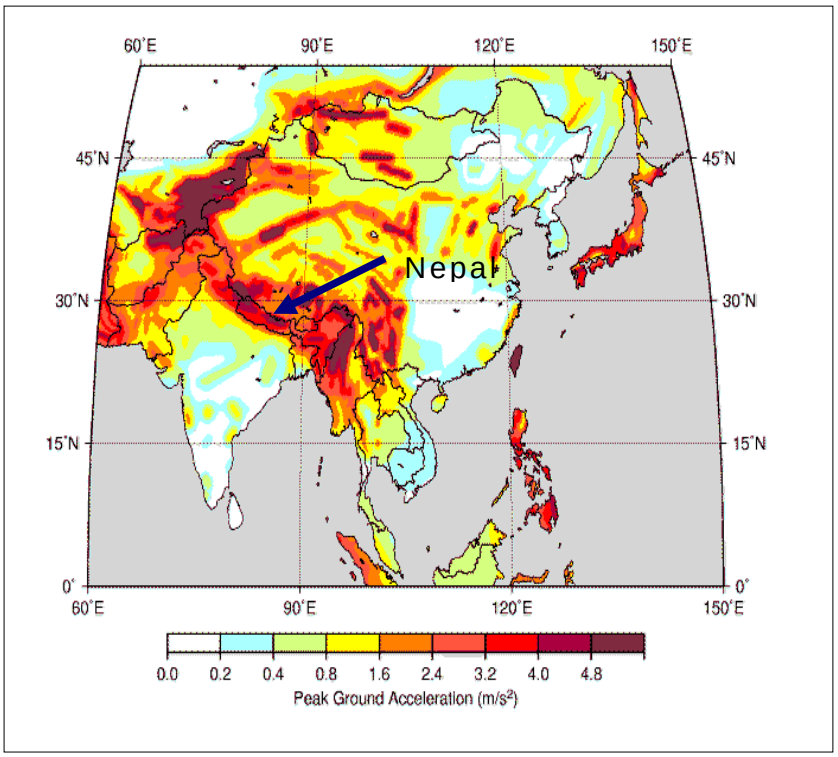


***Fig**. 1.5: Location of Nepal showing its regional setting with respect to the seismic hazard zone along the Himalayan Arc. (Source: Internet).*

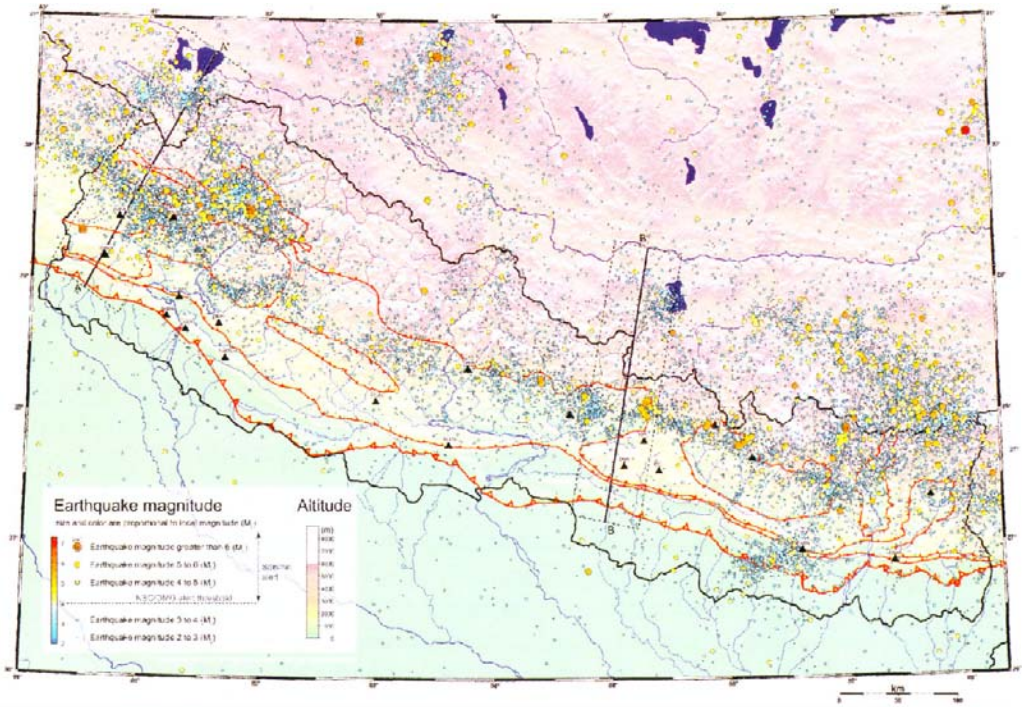
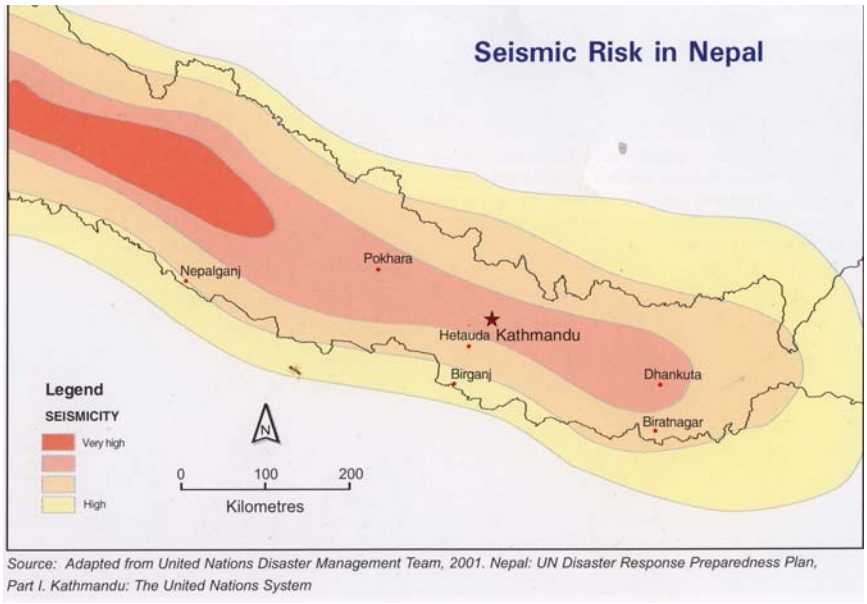
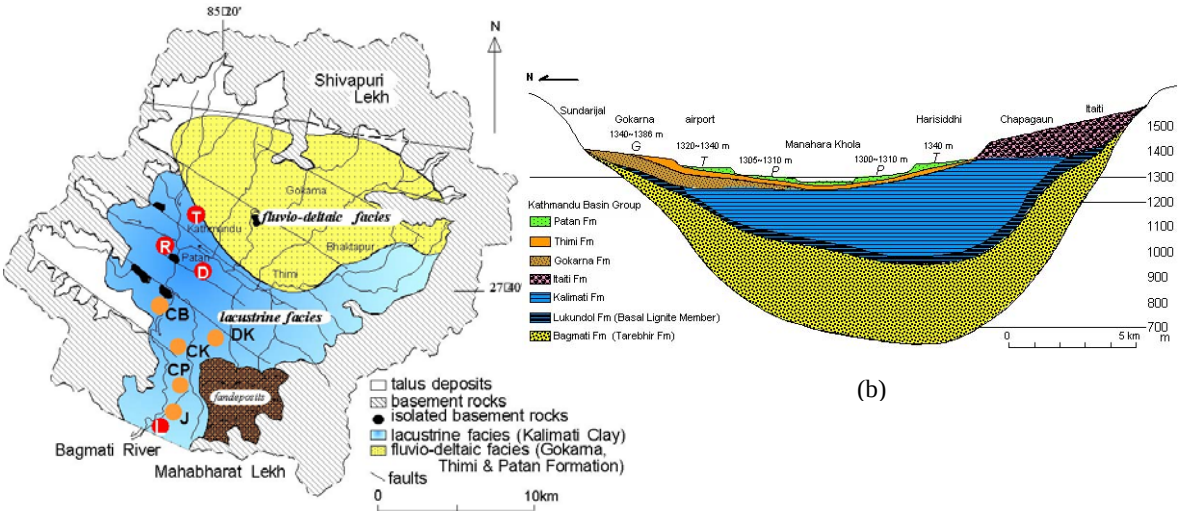


***Fig**. 1.6: Earthquake Epicentre map of Nepal Himalaya data from 1994-2005 (DMG 2006)*



Source: Adapted from United Nations Disaster Management Team, 2001. Nepal: UN Disaster Response Preparedness Plan, Part I. Kathmandu: The United Nations System

***Fig**. 1.7: Seismic risk map of Nepal (Zurick et al. 2005)*



(a) (b)

***Fig**. 1.8: (a) Map of Kathmandu Valley with distribution of sediments (Sakai 2001), (b) a N-S geological cross-section of the Kathmandu valley showing basin sediments (Sakai 2001).*

The Himalayan, the Hill and the Terai belt of Nepal accommodate 7.3, 44.3 and 48.4 per cent of the population respectively. The Himalayan and the Hill belts use heavy construction materials such as stone masonry and hence these two belts are highly vulnerable to earthquake hazards especially when it occurs in the night time. The urban Terai areas have become vulnerable due the inappropriate construction practices having no earthquake resistant components in the design of buildings including recently constructed buildings using reinforced concrete. The rural Terai however, are less vulnerable as most houses are made of light materials such as timber and bamboo with thatched roofs.

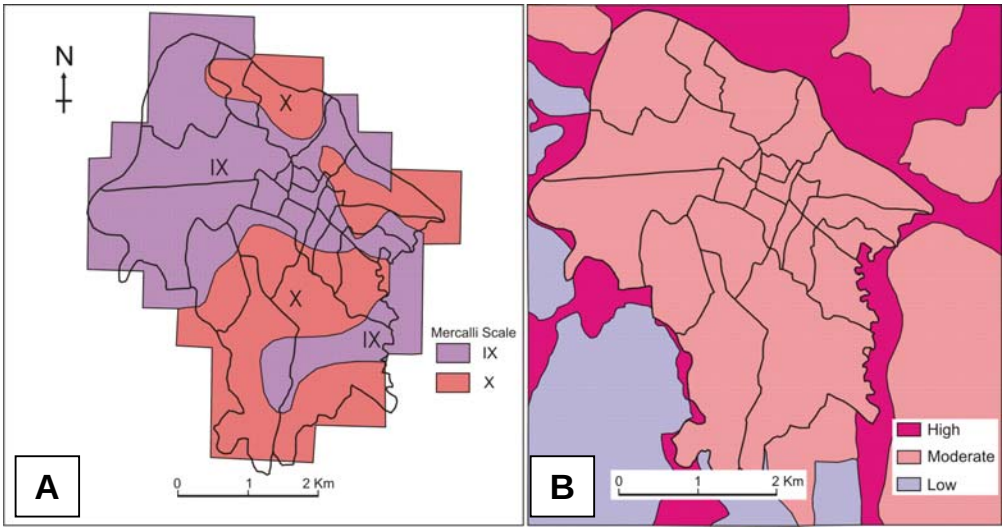


***Fig**. 1.9: Earthquake vulnerability studies in Lalitipur District. a) Intensity map b) Liquefaction susceptibility map (Piya 2004, Guragain 2004).*

1.9.5 Epidemics

With poor medical infrastructure, resources and manpower, health services in Nepal, particularly in the rural areas, is highly inadequate. This situation is mainly responsible for the loss of large number of lives every year due to epidemic outbreaks. Not surprisingly, epidemics are the largest killer in Nepal nearly 519 deaths per year, (source, MoHA 2004, DWIDP 2006).

The epidemics of cholera, gastroenteritis, encephalitis, meningitis, diarrhoea pneumonia are common during hot and rainy seasons. It is usually on the peak during the month of May and June (beginning of the rainy season). But the recent studies have revealed that the epidemics got into peak during the month of August also. Every year in remote village communities epidemic outbreaks like diarrhoea, measles, typhoid and cholera and so on are found to be very common and kill many people in a short span of time.

1.9.6 Fire

Fire is another recurring common disaster in Nepal. Every year, particularly in the dry season of February to May, large number of fire accidents is reported in the country. Most disasters occur in Terai where houses with thatched roofs are more prevalent. However, fires in the hills in large townships and isolated houses are not uncommon. Although the number of deaths by fire is comparatively less (about 50 deaths per year), the amount of loss of property is very high (nearly 245 million NRs or 3.5 million US$ per year, source, MoHA).

A total of 959 people were reported killed and about 60,243 houses were destroyed by fire during the last ten years. Some of the reasons for the fire outbreaks are improper use of fire for cooking and other domestic purposes and lack of adequate fire safety measures. As about 90% of the population of the country inhabit in the rural areas mainly in thatched houses and closely clustered, the fire hazards in the settlement area are more common. On the other hand, every year fire has been destroying considerable amount of forest resources in Nepal. Forest

fires occur annually in all major physiographic /climatic regions of Nepal, including the Terai, Siwalik and High Mountainous regions mainly during the dry season. Forest fire is a major cause of degrading biological diversity in Nepal's forests. It also causes soil erosion and induces floods and landslides due to the destruction of the natural vegetation indirectly. The main causes of forest fire are anthropogenic due to negligence and occasional deliberate burning of bushes to induce succulent grass growth for domestic animals. The embers from forest fire also causes fire in nearby villages, especially in the Terai region where the roofs are made of thatched grass.

1.9.7 Drought

The uneven distribution of monsoon rainfall is responsible for the drought situation. The transhimalayan part of the kingdom is generally dry. Primarily, the Terai region and western hilly areas are affected by drought more frequently. The insufficient irrigation facilities make the problem even more serious as prolonged drought condition has adverse effect in crop production. The process of desertification is also noticed in the northern hilly areas mainly in Mustang and Manang districts.
Unfortunately, the country lacks a clear and systematic picture of the effect of the drought in the country. However, the rough estimates show around 5,000 families are affected in different parts of the country due to drought and a significant amount of food grain production particularly the cereal production is decreased.

1.9.8 Thunderbolt

Thunderbolt is another common natural disaster where in an average nearly 27 persons die every year and over 33 are seriously injured (MoHA 2004). The record shows that although the disaster is common during the pre-monsoon months of April, May and June it is also common in other months too.

1.9.9 Other disasters

Other disasters such as hailstorm, snow avalanches, cold waves, hot waves also cause considerable loss of lives and property in Nepal. They occur frequently with localized effects. The sudden avalanche and heavy snow fall in fair season sometimes cause heavy losses of human lives. Thousands of villagers in Nepal's remote mountainous districts fall in the grips of severe famine, which demands for the government's additional efforts to ensure the emergency food supplies. Unexpected and heavy hailstones and rainfall occasionally destroy seasonal crops of paddy, millet, wheat and maize leading to widespread hunger in remote mountain districts. Famines are not frequently reported as other natural disasters but it has been increasingly affecting the poor people every year. However, so far no records of deaths due to famine are maintained by the Home Ministry.

Chapter 2

Impact of Natural Disaster in Nepal

It is a great challenge to protect lives, infrastructure and property from frequent natural disasters in Nepal. Each year flood, landslide, fire, epidemic, avalanche and various other natural and man made disasters cause the casualty of thousands of human lives and destruction of physical assets worth hundreds of millions of rupees. Landslides, debris flows, floods, and earthquakes alone contribute the bulk of loss of lives and damages to property in Nepal. Although, the yearly trend shows ups and downs, the last decade shows a rising trend of loss of lives and damages to property due to disasters compared to the earlier ones.

2.1 Impact on Human lives and Infrastructure

2.1.1 Loss of Human lives

The number of losses of human lives and rehabilitation/ reconstruction cost of damaged and destroyed infrastructures are the direct measure of disaster impact. However, even these measures reveal only the tip of the iceberg when compared to the human sufferings, psychological impacts/ trauma etc. that the people have to undergo after the disaster.

The record of disasters and their impacts from 1983 to 2005 (MoHA 2004, DWIDP, 2006, **Table** 2.1, Annex II) shows how severely the country has suffered from various disasters in the last two decades. It can be seen that over the last 23 years in an average every year 943 people lost their lives in Nepal. Due to landslides and floods alone the number of loss of lives reached 304 per year. The district-wise distribution of total number of deaths of people between the years 1995-2003 is shown in **table** 2.2. The records also reveal that in south Asia Nepal stands third in having highest number of average annual human deaths per million living population with 39 deaths per year per million (**Table 2.3**), only behind Sri Lanka and Bangladesh. Even, these numbers may be on the lower side as there are many cases when disasters are unreported from remote areas. **Table** 2.2 also reveals that Nepal has the highest ratio of number of affected persons to number of Killed (1:144), i.e. for every 144 persons affected by disaster one is killed. **Figure 2.1** shows the district–wise data on persons killed by natural disasters during the years 1995-2003 (2052-2060 BS). The percentage of loss of lives from different types of natural disasters (1983-2005) is shown in **Fig. 2.2** and the total families affected by different disasters between 1983 and 2005 are shown in **Fig**. **2.3**. **Figure 2.4** shows the trend of loss of lives from different types of natural disasters (1983-2005).

Table 2.1: Loss of lives due to various disasters in Nepal from 1983 to 2005

Year	Flood & Landslide	Fire	Epidemics	Windstorms, Hailstorm & Thunder bolts	Earthquake	Avalanche	Stampede	Total
1983	293	69	217	0	0	0	0	579
1984	363	57	521	0	0	0	0	941
1985	420	52	915	0	0	0	0	1387
1986	315	96	1101	0	0	0	0	1512
1987	391	62	426	2	0	0	0	881
1988	328	23	427	0	721	14	71	1584
1989	680	109	879	28	0	20	0	1716

1990	307	46	503	57	0	0	0	913
1991	93	90	725	63	0	0	0	971
1992	71	97	1128	20	2	0	0	1318
1993	1336	43	100	45	0	0	0	1524
1994	49	43	626	47	0	0	0	765
1995	203	73	520	34	0	43	0	873
1996	258	61	494	75	3	4	0	895
1997	78	45	947	44	0	9	0	1123
1998	276	54	840	23	0	0	0	1193
1999	209	46	1207	22	0	3	0	1489
2000	173	53	141	26	0	0	0	393
2001	196	26	154	41	1	0	0	418
2002	441	14	0	6	0	0	0	461
2003	232	16	0	62	0	0	0	310
2004	131	10	41	10	0	0	0	192
2005	141	28	34	18	0	21	0	242
Total	6984	1213	11946	623	727	114	71	21680
							Average of 23 years	**943**

(Source: MoHA 2004, DWIDP 2006)

Table 2.2: District–wise data on persons killed by natural disasters during the years 1995-2003 (DWIDP 2006)

District	Persons killed	District	Persons killed	District	Persons killed
Achham	21	Ilam	49	Panchthar	20
Argakhanchi	46	Jajarkot	34	Parbat	8
Baglung	81	Jhapa	66	Parsa	11
Baitadi	15	Jumla	7	Pyuthan	58
Bajhang	18	Kailali	23	Ramechhap	68
Bajura	30	Kalikot	12	Rasuwa	46
Banke	9	Kanchanpur	18	Rautahat	20
Bara	19	Kapilbastu	19	Rolpa	50
Bardiya	15	Kaski	42	Rukum	39
Bhaktapur	3	Kathmandu	83	Rupendehi	38
Bhojpur	69	Kavre	50	Salyan	14
Chitwan	76	Khotang	130	Sankhuwasabha	79
Dadeldhura	2	Lalitpur	42	Saptari	11
Dailekh	33	Lamjung	44	Sarlahi	24
Dang	42	Mahottari	24	Sindhuli	19
Darchula	26	Makawanpur	139	Sindhupalchowk	127
Dhading	120	Manang	21	Siraha	12
Dhankuta	19	Morang	45	Solukhumbu	47
Dhanusa	26	Mugu	8	Sunsari	30
Dolakha	85	Mustang	3	Surkhet	3
Dolpa	4	Myagdi	55	Syangja	99
Doti	13	Nawalparasi	30	Tanahun	65
Gorkha	62	Nuwakot	15	Taplejung	52
Gulmi	62	Okhaldhunga	34	Tehrathum	13
Humla	13	Palpa	29	Udayapur	55

Table 2.3: Total number of affected people vs. total persons killed and deaths of persons per million/ per year

Name of country	Total number of affected people vs. total persons killed (based on data from 1985-2004)	Deaths of persons per million/ per year (based on data from 1985-2004)
Sri Lanka	1:321	94
Bangladesh	1:1661	63
Nepal	**1:144**	**39**
Afghanistan	1:593	21
China	1:5754	13
Bhutan	1:278	12
India	1:9531	6
Pakistan	1:2448	4
Maldives	1:360	2

(Data source: WDR 2005, DWIDP 2006)

2.1.2 Infrastructure damage

The infrastructure damages due to landslide/debris flow and flood related disasters in Nepal are mostly, 1) washout of sections of roads, 2) reservoir siltation due to excessive inflow of sediments during flood, 3) irrigation canal breaches and damage to diversion dams, 4) damage to headrace canals of hydropower generation, (5) powerhouse damages, 6) utility transmission tower collapse and 7) damages to public and private building etc. However, systematic and detailed data base on infrastructure damage/ destruction and their rehabilitation/ reconstruction costs are not easily available in Nepal. The Ministry of Home Affairs (MoHA) compiles data only on the number of houses destroyed and loss of agriculture land by various types of disasters. Even these data do not specify the type of houses-whether they are public, private or school buildings. It is found that the respective departments such as Roads, Irrigation, Housing and Physical Planning, and Nepal Electricity Authority which have the responsibilities of infrastructure construction, maintenance, reconstruction and rehabilitation also do not keep proper record of damages and rehabilitation costs after damage by disasters. Therefore, it is very difficult to evaluate the actual annual cost of rehabilitation/ reconstruction of infrastructures damaged or destroyed by disasters. **Table** 2.4 shows the district-wise data on economic loss dude to damage to infrastructures by different kids of disasters during the years 2001-2003 and the same data is also presented in **Fig**. 2.5.

As per the available data, a total of 143,554 houses in Nepal have been destroyed by floods and landslides during a period from 1983 to 2003 **(**MoHA 2003). This amounts to an average of 7, 329 house destruction per year. **Figure** 2.6 presents the annual number of houses destroyed by landslides and floods, immediately after the disasters. The number of houses that become critical and collapsed after some time of the disasters are not covered in this figure. Therefore, the actual number of houses destroyed can be higher than that presented in the figure. Khanal (1996) has estimated that the average annual infrastructure damage in Nepal due to landslides and floods in terms of financial loss is approximately US$ 20 million. The data on number of infrastructure damages due to the July 1993 disaster is shown in **table** 2.5.

