



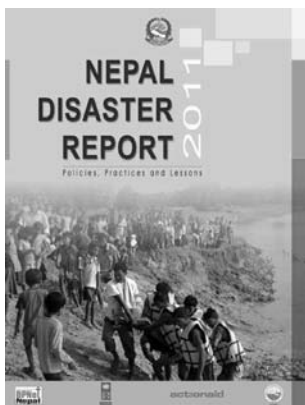
Government of Nepal  
Ministry of Home Affairs

# NEPAL DISASTER REPORT

2017  
2018

Policies, Practices and Lessons





Cover Photo: Training on search and rescue techniques using local resources, Kailali district

Photo Courtesy: Mercy Corps



Government of Nepal  
Ministry of Home Affairs

# NEPAL DISASTER REPORT

2012

Policies, Practices and Lessons



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GOVERNMENT OF NEPAL  
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**Foreword**

Nepal is highly prone to natural hazards such as floods, landslides, fires, extreme weather events, earthquakes and many others. An inventory of past disastrous events reveals that, in an average, one disaster and two deaths per day, creating devastating impact on physical and socio-economic spare of the country. Earthquake is a major potential hazard to reckon with the country is located on an active seismic belt and the exponential urbanization trend over the past decade with general disregard of earthquake-resistant measures in building construction is the cause of ever increasing risk.

In line with this, Ministry of Home Affairs (MoHA) is very much pleased to bring out this edition of Nepal Disaster Report, 2011. The Report is an attempt to documentize the Disaster Risk Reduction efforts and initiatives, Hazards and Disaster events, socio-economic impacts and pertinent issues in regard to Disaster Risk Management in Nepal, as well as sharing the good practices. This report comprises disaster related policies, practices and lessons learned during the year 2010 and even earlier since past decades. The report has been produced and published by MoHA in collaboration with Disaster Preparedness Network Nepal and other partner agencies.

Being as a Focal Ministry of Government of Nepal for Disaster Risk Management, the Ministry is leading Disaster Risk Management initiatives in Nepal. In recent years, many significant efforts have been carried out to identify the disaster risk reduction activities in Nepal in order to optimize the outcomes of implementation followed by positive impact. The Government of Nepal has been working together with international community, I/NGOs and all organizations interested and involved, as well as communities and individuals towards Disaster Risk Management in Nepal, which includes key concerted activities that need to be implemented in the country to reduce risk and prevent disasters.

Identification of hazards, assessment of vulnerability and risks and evaluation of response capacity are the first activities to be conducted if we want to focus disaster management and optimize its results. It is the objective of this report to help disaster managers to reduce risk at all levels mainly national, district and local, by being used in the design and implementation of disaster management programs, plans and specific activities always within the framework of the National Strategy for Disaster Risk Management, District Disaster Preparedness and Response Plan, the Five Flagship Program and the Hyogo Framework for Action. All disaster management activities should be compatible and be part of the overall ongoing disaster management process in Nepal.

I take this opportunity also to extend sincere thanks to the staffs from this office, partner agencies and individual professionals involved in preparing Nepal Disaster Report 2011. Our collective efforts can make a difference in building disaster resilient communities in Nepal.

(Navin Kumar Ghimire)

Secretary

Ministry of Home Affairs  
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### Acknowledgement

At the onset, I would like to express my deepest pleasure to come up with this Nepal Disaster Report 2011. However, the process of this production delayed due to certain unavoidable circumstances and adversities. Nevertheless, despite the delay, we have been able to incorporate recent and much comprehensive data, information, views and experiences on disaster related events and activities in this form and make the document much valuable.

On behalf of the publishers; Ministry of Home Affairs (MoHA), Government of Nepal and Disaster Preparedness Network-Nepal (DPNet-Nepal); I would like to extend my sincere gratitude to the United Nations Development Program (UNDP), ActionAid Nepal and National Society for Earthquake Technology-Nepal (NSET) for their support in producing this report.

We highly appreciate and wish to thank the intellectual Editorial Board members for their invaluable and tireless effort and contribution to make this document a worth. Their diverse and pervasive knowledge, rich experiences, and ideas in finalizing this report with high professionalism and technical standards are very much acknowledged.

We also acknowledge the contributions made by NSET Working Team and individual professionals for their hard works and untiring efforts to work on the draft contents under the guidance of Editorial Board. We would also like to take this opportunity to appreciate DPNet-Nepal staff Mr. Bhesh B. Parajuli, Mr. Safal Khatiwada and Mr. Bikash Shrestha for their dedication and coordination in this endeavour.

We remain thankful to all the national and international DRR partners, various agencies and many more professionals who have contributed directly and indirectly to this report.

Finally, I on behalf of the publishing partner DPNet-Nepal would like to express my sincere thanks and appreciation to the Ministry of Home Affairs (MoHA), Disaster Risk Management lead agency of the Government of Nepal for their dynamic and visionary leadership in all the DRM processes in Nepal. Their direction in producing this important report is highly acknowledged. We look forward to have their continued support and guidance in the days to come.

Thanking you all once again;

Meen B. Poudyal Chhetri, Ph.D.

Chairperson

Disaster Preparedness Network-Nepal (DPNet-Nepal)



## Editorial

**NEPAL DISASTER REPORT 2011 Policies, Practices and Lessons** tries to become a compendium of understanding, concepts, experiences and lessons of disaster risk management (DRM) and emergency response planning and capacity building in Nepal. It tries to reflect the current status of DRM in Nepal including peoples' aspiration and portrays the efforts made by people and agencies - the government at the central and local levels, the international development partners, the civil society and national private businesses, and the people at the ward, tole (neighborhood) and community levels, to get out of the vicious cycle of poverty and disaster vulnerabilities. Thus, this document is a compilation of facts of disaster occurrence and the efforts made in Nepal in reducing the impact of the disasters and in getting prepared for future events. The document looks into the level of natural hazards the country is exposed to, tries to explore the social, economic, and political meanings of disasters for the country, and tries to make a case on why and how Nepal should address the issues of disaster risk management in order to preserve and enhance the well-known resilience of the Nepalese to adversaries and vagaries of nature, safeguard peoples' life and property, and ensure incorporation of disaster risk reduction (DRR) into our developmental efforts.

The message of this document is organized into five chapters.

**Chapter 1: Disaster Management in Nepal – An Overview** lays out the context by providing facts on natural hazards in Nepal and their causative factors. It also provides a chronology of the development of DRM processes in the country including the government's initiatives in creating suitable policy and legal environments for effective DRR and response planning starting from the promulgation of the Natural Calamity (Relief) Act, 1982. These are given in the background of large disasters the country faced due to the 1988 Udaypur Earthquake, 1993 Floods in South-Central Nepal, lessons learned from managing these devastating events and the consequent milestone initiatives of the government such as the formulation of the National Building Code and the establishment of sector-specific Working Groups on Health, Logistics, Food and Agriculture etc. The establishment of the Disaster Prevention Technical Centre (DPTC), which subsequently metamorphosed into the Department of Water-induced Disaster Prevention (DWIDP), institutionalization of the annual Earthquake Safety Day, formulation and promulgation of the Local Self-Governance Act 1999, the Study on Earthquake Disaster Mitigation in Kathmandu Valley (SEDM) by MoHA and JICA in 2000-2002, efforts on Climate Change Impact Adaptation, constitution of the National Platform on DRR, formulation of the National Strategy for Disaster Risk Management (NSDRM), 2009 and drafting of the Disaster Risk Management Bill, preparation of Disaster Preparedness and Response Plans for a majority of districts, establishment and commissioning of the National Emergency Operations Centre (NEOC), creation of Disaster Cluster Groups, participation of Nepal in Global initiatives in DRR including the International Decade for Natural Disaster Reduction (IDNDR) and the International Strategy for Disaster Reduction (ISDR), participation in the formulation of Hyogo Framework of Action (HFA) and translation of its meaning to Nepalese context, formulation of National Action Plan for Disaster Management, participation in Global Platform for Disaster Risk Reduction.



Experiences gained and lessons learned from such rich engagement of the government have also been described.

Further, this Chapter 1 also reports on the milestone initiatives undertaken by the civil society organizations and NGOs and the lessons learned: e.g. establishment of Disaster Management section in the Nepal Red Cross Society (NRCS), establishment of National Society for Earthquake Technology-Nepal (NSET) and implementation of the Kathmandu Valley Earthquake Risk Management Program (KVERMP), establishment and landmark contributions of Disaster Preparedness Network-Nepal (DPNet-Nepal), Disaster Management Network Nepal (DiMaNN), National Network of Community Disaster Management Committee (N-NCDMC), Nepal Geological Society (NGS), Nepal Landslide Society (NELS), The Society of Hydrologists and Meteorologists – Nepal (SOHAM-Nepal), Nepal GIS Society (NEGISS), Association of International NGOs (AIN), and the Centre for Disaster Studies of the Institute of Engineering (IOE). Collective efforts of networks and agencies under such milestone programs as DIPECHO projects, Developing DRR Terminologies in Nepali language, efforts on sensitizing CA Members on DRR, Mainstreaming DRR in Nepal's Education System, Study on Strengthening Legal Preparedness for International Disaster Response are also described in terms of their contribution, impacts, challenges and lessons learned.

**Chapter 2: Disaster Data Analysis for 2010** provides disaster statistics for Nepal during 1971-2010, with detailed description and analysis of disaster data for the year 2010. It reports that epidemic presents itself as the most lethal hazard with a total toll of 16,521 deaths from 3,413 events during the period of past four decades. The second and third hazards with huge toll of life are landslide and flood respectively. There were 95 episodes of damaging earthquake in Nepal or its surroundings, with a total toll of 873 lives dead. One has to remember that the medium sized Udaypur Earthquake of 1988 alone was responsible for a death toll of 721 persons and collapse / damage to several thousand houses. Epidemics (130 deaths), and Landslide (67 deaths), Fire (61 deaths), Flood (27 deaths) were the most lethal hazards in the year 2010. There were a total of 1,551 disaster events in the year (almost three events per day) and more than two disaster-related deaths per day. Total monetary losses due to disaster in 2010 amounted almost to 11 billion Nepali Rupees or about 1 % of GDP. The year 2010 is witnessed less disaster impact in comparison to the years 2008, and 2009.

**Chapter 3: Impacts and Lessons of Major Past Disasters** reports the event details, casualty and other societal impacts, damage to the different sector of economy including building, infrastructure, and provides an account of emergency response made. The events considered are the Udaypur Earthquake of 1988, the 1993 Flood of South-Central Nepal, Koshi Flood of 2008, and the 2009 Jajarkot Diarrhea Outbreak. While the events as well as the impacts have been described in details, the report has tried to distill out the major lessons and the needs for intervention in national mechanism of response in a strategic way.