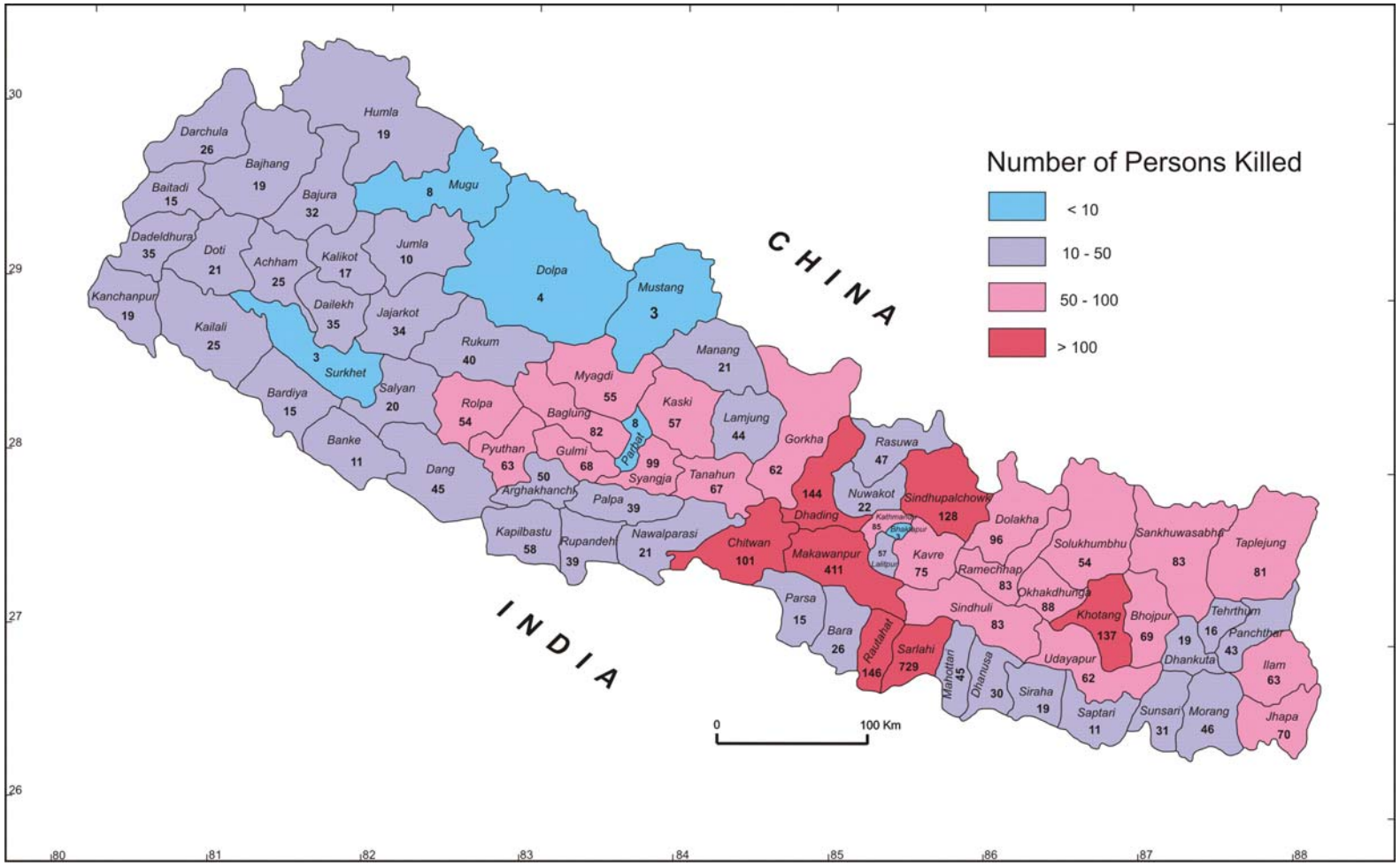


***Fig**. 2.1: Map showing district–wise data on persons killed by natural disasters during the years 1993-2005 (2050-2062 BS). Data Source: MoHA and UNDP 1999, MoHA 2004, DWIDP 2006*

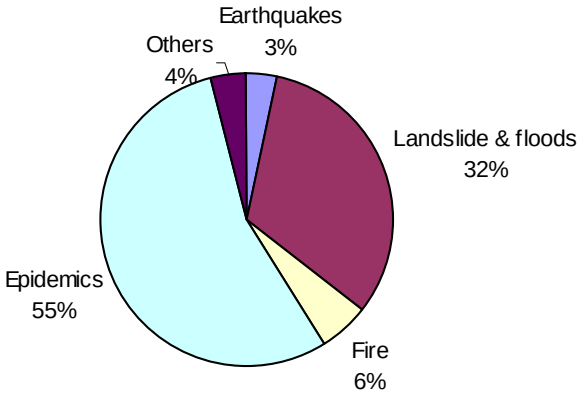


***Fig**. 2.2: Percentage of loss of life due to various types of disasters in Nepal in the last 23 years (1983-2005) (MoHA 2004, DWIDP 2006)*

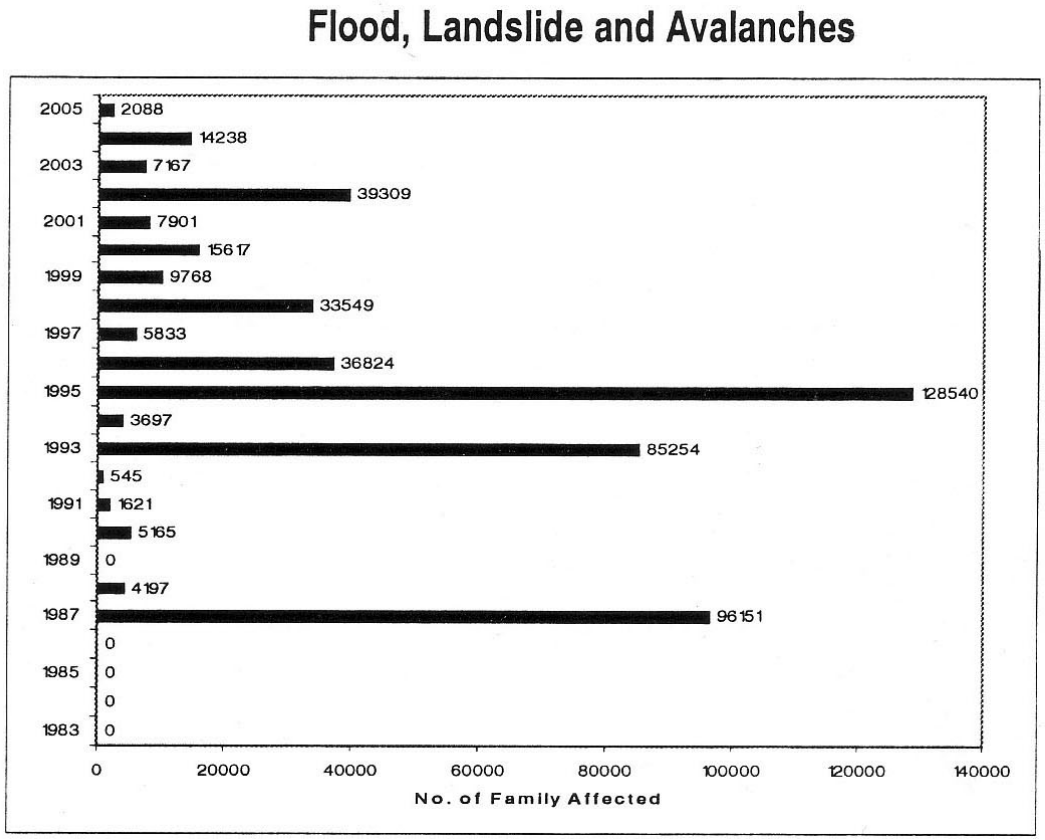


***Fig**. 2.3: Total number of affected families by different disasters, 1983-2004 flood, landslide and avalanches (Data Source: MoHA 2004, DWIDP 2006)*

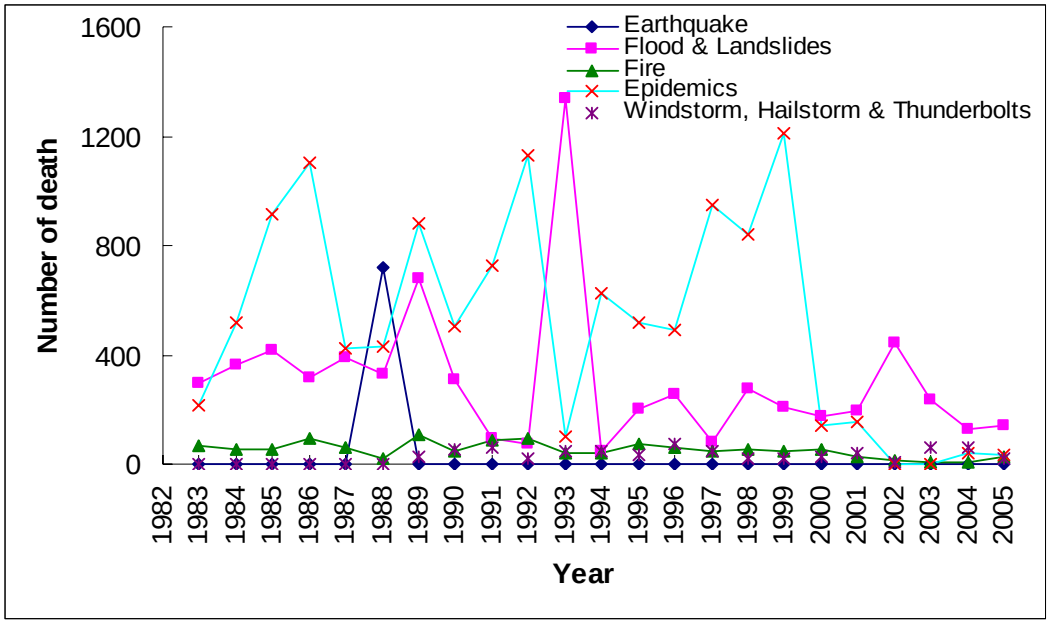


***Fig**. 2.4: The trend of loss of lives by different types of natural disasters between 1983 and 2005 (Data Source: MoHA 2004, DWIDP 2006)*

Table 2.4: District–wise data on economic loss (in NRs. Millions) due to damage to infrastructures by different kinds of disaster during the years 2001-2003 (2058-2060 BS) (MoHA 2004, DWIDP 2006)

District	Million NRs.	District	Million NRs.	District	Million NRs.
Achham	50.54	Ilam	110.60	Panchthar	14.38
Argakhanchi	39.41	Jajarkot	8.86	Parbat	24.37
Baglung	43.53	Jhapa	179.48	Parsa	26.73
Baitadi	14.41	Jumla	0.42	Pyuthan	3.63
Bajhang	3.06	Kailali	7.73	Ramechhap	20.32
Bajura	7.74	Kalikot	2.70	Rasuwa	1.28
Banke	6.20	Kanchanpur	19.30	Rautahat	80.03
Bara	18.50	Kapilbastu	7.40	Rolpa	38.39
Bardiya	0.08	Kaski	21.13	Rukum	9.31
Bhaktapur	6.40	Kathmandu	42.06	Rupendehi	20.58
Bhojpur	12.40	Kavre	20.87	Salyan	7.53
Chitwan	45.54	Khotang	1.12	Sankhuwasabha	26.36
Dadeldhura	1.51	Lalitpur	15.64	Saptari	78.99
Dailekh	14.39	Lamjung	23.56	Sarlahi	156.91
Dang	17.48	Mahottari	40.73	Sindhuli	293.36
Darchula	10.15	Makawanpur	28.81	Sindhupalchowk	21.21
Dhading	17.01	Manang	0.07	Siraha	33.22
Dhankuta	0.64	Morang	64.93	Solukhumbu	30.18
Dhanusa	50.27	Mugu	1.51	Sunsari	23.25
Dolakha	1.16	Mustang	14.95	Surkhet	2.24
Dolpa	1.10	Myagdi	45.13	Syangja	17.77
Doti	22.34	Nawalparasi	9.15	Tanahun	37.51
Gorkha	17.89	Nuwakot	6.91	Taplejung	647.01
Gulmi	9.29	Okhaldhunga	24.73	Tehrathum	25.44
Humla	8.74	Palpa	5.67	Udayapur	212.54
Total					**2,975.78**

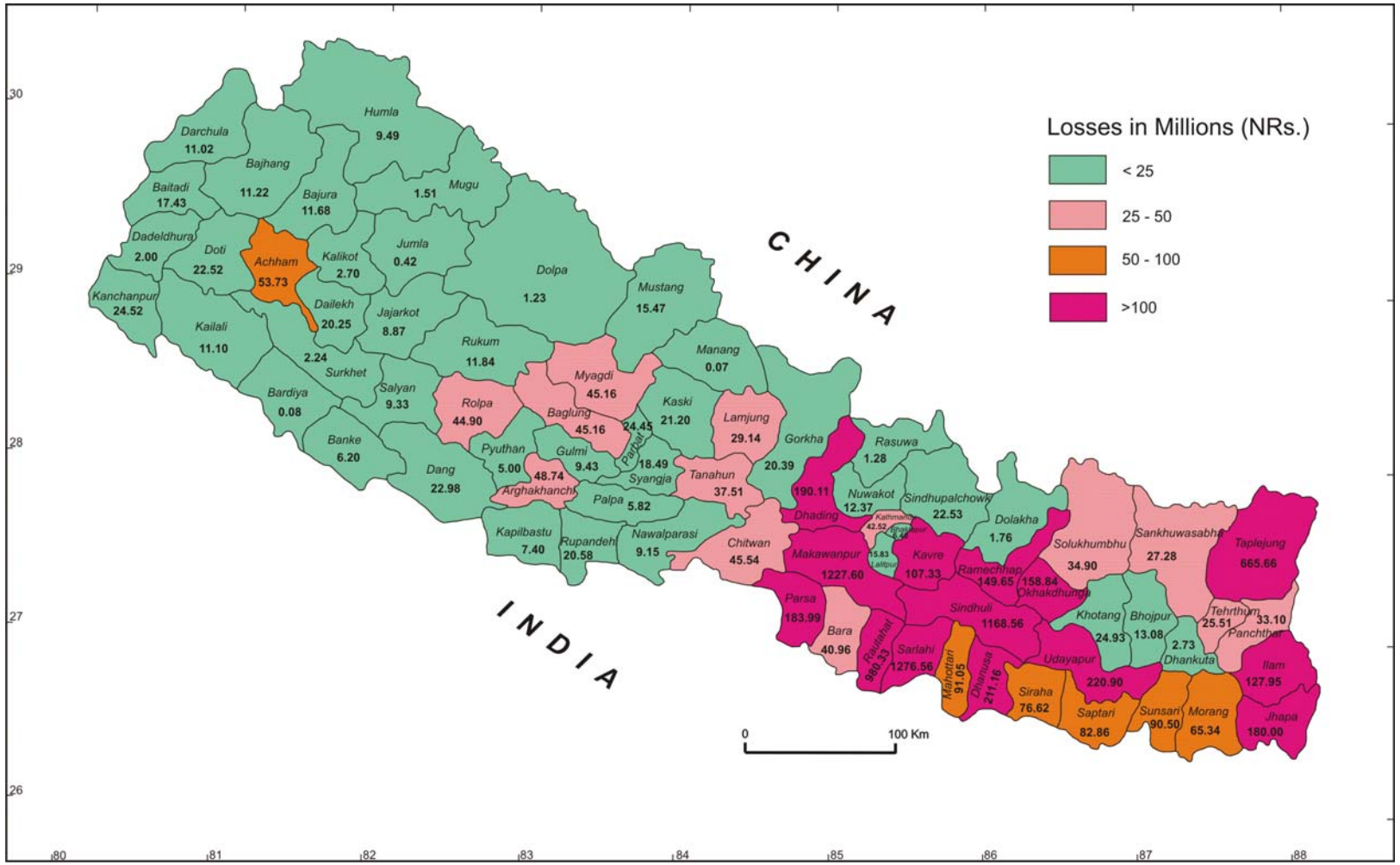


***Fig**. 2.5: Map showing district–wise data on economic loss (in NRs. Millions) due to damage to infrastructures by different kinds of disaster during the years 1993-1994 & 2000-2005* (2051-2052 & 2057-2062 BS). Data Source: *Data Source: MoHA and UNDP 1999, MoHA 2004, DWIDP 2006*

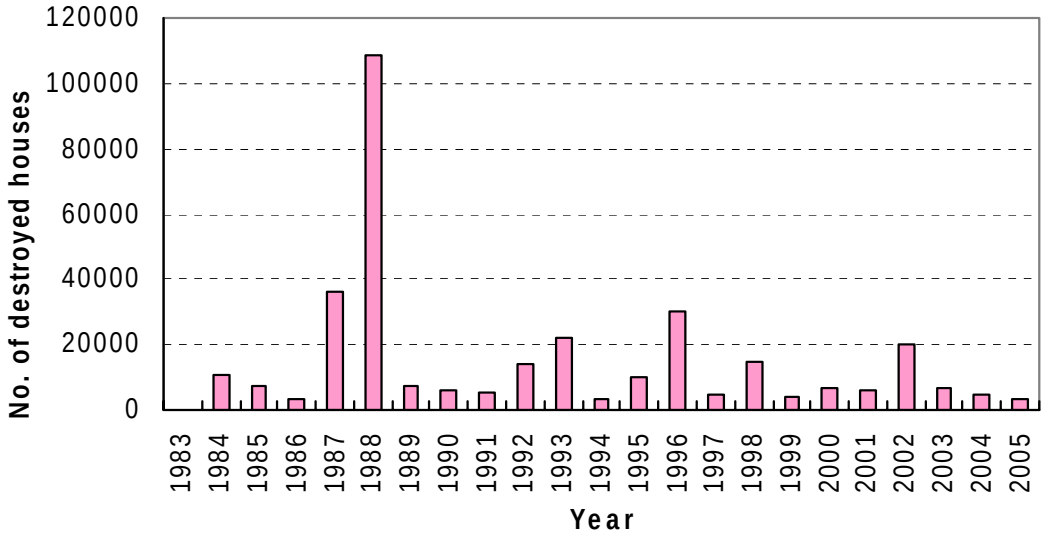


***Fig**. 2.6: Number of houses destroyed by natural disasters between1983 and 2005 (Data Source: MoHA 2004, DWIDP 2006)*

Table 2.5: Infrastructure Damage in July 1993 in Nepal (Khanal 1996)

Roads (km)	Number of Bridges	Number of Dams	Number of FMIS	Number of Public Buildings
367	213	64	620	452

FMIS: Farmer-managed Irrigation System

According to the data available from the Department of Roads, the damage to Prithvi Highway due to landslides and debris flows of 1993 disaster amounted to a total of NRs. 572 million (Dhital et. al. 1993). It has been estimated that the cost of reconstruction and rehabilitation of roads damaged by landslides and floods in Nepal between the periods 1979 to 1993 was NRs 2,250 millions (i.e., equivalent to US$ 50 million). An estimated 10%-25% of the hill roads in Nepal passing through river valleys is completely washed out every four to five years by a combination of landslides and floods (Deoja 2000)**.**

Nepal also suffers from a different type of infrastructure damage often caused by landslides and debris flows in filling up of reservoirs from excessive sedimentation, thus rendering the reservoirs less effective or reducing the reservoir's life. The rivers of Nepal are notorious for very high sediment discharge particularly during the monsoon season. In fact, sediment production in Nepalese watersheds has been acknowledged to be the highest in the world (Carson 1985; Laban 1978). For example, the storage of Kulekhani Reservoir was reduced from 12 million m^3 to 7.6 million m^3 as a result of sedimentation and siltation during landslide and flood disasters of 1993 alone (Galay et. al. 1995). This is equivalent to an economic loss of hundreds of millions of Nepalese rupees. Prithvi Highway and Narayanghat-Mugling Highway pass through the catchment area of Narayani River.

The effects of disruption of surface transportation services due to landslides, debris flows and floods, ranging from days to many weeks, is another type of indirect economic loss due to disasters and badly affects the economy and causes inconveniences and hardship to people.

Almost every year the Prithvi Highway, Tribhuvan Highway, Arniko Highway and others get disrupted due to landslides and floods. In 1993, Kathmandu, the capital city, was cut off from rest of the country for 28 days due to the disruption of Prithvi Highway and Narayanghat-Mugling road section. The frequency and length of transportation disruptions are increasing in the recent years. Such incidences of disruption in their service severely cripple the transportation service infrastructure causing a great economic loss. This type of infrastructure damage consequences, however, is not accounted for in the yearly disaster reports under landslide-flood related damage.

2.2 Some Cases of Impact from Water-induced Disaster

2.2.1 Landslide and flood

The indirect effects of the landslides and floods, such as the reduction in agricultural productivity due to erosion of top soil, loss in efficiency of hydropower plants and damage to irrigation facilities and siltation in canals and reservoirs, long-term physical and psychological impacts to the disaster victims, cost of resettlement of people affected, loss of work-hours in industry and service sectors, environmental damages, economic losses due to disruption in traffic movement, and disruption in agricultural activities due to loss of animals used for tilling farms, etc. are not available and therefore could not be accounted for in this report.

The data of the last two decades (**Figure** 2.7) show that the average annual loss of human life in Nepal due to landslides and floods is more than 300. This number, however, does not cover the number of people who died due to epidemics and other secondary impacts of landslides and floods. Similarly, due to lack of proper information network, human deaths caused by landslides in remote parts of Nepal often go unreported unless they are of large scale. This is one of the reasons behind the variation in data on disasters from different agencies. For example the number of human deaths from landslides and floods in the year 1993 is officially reported to be 1336, while some other publications put that number to be 1612. Compared to its population size, the scale of disaster from landslide in Nepal in terms of human deaths is staggering if compared to the statistics from its neighbouring countries.

To provide some insight on the nature of natural disasters in Nepal and their impacts on life and infrastructure, a few major landslide/flood and earthquake disasters are described below. A summary of the extreme weather events and infrastructure failures in different years is provided in **table** 2.6.