**Chapter 4: Good Practices of Disaster Risk Management (DRM)** provides details accounts of about 13 DRM programs and concepts implemented in Nepal and rightly considered as the "Good Practices". These are: 1) Disaster Preparedness and Response

Planning for all administrative districts of Nepal, 2) Early Warning System - Forewarned is forearmed – a flood early warning system in Kailali district, 3) Establishing Community Based Early Warning Systems in Nepal – a flood early warning system implemented in Chitwan and Nawalparasi districts of Nepal, 4) Promoting Safer Construction Practice-Training the masons in Nepal, 5) Building Code Implementation in Dharan Municipality, 6) Child Centered Disaster Risk Reduction in Sunsari District, 7) DRR Income Generation Program (IGP)/Community Based Disaster Risk Reduction Program implemented in Ilam, Jhapa and Panchthar districts, 8) Developing and Implementing Emergency Response Plan of Bheri Zonal Hospital, 9) School Earthquake Safety Program (SESP), 10) Disaster Preparedness for Safer Schools (DPSS), 11) Community Based Disaster Risk Management in Nepal (CBDRM-N) implemented as pilot program in Kathmandu, Lalitpur and in Alapot VDC, 12) Local level Disaster Management Committees – Effective Vehicles for reducing disaster risk (Community Based Disaster Risk Management) in Banke, Makwanpur, Rasuwa and Kathmandu districts, and 13) Pre-Monsoon Workshops: Effective Tool to enhance National as well as Local Preparedness Planning for Flood Response. These good practices are described in terms of their contents, objectives, methodology, beneficiary, achievements, challenges, lessons learned and opportunities for further improvement, and their replication potentials. There were many more candidates of good practices, and not all could be accommodated, and the ones chosen were those that represented different locations, approaches, or contents. It is heartening to note that these are excellent examples that serve as evidence of the feasibilities of DRM in Nepal despite the very adverse economic and political situation.

**Chapter 5: Thematic Discussion on Economics of Disasters** provides a discourse on the direct and indirect losses due to disaster events. The losses are presented separately for casualty, and damage to infrastructure (roads, dams, bridges, and buildings). An analysis of the impact on macroeconomics and on national GDP is also presented together with an analysis of the trend of investments on disasters against losses.

It is to be emphasized here that the works represented in this compendium is the overall achievement made by Nepal with contribution of all agencies, public or private, academic or community-based. The successes as well as the failures are to be shared by all and further efforts to meet the identified challenges are to be made by all.

Nepal suffers a loss of several million rupees every year due to damage of infrastructures by natural hazards. The official data for 1983-2010 shows that over 30 billion rupees were lost due to disasters; this is an average of about a billion Nepali Rupees every year. And the report makes a case that the situation should not continue this way because Nepal has learned and has developed capacity for disaster risk management as demonstrated by the good practices. The real need is to scale up the successes and to institutionalize the methodologies. **That is the real Challenge!**

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## Acronym

AAN	Action-Aid Nepal	DERMP	Dharan Earthquake Risk Management Program
ADB	Asian Development Bank	DHM	Department of Hydrology and Meteorology
ADPC	Asian Disaster Preparedness Center	DHS	Department of Health Services
ADRA	Adventist Development and Relief Agency	DHWG	Disaster Health Working Group
AEPC	Alternative Energy Promotion Centre	DiMANN	Disaster Management Network Nepal
AINTDGM	Association of INGOs in Nepal Task Group on Disaster Management	DIMS	Disaster Inventory/Information Management System
AMCDRR	Asian Ministerial Conference on Disaster Risk Reduction	DIS	Digital Information System
APF	Armed Police Force	DLSA	District Lead Support Agency
APN	Asia-Pacific Network	DMC	Disaster Management Committee
ARC	American Red Cross	DMG	Department of Mines and Geology
AUDMP	Asian Urban Disaster Mitigation Program	DMSP	Disaster Mitigation Support Program
AWD	Acute Watery Diarrhea	DOI	Department of Irrigation
BDMT	Basic Disaster Management Training	DOR	Department of Roads
BZH	Bheri Zonal Hospital	DPC	Disaster Preparedness Committee
CA	Constituent Assembly	DPNet-Nepal	Disaster Preparedness Network-Nepal
CBDRMN	Community Based Disaster Risk Management in Nepal	DPRP	Disaster Preparedness and Response Plan
CBO	Community Based Organization	DPSS	Disaster Preparedness for Safer Schools
CBS	Central Bureau of Statistics	DPTC	Disaster Prevention Technical Center
CCDRR	Child-Centered Disaster Risk Reduction	DPHO	District Public Health Office
CDO	Chief District Officer	DRM	Disaster Risk Management
CDRF	Central Disaster Relief Fund	DRR	Disaster Risk Reduction
CDS	Center for Disaster Studies	DRRSP	Disaster Risk Reduction through Schools Project
CEAARRC	Central Earthquake Affected Areas Reconstruction and Rehabilitation Committee	DSCWM	Department of Soil Conservation and Watershed Management
CECOD	Center for Community Development	DUDBC	Department of Urban Development and Building Construction
CNDRC	Central Natural Disaster Relief Committee	DWIDP	Department of Water Induced Disaster Prevention
CRED	Centre for Research on the Epidemiology of Disasters	EAARRP	Earthquake Affected Areas Reconstruction and Rehabilitation Project
DAO	District Administration Office	ECHO	European Commission's Humanitarian Aid Department
DCWB	District Child Welfare Board	EDCD	Epidemiology and Disease Control Division
DDC	District Development Committee	EPC	Environment Protection Council
DDRC	District Disaster Relief Committee	ESD	Earthquake Safety Day
DEO	District Education Office	EU	European Union
DEPROSC-Nepal	Development Project Service Center- Nepal		



EWS	Early Warning System	KDRRI	Kailali Disaster Risk Reduction Initiatives
FAO	Food and Agriculture Organization	KMC	Kathmandu Metropolitan City
FCHV	Female Community Health Volunteer	KVERMP	Kathmandu Valley Earthquake Risk Management Project
FMIS	Farmer Managed Irrigation System	LARED	Latin American Research Education and Development
GAR	Global Assessment Report	LSAR	Light Search and Rescue
GDP	Gross Domestic Production	LSGA	Local Self Governance Act
GHI	Geo-Hazards International	LSMC	Lalitpur Sub Metropolitan City
GIS	Geographic Information System	LWF	Lutheran World Federation
GLOFs	Glacial Lake Outburst Floods	LWR	Lutheran World Relief
GPS	Global Positioning System	MCH	Maternal Child Health
HFA	Hyogo Framework for Action	MCPM	Minimum Conditions and Performance Measurements
HI	Handicap International	MDGs	Millennium Development Goals
HICS	Hospital Incident Command System	MEDEP	Micro-Enterprise Development Program
HKH	Hindu Kush Himalaya	MHPP	Ministry of Housing and Physical Planning
HRDC	Hospital and Rehabilitation Center for the Disabled Children	MMI	Modified Mercalli Intensity Scale
HVCA	Hazard, Vulnerability and Capacity Assessment	MoAC	Ministry of Agriculture and Cooperatives
IASC	Inter Agency Standing Committee	MoFSC	Ministry of Forest and Soil Conservation
ICAO	International Civil Aviation Organization	MoHA	Ministry of Home Affairs
ICIMOD	International Centre for Integrated Mountain Development	MoLD	Ministry of Local Development
IATF/DR	Inter-Agency Task Force on Disaster Reduction	MoST	Ministry of Science and Technology
IDA	International Development Association	MoWR	Ministry of Water Resources
IDNDR	International Decade for Natural Disaster Reduction	MRT	Mandatory Rule of Thumb
IDP	Internally Displaced Person	NA	Nepalese Army
IFRC	International Federation of Red Cross and Red Crescent Societies	NAPA	National Adaptation Program of Action
INF	International Nepal Fellowship	NAST	Nepal Academy of Science and Technology
INGO	International Non-Governmental Organization	NBC	Nepal Building Code
INSARAG	International Search and Rescue Advisory Group	NCDM	Nepal Center for Disaster Management
IOE	Institute of Engineering	NCDM	National Council for Disaster Management
IPCC	Intergovernmental Panel on Climate Change	NCRA	Natural Calamity (Relief) Act-1982
IRA	Initial Rapid Assessment	NDC	National Development Council
ISDR	International Strategy for Disaster Reduction	NDMA	National Disaster Management Authority
ITDG	Intermediate Technology Development Group	NDMF	Natural Disaster Management Forum Nepal
JICA	Japan International Cooperation Agency	NDMF	Natural Disaster Management Form Nepal
JYRC	Junior Youth Red Cross		

NDMP	National Disaster Management Policy	SOHAM	Society of Hydrologists and Meteorologists
NEA	Nepal Electricity Authority	SOP	Standard Operating Procedure
NEA	Nepal Engineers' Association	SMC	School Management Committee
NEGIS	Nepal GIS Society	TU	Tribhuvan University
NELS	Nepal Landslide Society	UN	United Nations
NEOC	National Emergency Operations Center	UNCHS	United Nations Center for Human Settlements
NEPAP	National Environmental Policy and Action Plan	UNCRD	United Nations Center for Regional Development
NEWAH	Nepal Water for Health	UNDMs	United Nations Disaster Management Secretariat
NFHP	Nepal Family Health Programme	UNDMT	United Nations Disaster Management Team
NFI	Non Food Item	UNDP	United Nations Development Programme
NGO	Non-Governmental Organization	UNDRO	United Nations Disaster Relief Organization
NGS	Nepal Geological Society	UNESCO	United Nations Educational Scientific and Cultural Organization
NHEICC	National Health Education Information and Communication Center	UNFCCC	United Nations Framework Convention on Climate Change
NP	Nepal Police	UNICEF	United Nations Children's Fund
NPC	National Planning Commission	UNISDR	United Nations International Strategy for Disaster Reduction
NPDRR	National Platform for Disaster Risk Reduction	UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
NNCDMC	National Network of Community Disaster Management Committee	USAID	United States Agency for International Development
NRCS	Nepal Red Cross Society	USAID-NFRP	USAID- Nepal Flood Recovery Program
NRRC	Nepal Risk Reduction Consortium	VDC	Village Development Committee
NSDRM	National Strategy for Disaster Risk Management	VFL	Views from the Frontline
NSET	National Society for Earthquake Technology - Nepal	WCDR	World Conference on Disaster Reduction
OECD	Organization for Economic Co-operation and Development	WECS	Water and Energy Commission Secretariat
OFDA	Office of the U.S. Foreign Disaster Assistance	WFP	World Food Program
ORS	Oral Rehydration Solution	WHO	World Health Organization
PVA	Participatory Vulnerability Assessment	WMO	World Meteorological Organization
PVCA	Participatory Vulnerability Capacity Assessment	WOREC	Womens Rehabilitation Center
SAR	Search and Rescue	WSSI	World Seismic Safety Initiative
SBDPTOT	School Based Disaster Preparedness Training of Trainers	WSSDO	Water Supply and Sanitation Division Office
SDC	Swiss Development Cooperation	WVI	World Vision International
SEDM	Study on Earthquake Disaster Mitigation for Kathmandu Valley	WWF	World Wildlife Fund
SESC	School Earthquake Safety Committee	YARCN	Youth Awareness Raising Center Nepal
SESP	School Earthquake Safety Program		
SFRALSO	Saptakoshi Flood Rehabilitation Agriculture and Livestock Service Office		