Infrastructure failure is another cause of flooding in Nepal. While well-planned infrastructure can be a critical asset in disaster mitigation, the haphazard, poorly engineered, or unplanned infrastructure actually may increase vulnerability, particularly in case of flooding. This issue is of increasing importance everywhere,

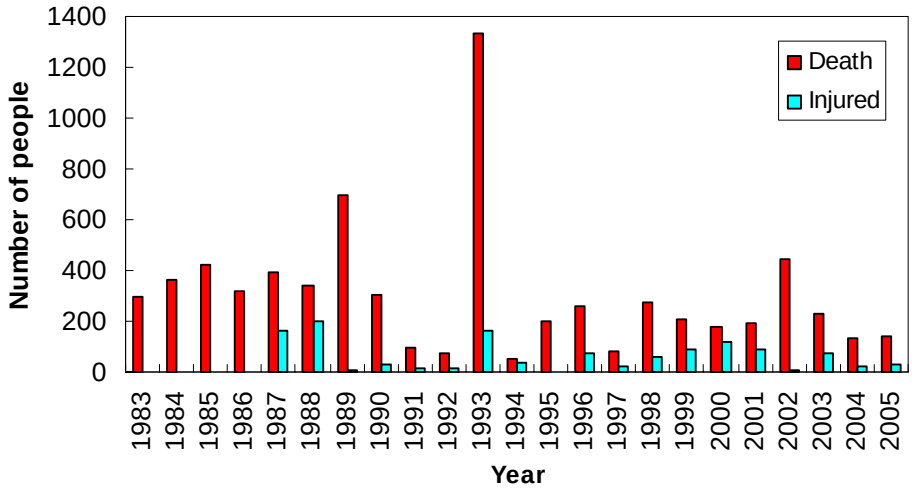


***Fig**. 2.7: Death and injured peoples by landslides and floods from 1983 to 2005 (Data Source: MoHA 2004, DWIDP 2006)*

Table 2.6: Large events of flash floods in Nepal (Thapa and Khanal 2001)

Type	Event location and year
Extreme weather events Landslide damming	Lele l981, Kulekhani 1993, Larcha 1996, Syangja-Butwal 1998, Budhigandaki 1967/68, Tinau 1970, Phalahgku 1971, Baglung 1976, Dalephi 1982, Trisuli 1985, Tadi 1986, Sunkosi 1987, Myagdi 1988, Tarukhola 1989.
GLOF	Taraco 1953, Gelhaipoci 1964, Longda 1964, Zhangzangbo 1964, Ayico 1968, Nare Drangka 1977, Phucan 1980, Zhangzangbo 1981, Jinco 1985, Dig Tsho 1985, Kaligandaki 1987, Chubung 1991, Tamapokhari 1998.
Infrastructure failure	Kosi Barrage-nearly every year, River embankment/dam construction near Dhanusa, Rautahat, Nepalgunj, Bardiya, and Kailali every year, irrigation dam Bagmati 1993, check dam in Rapti, Chitwan 1990/93, check dam in Tinau 1970/81

but nowhere is it more pronounced in Nepal than in the *Terai*. As the population continues to increase, infrastructures such as barrages across the rivers in front of the Churia foot hills can be very dangerous if proper design and safety measure are not taken in advance. The Bagmati Barrage can be taken as the worst case scenario during the 1993 flood disaster. Settlement expansion, infrastructure build-up, and environmental degradation will result in more landslides and debris flows in the mountains. This may result in more frequent, higher magnitude, and more devastating flood and debris flow disasters affecting both the hills and the Terai. Some examples of disasters due to infrastructure failures are shown in **table** 2.7.

(a) Loss of lives and property due to July, 1993 disaster

Unprecedented high intensity precipitation (cloud burst) occurred in the upper part of the Mahabharat Range of Makawanpur and Dhading districts, covering three major waters sheds- Bagmati in the east, Trishuli in the north, and Rapti in the south - on July 19, 1993. The volume of precipitation within 24 hours, recorded

Table 2.7: Losses due to infrastructure damage/failure (Khanal 1996, Chhetri and Bhattarai 2001)

Infrastructure	Location	Description
Kosi barrage	Saptari, Sunsari	Nearly every year, thousands are affected
River embankment	Dhanusa	1998: 200 houses, 4,500 families affected;
Ring dam	Rautahat	1978: 4 casualties, 850 houses damaged, 4,500 families affected;
Irrigaton dam	Rautahat, Sarlahi	1993: 793 casualties, 9500 houses, 14,500 livestock, 31,500 families
		affected;
Check dam	Rapti, Chitwan	1990: 26 casualties, 880 houses; failure of check dam
		1993: 24 casualties, 2,206 houses, 5,880 livestock, 5293 affected
Hydropower dam	Syangja	1990: 5 casualties; opening gate at Andhikhola dam

within the area, ranged from 362 mm at Nibuwatar in the southern part of the Mahabharat Range to 320 mm at the Kulekhani dam site, 337 mm at Markhu (1530 m), 373 mm at Daman (2,364 m), and a maximum of 539.5 mm at Tistung (1,940 m). Such high intensity rainfall occurred over about 530 sq. km. with a maximum east-west length of 40 km and maximum north-south width of 20 km (**Fig**. 2.8). Almost all the VDCs located in the Mahabharat Range and its adjoining areas of Makawanpur and Dhading districts were affected by landslides, debris flows and floods triggered by this torrential rain. Nearly 8,000 families of 17 VDCs, namely, Tistung, Bajrabarahi, Palung, Daman, Agra, Gogane, Namtar, Raksirang, Khairang, Kankad, Bharta, Surikhet, Kalikatar, Bhimphedi, Markhu, and Chitlang in Makawanpur district, and 3,000 families from Naubise, Thakre, Tasarpu, Pida, Baireni, and Gajuri VDCs in Dhading district, were affected caused by this rainfall. Nearly 160 persons from these areas died. VDCs' located far down in the Rapti Valley were also affected by the flood generated by the rain. Five thousand families in seven VDCs, namely, Bhandara, Piple, Kathar, Kumroj, Bachhauli, Padampur, and Khaireni of Chitwan district (about 40-60 km downstream from the area of high intensity rain) were also affected, and 22 persons were swept away. Similarly, 1,600 families from five VDCs, namely, Manohara, Handikhola, Basamadi, Bhaise, and Nibuwatar in Makawanpur district, were affected, and 33 persons were swept away by the floods on the Rapti River. Almost all the bridges located over the rivers originating from the Mahabharat Range (area of high intensity rainfall) were swept away by the floods.

Another very high intensity precipitation event occurred in the Churia and in the lower part of the Mahabharat Range on July 20, 1993, one day after the heavy precipitation in the Daman-Palung area. This area of high precipitation fell in the eastern part of Makawanpur District (Phaperbari-Raigaun), in the southern part of Kavre district (Milche-Saldhara), and in the western part of Sindhuli district (Hariharpur-Marin Khola*)*. The total precipitation recorded in the Hariharpur area within 24 hours was more than 500 mm. High intensity precipitation was concentrated in about 500-800 sq. km with a maximum east-west length of 60 km and a north south width of 25 km. Nearly 1,600 families in Kavre District, 11,000 families in Sindhuli District, and 4,000 families in Makawanpur District were affected by this rain. Similarly, about 35,000 families in Rautahat and Sarlahi districts in the downstream areas (20-60 km south) were affected and a total of 760 persons were swept away by the flood. Bagmati barrage, located about 20 km downstream from the area of high intensity precipitation, was also badly damaged.

The July 1993 flood/landslide disaster was the second very big natural disasters that Nepal faced after only five years of the 1988 eastern Nepal earthquake. During this flood disaster five hundred thousand people were affected, about 1500 people died, 60,000 ha of land was damaged, and numerous irrigation, transportation systems, and other infrastructure were destroyed (**Table** 2.8). Estimates place the losses from this single event at about 5 billion NRs. (Chhetri and Bhattarai 2001). The flooding/landslide disaster of 1993 is a periodic extreme event, and it is not so unlikely or uncommon. Such events have occured in the past. It is estimated that such huge destruction was caused by a 78-year precipitation event (Dhital et al. 1993).

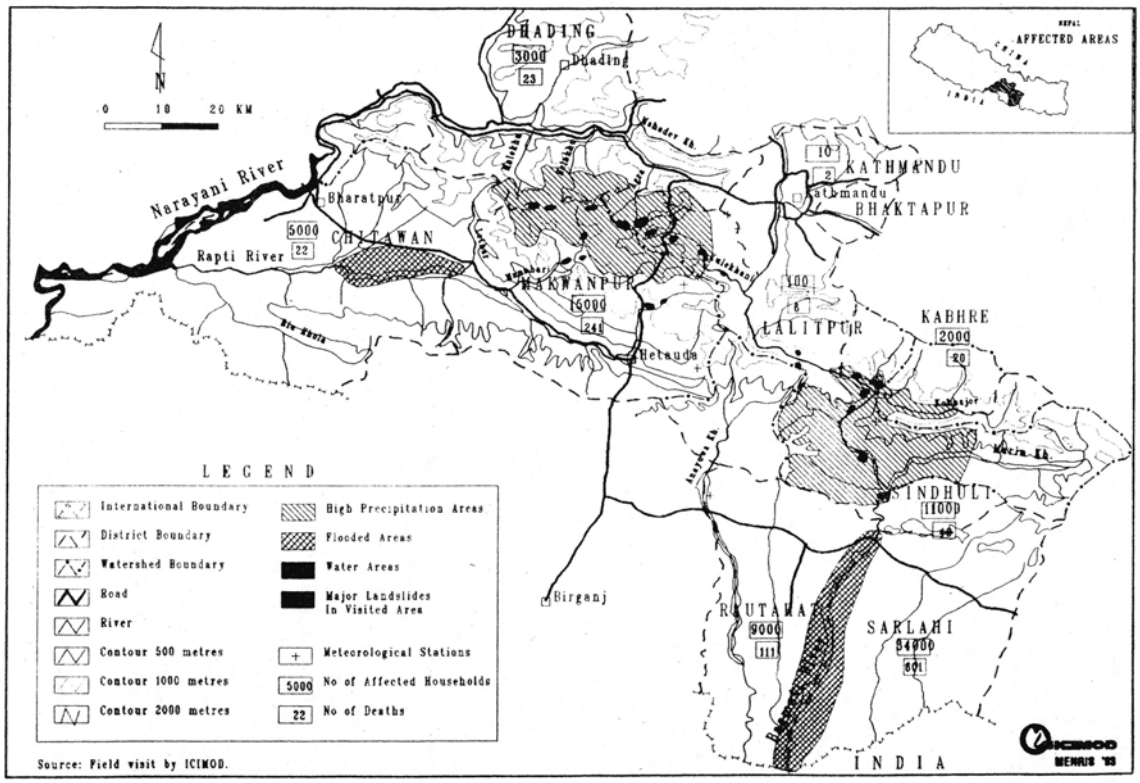


***Fig**. 2.8: Area affected by landslides and flood disasters during high intensity rainfall of July 19 & 20, 1993 (Dhital et al. 1993)*

Mass movements on Highways and Adjacent Regions

The floods and heavy rain caused severe damage to the roads (Dhital et al. 1993). The damage was confined to the gullies, steep soil slopes, and slopes with highly weathered rock. Gully erosion and alluvial fans either destroyed or blocked the road in several places. The road very close to the river channel also suffered from bank scouring, whereas, in several places, small debris fan debouched on the road.

Table 2.8: Estimated loss of lives and property from landslides and floods of 19-22 July 1993 (Chhetri and Bhattarai 2001)

Dead	1,336
Missing	201
Injured	110
Families affected	85,451
Houses destroyed	18,322
Houses damaged	20,721
Public buildings lost	452
Land loss	57,013 ha
Livestock loss	25,628
Roads destroyed	366 km
number of bridges destroyed	213
Dam destroyed	34
Number of Irrigation Channels destroyed	620
Total estimated loss of property	**NRs 4,901 million**

Damage to the Tribhuvan Highway and Adjacent Area

There were more than 2,000 landslides (with major landslides in more than 200 places) ranging in size from tens of square metres to thousands of square metres.

There were about 20 places with severe washouts. Areas where heavy damages occurred were Naubise (Km 26), Around Jhapre (Km 49- Km 53), between Sikharkot and Daman (Km 71 – Km 76), between Aghor and Mahabhir (Km 89-98), around Bhainse Dobhan, and at Bulbule (Km 122-123). More than 100 metres of retaining walls and 23 culverts were damaged. The bridge at Mahabhir, Bhaninse, and Trikhandi were completely washed out and the bridge over the Sopyang Khola and the Sankhamul khola were partially damaged (Dhital et al. 1993).

Damage to the Prithvi Highway and its Surroundings

Considerable damage to the Prithivi Highway was incurred by floods, debris flows, and landslides. According to the data provided by the Department of Roads, the cost of the damage along the Prithivi Highway is estimated to be about 572 million NRs. The Malekhu Khola Bridge with a span of 44 m was washed away. Similarly, the Belkhu Khola Bridge, with a span of 66 m, and the Agra Khola Bridge, with a span of 88 m were destroyed (Dhital et al. 1993). The Prithvi Highway was either damaged severely by the Trisuli River or damaged by landslides in more than 50 places. In those areas, the retaining walls were also damage considerably.

In several areas, the highway is very close to the river. In such areas, the river scoured the road and deposited from one to three metres of sand and gravel. Several suspension bridges were also either washed away or severely damaged during the same event. On the other hand, the flood, and rock-and soil slides damaged the road and adjacent slope at Naubise, Galchi, around Mahadev Besi, Belkhu, Gajuri, Malekhu, Benighat, Bisal Tar, and Jogimara. During the same event, the Blue Heaven Restaurant, situated on the left bank of the Trisuli River, about 500 m west of Malekhu, was washed away completely.

Damage to the Kulekhani Reservoir Area

Huge amount of sediment was brought into the Kulekhani Reservoir by this event. The survey carried out by the Department of Soil Conservation (DSC 1994), in March 1993 and

December 1993, in the Kulekhani Reservoir indicated that the sediment deposited during the 1993 monsoon was about 771 hectare-metres. During the period, the gross capacity of the reservoir was reduced by 10.19 million cubic metres of its capacity at construction, of which 7.71 million cubic metres of sediment were due to the 1993 floods. The Kunchal-Kulekhani Road, the Kulekhani Penstock pipe, the portal of the Kulekhani I tailrace tunnel, and the intake of the Kulekhnai II were also severely damaged. The damage to Kulekhani Penstock pipe alone amounted to about 200 million NRs (Dhital et al. 1993).

Damage to Bagmati Barrage

The Bagmati Barrage at Karmaiya in Sarlahi District was severely damaged by the flood and losses were estimated at more than 150 million NRs (Upreti and Dhital 1996).

The Debris Flow at Phedigaun

Phedigaun is located in the Palung Khola in Central Nepal was most severely affected by the July 1993 disaster in which 62 people were killed and 52 houses were destroyed (Dhital et al. 1993). About 2 square kilometres of the cultivated land and the village were washed away during the night of 19th July.

(b) Water-Induced Disaster Scenario of 2005

Based on the data of the Ministry of Home Affairs, the water-induced disaster scenario of the year 2005 was assessed to identify the most disaster affected districts of Nepal. In 2005, twenty eight districts were hit by disasters. The districts are ranked in descending order, having the highest figure at the top. The Rank Factor (R.F.) is calculated so as to give the weightage to the affected districts, and is computed as below:

$$R.F. = \frac{(N + 1) - i}{N}$$

Where,

R.F. = Rank factor of the district selected, N= No. of districts selected, i = Rank number: 1, 2, 3,……..n.

Based on these parameters, DWIDP (2006) has ranked the top ten districts that are shown in **table** 2.9.

Parameter Repetition disaster events Frequency (PRF) is the number of repetitions of the disaster affected districts occurring under various parameters in different tables. The districts appearing higher in the tables were weighed as more disastrous affected districts by water-induced disaster. Sum Rank Factor (SRF) is the sum of the Rank Factors of the district under different disaster parameters. The most disaster prone districts are assessed based on the PRF and SRF. The Total Disaster Factor (TDF) is the multiplication of PRF and SRF. The district obtaining the highest TDF score is considered as the most disaster affected district. The **table** 2.10 shows the PRF, SRF and TDF and the rankings of the top twenty disaster affected districts of the country.

Table 2.9: Ranking (with RF) of the top ten districts having high death casualties and affected families due to water induced disasters in 2005 (DWIDP 2006)

Loss of life					Affected families				
Region	**District**	**number of Deaths**	**Rank Factor**	**Rank No.**	**Region**	**District**	**Number of Affected Families**	**Rank Factor**	**Rank No.**
Western	Kapilbastu	39	1	1	Far-western	Kanchanpur	744	1	1
Far-western	Dadeldhura	33	0.9	2	Eastern	Udayapur	306	0.9	2
Western	Kaski	10	0.8	3	MM-western	Dang	114	0.8	3
Central	Rautahat	9	0.7	4	Eastern	Jhapa	102	0.7	4
Central	Mahottari	7	0.6	5	Eastern	Morang	86	0.6	5
Mid-western	Humla	6	0.5	6	Central	Mahottari	77	0.5	6
Eastern	Ilam	5	0.4	7	Far-western	Dedeldhura	66	0.4	7
Central	Nuwakot	5	0.3	8	Eastern	Saptari	59	0.3	8
Eastern	Jhapa	3	0.2	9	Central	Sarlahi	49	0.2	9
Central	Kavrepalanchok	3	0.1	10	Central	Rautahat	43	0.1	10
Total		**120**					**1,646**		

(c) Glacial lake Outburst Floods (GLOF)

GLOF events are frequent in the high Himalaya. Although data on GLOF is limited, they are potentially the most destructive type of floods, and have a very short or no advance warning. A serious GLOF of the Zhangzangbo Lake in 1981 damaged the Friendship Bridge, seven other bridges, the Araniko Highway, and a hydropower plant along the Sunkoshi river valley in Sindhupalchowk district. As infrastructure continues to be built in more remote mountain areas, it increases the vulnerability to GLOF. Economic losses tend to be great from the GLOF, as major pieces of infrastructure can be completely wiped out in a single event.

2.3 Impact from Earthquakes

2.3.1 The Great Nepal-Bihar Earthquake of 1934

In Nepal, there were 8519 deaths (male: 3,850 and female: 4,669) and 207,740 buildings, temples & travellers' shelters (*Pati Pauwa*) were damaged (Rana 1935). Deaths in Kathmandu valley and other regions of Nepal is given in **Figure** 2.9. Kathmandu Valley was almost completely destroyed and rural houses in the hills of eastern and central Nepal were heavily damaged.

Table 2.10: List of Ranked Districts based on Total Disaster Factor (TDF)(DWIDP 2006)

Rank	District	Parameter Repetition Factor (PRF)	Sum Rank Factor (SRF)	Total Disaster Factor (TDF)
1	Dadeldhura	5	3	15
2	Uadayapur	4	2.4	9.6
3	Dang	4	2	8
4	Kanchanpur	3	2.4	7.2
5	Jhapa	3	1.7	5.1
6	Mahottari	3	1.3	3.9
7	Arghakhanchi	2	1.7	3.4
8	Khotang	2	1.1	2.2
9	Bajura	2	0.9	1.8
10	Rautahat	2	0.8	1.6
11	Darchula	1	1	1
12	Kapilvastu	1	1	1
13	Lamjung	1	1	1
14	Sunsari	1	0.9	0.9
15	Kaski	1	0.8	0.8
16	Sidhupalchowk	1	0.6	0.6
17	Morang	1	0.6	0.6
18	Sindhuli	1	0.5	0.5
19	Humla	1	0.5	0.5
20	Ilam	1	0.4	0.4

2.3.2 The Udayapur Earthquake of 1988

After 54 years of the occurrence of the great Bihar-Nepal earthquake Nepal was hit by another earthquake of medium size. This earthquake affected 22 districts in eastern and central and caused 721 deaths. The estimated total direct economic loss was 5 billion NRs (JICA 2002). A record of the damage is summarized in **table** 2.11. The Udayapur earthquake in eastern Nepal was a turning point in the history of Nepal which for the first time brought considerable concern particularly at the government level regarding the urgency for the disaster management in the country. In response to the 1988 earthquake, a National Building Code was developed in 1994 under the UNDP/UNCHS (Habitat) project carried out by the Ministry of Housing and Physical Planning. The building code attempts to address the structural safety of all types of buildings in Nepal. This code has been prepared following the two design philosophy objectives (UNDP 1994):

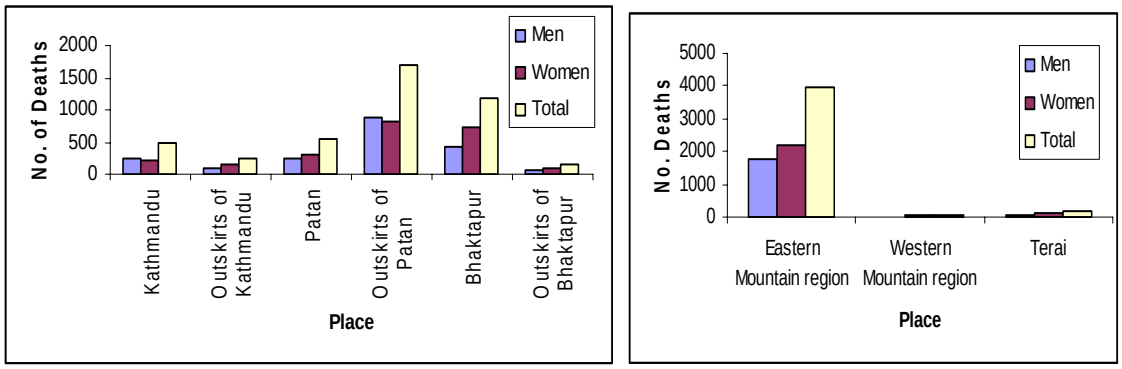


***Fig**. 2.9: Deaths in Nepal due to 1934 earthquake*

1. Structures should be able to resist moderate earthquakes without significant damage; and
2. Structures should be able to resist major earthquakes without collapse.

Table 2.11: The Damage caused by the Udayapur earthquake, eastern Nepal (1988 August, Bhadra 5, 2045 at 4.54.35 A.M. (Magnitude: 6.5 Richter scale)

S.N.	Description	Total Number
1.	Death of people	721
2.	Seriously injured people	1657
3.	Minor injured people	4896
4.	Collapse of private building	21976
5.	Seriously damaged private buildings (can not be used further)	42198
6.	Collapse of public buildings	150
7.	Seriously damaged public buildings (can not be used further)	318
8.	Collapse of government building	223
9.	Seriously damaged government buildings (can not be used further)	567
10.	Collapse of government schools	346
11.	Damage of Government Schools (can not be used further)	604
12.	Death of cattle	1566

2.4 Economic Impact of Disasters

Road failures and washouts as a result of heavy monsoon rains during fifteen years (1979-1993) resulted in the rehabilitation works amounting to nearly 2.5 billion NRs in Nepal. Thus, roads have often become liabilities rather than becoming agent of change and prosperity. Many mountain roads have been completely abandoned after full or partial completion, not only in Nepal but also in other parts of the world. The implication of the cost of roads in Nepal requires investment of 5 to 30 million rupees per km that is about 0.01 to 0.04 per cent of the annual budget of the nation for every km of road (Deoja 2000).

The Arniko Highway is one of the Nepal's most important and 'a strategic national highway', the only highway linking the capital city to the international border of its northern neighbour. The highway has experienced a number of major hydrological disasters owing as a result of both glacial lake outbursts and incessant heavy (monsoon) rainfall leading to floods and debris flows. Major GLOF events occurred along the Bhotekoshi River in 1964 and 1981. In 1964 the magnitude of devastation was less as the valley was only in the initial stages of infrastructure development. The GLOF incident of 1981 washed out many sections of the highway and two major bridges. The highway experienced another catastrophic flood in July 1987 that resulted in disastrous washouts and major erosion along the Sunkoshi, Charnawati, and Tungbhadra rivers. More than hundred human casualties, and heavy loss of cattle, houses, and cultivated land were reported. A number of suspension bridges and a substantial length of the Arniko Highway and Lamosangu-Jiri road were damaged or washed out (Adhikari 2001). The total cost of stabilisation and mitigation of the nine medium-size and medium complex landslides excluding the cost for the rehabilitation of the road itself was about NRs 37 million (approx. US$ 0.55 million).