# CHAPTER 1 : DISASTER RISK MANAGEMENT IN NEPAL – AN OVERVIEW



Boat ferrying food and goods across what used to be normal dry land but then flooded, Koshi Flood  
Photo Courtesy: [www.everestunscored.org](http://www.everestunscored.org)

## Disaster Risk Management in Nepal – An Overview

### The Context

Nepal is exposed to several types of natural as well as human-induced hazards. A wide variety of physiographical, geological, ecological and hydro-meteorological factors contribute to the high levels of hazards

during the monsoon periods (June-August). Most of the flood disasters take place along the banks of the larger rivers such as Mechi, Kankai, Koshi, Kamala, Bagmati, East Rapti, Narayani (Gandak), West Rapti, Babai,

Table 1.1: Top 10 hazards types and their impact in Nepal 1971-2010

S.N.	Hazard Type	Number of records/events	Number of deaths	Number of injury	Affected population
1	Epidemics	3413	16521	43076	512967
2	Landslide	2705	4327	1446	555607
3	Flood	3377	3899	461	3665104
4	Fire	4936	1293	1097	252074
5	Thunderstorm	1034	986	1810	6668
6	Accident	1000	969	359	2137
7	Earthquake	95	873	6840	4539
8	Cold wave	320	442	83	2393
9	Structural Collapse	389	404	596	2016
10	Boat Capsize	135	269	124	410
11	Other events	2651	999	1335	928331
	Total	20055	30982	57227	5932246

Source : DesInventar, 2011

faced; while demographic factors such as rapid population growth, slow economic development and the resulting rampant poverty, widespread unawareness on the possibilities and means of mitigation, limited firm political and social commitment etc. also make the country extremely prone to disasters. The major types of natural hazards of concern and their impact are listed in Table 1.1 and major hazards are described briefly.

### Flood

Flood is a recurrent problem in the Tarai as well as in the mountain regions.

Most part of Tarai faces problem of floods

Karnali and Mahakali rivers. Rivers originating from the Siwaliks are mostly of ephemeral nature, being wild during the monsoon season, and they also pose high flood hazards to the Tarai. Extensive inundation in the Tarai plain is due to frequent change in the river courses, bank erosion and erosion in the river meanders.

In the mountainous regions, rivers are in spates during the monsoon season. Bank undercutting, inundation of the flood plains are the results. But more disastrous are the floods in the high gradient tributary streams due to cloud bursts or high intensity rainfall concentrated usually in a small catchment. Such flash floods cause triggering of

landslide, deep scouring of the stream bed and the side slopes and they rapidly develop into debris flows capable of transporting several cubic meter sized boulders.

The problem of flooding in the Tarai is also high due to the high bed load, in addition to the suspended load, carried by the rivers. In the plains, almost all the rivers are widening and cutting their banks each year.

### Landslide and Debris Flow

The causes of landslides in Nepal can be assigned to a complex interaction of several factors which are natural as well as human activity related. High relief, concentrated monsoon rainfall, withdrawal of underlying as well as lateral supports by toe cutting and bank erosion, presence of weaker rocks, active neotectonic movements and a complex geological history, which has resulted in very intense faulting, folding and fracturation of the rocks, are the natural factors causing landslides in Nepal. But human activities are also responsible for the very high extent, and they add to the density of landslides in the country. Overgrazing of protective grassy cover, mass felling of trees leading to an unprecedented deforestation, disturbance of the hill slopes by road/canal construction, non consideration of the geologic conditions in the corresponding location, planning or designs of infrastructures etc. are some of the important anthropogenic factors leading to landslides.

There are other social causes for the greater extent of damage. Unawareness on the part of the population and the decision makers may be cited as the most important of all the anthropogenic activity related indirect causes of landslides.

All these factors set the stage for the landslide to take place. But the stability balance is usually tipped by one of the two triggers, namely; a) rainfall/cloud burst, and b) earthquake, excavation and transitory stresses.

High intensity rainfalls, which occur frequently during the monsoon season are found to have triggered many highly destructive debris slides and debris flow along the high gradient hill slope channels.

Majority of the landslides in Nepal occur in the late monsoon periods. Incessant rainfall during the period, when the antecedent moisture content of the land surface reaches a certain critical stage, is found to be accompanied by landslides.

Earthquake is another important landslide triggerer. Apart from developing fissures both along and parallel to the hill slopes, and thus generating the potentials for debris slides, the earthquakes are found to trigger a variety of landslide types including huge rock slide, rock fall and slumps. Some of the very big landslides have been reported to have been initiated by the Nepal-Bihar earthquake of 1934 AD.