Disasters are serious liability as they destroy lives and property on a regular basis in Nepal. Considering the annual direct losses to lives, buildings, infrastructure, industry, and agriculture and the additional indirect losses in production, income-earning activities,

employment and displacement, plus the cost of relief and recovery, disasters place a heavy burden on the already fragile economy of one of the world's poorest nations. Each large disaster can potentially set the country back several years in terms of development efforts. When scarce resources of time, energy, expertise, and funding are directed towards relief and recovery, they are diverted away from the overall development process. Agricultural, environmental, and infrastructure development are hit particularly hard as their resources are often the first to be diverted.

The economic loss due to natural disasters in Nepal is truly phenomenal. A resource-constrained and economically poor country, Nepal suffers a loss of several million rupees every year due to disasters. Based on the data compiled by the Ministry of Home Affairs, **table** 12 and **figure** 2.10 illustrates the annual economic loss from different types of disasters in Nepal. In the twenty three years between 1983 and 2005, over 28 billion rupees were lost due to disasters; this is an average of nearly 1208 million rupees per year. JICA (1993) estimated that the total disaster loss from floods and landslides in the year 1993 in Nepal is nearly five billion Nepalese rupees. In 2000 alone, the economic losses were estimated at 1.2 billion rupees; this in a normal year, when no exceptional disastrous events were reported (Chhetri 2002). Additionally, the frequency of disasters causing estimated annual economic loss is increasing. If this trend holds, which is likely due to higher economic activities at or close to the marginal lands, the country can expect to face higher overall economic loss with the passage of each year.

The estimated loss of property by all types of disaster in the year 2005 is about Rs. 388.21 million. Among them the loss of property due to flood and landslides only is 131.56 million. Hence, the water-induced disasters have played a vital role in the loss of lives and property of the country in 2005. The region-wise water induced disaster data from 14 April 2005 to 13 April 2006 is presented in **figure** 2.11.

The year 2005 was a normal year without any large-scale major disaster; even then the estimated loss reached over 100 million NRs only within the top ten districts. Even though this is not a complete list of losses and does not take into account events that go unreported or under-reported. This is a substantial amount of loss on annual basis to warrant serious attention. Average annual losses to disaster are quite high by any standard in a poor country like Nepal. The total losses due to property and infrastructure damages/destruction reach billions of rupees on an annual basis. Thousands feel the impacts of disasters in the loss of livelihoods, property, infrastructure, or income-generating activities. Major disasters, such, as the 1934 and 1988 earthquakes and the floods of 1993, cause widespread devastation, costing thousands of lives and billions of rupees.

Table 2.12: Estimated Loss for rehabilitation/relief works (NRs in Million) by Different Types of Disasters in Nepal (1996-2005) (MoHA 2004, DWIDP 2006, Annex - II)

Year/Type	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Avalanche		7.43	0.00	0.00	0.00	0.00	-	-	-	-
Flood & Landslide	11859.81	94.50	10933.03	364.95	919.38	251.09	416.92	234.78	219.29	131.56
Fire	308.36	230.75	33.56	135.78	239.25	246.26	94.74	734.96	121.04	247.76
Epidemics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Windstorm	-	15.31	225.35		1.56	0.81	4.85	18.85	0.54	0.62
Hailstorm	-	58.03	0.00		124.78	37.90	7.00	0.67	0.00	1.60
Windstorm & Hailstorm	816.61	-	-	5.52	-	-	-	-	-	-
Thunderbolt	0.00	1.83	1.74	1.66	1.99	0.63	0.06	0.67	0.23	0.43
Earthquake	3.27	2.17	0.06	0.63	0.00	3.19	0.00	0.00	0.00	6.25
Total	**12253.10**	**410.02**	**11193.73**	**508.54**	**1286.96**	**539.87**	**523.57**	**989.94**	**341.10**	**388.22**

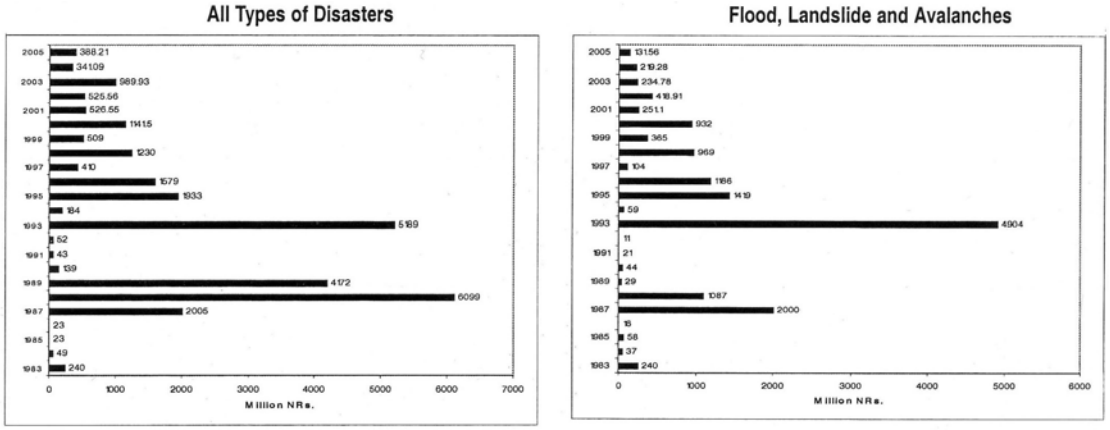


***Fig**. 2.10: Loss of property due to different disasters, 1983-2005 (DWIDP 2006)*

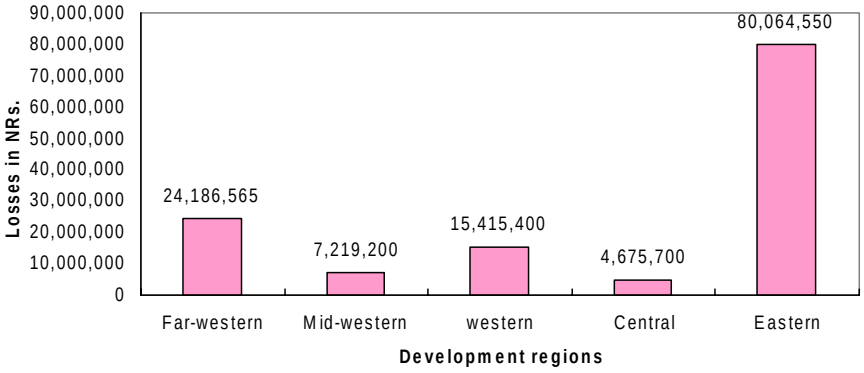


Fig. 2.11: Region-wise Water-induced Disaster Scenario of 2005/06 (Data Source: DWIDP 2006)

Table 13 shows the top ten districts having high estimated loss (NRs.) in 2005 (DWIDP 2006).

Table 2.13: The top ten districts having high estimated loss (NRs.) in 2005 (DWIDP 2006)

Rank	District	VDC/Municipality & Ward No.	Estimated Losses (in million NRs.)
1	Udayapur	Trijuga	34.50
2	Udayapur	Sunkoshi	30.00
3	Dadeldhura	Jogabudha-1	11.98
4	Arghakhanchi	Achham-5	5.02
5	Kanchanpur	Chandani	5.00
6	Bajura	Martadi-1	4.07
7	Kanchanpur	Mahendranagar	3.25
8	Parbat	Khaniyaghat	2.77
9	Kailali	Khulbari-3	2.45
10	Morang	Urlabari-4	2.35
Total			**101.39**

Due to a combination of geomorphic and anthropogenic factors, Nepal will continue to sustain great losses to natural disaster. As current trends of accelerated population growth, migration, expansion of settlements, urbanisation, infrastructure development, and environmental degradation continue, vulnerability and, therefore, losses will increase steadily. There is already evidence that the frequency of disasters and losses associated with them have been increasing in recent years. On an annual average basis, Nepal already spends 12.9% of its development expenditure and 5.39% of its real GDP per year in disaster response and recovery (Tianchi and Berhans 2002). **Tables** 2.14 and 2.15 show the compilation of Hazard loss with respect to GDP and development expenditure of Nepal between 1983-1995 and 1996-2005 respectively.

These figures may be somewhat skewed, as the data set does not accurately represent the loss, and the actual loss may be much higher. Nonetheless, it tells the current condition of disaster costs in Nepal. In Nepal a small economic loss of infrastructure and assets can be critically important when compared with its low GDP. The use of economic loss as an indicator of disaster impact on development varies for different natural hazards. For example, earthquakes often appear to trigger the most expensive disasters, but losses are concentrated. Individual floods may not record large losses, but total human impact may be higher.

2.5 Fiscal impact vis-à-vis hazard loss to GDP and development expenditure

Past economic impact indicators on loss of lives and infrastructure damages due to disasters must be taken into account while making annual budget and five-year plans. The clear realization to set for the natural disaster management budget is not yet started in many different development sectors. However, money comes for reconstruction/rehabilitation works after the damage after disasters have occurred. **Tables** 2.14 and 2.15 show the hazard loss to GDP which comes to a maximum of 23.69 per cent of GDP in the year 1988 (1988 eastern Nepal earthquake year). The next largest loss due to disaster was 16.17% in 1993 (the 1993 landslide and flood disaster year). The hazard loss to GDP in the 1996-2005 decade shows less values compared to the earlier decade. This is due to the fact that this decade did not receive large disaster as in the previous decade.

Table 2.14: Hazard loss with respect to GDP and development expenditure of Nepal, 1983-1995

Year	Nominal GDP (million NRs.)	Real GDP (million NRs.)	Development Expenditure	Total Hazard Loss (million NRs.)	% Nominal GDP	% Real GDP	% Development expenditure
1983	32,219	19,624	4,982	240	0.74	1.22	4.82
1984	37,671	21,390	5,163	48	0.13	0.23	0.94
1985	42,880	22,600	5,488	71	0.17	0.32	1.31
1986	49,856	23,753	6,213	23	0.05	0.1	0.37
1987	57,068	24,077	7,378	2,004	3.51	8.33	27.17
1988	68,321	25,749	9,428	6,099	8.93	23.69	**64.69**
1989	80,423	27,201	12,328	4,171	5.19	15.34	**33.84**
1990	93,425	28,661	12,997	139	0.15	0.49	1.07
1991	108,422	30,249	15,979	42	0.04	0.14	0.27
1992	135,036	31,376	16,512	52	0.04	0.17	0.32
1993	153,756	32,081	19,413	5,188	3.37	16.17	26.73
1994	177,915	34,251	21,482	185	0.1	0.54	0.86
1995	198,605	35,401	19794.9	930	0.47	2.63	4.70
Avg.	95,046	27,416	12,089	1,476	1.55	5.39	12.9

CBS Statistical Yearbook 1995 and Economic Survey, the Ministry of Finance, 1995

Table 2.15: Hazard loss with respect to GDP and development expenditure of Nepal, 1996-2005

Year	Nominal GDP (million NRs.)	Real GDP (million NRs.)	Development Expenditure	Total Hazard Loss (million NRs.)	% Nominal GDP	% Real GDP	% Development expenditure
1996	239398	221930	24980.5	1579	0.66	0.71	6.32
1997	269570	233040	26542.6	410	0.15	0.18	1.54
1998	289798	240816	28943.9	1230	0.42	0.51	4.25
1999	330018	251758	28531.3	509	0.15	0.20	1.78
2000	366251	267096	31749.2	1141.5	0.31	0.43	3.60
2001	394052	280106	37065.9	526.55	0.13	0.19	1.42
2002	406138	279169	31482.2	525.56	0.13	0.19	1.67
2003	437546	287689	29033.0	989.93	0.23	0.34	3.41
2004	474919	298023	33890.5	341.09	0.07	0.11	1.01
2005	508651	305244	40874.0	388.21	0.08	0.13	0.95
Avg.	371634.10	266487.10	31309.3	764.08	0.23	0.30	2.60

CBS Statistical Yearbook 2006 and Economic Survey, the Ministry of Finance, 2006

2.5.1 Water Induced Disasters: Rehabilitation Budget

In order to mitigate disasters in Nepal, the Department of Water Induced Disaster Prevention (DWIDP) formerly established as Water Induced Disaster Prevention Technical Centre (DPTC) is working for contributing to achieve the national goal of poverty alleviation through minimizing human casualties and damages of infrastructures due to water induced disasters by appropriate management and conservation of rivers and river basins of Nepal. Every year, natural disasters have significant impact on Fiscal Year planned development budget.

Mugling- Narayanghat Water Induced Disaster Prevention Project

This project was started in the Fiscal year 2005 (2061/62 BS) to mitigate the water-induced disaster like landslide and debris flow damages along Mugling-Narayanghat Road sector which was damaged due to the intensive rainfall of July 2003. The total estimated cost of the project is Rs. 302 million out of which the Government of Nepal bears Rs. 30 million and the rest by JICA. The project duration is 3 years.

Bagmati River Training Project

The seventh meeting of the Standing Committee on Inundation Problems (SCIP), a joint committee for mitigation of the disasters of Indo-Nepal border rivers formulated Bagmati River training project for the construction of embankments along the banks of Bagmati River in the Terai. With NRs. 314.13 million contribution from the Government of India and NRs. 78.43 million contribution of the Government of Nepal this project is going to spend NRs. 392.56 million.

Lai Bakaiya River Training Project

Lai Bakaiya River Training Project has been formulated for the training work of Lai Bakaiya River in Rautahat district with the total project cost of NRs. 61.4 million among which NRs. 45.8 million is the contribution from the Government of India and NRs. 15.6 million from Government of Nepal.

Sinduli-Bardibas Water Induced Disaster Prevention Project

This project was started in the Fiscal Year 2005 (2062/63 BS) under WIDP for the protection of the Sindhuli-Bardibas road from water-induced disasters like landslides and debris flows. The estimated cost of the project is NRs. 160 million and will commence till the Fiscal year 2007 (2064/65).

Furthermore, Sabo and Landslides Section of DWIDP has set for fiscal year 2006 (fiscal year 2006 (062/63) BS) (NRs 10 million for river training and flood control works.

2.5.2 Planned budget: Department of Irrigation (DoI)

The prime concern of the Department of Irrigation (DoI) is to safeguard the irrigation infrastructures and maintain the canal in the functional condition at all times. Landslide and flood disaster of 2002 caused severe damages to irrigation systems in different parts of the country. This disaster caused damage to many irrigation projects and was the most destructive one in the past 50 years. After the devastating effect of 2002 disaster, The DoI set out budget for reconstruction and rehabilitation to the damaged irrigation systems in different districts (**Table** 16). The total budget is 319.3 million rupees (4.3 million US$).

Table 2.16: Planned budged (in million) in different districts from DoI for reconstruction works of irrigation systems damaged by rainstorm of 2002 (DoI Unpublished report)

District	Budget NRs (in millions)	District	Budget NRs (in millions)	District	Budget NRs (in millions)
Jhapa	1.0	Bara	11.2	Runpandehi	9.9
Ilam	0.5	Parsa	27.0	Kapilbastu	3.4
Morang	11.6	Chitwan	23.7	ArghaKhanchi	0.8
Sunsari	0.2	Lalitpur	13.8	Bardia	0.3
Saptari	46.2	Nuwakot	2.3	Kailali	6.5
Udayapur	0.2	Dhading	12.5	Doti	2.3
Okhaldhunga	0.5	Kavre	10.6	Achham	1.3
Danusha	51.8	Sindhupalchowk	0.5	Bajura	0.6
Mahottari	1.9	Gorkha	1.5	Bajhang	6.3
Sarlahi	11.9	Lamjung	0.9	Kanchanpur	3.3
Sindhuli	5.6	Kaski	20.00	Dadeldhura	3.4
Ramechhap	0.9	Parbat	2.00	Baitadi	2.2
Dolakha	2.9	Myagdi	5.7	Darchula	0.5
Rautahat	2.3	Nawalparasi	7.5	Sunsari-Morang	11.5
Total	**137.5**	**Total**	**139.2**	**Total**	**52.3**
Grad Total					**329**

2.5.3 Allocated Budget for Disaster Rehabilitation (DWIDP/DMSP)

Department of Water Induced Disaster Prevention (DWIDP) and Disaster Mitigation Support Program (DMSP) had conducted disaster rehabilitation work in around Kathmandu Valley (**Table** 2.17).

2.5.4 Rehabilitation cost of damaged roads (DoR)

Recently, Department of Roads (DoR) has started collecting data from its different divisions throughout the country on the damage assessment and the cost estimates required for the rehabilitation of the damaged infrastructures. **Table 2.18a,b** shows the rehabilitation cost of the roads damaged and destroyed by natural disasters in different divisions. Every year DoR spends a huge amount of money on rehabilitation work although GoN does not set aside such a budget. The rehabilitation work is generally carried out from the regular maintenance budget. This has a detrimental effect on the regular maintenance of the roads. The road network in Nepal is increasing day by day and disasters will certainly damage roads every year. Therefore, a separate budget for road rehabilitation has to be seriously considered. Total expenditure for rehabilitation works between 2002 and 2006 is NRs. 233.5 Millions (**Table** 2.18a,b).

Table 2.17: Disaster rehabilitation sites and Budget from 2000 to 2004 (DWIDP/DMSP 2004)

Year		2000/2001	2001/2002	2002/2003	2003/2004
No. of Sites which we conducted Survey		8	15	22	18
DMSP Model Site		Dhapakhel	Bigahi River Gamaha River Bhimdhunga Syuchatar Khado River Sundari River	Sundari River Mahuli River Khado River	Dhapakhel Mahuli River
DWIDP Rehabilitation Site				Balkuhu, Kathmandu Matatirtha, Kathmandu Manamati, Kathmandu Dhobi Khola, Kathmandu Godavari Bridge, Lalitpur Thimi MAHA LAXMi, Bhaktapur Thimi Nil Barahi, Bhaktapur Kharkigayn, Bhaktapur Thimi Bazar, Bhaktapur Naikap, Kathmandu Hasantar, Kathmandu Bishankhu Village, Lalitpur Bhimdhunga, Kathmandu syushatar, Kathmandu total 14 Sites	Akashtole Road Protection, Kathmandu Gundu Road Protection, Bhaktapur Majhuwa Landslide Protection, Kathmandu Bai Sikshya Sec. School & Road Protection, Sindupalchowk Painyatar Road/River/Drain Protection, Kathmandu Bhakundechaur Gully Control, Kathmandu Dandagaon Road Culvert & Landslide Protection, Kathmandu Balkhu River Training Works, Kathmandu Hasantar Nursery Protection Works, Kathmandu Lakhetar Slope Protection, Kathmandu Gagalphedi-2/3 Road Protection, Kathmandu Bakhe! Kumari Pri. School Landslide Protection, Lalitpur Mahadev Khola Bridge Protection total 13 Sites
Budget (NRs.)	GoN	1,145,000	4,600,000	5,800,000	8,000,000
	DMSP			8,000,000	5,000,000
Remarks					

Table 2.18a. Rehabilitation cost of damaged roads due to natural disasters (2000-2005)
Data source: DoR (unpublished reports)

2005		2004		2003	
Division	**Expenditure (NRs.)**	**Division**	**Expenditure (NRs.)**	**Division**	**Expenditure (NRs.)**
Baitadi	200000	Lalitpur	300000	Baitadi	200000
Lalitpur	300000	Surkhet	0	Lalitpur	10649277
Surkhet	200000	Tanahun	400000	Surkhet	0
Tanahun	400000	Lahan	300000	Tanahun	400000
Lahan	300000	Kathmandu	3945460	Nepalgunj	200000
Kathmandu	200000	Kapilbastu	200000	Mahendranagar	2187367
Palpa	300000	Mahendranagar	200000	Bharatpur	3200000
Nepalgunj	200000	Bharatpur	71500000	Charikot	11449000
Kapilbastu	19575000	Ilam	300000	Damak	0
Mahendranagar	14800000	Biratnagar	200000	Hetauda	3500000
Bharatpur	54500000	Dhankuta	100000	Pokhara	2459214
Charikot	300000	Damak	100000	Bhaktapur	300000
Ilam	441800	Pokhara	3184000	Butwal	1800000
Biratnagar	200000	Dipayal	600000	Doti	700000
Pyuthan	200000	Devisthan	200000	Devisthan	200000
Dhankuta	500000	Nuwakot	700000	Nuwakot	400000
Damak	100000	Dang	300000	Dang	300000
Hetauda	0			Shivpur	200000
Pokhara	500000			Janakpur	0
Bhaktapur	200000				
Butwal	300000				
Doti	300000				
Total	**94016800**	**Total**	**82529460**	**Total**	**38144858**

Table 2.18b. Rehabilitation cost of damaged roads due to natural disasters (2000-2005)
Data source: DoR (unpublished reports)

2002		2001		2000	
Division	**Expenditure (NRs.)**	**Division**	**Expenditure (NRs.)**	**Division**	**Expenditure (NRs.)**
Baitadi	200000	Lahan	97000	Lalitpur	100000
Lalitpur	25000	Surkhet	100000	Ilam	100000
Tanahun	436000	Mahendranagar	200000	Butwal	100000
Lahan	100000	Devisthan	100000	Bharatpur	1500000
Kathmandu	100000	Lalitpur	0	Tanahun	200000
Palpa	250000	Nepalgunj	100000	Dipayal	300000
Kapilbastu	200000	Baitadi	500000	Palpa	300000
Mahendranagar	200000	Janakpur	100000	Pokhara	200000
Charikot	843000	Dipayal	200000	Kapilbastu	300000
Ilam	100000	Bharatpur	1200000	Dang	200000
Dhankuta	1000000	Biratnagar	99000	Banke	100000
Pokhara	700000	Nuwakot	198408	Nuwakot	263000
Bhaktapur	971000	Dang	100000	Lalitpur	100000
Butwal	400000	Damak	100000	Bhaktapur	100000
Doti	600000	Charikot	200000	Charikot	200000
Devisthan	100000	Tanahun	200000	Kathmandu	300000
Nuwakot	419000	Bhaktapur	100000	Janakpur	100000
Janakpur	3244000	Ilam	97000	Mahendranagar	100000
		Dhankuta	100000	Biratnagar	100000
		Pokhara	200000		
		Bara	200000		
		Dhankuta	100000		
Total	**9888000**	**Total**	**4291408**	**Total**	**4663000**

Chapter 3

Natural Disaster and Development: Key Issues

3.1 Natural disasters and Millennium Development Goal

At the Millennium Summit of September 2000, the Member States of the United Nations adopted the Millennium Declaration, which aims to bring peace, security, and development to all people. The Millennium Development Goals (MDGs), drawn from the Millennium Declaration, are a groundbreaking international development agenda for the 21st century to which all member nations are committed. The MDGs outline major development priorities to be achieved by 2015. Numerical targets are set for each goal and are to be monitored through 48 indicators.

The Millennium Declaration contains a statement of values and objectives for the international agenda for the 21st century. Eight Millennium Development Goals, based on the Millennium Declaration, have been approved by the General Assembly as part of a road map for the implementation of the Declaration. These are set out below and each one's relationship with disaster risk is highlighted. In the following paragraphs UNDP (2004) has very succinctly brought out the relevant issues from the Millennium Declaration that have direct bearing on disaster impacts.

3.1.1 Eradicating extreme poverty and hunger

i) To halve the proportion of people whose income is less than one dollar a day
ii) To halve the number of people who suffer from hunger

The Disaster Risk Index (DRI) proves through statistical analysis a long-held theoretical position that human vulnerability to natural hazards and poverty are largely co-dependent. At the national level, reducing disaster risk is often contingent upon alleviating poverty and vice versa. Hunger reduces individual capacity to cope with disaster stress and shock and disasters can destroy assets leading to hunger. The economic and political underpinnings of hunger, particularly within complex political emergencies, are well documented.

3.1.2 Achieving universal primary education

i) To ensure that children everywhere - boys and girls alike - complete a full course of primary education

Educational attainment is a fundamental determinant of human vulnerability and marginalization. Basic literacy and numeric skills enable individuals to become more engaged in their society. Broadening participation in development decision-making is a central tenet of disaster risk reduction.
The destruction of schools is one very direct way in which disasters can inhibit educational attainment, but perhaps more important is the drain on household resources that slow and sudden-onset disasters inflict. Households frequently have to make difficult decisions on expending resources on survival and coping with poverty, or on investments (such as education and health care) to alleviate human vulnerability and enhance longer-term development prospects. Unfortunately, for the poorest, there is no choice and human vulnerability deepens as resources are targeted towards survival.

3.1.3 Promoting gender equality and empowering women

i) Eliminate gender disparities in primary and secondary education, preferably by 2005, and in all levels by 2015.

Facilitating the participation of women and girls in the development process, including efforts to reduce disaster risk, is a key priority. Women across the world play critical roles in the shaping of risks in development. In some contexts, women may be more exposed to and vulnerable to hazards. For example, those with responsibilities in the household may be more exposed to risk due to unsafe building and from local hazards stemming from inadequate basic services or exposure to smoke from cooking fuel. At the same time, women are often more likely than men to participate in communal actions to reduce risk and enhance development. Orienting disaster risk policy so that it builds on the social capital represented by women can enable a more informed development policy. As criticisms of participatory development indicate, achieving such a model will not be easy, but best practice does exist to point the way.

When women face barriers in participating at higher levels of decision-making, this severely limits the skills and knowledge available for sustainable development and risk reduction. Overcoming disparities in access to education is a fundamental component of the disaster risk reduction agenda.

3.1.4. Reducing child mortality

i) Reduce infant and under-five mortality rates by two-thirds

Children under five years of age are particularly vulnerable to the impacts of environmental hazards ranging from the everyday risks of inadequate sanitation and drinking water to death and injury following catastrophic events and their aftermath. The loss of care givers and household income earners and the stress of displacement can have especially heavy tolls on the psychological and physical health of children under five years of age. Policies aiming to support sustainable development paths by reducing child mortality need to build in strategies to limit or reduce disaster risk.

3.1.5. Improving maternal health

i) Reduce maternal mortality ratios by three-quarters,

As environmental hazard stress or shock erodes the savings and capacities of households and families, marginal people within these social groups are most at risk, in many cases it is women and girls or the aged who have least entitlement to household or family assets. Maternal health is a strategic indicator of intra- and inter-household equality. Reducing drains on household assets through risk reduction will contribute to enhancing maternal health. More direct measures through investment in education and health will similarly contribute to household resilience as maternal health indicators improve. Children have already been identified as a high-risk group and maternal health plays a part in shaping the care received by young children.

3.1.6. Combating HIV/AIDS, malaria and other diseases

i) Halt and begin to reverse the spread of HIV/AIDS ii) Halt and begin to reverse the incidence of malaria and other major diseases

The interactions between epidemiological status and human vulnerability to subsequent stresses and shocks are well documented. For example, rural populations affected by HIV/AIDS are less able to cope with the stress of drought because of a shortage of labour. Individuals living with chronic terminal diseases are more susceptible to the physiological stress of hunger. For diseases transmitted through vectors, there is a risk & epidemic following floods or drought, similar the destruction of drinking water, sanitation and health care infrastructure in catastrophic events can increase the risk of disease.

3.1.7 Ensuring environmental sustainability

i) Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources
ii) Halve the proportion of people without sustainable safe drinking water
iii) By 2020, achieve a significant improvement in the lives of at least 100 million slum dweller

Major disasters, or the accumulation of risk from regular and persistent but smaller events, can wipe out any hope of sustainable urban or rural environments. Again, the equation works both ways. Increasing destruction due to landslides, floods and other disasters related to environmental and land-use patterns are a clear signal that massive challenges remain in achieving this MDG. The target of achieving signifies improvement in the lives of at least 100 million slum dwellers by the year 2020 will be impossible without developing policies to confront the currently high risk from earthquake, tropical cyclones, flooding and drought.

3.1.8 Developing a global partnership for development

i) Address the least developed countries' special needs and the special needs of landlocked and small island developing states
ii) Deal comprehensively with developing countries debt problems
iii) Develop decent and productive work for youth
iv) ln cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries
v) In cooperation with the private sector, make available the benefits of new technologies - especially information and communication technologies

Efforts to enhance sustainable development and reduce human vulnerability to natural hazard are hampered by national debt burdens, terms of international trade, the high price of key drugs, lack of access to new technology and new hazards associated with global climate change.

Difficulties in reaching international agreement on a range of issues, for example at the World Summit on Sustainable Development in Johannesburg in 2002 and the World Trade Organization meeting at Cancun in 2003, highlight the efforts needed to build a global partnership for development that might contribute to disaster risk reduction.

Examples of progress at the international level include cooperation between states at high risk from natural disaster that has increased their negotiating power. In the case of small island developing states, the Association of Small Island States has been active in climate change talks. Within the machinery of international organizations, the ISDR Task-Force constitutes a good example of global partnership for development and disaster risk reduction.

3.2 Disaster risk reduction for development and poverty alleviation to meet MDG's

Reducing disaster vulnerability may very well be the most critical challenge facing development in the new millennium. Many people are aware of the terrible impact of disasters throughout the world few realize that this is a problem that we can do something about. Therefore, natural disaster is intimately connected to the processes of human development. Disasters triggered by natural hazards put development gains at risk.

Meeting the MDGs is extremely challenging in Nepal due to the effects from different types of natural disasters. The destruction of infrastructure, the erosion of livelihoods, damage to the ecosystems and architectural heritage, injury, illness and death also aggravate other stresses and shocks such as a financial crisis, a political or social conflict, disease (especially HIV/AIDS), and environmental degradation. And such disaster losses may set back social investments aiming to ameliorate poverty and hunger, provide access to education, health services, safe housing, drinking water and sanitation, or to protect the environment as well as economic investments that provide employment and income.

Review of past historical events of disasters in the country and/or comparison other parts of the world and analyzed data has clearly demonstrated how disaster risks accumulate historically through inappropriate development interventions. The investigations indicated that achieving a sustainable development and moving towards meeting of the MDGs, will not be possible while leaving disaster risk management strategies is left outside of the development. The challenge for integration lies in devising the implementation already approved policy and future transformation in order to justify the closer operation of disaster and development policy.

3.3 Linkage of Disaster and Development

The primary focus of reducing disaster risk: Challenge of Development is on the relationship between human development and disaster. In order to clarify the ways in which disaster and development interact, it is helpful to distinguish between the economic and social elements of human development. These components are interdependent and overlapping. Nevertheless it is useful to think of the ways that these two elements, and their constituent institutional and political components, are shaped, retarded and sometimes accelerated by disaster (UNDP 2004). Similarly, one can analyze the ways in which economic and social development (and their constituent processes) work directly or indirectly to decrease or increase disaster risk.

Table 3.1 sets out these complex interactions schematically. Social development includes social assets such as inclusive governance, but also the health and educational infrastructure that enable participation. Economic development concerns economic production and its supporting infrastructure, for example transport networks to enable market access and the integrity of natural resources for the sustainability of resource-dependent livelihoods.

Table 3.1: Disaster and development (UNDP 2004)

	Economic Development	Social Development
Disaster limits development	Destruction of fixed assets. Loss of production capacity, market access or material inputs. Damage to transport, communications or energy infrastructure. Erosion of livelihoods, savings and physical capital.	Destruction of health or education infrastructure and personnel. Death, disablement or migration of key social actors leading to an erosion of social capital.
Development causes disaster risk	Unsustainable development practices that create wealth for some at the expense of unsafe working or living conditions for others or degrade the environment.	Development paths generating cultural norms that promote social isolation or political exclusion.
Development reduces disaster risk	Access to adequate drinking water, food, waste management and a secure dwelling increases people's resiliency. Trade and technology can reduce poverty. Investing in financial mechanisms and social security can cushion against vulnerability.	Building community cohesion, recognising excluded individuals or social groups (such as women), and providing opportunities for greater involvement in decision-making, enhanced educational and health capacity increases resiliency.

3.4 Millennium Development Goal of Nepal and reducing disaster risk

The Government of Nepal (GoN) endorsed the Millennium Declaration; and has committed to achieving the MDGs. As the primary medium-term strategy and implementation plan for reaching the MDGs, the country's Tenth Plan/Poverty Reduction Strategy Paper (2002/03-2006/07) has incorporated the MDGs into its strategic framework, and has highlighted the importance of improving the monitoring mechanism. Furthermore, the MDG needs assessment, identifies the interventions needed and estimates the resources required to achieve the MDGs by the year 2015 with the aim of helping Nepal shape its future development interventions.

In the past decades, Nepal has been subject to some of the worst disaster situations, causing great loss of life and tremendous damage to property. Increasingly the links between poverty and development strategies has been recognized. The need to mainstream disaster management and incorporate elements of risk reduction into development plans and poverty alleviation programmes is emphasized in this policy framework of MDGs of the country.

3.4.1 Poverty and Disasters in Nepal

The hazards that affect Nepal are the earth’s natural phenomenon. Given the diverse geophysical conditions of the country, these natural phenomena will continue, they are natural process. Yet, since the early 1970s each decade has brought another huge increase in number of disasters in Nepal and around the world. While there is no clear evidence that the frequency or intensity of natural phenomenon has increased, the destruction left in the aftermath of these events has increased exponentially. In short, humanity has become more vulnerable to natural disasters. While it is rather impossible to control nature, human activity, it’s impact on the development, and the subsequent impact on vulnerability can be altered (Tianchi and Berhans 2002).

(a) Literacy and Poverty

Educational status is one of the important indicators of the well being. Literacy, different aspect of schooling, and enrolment rate are closely linked with the poverty. The relationship between poverty and educational status in Nepal is based on the data of Nepal Living Standards Survey, 1995/96 and 2003/4 (**Fig.** 3.1). The literacy is one of the most important social indicators for the development of a society. Table 3.2 presents the literacy rates for population 6 years and older by poverty status, sex and urban category.

(b) Poverty incidence and governments' dependency

Poverty incidence

The mid term evaluation of the Ninth Plan has estimated that 38% of population lives below poverty line. These macro levels of estimates do not provide disaggregated statistical distribution of poverty on geographical basis. According to Nepal Living Standard Survey 1996, 44% of rural population lives below poverty line whereas the figure for urban sector is 23% only. It is bitter reality that some groups in society are compelled to traditional social values. These groups are denied of any new opportunities created by development as they are extremely backward; access to resources is extremely limited and so is their participation in decision making process. From this point of view, poverty and human development indicators are of crucial importance as an effort to mitigate poverty of backward and low caste groups.

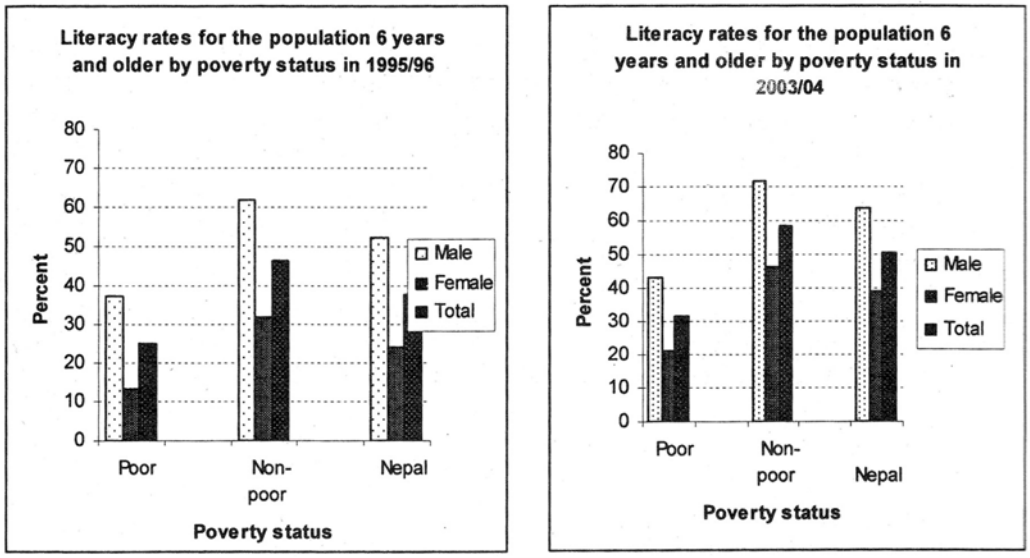


Fig*. 3.1: Literacy rates for the population 6 years and older by poverty status (*Bhandari 2006)

Table 3.2: Literacy rates for population 6 years and older by poverty status, sex and urban-rural category (Source: Nepal Living Standards Survey 1995/96 and 2003/04, CBS 2005a, Nepal)

(Percent)

		1995/96			2003/04	
	Male	**Female**	**Total**	**Male**	**Female**	**Total**
Poor	**37.4**	**13.3**	**24.8**	**43.3**	**21.2**	**31.4**
Urban	42.5	23.4	32.7	50.0	29.1	38.9
Rural	37.2	12.9	24.5	42.9	20.9	31.0
Non-poor	**61.8**	**31.9**	**46.5**	**71.4**	**46.3**	**58.3**
Urban	85.5	57.6	72.0	87.6	67.8	77.7
Rural	59.1	29.3	43.8	67.0	41.0	53.3
Nepal	**52.1**	**24.3**	**37.8**	**63.5**	**38.9**	**50.6**

The major indicators of human development reveal that some castes are high above the average while some others fall far behind. The so-called untouchables, in Nepalese social hierarchy who actually are occupational castes, fall back in almost all human development indicators.

Data from 1995-96 and 2003-04 Nepal Living Standards Surveys (NLSS-I and II) carried out by the Central Bureau of Statistics (CBS) are used to estimate trends in poverty incidence in Nepal during 8 years between these two surveys (CBS 2005a). Headcounts rates suggest that poverty has dramatically declined in Nepal between 1995-96 and 2003-04 (**Fig.** 3.2). In 2003-04, 31 per cent of population was poor in Nepal compared to 42 percent in 1995-96. Thus, the incidence of poverty in Nepal declined by about 11 percentage points (or 26 percent over the course or eight years, a decline of 3.7 per cent per year. The incidence of poverty in urban area more than halved (it declined from 22 to 10 per cent, a change of 9.7 per cent per year). While poverty in rural areas also declined appreciably, at once percentage point per year, its incidence remained higher than in urban areas (**Fig.** 3.2).

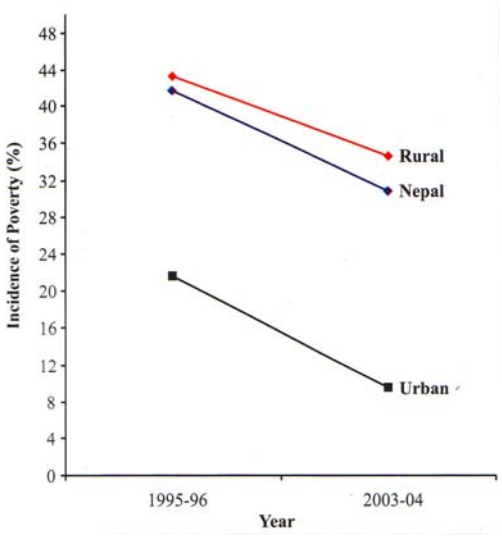


***Fig**. 3.2: Nepal 1995-96 and 2003-04, Poverty measurement (CBS 2005b)*

Growth also accelerated in manufacturing (led by experts), in services, and especially in tourism. Remittances from abroad soared, and those sent through official channel totalled about 54 billion NRS in FY03, equivalent to 12.4 percent of GDP. This large inflow of remittances suggests that households' disposable income and private consumption are growing faster than the GDP growth figures would suggest (**Fig**. 3.3).

The incidence of poverty in 2003-4 varied considerably across different parts of the country, ranging from a low of 3.3% in Kathmandu to 42.9% in rural Eastern Hill and 38.1% in rural Western Terai. Between 1995-96 and 2003- 4, poverty declined both in urban areas under consideration: in Kathmandu by 23%, and in "other urban" areas by 59%. In rural areas, the fastest decline in poverty occurred in rural Eastern Terai (33%) and rural Western Hill (32%). The incidence of poverty declined in rural Western Terai 17%. By contrast, poverty in rural Eastern Hills increased from 36 to 43%. These changes affected the poverty rankings of the regions, with Eastern Hill undergoing the most dramatic shift, from having the third lowest incidence of poverty in 1995-96 to having the highest incidence in 2003-4 (CBS 2005a).

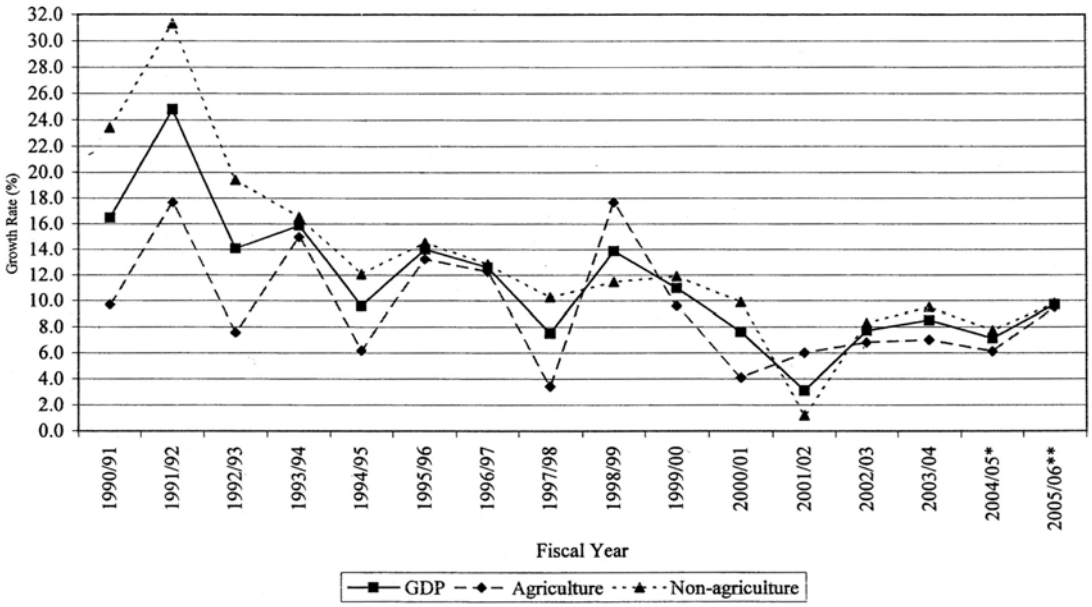


***Fig**. 3.3: Gross Domestic Product at current price (Source: Economic Survey of Nepal 2006)*

Government Dependence

The government of Nepal is highly dependent upon foreign aid and international lending institutions for public works and development projects. A full 34% of the total country expenditure comes from foreign aid, and 64% of the development expenditure is financed by overseas development funding agencies (Chhetri and Bhattarai 2001). **Figure** 3.4 shows the foreign aid contribution to disaster relief activities of Nepal. Against this economic background, Government of Nepal and funding organization must make sound strategies to manage natural disasters into all development and poverty alleviation programmes.

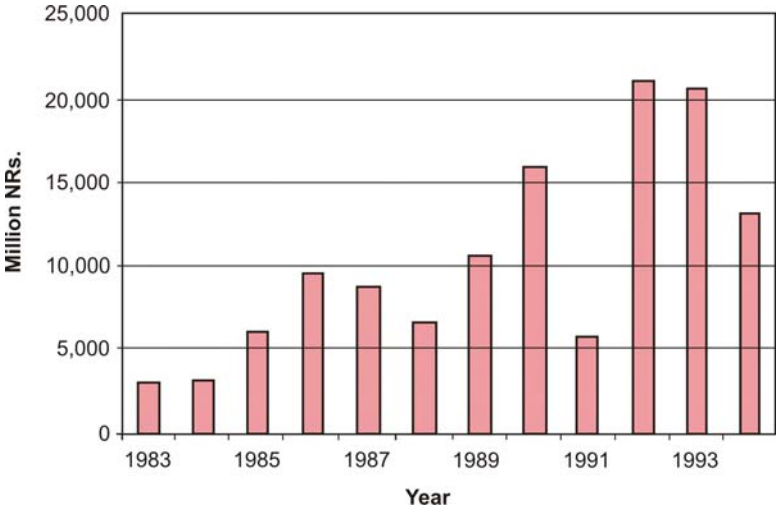


***Fig**. 3.4: Foreign aid contribution to disaster related activities (CBS 1995)*

Each year between 1983 and 2005, Nepal lost an average of 943 lives and NRS 1120 million to natural disaster. During the same period the average annual hazard loss was 7.8% of the average annual government development expenditure and 2.9% of the average annual real GDP (**Table** 2.14 and 2.15). Although it is difficult to prioritise hazard mitigation in a nation where so much lacking in terms of basic needs, GoN must give emphasis to integrate disaster reduction policy in all development woks. While the presence of natural hazards in Nepal can not be controlled, human behaviour can be adjusted in such way to reduce the incidence of disasters thereby saving lives, investment, and development gains in the long term.

(c) Poverty and disasters' vulnerability

Vulnerability refers to defenceless, exposure to injury, damage, or danger. Vulnerability also can be used in socioeconomic sense to explain human beings and their ability to cope with natural disasters. In this context, vulnerability has been defined as "a condition or set of conditions which adversely affect a person's ability to prepare for, withstand, or response to disaster" (Twigg 1998). Each year societies are affected by and respond to disasters and millions are becoming vulnerable to natural disasters.

While every human being faces some level of vulnerability, there are distinct groups of the population that may be more or less so based upon social status. Marginalised groups include, but are\not limited to, women, children, the elderly the disabled or ill, landless, illiterate, and migrants or refugees. These characteristics may have more or less relevance given a specific culture or context and therefore they should not necessarily be universally applied. However in many cases, these sub-sectors of society share a common characteristic; they are relatively poor and therefore warrant specific attention in vulnerability assessments and decision-making processes.

There are both immediate and root causes to vulnerability. Physical, spatial, economic, and social are more than simply a means of categorising vulnerability; they are its major causes. One may live in a flood plain, and therefore be spatially vulnerable. Perhaps this person is a migrant and is unable to leave for reasons of poverty In which case, the root cause of vulnerability is socio-economic. The poor are more likely to be living in dangerous areas, be it on hillsides or in the floodplains, have very limited access to safe building

technologies, and are the ones least able to relocate or prepare themselves for potential disasters. The economic status often explains why people live where they do; the condition of the buildings in which they live (Sampath 1991). In most cases, the immediate cause of vulnerability is physical yet the root causes are almost always economic or social.