Debris flows are frequent in the mountainous parts of the country. They are caused by deep scouring of the stream bed and side slope by a high gradient stream. Materials are the deeply weathered rock and colluvium in the middle mountains and the thick glacial deposits in the high mountains. Damming of rivers and tributaries due to landslides and debris and subsequent sudden breaching of the dam is another important phenomena for the generation of debris flows. In the higher mountains, debris flows are frequently generated by Glacial Lakes Outburst Floods (GLOFs) due to the breaching of the moraines or glacier ice damming the lakes.

The debris flow travels usually to greater distances along the river valley and destroy terraces, infrastructures and settlements along its course. Destruction of bridges, hydropower facilities and other infrastructures along the Sunkoshi and Bhoté Koshi rivers in 1967 and 1996 were due to debris flows.

## Earthquake

The entire territory of Nepal lies in high seismic hazard zone. The country's high seismicity is related to the movement of tectonic plates along the Himalayas that has caused several active faults. A total of 92 active faults have been mapped throughout the country by the Seismic Hazard Mapping and Risk Assessment for Nepal carried out as part of the Building Code Development Project – 1992-1994 (MHPP, 2004). Earthquakes of various magnitudes occur almost every year and have caused heavy losses of lives.

The entire country falls in a high earthquake intensity belt: almost the whole of Nepal falls in high intensity scale of MMI IX and X for the generally accepted recurrence period. The seismic zoning map of Nepal, which depicts the primary (shaking hazard), divides the country into three zones elongated in northwest-southeast direction; the middle part of the country is slightly higher than the northern and the southern parts.

The country has a long history of destructive earthquakes. In this century alone, over 11,000 people have lost their lives in four major earthquakes. A 1934 AD earthquake produced strong shaking in Kathmandu Valley, and destroyed 20 percent and damaged 40 percent of the valley's building stock (NSET, 1999). In Kathmandu itself, one quarter of all homes was destroyed. Many of the temples in Bhaktapur were destroyed as well. This earthquake was not an isolated event. Three earthquakes of similar size occurred in Kathmandu Valley in the 19th Century: in 1810, 1833, and 1866 AD. The most recent earthquake that badly hit Nepal was the earthquake of 1988 which was a moderate size earthquake (Magnitude 6.5) affecting mostly the eastern part of Nepal. 721 people lost their lives in this earthquake.

Based on the data available from the Department of Mines and Geology, CBS (1998) concludes that earthquakes of more than or equal to 5.0 on the Richter scale have occurred at least once every year in

### Box 1.1: Measuring earthquakes

#### The Richter scale

The Richter scale or the local magnitude (ML) scale assigns a single number to quantify the amount of seismic energy released by an earthquake. The Richter magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs (adjustments are included to compensate for the variation in the distance between the various seismographs and the epicenter). Because of the logarithmic basis of the scale, an increase by a whole number in magnitude represents a 10-fold increase in amplitude; in terms of energy an increase by a whole number, corresponds to an increase of about 32 times the amount of energy released.

#### The Modified Mercalli Intensity (MMI) Scale

The MMI scale is used for measuring the intensity of earthquake. It quantifies the effects of an earthquake on the earth's surface, human beings, object of nature and man-made structures on a scale of MMI I through MMI XII. MMI I denotes the lowest intensity, and a shaking of MMI XII can cause total destruction. The strongest shaking usually occurs near the epicenter (epi-central intensity) and the intensity of shaking decreases with the increase of distance from the epicenter. This decrease is called "attenuation" and the mathematical expression of the decrease in the level of shaking is called "Attenuation Relationship". The scale is commonly abbreviated as MMI.

Nepal since 1987, with the exception of 1989 and 1992 when no such events were recorded. The current disaster database of Nepal shows that there were 22 earthquakes with magnitudes ranging from 4.5 to 6.5 on the Richter scale throughout the country for last 37 years period (1971-2007). About 34,000 buildings were destroyed and 55,000 were damaged (DesInventar, 2007) during this period due to earthquakes.

Many studies have been carried out in the past to evaluate the earthquake risk of Kathmandu Valley. The most significant among such studies are: the Study on Earthquake Disaster Mitigation for Kathmandu Valley conducted in 2002 by Ministry of Home Affairs (MoHA) with support from Japan International Cooperation Agency (JICA); and the earthquake risk assessment and scenario development in 1997 by Kathmandu Valley Earthquake Risk Management Project (KVERMP) implemented by the National Society for Earthquake Technology – Nepal (NSET). A simple loss estimation carried out during the KVERMP suggested that in case of a reoccurrence of similar shaking to that of 1934 in Kathmandu Valley would result in the following consequences: death: 40,000, injury: 95,000, homeless population: 600,000 – 900,000, and building damage: 60% (NSET, 1999). Recent studies have shown that the situation is not much different in other cities also.

## Epidemic

Epidemics are in fact the number one killer in Nepal, with an average of 410 deaths per year. During 1983-2010, 22,306 people lost their lives (MoHA, 2004; DWIDP, 2010). Fifty-two per cent of those deaths were caused by epidemics. The pattern is not much changed during later time as well.

Lack of treated drinking water supply and poor hygiene conditions, not only in the rural areas but also in the crowded,

unplanned urban settlements are the cause for the potentially high risk from epidemic. gastro-enteritis, cholera, encephalitis, meningitis, dysentery and diarrhea account for more than 50% of the total deaths due to epidemics. Break out of epidemics after a major disaster such as flood and earthquake etc. is quite frequent.

Epidemics of contagious diseases have two peaks: during the months of May and June, before the rainy season begins and in August, the height of the monsoon. Unsafe drinking water and poor sanitation are the main causes of water-borne diseases in Nepal. Water-borne diseases continue to take lives in Nepal. In fact, over 80 per cent of all illness is attributed to inadequate access to clean water supplies, poor sanitation and poor hygiene practices.

## Fire

Forest fires are prevalent in the Tarai forests as well as in the forests belonging to the Siwaliks and middle mountains. Although damages by such fires have been severe in terms of environmental degradation, these have not been followed as disasters to communities.

On the other hand, disasters due to fires in settlements are common in the Tarai where most of the houses are thatched roof and clustered and there is little fire safety measures implemented. Fires are sporadic

also in the mountain settlements. Most fire disasters occur during summer (April - July) when temperatures are high and strong winds occur. The large number of small fire incidences has a cumulative effect throughout the country

## Drought

A severe drought hit Nepal during 1981-1982 causing heavy damage to crops leading to a decline in Gross Domestic Product (GDP) by about 1.4%. Failure of monsoon



rains or its late arrival causes partial drought affecting major crops in different parts of the country. Uneven distribution of the monsoon rains, with several parts of the country not receiving the required rains in the required time for the major crop is a recurrent phenomenon. Since a large part of the country still depends on rainfall for cultivation, such phenomena affect the agriculture production of the country very adversely.

### Storm

Storms (line-squalls) with heavy rainfall and hail are common during the summer months in the tropical and sub-tropical parts of the country. Major damage from storms has been recorded in eastern Nepal (1980) and mid-western Nepal (1983). Storm winds of even moderate velocities have major effects in the Tarai, where most of the houses and structures are lightly roofed.

The most occurring disaster in March/April and October are hailstorms that have a disastrous effect especially on agriculture. While most of the hail that precipitates from the clouds is fairly small and virtually harmless, there have been cases of golf ball sized hail that causes much damage especially to the standing crops and inflict injuries.

Thunderstorms dominate the weather during May to September. A thunderstorm is normally accompanied by heavy precipitation. During wintertime, especially in December and January, the northern areas of Nepal suffer harsh snow storms.

### Other Hazards

In Nepal, cold waves –related casualties have taken place not much in the very cold places in the high Himalayas, but in the sub-tropical Tarai. They have also caused death and injury to livestock and wildlife. If a cold wave is accompanied by heavy and persistent snow, grazing animals may be unable to reach needed food and die of hypothermia or

starvation. Such cold waves can cause famines and result in numerous fatalities. November to February are the months for the cold waves.

Heat waves with rise in atmospheric average temperature well above the average of a region have been reported to induce adverse effects on human populations, crops, properties and services. This is common in Tarai region in southern Nepal.

The flat plains of Tarai in the south of the country also show the highest level of susceptibility to liquefaction.

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

Historically, famines have occurred because of drought, crop failure, pestilence, and because of human-induced causes such as war or misguided economic policies. Famines are not frequently reported as other natural disaster events in Nepal but every year they have serious effect on people in the country. Rarely lives are lost by famine but the effect on people is high.

Glacial Lakes Outburst Floods (GLOFs) and Avalanches are typical of high Himalayan regions. The problem of GLOFs is being intensified due to the climate change resulting in accelerated melting of the glacier tongues and rapid enlargement of the glacial lakes contained by natural moraine dams. Several glacial lakes have been mapped in Nepal. Snow avalanches are prevalent in the Himalayan region – they pose risk to the high mountain tourism industry.

Other hazards including boat capsizing, frost, accidents (caused by natural phenomenon), leaks, panic, pollution, sedimentation, structural collapse are also recorded in Nepal.

## The development of Disaster Risk Management in Nepal

As stated, Nepal is prone to various kinds of frequently occurring disasters. Flood, landslide, fire, epidemics, drought are some regular events which cause huge loss of life and property every year; whereas, large earthquakes on the other hand, are less frequent but when they occur, cause severe damage and destruction. Developmental achievements gained in decades are lost within few seconds and minutes during such large disasters. Economics of such disaster losses are also great: a significant proportion of Gross Domestic Product (GDP) is lost every year due to large, medium and small disasters. Therefore, fighting with disaster events through effective search, rescue and relief to disaster victims; timely and equitable reconstruction and rehabilitation; and mitigation in the long run always required significant amount of time, efforts and budget from the government and local communities. Management of disasters and disaster risks have been a key area of work.

There was a time when occurrence of natural hazard events were regarded as the acts of god or divine power and each disaster event was treated on a case to case basis. The management consisted in providing relief in the form of cash grants, cloths and food grains on ad-hoc basis from the available resources.

More systematic work related to disaster risk management began in Nepal only after 1982 when the Natural Calamity (Relief) Act was first promulgated. Starting from 1970s, the necessity for a more organised treatment of natural disaster started being felt in the country due mainly to the experience gained while administrating relief works and surveys of several disasters, such as the landslide at Deurali (Pokhara) in 1974 which claimed 62

lives in one night. Several expert missions fielded by Office of Foreign Disaster Assistance (OFDA), United Nations Disaster Relief Organization (UNDRO) and United Nations Educational, Scientific and Cultural Organization (UNESCO) also recommended for comprehensive approach for disaster management in the country.