As many of the rural poor of Nepal are barely living at a sustenance level, a natural disaster could be completely devastating for them. A landless, illiterate farmer (family) with no savings and no other means of income if hit by a flood, faces a much graver situation than another farmer in the same village who owns land and has additional sources of income. Although these two families experience the same disaster, their level of vulnerability is different. For the first farmer, the disaster may mean debt, forced migration, or starvation for his family. The second farmer with back-up resources has a better chance of recovering to pre-disaster standards of living.

Due to lack of management of human settlement in Nepal, people are forced to settle in the disaster vulnerable areas. They are compelled to settle in riversides, fragile geography, unproductive land excluded by the so-called upper casts. Their roofs of houses are fire prone. Women, on the other hand, are other groups who are deprived and left behind interims of access to resources (Source: Internet). It is not limited to any particular caste or area but overall sectors of society. The households of women-headed are mostly under extreme poverty where the source of income is not definite. Due to all these causes women and marginalized are the first victims of any kinds of Disaster.

Economically, Nepal is one of the poorest countries in the world. Nepalese governments have been facing big challenges to fulfill basic needs of people. Disadvantaged and indigenous people are bound to overexploit the natural resources, which is the major cause of any kind of disaster. Similarly, Nepal is a multi-religious and multi-cultural country. Nepalese society is a religious society and their culture is guided by religion. Some of them believe that disaster is the 'ACT OF GOD' but not the reproduction of their own activities. Many of them do not know that disaster can be mitigated by human being themselves (Source: Internet).

Integrating of poverty alleviation and development strategies in disaster risk;

a. Poverty alleviation and development strategies in disaster management system should be integrated for reducing effect of disaster to the poor and marginalized.
b. Reservation for the protection and advancement of the interests of women and economically, socially or educationally backward classes should be made by necessary laws.
c. Public participation, specially, of women and backward classes e.g. *dalit* of people in decision making process should be ensured.

3.5 Reducing Disaster Risk for Development

3.5.1 Mainstreaming disaster risk considerations into development

It is highly emphasized on mainstreaming disaster risk reduction into development. Its strength has been in pre-disaster mitigation and preparedness work across all levels (policy, district and community) of administration in Nepal. The critical importance of disaster risk reduction for the achievement of sustainable development is specifically recognised in the Millennium Declaration, section IV, “Protecting Our Common Future”, which states the need

"to intensify our collective efforts to reduce the number and effect of natural and human-made disasters". Furthermore, the Roadmap for the Millennium Development Goals calls for the use of the ISDR as a basis to further commit to this goal.

Disasters frequently result from development failures that increase vulnerability to hazards. To promote awareness of the crucial link between disaster risk reduction and the achievement of the Millennium Development Goals, Nepal is currently working with partners and agencies to include the disaster risk reduction dimension in key development for contributing substantively to the overall aims of the Hyogo Framework.

3.5.2 Mitigate loss of life in disasters and protect development gains

Nepal is focusing on mitigating loss of life in disasters to protect development gains for the achievements of MDGs at national level through the development and poverty alleviation policies. Removing economic poverty and improving the quality of life of people is a great challenge because the biggest killer in natural disasters is poverty (Source: Internet).

3.5.3 Reduction of disaster risks and sustainable human development agenda

The growing complexity surrounding the links between natural disaster risk reduction and development process has raised the fundamental needs for transformative programme for sustainable livelihoods and building community resilience. Nepal has tried to build and sustain its capacities to promote information-sharing about natural disaster risk reduction issues in human sustainable development agenda.

Chapter 4

Disaster Risk Management: Strategies and Policies

4.1 The Hyogo Framework for Action

Increasingly concerned about the impact of disasters, the United Nations declared the 1990s The International Decade of Natural Disaster Reduction. This emphasis served to raise awareness at the national level, and focused on governments drawing up national disaster management plans. In 1994 the Yokohama Strategy for a Safer World provided guidance on reducing disaster risk and the impacts of disasters. However, approaches were mainly emergency response focused and did not look at long-term mitigation and preparedness as a way of dealing with disasters.

The International Strategy for Disaster Reduction (ISDR) was set up to build on the gaps and challenges identified in the Yokohama Strategy. It sought to coordinate approaches at a local, national and international level with the aim of building disaster resilient communities by promoting increased awareness of the importance of disaster reduction as an integral component of sustainable development.

In January 2005 The World Conference on Disaster Reduction was held in Kobe, Japan. Coming as it did less than a month after the Indian Ocean Tsunami, the conference gained widespread attention as the world sought to respond to such a major disaster. The message of Kobe came loud and strong that disaster risk reduction is strongly linked to poverty alleviation and development, and as such disaster risk reduction needs to be mainstreamed. Out of that came a commitment by the world community to build resilience to disasters, through agreeing a ten-year action plan: The Hyogo Framework for Action 2005-2015.

4.1.1 The Hyogo Framework for Action (HFA) 2005-2015

The HFA is a ten-year action framework, 2005-2015 (Annex III). It aims to substantially reduce the loss of life as well as the social, economic and environmental losses caused to communities and nations as a result of disasters. In order to achieve this, the HFA identified three strategic goals and as a means of achieving these goals, five priorities for action were also agreed as part of the HFA.

(a) The Three Strategic Goals of the HFA

1. The integration of disaster risk reduction into sustainable development policies and planning at all levels, with special emphasis on disaster planning, mitigation, preparedness and vulnerability reduction
2. The development and strengthening of institutions, mechanisms and capacities at all levels, especially the community, to build resilience to hazards.
3. The systematic incorporation of risk reduction approaches into the implementation of emergency preparedness, response and recovery programmes.

(b) Five Priorities for Action of the HFA

1. Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation.

2. Identify, assess and monitor disaster risks and enhance early warning.
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
4. Reduce the underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels.

Whilst placing the primary responsibility for achieving resilience on national governments, the HFA crucially notes the importance of the following:

- Participation by civil society, NGOs, community organisations, and voluntary groups as well as the involvement of the scientific community and the private sector;
- Strong regional capacities;
- Increased coordination at the national, regional and international levels.
- Integration of Disaster Risk Reduction (DRR) into other relevant international initiatives;
- Mainstreaming DRR measures into multilateral and bilateral development assistance programmes;
- The provision of adequate funding for the DRR work, specifically for the UN Trust Fund for Disaster Reduction

4.2 Organisation, Strategy and Policy in Nepal

The Ministry of Home Affairs (MoHA) is the apex body in relation to disaster management in Nepal which formulates and implements national policies, plans and programs. The Ministry is responsible to provide rescue and relief materials to the disaster victims. The function of data collection and dissemination, collection and distribution of funds and resources are also the vital functions of the Ministry of Home Affairs. A Central Disaster Relief Committee under the chairmanship of the Home Minister provides policy guidelines and directives to the operating agencies for rescue and relief works. Being the focal point, the Ministry of Home Affairs has the responsibilities to coordinate the activities relating to disaster preparedness, mitigation and reconstruction as well as rehabilitation with other disaster management related agencies. The organizational chart of MoHA is shown in figure 4.1).

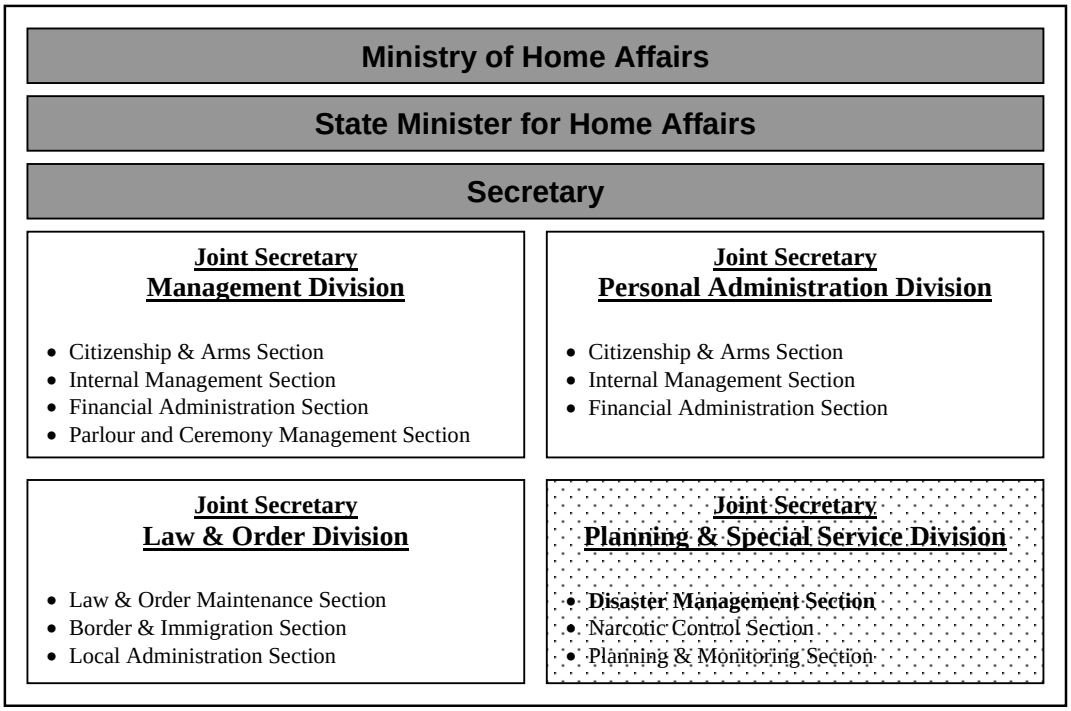


Fig. 4.1: Disaster Management section under MoHA structure

Governments' strategies, policies and programs are important consideration in disaster management system in Nepal. Disaster Management never became a policy issue of His Majesty's Government of Nepal and could not attract attention and interest of the planners for many decades. It was in fact the earthquake of 1988 in eastern Nepal that created some sensation among the government agencies, which got again reinforced during the disastrous flood of 1993 and the drafting of an Action Plan got started. The government also presented a preliminary National Action Plan, prepared through extensive local consultations, in the International Decade for Natural Disaster Reduction, Yokohama Conference of 1994. This plan was revisited and improved by incorporating the Yokohama Strategies. Thus, GoN adopted the country's first-ever *National Action Plan on Disaster Management in 1996.* This Action Plan has spelled out time-bound actions and responsible executing agencies on disaster preparedness, Response, Reconstruction and Rehabilitation & Mitigation. Among others this Action Plan includes important policy and institutional perspectives such as the establishment of the National Disaster Management Council and National Disaster Information System, which were supposed to be accomplished by the year 2000 but have not yet been materialized.

The indifference and lack of seriousness in policy formulation and its updating can be seen by the fact that, despite the introduction of the *Disaster management element in the approach to the Ninth Plan* in the National Planning Commission's document it missed detailing the subsequent five years programmes in the main document of the ninth plan. The approach document had listed few important actions, which could have streamlined many activities to effectively handle the disasters occurring almost on a regular basis in the country. Establishment of Disaster Management Information System; Preparation of hazard mapping of vulnerable areas and implementation of mitigation measures based on research; Construction of at least one warehouse to store sufficient rescue and relief materials in every development region; Capacity enhancement in fire hazard control; Improvement in

organizational structure and existing Acts and regulations concerned with disaster management and Formation of separate permanent committees at district level for rescue, relief, damage assessment, reconstruction and rehabilitation were provisioned in the approach paper which could not receive serious attention of the concerned government offices due to the lapses in the Ninth Plan.

However, for all practical purposes, the Tenth Plan has for the first time allocated a separate sub-chapter on disaster risk management stating mainly the policies, approaches and broader strategies in disaster risk reduction. It has also touched upon the aspects of natural hazards and the need of considering their potential impact on development works including infrastructure. The necessity of proactive approaches on pre-disaster mitigation and preparedness, proper implementation of the programmes and effective mobilization of the resources are emphasized so as to contribute to the safety of the people and the physical properties. The Millennium Development Goals in general and poverty reduction in particular cannot be achieved without reducing the disaster risk in the country. Thus, attempts have been made to establish linkages between disaster and development.

4.3 Nepali Acts concerning disasters

Disaster management has mostly remained as a low priority sector in Nepal except during the time of disasters. However time to time there has been a series of commitments made at the national level to reduce the risk of disasters in the country. The earthquake disaster of 1980 and the growing concerns of the national and international partner institutions on the existing poor state of disaster management set a tone for the emergence of the first major legal instrument to handle disaster management activities in the country. As a result, an Act for this sector was promulgated by GoN in 1982 namely Natural Calamity Relief Act 2039 B.S. (NCRA). NCRA has tried to improve the processes of handling various issues primarily such as rescue and relief operations during disasters through institutional arrangements, which used to be undertaken on an adhoc basis. The Act has provisioned the establishment of Disaster Relief Committees at different levels to deal with relief and rescue works. However, though the committees at the central, regional and district level are functional at the local level they are yet to operate on a regular basis.

NCRA is so far the main legal instrument for disasters management in the country and was amended twice in 1989 and 1992 respectively. Though there are still several issues yet to be adequately addressed the Act has specified few standards for relief operations based on the extent of impact of a disaster.

In addition to above act, responsibilities related to disaster management are also assigned to the local bodies through Local Self Governance Act, 2055 (1999) (LSGA). The concerning Acts of Royal Nepal Army, Nepal Police and the Armed Police Force has given the responsibility to their officials to work closely with the Ministry of Home Affairs (MoHA) and other partners during disaster. These provisions have made the security forces authorized to immediately engage in assisting the government and non-governmental agencies in rescue and relief operations in the affected areas.

4.3.1 Institutional arrangements in the Natural Calamity Relief Act (NCRA)

NCRA has constituted the disaster relief committees at different levels (**Fig.** 4.2) and has also elucidated their interrelationship. The role and responsibilities of the individual committees are specified in detail and the chain of command is also illustrated as follows:

(a) Central Disaster Relief Committee (CDRC)

CDRC consists of a total of 24 representatives of which 19 are the government officials. It is an apex body in the field of disaster management with the sole responsibility of formulating policies as well as implementing those policies through appropriate programmes related with disaster relief works. It is also engaged in the overall coordination of the activities especially during the disasters. CDRC prepares specific norms for relief assistance, in cash and/or in kind, and get that assistance distributed to the victims in the affected areas. As the CDRC functions as a central agency and District Committees functions as the field agencies the support funds, resources and relief materials provided by CDRC for distribution to the disaster victims are carried out by District Disaster Relief Committees (DDRC). Though being a high-powered legal body in the field of disaster management CDRC is often found to have engaged in formulating only short-term directives and approaches for dealing with disasters. While the Committee enjoys the privilege to meet as many times as it is deemed necessary, it is normally found to be meeting only two times a year i.e. before and after the monsoon season. The Committee is empowered to invite concerned Members of Parliament representing the affected districts in its meeting.

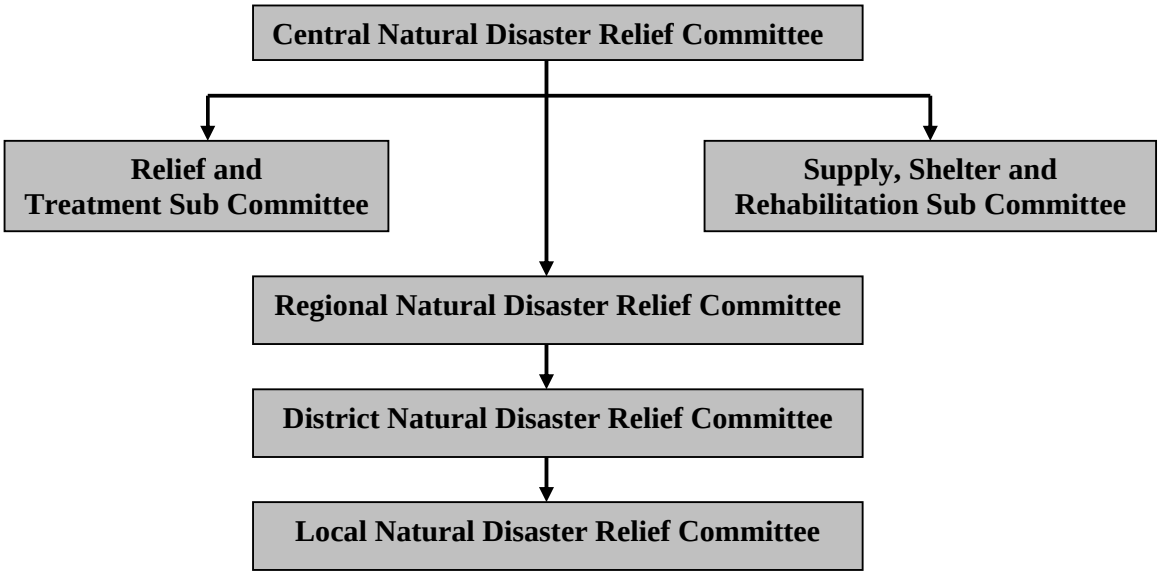


***Fig**. 4.2: Organizational structure in the Natural Calamity Relief Act*

The CDRC is chaired by the Minister of the Home Affairs and represented by Ministers in the Physical Planning & Works and the Health. The Secretaries in the Ministries of Finance; Defense; Home Affairs; Foreign Affairs; Water Resources; Physical Planning & Works; Information and Communication; Forests & Soil Conservation; Women, Children & Social Welfare; Industry, Commerce & Supplies; National Planning Commission Secretariat are also the member of the Committee. Other government representatives in CDRC include Brigadier from Nepal Army; Inspector General of Nepal Police; Director Generals from Department of Mines and Geology and Department of Hydrology & Meteorology. The non-

governmental representations in the Committee are only from the Social Welfare Council; Nepal Red Cross Society and Nepal Scout. There is also a provision to nominate two independent persons of high reputation by GoN in the CDRC but these positions are still vacant. Most important ones but missing in the original list of concerned government agencies includes Ministries of Local Development; Agriculture & Co-operatives; Education & Sports; Science & Technology; Armed Police Force and few other related organizations.

Apart from implementing GoN directives through district and local level committees, other major responsibilities of the CDRC include:

- Recommending GoN to declare and define the disaster area;
- Submitting for approval of GoN and thereby implementing the national policy and subsequent programmes related to prevention, control, preparedness as well as relief, rehabilitation and reconstruction works in the disaster affected areas;
- Arranging proper storage and distribution of cash, food stuff, clothes, medicine, construction materials and other goods received as donation from outside or locally in the affected areas;
- Ensuring participation of social organizations in the relief work and effectively coordinate their activities;
- Sending special groups to disaster areas to assist in relief works;
- Constituting Sub-committees on Relief and Treatment & Supply, Shelter and Rehabilitation to help execute its policies and directives.

Sub-Committees

In order to provide immediate relief and treatment to the victims as well as planning for such activities in the affected areas a Relief and Treatment Sub-committee (RTSC) is constituted with Minister of Health as the coordinator. Other members of the sub-committee include Secretaries of the Ministries of Information & Communication; Physical Planning & Works; Brigadier of the Royal Nepal Army; Inspector General of Nepal Police and Representatives from the Nepal Red Cross Society and Nepal Scout.

Another sub-committee on Supply, Shelter and Rehabilitation (SSRSC) also deals with the assigned responsibilities. Minister of Physical Planning & Works is the Coordinator of the sub-committee, which is also represented by Secretaries in the Ministries of Finance; Home Affairs; Industry, Commerce & Supplies; Women, Child & Social Welfare; Water Resources; Physical Planning & Works and the Representative from the Social Welfare Council.

(b) Regional Disaster Relief Committee (RDRC)

In order to help and advice CDRC to formulate regional level policy and programmes and to coordinate among district level committees in the matters of disaster management a RDRC is provisioned in the NCRA. RDRC is normally activated when the disaster area extends beyond one or more districts. The Regional Administrator is designated to chair this regional committee, which is represented by Chiefs of Royal Nepalese Army Unit of the Region and Regional Public Health Office/Hospital; DIG of Regional office of Nepal Police; Regional Directors of the offices of Forests, Irrigation and Roads; Representative from the Nepal Red Cross Society and reputed social workers. The Deputy Regional Administrator serves as the Member Secretary.

(c) District Disaster Relief Committee (DDRC)

DDRCs are the main actors and real contributors at the field level in all aspects of the disaster cycle. These committees are composed of representatives from the district level offices of the various line agencies related with law and order, emergency response, and development institutions. The CDO, who enjoys authority to take decisions in the areas of rescue, relief and distribution of relief materials, is also the chairperson of the committee. The members of the DDRC include district level representative of the national level Political Parties; Chiefs of district level offices of Royal Nepalese Army, Nepal Police, Public Health Office/Hospital, Irrigation, Forests, Agriculture Development Bank, Engineer of the Housing and Town Development; Representative of Nepal Red Cross Society and reputed local level Social Workers. The Local Development Officer (LDO) serves as the Member Secretary of the Committee.

CDO is also responsible for collecting and disseminating disaster related data and information to help assess disaster impacts so that adequate rescue and relief operation as well as harnessing local and outside support could be facilitated. DDRC have already been constituted in all the 75 districts of the country. The Committee could meet as deemed necessary but are found to be meeting mostly twice a year i.e. before and after the monsoon season. Other major responsibilities of DDRC include formulating district level natural calamity relief plans for the approval by the higher committees, coordination and monitoring of relief works of Local Committees.

(d) Local Disaster Relief Committee (LDRC)

LDRCs are provisioned in the NCRA to carryout programmes to raise people's awareness and the disaster preparedness works among local residents. Presently LDRCs are practically non functioning.

Fund

A Central Disaster Aid Fund (CDAF) has been established under the supervision and control of the CDRC as provisioned by the NCRA. Apart from the resources received from any sources the Fund basically consists of:

- Cash and kind contributions of GoN;
- Contributions from the Prime Minister's Aid Fund (PMAF); and
- Assistance received from foreign countries, agencies and individuals;

Provision of Disaster Relief Funds is also made at the Regional, District and Local level with the cash and/or kind assistance from GoN, CDAF or from any other sources. To supplement the efforts of CDAF, a less cumbersome Prime Minister’s Aid Fund (PMAF) is established at the Prime Minister's office to provide assistance to communities and the individuals suffering from several distresses. The fund came into existence during the aftermath of 1993 flood and landslide disasters in the country. As the size of the PMAF is comparatively larger than the CDAF, this fund is also used in relief, rehabilitation and reconstruction works after natural calamities.

4.4 Local Self-Governance Act 2055 (1999)

It is an Act made for empowering the local bodies to proceed towards a self-governance practice. It has recognized the local people and the local bodies, elected through them, to serve as the entry point of all development processes at the local level be it a district, municipality or the village. The main aim is to involve the sovereign people through a decentralized scheme and carryout local level activities with full responsibility and authority with the District Development Committee (DDC), Municipality and Village Development Committee (VDC). Apart from many other developmental works, the Act has also provisioned for the disaster related management works under the domain of the VDCs, Municipalities and the DDCs. However, the duties and responsibilities are stated in such general terms that the authority of the institutions mentioned in LSGA become duplicated with the local level offices of administration and other developmental offices of the government. According to the LSGA, all three levels of the local bodies, VDC, municipality and the DDC are vested with the authority to carry out necessary works in respect of controlling natural calamities. Under the Act, Clauses 28 (k) (4) 96 (j) (7) and 189 (1) concern with the disaster management issues.

4.5 Weaknesses and policy gaps

There are still many areas in the disaster risk reduction procedure and practices where Government of Nepal has not given adequate attention and lack initiatives in the legal as well as managerial front. Among others, the major lapses noticed in this area are listed as hereunder:

- Though being amended twice, the Natural Calamity Relief Act (NCRA) does not include the following areas of disaster risk reduction such as preparedness, rehabilitation and reconstruction. Its priority works still remains the rescue and relief operations.
- The corresponding rules and regulations, which are vital to efficiently carry out the desired activities, are not yet formulated. Thus the NCRA's provisions are not been safeguarded through operational procedures.
- Neither there are any Standing Orders, Procedures or sufficient Codes, e.g. Fire Codes, nor any voluntary Codes of Conduct in disaster management in the country. Thus the disaster risk reduction and management has remained as an under priority actions for all practical purposes. Bangladesh has Standing Orders on Disaster in a published form from the Ministry of Disaster Management and Relief, Disaster management Bureau.
- Compensation scheme are both inadequate and less trust worthy and does not cover the works of the volunteer emergency workers in case of serious injury, fatal disease or death.
- NCRA is shy on stating clearly the roles and responsibilities of Committees, institutions, organizations or individuals other than the CDRC. The most noticeable omission is the role of non-governmental sector. As a result, NGOs have been working arbitrarily in the field of disaster management outside the main frame of CDRC and DDRC and their activities are not integrated in the main stream.
- LDRC, which is most vital to carry out works at the local level, has not been established yet.
- Attention towards the research and development, which could be instrumental to reduce the impact of disaster, is non-existent. The efficiency and suitability of the

focal agency of disaster management system in the country, i.e. MoHA, has never been reviewed.

- The high level National Disaster Management Council, as proposed in the National Action Plan, has not yet been established.
- Different legislations related with disaster in NCRA, LSGA and others concerned organizations like Army, Police have overlapping, ambiguous and insufficient provisions, which needs an immediate revisit. Security personnel's involvement in preparedness work could also be important, which has not yet been explored.

4.6 Government's sustainable development agenda

The links between environment, infrastructure, and poverty are strong. The challenge of coping with disasters and the need to integrate disaster reduction into sustainable development planning must number among the major concerns. Natural disasters result in loss of lives, serious economic damage and severe impacts on the social conditions. However, natural disasters have received very little consideration in development policies, especially policies towards alleviating poverty.

Despite some lapses, Nepal has made a steady and sustained stride towards disaster risk management in the last decade. Beginning with positive response to the Yokohama Strategy and Plan of Action, Nepal has also initiated several important strategies and initiatives both at government and non-government levels. Several initiatives in disaster risk management implemented by Nepalese I/NGOs have been regarded as successful cases and replicated in other countries of the region and the world. Some examples of such initiatives are; community-based local and district level disaster planning and preparedness, emergency response to high altitude hazardous events such as snow avalanches community-based disaster management etc. However, considering the magnitude of the issues there remains still other areas such as formulation of appropriate policy and Act, strengthening institutional framework and large-scale capacity building at all levels to be adequately addressed by GoN and non-governmental actors.

4.7 New initiatives

During the last few years Government of Nepal has taken some new initiatives on the disaster risk reduction on the national and international level. Nepal has enacted Natural Calamity (Relief) Act in 1982 which was amended twice. However, the present Act by its name only covers the relief/ rescue activities and is very much silent in the field of comprehensive disaster risk management in general and preparedness and mitigation in particularly.

For the first time in the history of planning in Nepal, in the Ninth Five Year Plan (1998 to 2002) issues on disasters were raised and addressed briefly. It emphasized on the need to strengthen the disaster management capability by adopting various possible means such as making efforts towards prevention, mitigation and reduction of natural disaster through more advanced geological, hydrological and meteorological technology, hazard mapping, vulnerability assessment, risk analysis and early warning system along with provision of well trained and efficient manpower. The plan also stresses the need to strengthen the capability of fire brigade. The plan emphasizes the importance and the need for national and/or international assistance.

Following the Ninth Plan, the Tenth Five year Plan (2002-2007) included more comprehensive guidelines and provisions on the disaster issues. Fist time it linked disaster with development, a major shift from its traditional outlook on disasters. The main objectives of the plan were to make development and construction works sustainable, reliable and effective and to keep life of the common people secured. The strategies formulated in the plan was to Adopt suitable technology to minimize environment effects and losses due to disaster, making rescue and relief reliable and effective, carrying out effective public awareness activities, strengthening Earthquake measurement stations, preparing hazard maps of vulnerable areas. The working policy developed was to carry out assessments of environmental and disaster impacts, enhance people's participation in watershed management and river control, timely reform legal and institutional frameworks, effective implementation of regional programmes, harness participation of stakeholders in all areas of disaster reduction, increase public awareness.

The programmes proposed under the plan were: Develop integrated information system in coordination with national and international agencies, develop reliable database, prepare institutional inventory, operate five regional warehouses with sufficient stockpile of relief materials, develop national fire code, prepare landslide inventory based on hazard maps and create epicentre map, provide immediate information to common people of any mode of disasters, adopt disaster preventive system and offer instant counselling and rehabilitation to the victims. However, though the policy was framed in the Tenth Five year Plan, no budgetary allocation was made by the government to implement the policy and therefore, the policy practically remained in the shelf and no actions were effectively initiated.

A National Action Plan on disaster management in Nepal was prepared and presented in the Yokohama Conference, Japan in 1994 and subsequently the document was revised and adopted in 1996. Similarly, in 2005 political commitments were made through the National Position Paper in the World Conference on Disaster Reduction Kobe, Japan and a further revised action plan was prepared for implementation. For the first time in the planned development history of Nepal, the Government of Nepal initiated activities for integrating disaster risk reduction into development initiatives. The Tenth Five Year Plan (2002 -2007) has made it compulsory that there should be natural disaster appraisal of each infrastructure or projects before its implementation. However, it is much more silent in its implementation and regular monitoring aspect of the plan. In the recent past several sectoral ministries/ agencies have initiated to incorporate the disaster risk reduction initiatives in their plan. In the recent the review exercises of the MDGs and PRSP, disaster aspect has been identified as one of the threat to achieve the MDGs and PRSP in the country.

Nepal developed National Building Code in 1994. However, due to several factors (technical, social and economic) it was not implemented for long time. Recently the building code has been enacted and enforced in all the municipalities of the country. Department and Mines and Geology, Department of Water Induced Disaster Prevention, United Nations Development Programme and few I/NGOs have carried out Geographic Information system (GIS) based hazard mapping and vulnerability assessments at micro level. However, there is a need to carryout the GIS based multi-hazard mapping and vulnerability assessment at the national level.

During the decade of 1990-1999, as the International Decade of Natural Disaster Reduction (IDNDR), GoN responded with the formation of IDNDR-Nepal Chapter within the MoHA auspices, which developed a National Action Plan for Disaster Management. This Action

Plan includes important policy and institutional perspectives such as the establishment of the National Disaster Management Council and National Disaster Information System, which were supposed to be accomplished by the year 2000 but have not been materialized yet. This action Plan was also approved in principle by GoN in 1996. Nevertheless, there have been significant developments in the disaster management arena in the country during the decade and afterwards as follows:

1. Increasing involvement of the academicians, researchers, INGOs, NGOs, Local Bodies and civil societies (CBOs) in the disaster response;
2. Establishment of the Disaster Prevention Technical Centre (DPTC) which has been transformed into the Department of Water Induced Disaster Prevention;
3. Establishment of the Emergency Operations Centre within the UN premises;
4. Establishment of optimum seismic monitoring system within the Department of Mines and Geology;
5. Formulation of National Action Plan on Disaster Response;
6. Implementation of pilot community led disaster mitigation programmes with the support of UNDP and Nepal Red Cross Society (NRCS);
7. Construction of cost-efficient disaster mitigation structures at the community level;
8. Formation and functioning of sectoral working groups in Food and Agriculture, Health and Logistics;
9. Preparation of sectoral working manuals and sector specific work plans. This exercise helps facilitate the communication between GoN and other stakeholders, actors in following manners:
    - Exploring local financial and technical support;
    - Assisting GoN to assess the losses, identifying needs and formulating response strategies;
    - Liasoning with GoN to explore the external financial and technical supports;
    - To help monitor disaster situations on continual basis; and
    - To provide a forum for information exchanges.

10. Increasing realization on the part of the GoN and policy makers of the need to have a policy and institutional set up for total disaster risk management based on the alternative paradigm;
11. Enactment of Local Self-governance ACT, 1999 which bestows the responsibilities of disaster management at the local level by the local bodies (DDC/VDC);
12. Creation of Disaster Preparedness Network (DP-Net) represented by government and non-government stakeholder, basically to exchange the information and experiences among the partners in the field of disaster management;
13. Compilation of the local and indigenous knowledge on local disaster management; and

Chapter 5

Policy-Action Matrix

5.1 Policy-Action

Disaster management is a complex as well as a sensitive task and has many constraints. The policy action constrains can be legal, intuitional, and administrative. A Policy- Action matrix has been prepared and presented in **table** 5.1. The matrix is prepared based on a wide range of supportive documents of the government and other agencies related to policy, action plans, as well as reports on outcomes of many workshops, seminars and interactions. All the major policy issues on disaster risk reduction have been considered in the preparation of the matrix.

5.2.1 Responsible Agencies

Various governmental (GOs), non-governmental (NGOs), and Community Based Organisations (CBOs) are actively involved in disaster management field in Nepal. The government agencies are; Ministry of Home Affairs (MoHA), Ministry of Water Resources (MoWR), Ministry of Physical Planning and Construction (MoPPC), Ministry of Health and Population (MoHP), Ministry of Finance (MoF), Ministry of Defence (MoD), Ministry of Foreign Affairs (MoFA), Ministry of Information and Communication (MoIC), Ministry of Agriculture and Cooperatives (MoAC), Ministry of Education and Sports (MoES), Ministry of Environment and Science and Technology (MoEST), Ministry of Woman, Children and Social Welfare (MoWCSW), Secretariat of National Planning Commission (NPC), Nepal Army, Nepal Police Force, Nepal Armed Police Force, Department of Water Induced Disaster Prevention, Department of Mines and Geology, Department of Hydrology and Meteorology, Department of Soil Conservation and Watershed Management. There are several non-governmental International agencies also working in this field like: Japan International Cooperation Agency (JICA), International Centre for Integrated Mountain Development (ICIMOD) United States Agency for International Development (USAID), Lutheran World Service (LWS), Technical Cooperation of the Federal Republic of Germany (GTZ), OXFAM, Cooperation for American Relief Everywhere (CARE), United Mission to Nepal (UMN), United Nation Development Programme (UNDP), Save the Children Fund (SCF), Action Aid Nepal (AAN), Nepal and others have been providing cash, kind and technical assistance. The district-wise activities of the important organizations are given in the Annex IV.

DP-Net, a network of organisations involved in disaster management is an active network that is contributing towards disaster reduction with its activities of information sharing, and collaborative works.

5.2.2 Policy Action Matrix

Table 5.1: Policy-Action Plan Matrix for Natural Disaster Reduction and Development Strategies

Sr. No.	Constraints	Recommendation	Activities	Indicators of achievement	Responsible agencies	Time Frame
1.	Lack of National Policy on Natural Disaster Risk Reduction Though 9th and 10th five year plan mentioned briefly about the disaster risk reduction but they not adequately addressed the issues. Natural Disaster Risk Reduction does not come under priority of the government. No appropriate agency for Disaster Risk Reduction exits	Prepare National Policy on Disaster Risk Reduction	Government of Nepal instructs National Planning Commission to prepare the National Policy document	The National Policy on Natural Disaster Risk Reduction is prepared, published and available to users	National Planning Commission	Short
2.	Lack of an appropriate Disaster Risk Reduction Act The present Natural Calamity Act is incomplete in the sense that it takes care of only rescue and relief operation and does not cover the pre-disaster phase such as preparedness and post-disaster phase such as reconstruction - rehabilitation for disaster risk management Therefore, a new Act is	Prepare a new Disaster Risk Reduction Act Revised act should cover role of central governing authority and related other organisations	Government instructs to Ministry of Home Affairs to prepare a new Act on Disaster Risk Reduction	The Disaster Risk Reduction Act is prepared and enacted by the parliament, published and available to users	Ministry of Home Affairs	Short

	necessary to be prepared as the amendment of the existing Act will not be sufficient.					
3.	Lack of appropriate amendments in Acts related to disaster issues such as Local Self-Governance Act, Irrigation Act, , Road and Transport Act, Water Resources Act, Nepal Electricity, Authority Act, Electricity Act, Water Supply Act, Mines and Geology Act, Industry Act, Agriculture Act, Soil and watershed conservation Act, Forest Act, Environment Conservation Act. Building Act, Municipality Development Act. The above Acts in many ways are related to disaster risk management. In these acts Disaster Impact Assessment must be made mandatory and disaster risk reduction components must be incorporated.	Amend the Acts as required	Government instructs to respective ministries for the amendment of the Acts.	The Acts amended by the parliament, published and available to users	Related ministries	Short Medium
4.	Lack of Regulations related to Disaster Risk Reduction Act For the Disaster Risk Reduction Act to be effective and implemented properly it must be backed by the. Even at present no regulations are	Prepare Regulations for the Disaster Risk Reduction Act	Government instructs the Ministry of Home Affairs to prepare the Regulations after the Disaster Risk Reduction Act is prepared and enacted.	The Regulation is prepared and passed by the respective agency of the Government, published and available to users	Ministry of Home Affairs	Medium

	formulated for the Natural Calamity Relief Act 2039 B.S					
5.	Lack of Policy and Act related to Land use practice. Due to lack of policy and legal provision, long history of haphazard and improper land use practices have been in use creating unnecessary loss of lives and property and promoting environmental degradation.	Prepare a National Land Use Policy and Act	Government instructs related agencies to prepare the Policy and the Act.	The policy is prepared, published and available to users The Act is prepared, enacted by the parliament, published and available to users	National Planning Commission Ministry of Agriculture	Medium
6.	Lack of National Disaster Management Council Establishment of this Council has been proposed in the Action Plan of the government	Establishment of National Disaster Management Council	Government establishes the National Disaster Management Council	The National Disaster Management Council established by the Government	Office of the Prime Minister	Short
7.	Lack of hazard maps on natural disasters	Prepare hazard maps for landslide/debris flows, flood, earthquake with priorities for densely populated settlements in most hazardous districts and important infrastructure locations. The maps should be at regional scale as well as the VDC/Municipality level	Instruct and provide budget for hazard map preparation to relevant agencies of the government	Prepared hazard maps available to users	Department of Mines and Geology Department of Water Induced Disaster Prevention Department of Soil Conservation and Watershed Management Universities	Medium Long
8.	Inadequate emphasis and programmes on watershed management	Develop more programmes for watershed management	Provide more budget to appropriate agencies for watershed management programmes	Number of projects and additional areas covered by watershed management projects	Department of Soil conservation and Watershed Management	Medium Long

				and improved conditions of watersheds.		
9.	Lack of Information and Documentation Centre on disasters Ministry of Home affairs collects data on deaths, missing, injured affected families and loss on private properties. No detailed information on loss due to infrastructure damage/destruction and other kinds of losses is collected by Ministry of Home affairs. Similarly Nepal Red Cross Society and other related agencies collect information on disasters for their own purposes. There is no central agency which collects all information related to disasters and disseminates information.	Establish/designate an organization to act as a National Information and Documentation Centre on disasters. Provide budget to run the Centre. Ministries and concerned departments dealing with development of infrastructure are instructed form a disaster unit with a designated person to collect information on loss and damage of infrastructures and the estimated rehabilitation cost annually. The data is also provided to National Planning commission, Central Bureau of Statistics and the proposed National Information and Documentation Centre	Government establishes a new Centre or designates one of its organizations to act as the National Information and Documentation Centre on disasters. The respective departments of the Ministries will collect the data annually and provide to the respective organizations and makes it public.	Establishment and functioning of the National Information and Documentation Centre Budget available Availability of published data	Office of the Prime Minister Respective departments and Ministries.	Short Medium
10.	Inadequate coverage given by government and private media	Frame policy to ensure adequate	Government instructs the concerned Ministry	Policy framed and available.	Ministry of Information and	Short

	on disasters	coverage on disasters for both print and electronic media Mobilize media	to frame an appropriate policy for media on coverage of disaster related issues including awareness creation.		Communication	
11.	Lack of awareness among majority of people about natural disasters vis a-vis development Adequate information is not provided in schools and higher educational institutions regarding the natural disasters and their negative impacts in society and national development activities.	Conduct awareness programmes and disseminate information through various media Introduce adequate disaster related materials in the curriculum of schools as well as higher level educational institutions	Government and non-governmental agencies develop and run awareness programmes through various activities Government instructs related ministry to develop and include disaster related materials in the curriculum of school as well as the higher level institutions.	Activities performed and reports received from various agencies. Annual number of loss of lives and property reduced Curriculum prepared and introduced at schools and higher educational institutions.	Ministry of Education and Sports Universities Ministry of Information and Communication Ministry of Home Affairs I/NGOs	Medium Long
12.	Lack of policy for capacity building on disaster Preparedness for people living in hazardous areas and belonging to vulnerable groups such as poor and marginalised people. Particularly women and children are not given enough priority as they are the most vulnerable during disasters.	Develop programmes to enhance capacity building also giving due attention to include programmes especially for women and children.	Introduce programmes for • Capacity building using micro credit facilities, trainings on disaster management and as well as skill development • Disaster risk reduction by using physical measures such as river training works, construction of embankments, check dams, construction of	Improved lively hood indicated by the economic indicators Improved capacity to deal against disasters as indicated by reduced number of loss of lives and property and increased level of safety	Department of Water Induced Disaster Prevention, Department of Soil Conservation and Watershed Management I/NGOs Ministry of Agriculture	Medium Long

			shelter houses etc. • Relocation and • Rehabilitation.			
13.	Lack of enough national budget allocation specified for disaster risk reduction	Allocate adequate separate annual budget for disaster risk reduction programmes in communities.	• Implement Community Based Disaster Management (CBDM) programmes • Implement awareness programmes • Trainings on disaster risk management	Number of functioning CBDM units in the project areas and level of preparedness attained. Number of awareness programmes conducted and level of awareness attained. Number of people having received trainings	Ministry of Finance I/NGOs Village Development Committees	Short Medium
14.	Inadequate budget for rehabilitation of infrastructures damaged and destroyed due to natural disasters.	Budget allocation by the government	• Data collection by respective departments, data analyses, printing and information dissemination.	Number of publications	Government Departments and ministries	Medium
15.	Lack of early warning system	Plan early warning system at local level	Installation of early warning system	Lives and property saved due top the operation of early warning system	Respective Government agencies/I/NGOs	Medium
16.	Neglect of Mainstreaming of disaster reduction strategy in development projects and poverty alleviation Preparation of Disaster Impact Assessment guidelines and	All development projects should be approved only after they have produced a separate Disaster Impact Assessment (DIA) report to	Disaster Impact Assessment (DIA) guide lines prepared and implemented DIA should include assessment of impacts	DIA guidelines prepared implemented and made available to users	Ministry of Environment	Short

	making mandatory for such assessments in all development projects	ensure the safety of the structures from future possible disasters	from landslides, debrisflows, flood, earthquakes, draughts, Glacial lake Outburst Floods (GLOF), snow avalanches, soil erosion, river bank erosion, impact of structure on the environment, possible occurrence of disasters and their impacts on human and environment due to the new structure to be constructed, etc.			
17.	Inadequate number of hydro-meteorological stations in the country Poor physical facilities and inadequate man power	Modernise Department of hydrology and meteorology (DHM) More new hydro-meteorological stations to be installed in the country Number of automatic recording stations should be increased Improve physical facilities and number of technical staffs	Government instructs DHM to install more stations Improve physical facilities Increase number of technical staffs	Number of new installation of stations New data acquisition Improved in weather forecast and early warning system for flood and landslides Increased physical facilities and number of technical staff	Department of Hydrology and Meteorology (DHM)	Medium Long
18.	Inadequate capacity of hospitals in handling disaster victims at the time of large disasters	Strengthen hospital capacity in terms of physical facilities and training of manpower	Provide adequate facilities and manpower in government hospitals in the capital as well as in the districts .to deal with disaster victims	Increased facilities and manpower Number of trained doctors and paramedics	Ministry of Health	Medium Long

			Regular drills in hospitals for disaster preparedness. Trainings to doctors and paramedics to deal with disaster situations			
19.	Poor bilateral and regional cooperation in disaster risk reduction	Strengthen cooperation on bilateral and multilateral levels	Sign memorandum of Understandings (MOUs) with institutions of other countries for cooperation Develop joint research and other activites for mutual benefits Share knowledge and information	Number of signed MOUs Number of joint projects under bilateral and multilateral collaborations	Ministry of Home Affairs Other related Ministries	Medium Long
20.	Neglect of Information/ improvement on age old traditional/indigenous knowledge/good practices on disaster risk reduction	Identify, record, research and disseminate information on traditional/indigenous knowledge/good practices	Carry out research on traditional/indigenous methods and find improvements Introduce such practices in other communities/projects Bring out publications on such methods and disseminate the knowledge	Number of research activities, publications and implementation in other communities/ projects	Relevant Ministries I/NGOs	Long

Chapter 6

Conclusions and Recommendations

6.1 Conclusions

The following conclusions are drawn from the study;

- Nepal is a highly disaster prone country. Large natural disasters occur in the frequent pace which cause loss of lives in hundreds and sometimes in thousands such as 1988 (earthquake) and 1993 (flood and landslides) disasters, and destroy and damage infrastructure requiring rehabilitation work worth millions of US$.
- Study shows that 90% of Nepalese people are constantly exposed to more than two disasters at any time. In the last two decades, in an average per year about 938 persons lost their lives in Nepal. Nepal stands at 11th with respect to relative vulnerability to earthquake and 30th country with respect to flood. Nepal suffers a loss of hundreds of million rupees every year due to disasters. The data compiled by the Ministry of Home Affairs, illustrates that in the last twenty three years (1983 – 2005), over 28 billion rupees were lost due to disasters, an average of nearly 1208 million rupees per year.

- Natural disasters have greatly slowed the pace of development in Nepal. When heavy infrastructures are damaged or destroyed by disasters in drains out the scarce resources of the country that have been set aside for other social and development projects.
- The annual GDP loss due to disasters in Nepal is at an unacceptable level and may represent the highest values in South Asia. The analysed data from the last two decades shows that the hazard loss in 1988 (1988 eastern Nepal earthquake year) was 23.69 per cent of. Similarly, the next largest loss due to disaster was 16.17% in 1993 (the 1993 landslide and flood disaster year). The average loss during the 1983-1995 was 12.9% and between 1996 and 2005 was 2.60% of the GDP.
- The poorest communities are hurt most, because they tend to live in greater density in badly-built housing on land at risk. The lives of vulnerable people living in disaster zones can be saved or dramatically improved by disaster preparedness and prevention measures. To achieve maximum impact it is necessary to incorporate such measures into development policy of nation.
- A disaster risk reduction policy would increase the sustainability and effectiveness of development aid and reduce the need for humanitarian aid. Planning ahead for disaster is a cost effective way to help people, since it reduces emergency, recovery and reconstruction expenditures. A successful policy would comprise both short-term disaster preparedness measures and long-term development policy.
- In rural areas, livelihood become at risk due to disasters with range of factors: poverty and asset depletion, environmental degradation, market pressure, isolation and remoteness and the reduced or lack of social services etc.
- The present study amply demonstrates that to achieve sustainable development and to meet the Millennium Development Goal of Nepal (2005-20015), natural disaster reduction is a key factor.

6.2 Recommendations

Recommendations are as follows;

1. Policy and legal framework: The extent of disasters can be reduced if timely preventive measures are taken for which pragmatic government policies and legal instruments are needed. Due to the difficult physiographical situation of the country, it is very difficult to cope with natural disasters. Disasters happen all of a sudden and disaster management is a complex and difficult task. Therefore, it becomes very difficult to cope with particularly large disasters with a normal administrative set up. At this juncture, initiation of a concrete, effective and practical policy and an appropriate Act is of utmost importance. Therefore, improvement of physical infrastructure, poverty alleviation, change in the people's perception, literacy campaign, public awareness raising programs and capacity building are necessary.
   The MoHA should take active role in the amendment of Act. In light of its amendment, the basic preparation for the formulation of regulation should be carried out.
2. Establishment of an Apex body: It is better to establish a separate agency (autonomous) such as the "National Disaster Management Council" to deal all sorts of disaster preparedness, mitigation and rehabilitation works. If so, it will be possible to implement the programs of the immediate needs.
3. Hazard Mapping: Hazard mapping of the country, vulnerability assessment, and risks analysis, monitoring of changes in the physical environment, effective early warning system, reliable data collection and dissemination are needed. For all this, political commitment and pragmatic policy formulation, availability of appropriate Act and Rules and Regulations are of great importance in the context of Nepal. Efforts should be made on identifying and prioritizing high-risk areas and developing disaster management plans, then efforts will be turned to better ways of managing. In order to adopt mitigation measures, it is important to identify the level of threats and extent of vulnerability. For it vulnerability and hazards mapping need to be prepared in the participatory way. The assessment of vulnerability condition of poor and disadvantaged and appropriate coping strategy is equally important. Community based disaster preparedness initiatives are needed for the long run to improve livelihood.
4. Building code enforcement and earthquake hazard preparedness: Nepal is one of the most vulnerable countries in the world. It is widely accepted that Nepal is threatened by an impending large earthquake in the future. The 1934 Nepal-Bihar Earthquake and the 1988 eastern Nepal earthquake have clearly shown how vulnerable the country is due to earthquakes. A large earthquake can bring an unprecedented loss of lives and property. Therefore a special and comprehensive National Earthquake Preparedness Programme should be formulated and implemented as soon as possible with adequate regular budgetary support. The government should also formulate the plan of action to enforce the Building code more effectively and disseminate its major provisions to all.
5. Public-Private partnership: There is need for institutional systems and administrative arrangement that link public, private and civil society sectors and build vertical ties between central, district, and local national and global scale actors.
6. CBDP Programmes: Enhancing the influence of local actors, through their participation in the local governance of risk such as through well rehearsed Community Based Disaster Preparedness projects (CBDP), offer great potential for increasing sensitivity and responsiveness of development planning to disaster risk.

7. Mainstreaming: Mainstreaming of disaster risk into development planning by suitable attributing of experience of other locations and created action in national context. The mainstreaming of disaster risk assessment into the ongoing development planning process can build on the wealth of methodologies already available and on administrative structures already in place at the local and national scales.
8. Networking: In many cases individual networks of organizations such as DP-Net are already commencing the task of reforming data collection, but broader cooperation is needed.
9. Defining role and responsibilities of GOs: The role and responsibilities should be defined more clearly. For example, the emerging role of DWIDP is to lead coordinating agency to facilitate its planning and coordination, DHM is to be lead agency for implementing and managing a flood warning system, and MoHA is to be lead agency for planning and implementing disaster relief/rehabilitation measures.
10. Shared responsibilities: During the disaster, the infrastructure such as road, water supply, electricity, bridge, schools, houses are damaged. But government alone has no sufficient resources to repair and maintain these damaged infrastructures. Similarly, rehabilitation program is a costlier effort. There should be joint initiatives of government, I/NGOs and private sectors for rehabilitation. The resettlement and rehabilitation program should be brought as a package program.
11. Transparency: NGOs need to be motivated to work in the disaster prone areas even during peak emergency periods but the activities and plans should be transparent. For it, there need to be amending in the Act. There should be the provision of proper monitoring and evaluation of ongoing activities.
12. Training for special skills: The livelihoods of poor people are threatened every time a disaster hits as they live in the marginalized land, depend on fishing, agriculture labour work. To improve the livelihood of people, they have to rehabilitate and given special skills to cope with disaster.
13. Policies for people living in vulnerable areas: Policies and legislations for people living in highly vulnerable areas should be made. The policies and legislations should also address the poor, marginalized and other vulnerable groups.
14. Lessons learnt: There is need to detail study on how the society is gradually developed by managing the various types of disaster and emergences, what were the coping strategies in the past and which can be still viable to replicate etc.
15. Linkage between disaster and poverty: Disaster and emergency programs should be dealt with economic and right based prospective. Till now, disaster is not much considered as the reason for poverty. It has multiplier effects that are responsible to poverty and vulnerability.
16. Awareness through formal education and media: A key factor for disaster reduction is also the creation of awareness to the majority of the population. This can be done through formal education in schools and higher educational institutions and through various forms of media such as radios, televisions, news papers etc.
17. Integrating disaster reduction programmes in community development projects of NGOs/INGOs: it is estimated that there are over 20,000 NGO's in Nepal out of which more than 16000 are registered in the Social Welfare Council. The related government agencies and Social Welfare Council should bring out a policy so that all community development projects of NGOs/INGOs integrate disaster reduction strategy in their regular development programmes.
18. Pro-active role of Village Development Committee's (VDCs) in Disaster Reduction: Presently all VDCs of Nepal receive one million NRs. annually as development budget. It is found that most VDCs are not pro-active towards disaster preparedness

and depend on outside help for rescue and relief operations as well as for preparedness. Therefore VDCs particularly vulnerable to disasters should be encouraged by the government to spend a certain proportion of the annual budget for disaster preparedness.

19. Annual review of disaster situation and plan for disaster mitigation strategy by National Planning Commission (NPC): Natural disasters are regular and annually recurring phenomena in Nepal. So far it has not received proper attention as well as its serious impacts on development and safety of the people. Therefore, NPC should review the disaster situation annually and propose appropriate policies and plans to mitigate the disaster impacts. In addition, the NPC should also take into account of the disaster issues while formulating its five-year plans.

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Annex I

Terms of Reference

Study Topic: *The Nexus between Natural Disasters and Development: Key policy issues in meeting the millennium development goals and poverty alleviation*

This assignment is equivalent to effective one-man month. The consultant should establish adequate interactions with key informants, stakeholders and government agencies while conducting the study.

Task Details:

1. Categorize natural disasters that Nepal is most vulnerable to on the basis of past episodes and their impacts on human lives and infrastructure.
2. Evaluate the economic impacts of natural disasters faced by Nepal in the past and their fiscal impacts vis-à-vis planned development budgets.
3. Review the government's organizational structure and strategy on disaster risk management, and identify weaknesses and policy gaps to effectively incorporate disaster risk management in the government's sustainable development agenda.
4. Suggest policy reforms needed to mainstream the concept of disaster risk management in the government's annual and periodic development plans.
5. Suggest a policy-action matrix containing (a) constraints (policy, legal, institutional, administrative, and others if applicable); (b) recommended policy improvements; (c) activities; (d) indicators of achievement; (e) responsible agencies; and (f) timeframe (immediate, intermediate, and long-term)
6. The paper should include an executive summary not exceeding five pages.
7. The consultant is requested to provide a short article, in English or Nepali, related to the above topic, to be published in a national daily for information dissemination.
8. Submit draft report (electronic and hard copy) to the EPN Focal Unit within 30 days from the date of assignment.
9. Present the draft at the Advisory Committee meeting (to be scheduled by EPN Focal Unit).
10. Present revised draft (incorporating comments from the Advisory Committee and external reviewer) at the workshop organized by the EPN Focal Unit.
11. Present final report (incorporating comments from the Workshop) at the Advisory Committee meeting for final validation. Submit final report to EPN Focal Unit (electronic and hard copy).

ANNEX - II

Loss of Lives and Properties by Different Types of Disasters in Nepal

1995 (2052 BS)

S. N.	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Avalanches	43	0	1	**5**	44	6	0		111960
2	Flood & Landslides	203	0	62	128973	3150	22251	252		1428006597
3 4	Fires	73	0	40	4794	436	4755	348		236280937
4	Epidemics	520	0	0	828	956	15	0		0
5	Windstorm& Hailstorm	5	0	8	802	58	246	1		20411048
6	Thunderbolt	29	0	26	116	71	22	**7**		1054950
7	Earthquake	0	0	0	0	0	0	0		0
Total		**873**	**0**	**137**	**135518**	**4715**	**27295**	**608**		**1685865492**

Source: Ministry of Home Affairs (MoHA, 2004)

1996 (2053 BS)

S. N.	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Avalanches	4	0	0	4	0	0	0		0
2	Flood & Landslides	258	0	73	37096	1548	28432	684		118598065
3	Fires	61	0	70	6630	995	6064	425		308364545
4	Epidemics	494	0	1292	1411	0	0	0		0
5	Windstorm& Hailstorm	47	0	58	13371	66	11547	34		816613558
6	Thunderbolt	28	0	34	93	225	37	8		0
7	Earthquake	3	0	0	2	0	0	0		3268337
Total		**895**	**0**	**1527**	**58607**	**2834**	**46080**	**1151**		**122531007**

Source: Ministry of Home Affairs (MoHA, 2004)

1997 (2054 BS)

S. N	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Avalanches	9	0	48	185	214	24	9		7430900
2	Flood & Landslides	78	0	21	5648	103	1790	137		94499074
3	Fires	45	0	54	3380	780	3214	593		230753959
4	Epidemics	947	0	882	1897	0	0	0		0
5	Windstorm	0	0	34	2598	46	555	7		15305352
6	Hailstorm	0	0	0	31933	0	0	0		58029906
7	Thunderbolt	44	0	79	144	48	25	9		1829310
8	Earthquake	0	0	2	269	0	273	0		2171000
Total		**1123**	**0**	**1120**	**46054**	**1191**	**5881**	**755**		**410019501**

Source: Ministry of Home Affairs (MoHA, 2004)

1998 (2055 BS)

S. N	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Avalanches	0	0	0	0	0	0	0	0	0
2	Flood & Landslides	276	0	58	33843	572	13922	1180	326.89	109330292
3	Fires	54	0	22	876	65	926	56	0	33558228
4	Epidemics	840	0	1896	2300	0	0	0	0	0
5	Windstorm	6	0	2	172	3	140	6	0	225348280
6	Hailstorm	0	0	0	0	0	0	0	0	0
7	Thunderbolt	17	0	13	87	129	23	2	0	1739300
8	Earthquake	0	0	0	3	0	3	0	0	56000
Total		**1193**	**0**	**1991**	**37281**	**769**	**15014**	**1244**	**326.89**	**111937310**

Source: Ministry of Home Affairs (MoHA, 2004)

1999 (2056 BS)

S. N	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Avalanches	5	0	0	1	22	5	0	0	0
2	Flood & Landslides	209	94	92	9768	309	2538	132	182.40	364950170
3	Fires	46	0	17	1516	268	1597	143	0	135776189
4	Epidemics	1207	0	0	6119	0	0	0	0	0
5	Windstorm& Hailstorm	6	0	7	293	1	51	3	0	5516985
6	Thunderbolt	16	0	30	55	49	23	8	0	1662420
7	Earthquake	0	0	0	90	1	90	0	0	633200
Total		**1489**	**94**	**146**	**17842**	**650**	**4304**	**286**	**182.4**	**508538964**

Source: Ministry of Home Affairs (MoHA, 2004)

2000 (2057 BS)

S. N	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Avalanches	0	0	0	0	0	0	0	0	0
2	Flood & Landslides	173	95	120	15348	796	5229	369	520	919384960
3	Fires	53	0	14	2926	387	3099	268	0	239251881
4	Epidemics	141	0	0	735	0	0	0	0	0
5	Windstorm	3	0	2	59	2	57	3	0	1560160
6	Hailstorm	0	0	0	7165	14	0	0	0	124776513
7	Thunderbolt	23	0	38	70	32	41	7	0	1990500
8	Earthquake	0	0	0	0	0	0	0	0	0
Total		**393**	**95**	**174**	**26303**	**1231**	**8426**	**647**	**520**	**128696401**

Source: Ministry of Home Affairs (MoHA, 2004)

2001 (2058 BS)

S. N	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Avalanches	0	0	0	0	0	0	0	0	0
2	Flood & Landslides	196	45	88	7901	377	3934	212	0	251090990
3	Fires	26	0	5	1347	236	1322	102		246256401
4	Epidemics	154	0	0	468	0	0	0		0
5	Windstorm	1	0	0	77	0	16	2		806300
6	Hailstorm	1	0	7	6085	30	814	26		37895834
7	Thunderbolt	39	0	32	40	20	13	0		632000
8	Earthquake	1	0	2	136	4	161	0		3193000
Total		**418**	**45**	**134**	**16054**	**667**	**6260**	**342**		**539874525**

Source: Ministry of Home Affairs (MoHA, 2004)

2002 (2059 BS)

S. N	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Flood & Landslides	441	21	265	38859	2024	18160	771	0	416915930
2	Fires	14	0	6	1388	100	1605	37	0	94739526
3	Epidemics	0	0	0	0	0	0	0	0	0
4	Windstorm	3	0	0	227	0	70	45	0	4847500
5	Hailstorm	0	0	0	0	0	0	0	0	7000000
6	Thunderbolt	3	0	0	12	2	1	0	0	63200
7	Earthquake	0	0	16	0	0	0	0	0	0
Total		**461**	**21**	**287**	**40486**	**2126**	**19836**	**835**		**523566156**

Source: Ministry of Home Affairs (MoHA, 2004)

2003 (2060 BS)

S. N.	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Flood & Landslides	232	58	76	7167	865	3017	174	0	234784700
2	Fires	16	0	23	1162	233	1274	144	0	734959300
3	Epidemics	0	0	0	0	0	0	0	0	0
4	Windstorm	20	0	30	3302	7	2520	1344	0	18851500
5	Hailstorm	0	0	0	47	0	0	0	0	666000
6	Thunderbolt	42	0	31	52	20	8	2	0	674500
7	Earthquake	0	0	0	0	0	0	0	0	0
Total		**310**	**58**	**160**	**11730**	**1125**	**6819**	**1664**	**0**	**989936000**

Source: Ministry of Home Affairs (MoHA, 2004)

2004 (2061 BS)

S. N.	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Flood & Landslides	131	11	24	14238		3684	143	321.82	219289760
2	Fires	10	0	24	1135		1120	147	0	121035352
3	Epidemics	41	0	150	480		0	0	0	NA
4	Windstorm	0	0	2	8		8	0	0	540100
5	Hailstorm	0	0	0	1116		3	0	0	NA
6	Thunderbolt	10	0	20	20		3		0	230000
7	Earthquake	0	0	0	0		0		0	0
Total		**192**	**11**	**220**	**16997**		**4818**		**321.82**	**341095212**

Source: Ministry of Home Affairs (MoHA, 2004)

2005 (2062 BS)

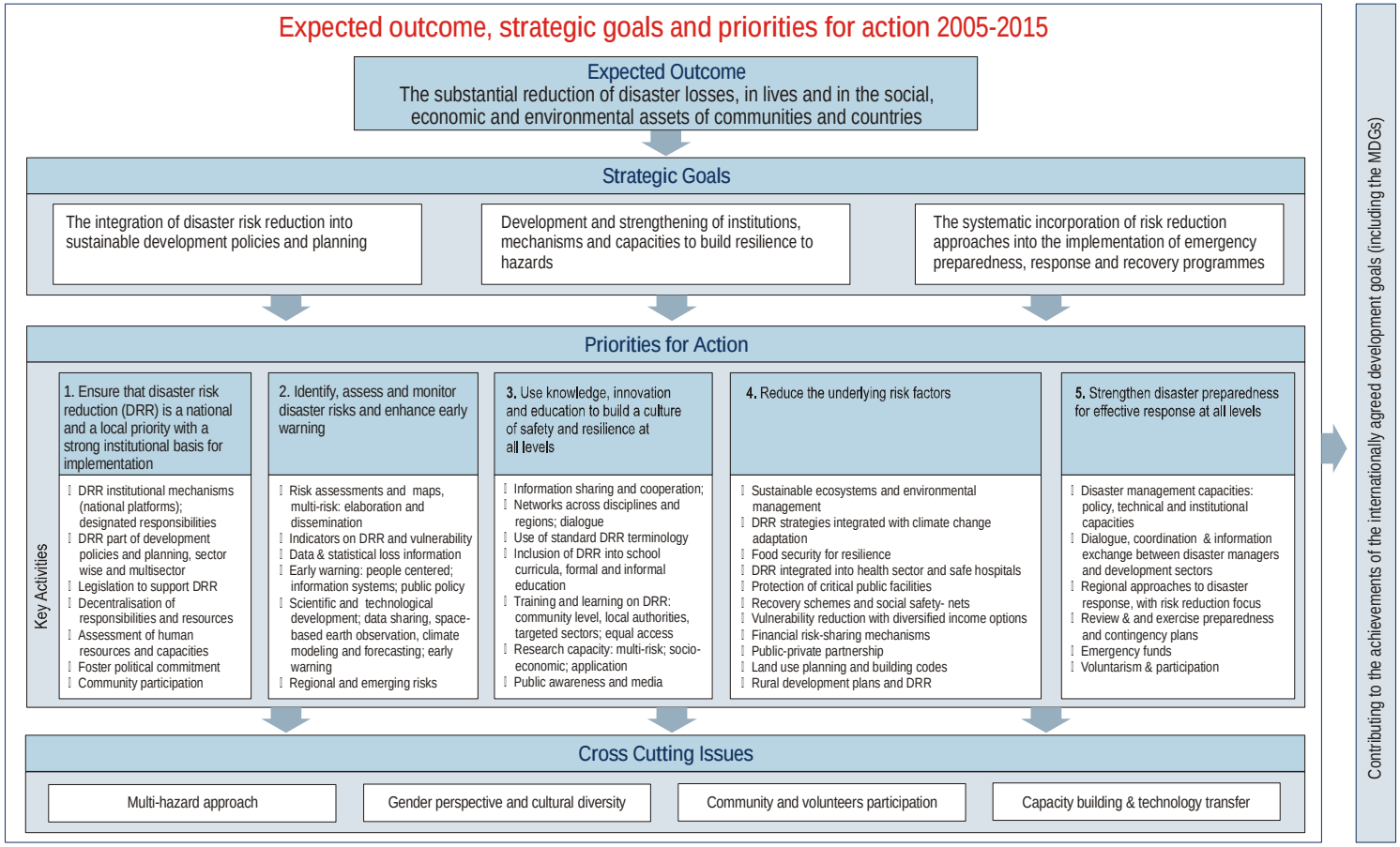
S. N	Types Of Disasters	People			Affected Families	Animal Losses	Houses Destroyed	Cattle Shed Destroyed	Land Loss (In Hectors)	Estimated Losses Rs.
			Missing	*Injured*						
1	Flood & Landslides	141	20	31	2088	360	1102	49	1033.311	131561415
2	Fires	28	0	56	2078	362	2056	179	0	247757140
3	Epidemics	34	0	45	79	0	0	0	0	-
4	Windstorm	0	0	0	1	0	1	0	0	620000
5	Hailstorm	1	0	5	1	0	0	0	0	1600000
6	Thunderbolt	17	0	13	26	5	9	0	0	430500
7	Earthquake	0	0	0	0	0	0	0	0	-
8	Avalanches	21	0	3	42	228	1	0	0	6249600
Total		**242**	**20**	**153**	**4315**	**955**	**3169**	**228**	**1033.311**	**388218655**

Source: Ministry of Home Affairs (MoHA, 2004)

Annex III

International Strategy for Disaster Reduction

SUMMARY of the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters (Hyogo Framework)



Annex IV

Currently working UN Organizations, Donor groups and INGOs in the field of disaster management

District / Agency		UN ORG			Donors			INGO								
		UNDP	UNICEF	WHO	CIDA/CCO	JICA	RNE	CAM	IFRC	LWF Nepal	OXFAM	SC USA	UMN	WORLD Vision	CARE Nepal
	Central project		X	X	X		X				X				
Eastern Development Region	Bhojpur														
	Dhankuta														
	Ilam								X						
	Jhapa									X					
	Khotang														
	Morang									X				X	
	Okhaldunga														
	Panchthar														
	Sankhuwasava														
	Saptari									X					X
	Siraha				X					X					X
	Solokhumbu														
	Sunsari														
	Taplejung														
	Terathum														
	Udayapur									X					
Central Development Region	Bara										X				
	Bhaktapur								X						
	Chitwan	X							X						X
	Dhading												X		X
	Dhanusha				X										X
	Dolkha														X
	Kathmandu					X					X				
	Kabhrepalanchowk														
	Lalitpur					X				X					
	Makwanpur	X			X										
	Mahottari				X						X				X
	Nuwakot														

	Parsa														X
	Ramechap									X					X
	Rasuwa														
	Rautahat				X					X	X				
	Sarlahi				X										X
	Sindhuli	X													
	Sindhupalchok														
Western Development Region	Arghakhanchi														
	Baglung														
	Gorkha														X
	Gulmi														
	Kapilbastu														X
	Kaski														X
	Lamjung														X
	Manang														
	Mustang														
	Myagdi														
	Nawalparasi										X				X
	Palpa														
	Parbat														
	Rupandhehi								X						
	Tanahu														
	Syangja	X													X
Mid Western Development Region	Banke									X					X
	Bardiya	X													X
	Dang														X
	Deilekh							X				X			
	Dolpa											X			X
	Humla											X			
	Jajarkot											X			
	Jumla											X			
	Kalikot											X			X
	Mugu											X	X		X
	Pyuthan														X

	Rolpa											X			X
	Rukum											X	X		X
	Salyan											X			X
	Surkhet							X							X
Far Western Development Region	Achham									X		X			X
	Baitadi														X
	Bajhang											X			X
	Bajura											X			X
	Dadeldhura											X			X
	Darchula														X
	Doti									X		X			X
	Kailali									X					X
	Kanchanpur														X