## Government Initiatives and Policy Intervention

### Natural Calamity (Relief) Act, 1982

Prior to 1982, rescue, relief as well as resettlement of disaster victims were carried out in Nepal on an ad-hoc basis, primarily as a social work. The Government of Nepal promulgated the Natural Calamity (Relief) Act in 1982 to carry out rescue, relief works in a systematic manner. The Act has since then been amended thrice (first in 1986, second in 1989 and third in 1992) enunciating the significance of the pre-disaster and post disaster activities.

The Act was instrumental in imparting an organized approach to disaster management in the country. It helped develop an organizational structure from central to local level, to deal with response and relief works. Furthermore, the Act provided the basis for coordination among various agencies, government and non-government in emergency response activities.

However, it has been widely felt that the present Act, just can not address the whole spectrum of hazard mitigation and disaster risk reduction issues. The Act does not discriminate between the different types of disaster for management purposes. It needs incorporation of the whole philosophy of the possibility of disaster reduction and should still further emphasise the pre-event activities for risk reduction. There has been a general consensus that the country requires a new act to incorporate the whole spectrum

of disaster risk management starting from risk reduction, mitigation to preparedness, response and reconstruction and rehabilitation.

### **Lessons of 1988 Earthquake and Development of National Building Code**

The magnitude 6.5 Udayapur earthquake of eastern Nepal that occurred in the morning of 21 August 1988 was a major turning point for Nepal in terms of starting the concepts for risk reduction and mitigation. One of the key lessons realized during this earthquake was the need for formulation and enforcement of building codes that ensure the earthquake safety of residential and all other buildings. Significant number of private houses and public buildings were damaged and destroyed due to the lack of seismic features. This realization led to the formulation of a project concept for development of building code and long-term shelter policy and plans.

In 1988, the then newly formed Ministry of Housing and Physical Planning (MHPP), requested technical assistance from United Nations Development Forum (UNDP) and UNCHS for institutional development and capability strengthening of MHPP and formulation of a long term shelter policy for Nepal. Subsequently in 1990, a three-year program of Policy and Technical Support to Urban Sector (PTSUS - UNDP/ UNCHS PROJECT NEP/88/054) was initiated within the MHPP. Originally scheduled to be completed in 1992, the project was extended until December 1993.

The project consisted of seven components: Formulation of a National Shelter Policy and Implementation Strategy based on a comprehensive shelter needs assessment; Preparation of a national shelter sector Training Needs Assessment and Strategy; Strengthening of MHPP capabilities in

management and co-ordination; Mapping earthquake hazard patterns and analyse risks to various types of buildings and development patterns; Formulate a national building code, incorporating earthquake-resistant standards and guidelines; Develop new and improved building materials and earthquake-resistant standards and guidelines; and Provide staff training in the shelter sector.

In addition to the Shelter Policy Development, the project consisted of a component for the development of National Building Code. The Building Code component of the project comprised of three distinct sub-components:

- 1) Seismic Hazard Mapping and Risk Assessment of Nepal: to establish an appropriate level of design against earthquake-induced damage in Nepal
- 2) Preparation and Implementation of National Building Code
- 3) Development of Alternative Building Materials and Technologies

The project, in 1994, finally completed the formulation of Nepal National Building Code and two other studies.

The Building Code developed was unique in itself; it incorporated provisions for making buildings earthquake-resistant, it addressed the problems not only of the engineered buildings but also those houses in rural, semi-urban and urban areas which are mostly constructed without the input from qualified building/structural engineers. It has four levels of code documents:

- i. Buildings designed with International State-of-the-art provisions
- ii. Provisions for Professionally Engineered Buildings
- iii. Mandatory Rules of Thumb for mostly available urban and semi-urban residential buildings
- iv. Guidelines for rural construction

Although the building code was unique in its nature to address the problems of Nepal it was not enforced immediately. It took several years to be formally enforced by the Government of Nepal. In 2003 only, the Government of Nepal decided to make the building code compliance mandatory in

all government buildings and encouraged to implement it in all municipal areas.

### 1993 Flood of South Central Nepal and Sectoral Working Groups

Three sectoral working groups, namely Health, Logistics, and Food and Agriculture were established during the flood response of 1993 in order to achieve better coordination and effective response. In 1994, the government requested the international community to help continue the three sectoral working groups in order to prepare sectoral contingency plans for future disasters. The UN system agreed to continue and coordinate the three sectoral working groups. The responsibility of the sectoral working groups, which included representatives from the government, the UN, donors and NGOs, was to provide support to the government's on-going relief efforts in the sectors of food and agriculture, health, and logistics.

In 1995, the sectoral working groups produced three manuals that were revised in 1999. These manuals were intended to serve as the rolling plans. The meetings and activities of the Working Groups gradually decreased over the years, and virtually became non-existing. However, at the end of 2000, the Epidemiology and Disease Control Division (EDCD) of Department of Health Services, Ministry of Health, and World Health Organization (WHO) decided to revitalise the Disaster Health Working Group (DHWG). Later, the DHWG prepared a health sector emergency preparedness and disaster response plan.

### Establishment of Disaster Prevention Technical Center (DPTC)

Nepal suffers from various types of water-induced disasters such as soil erosion, landslides, debris flow, flood, bank erosion etc. due to its rugged topographically weak geological formations, active seismic

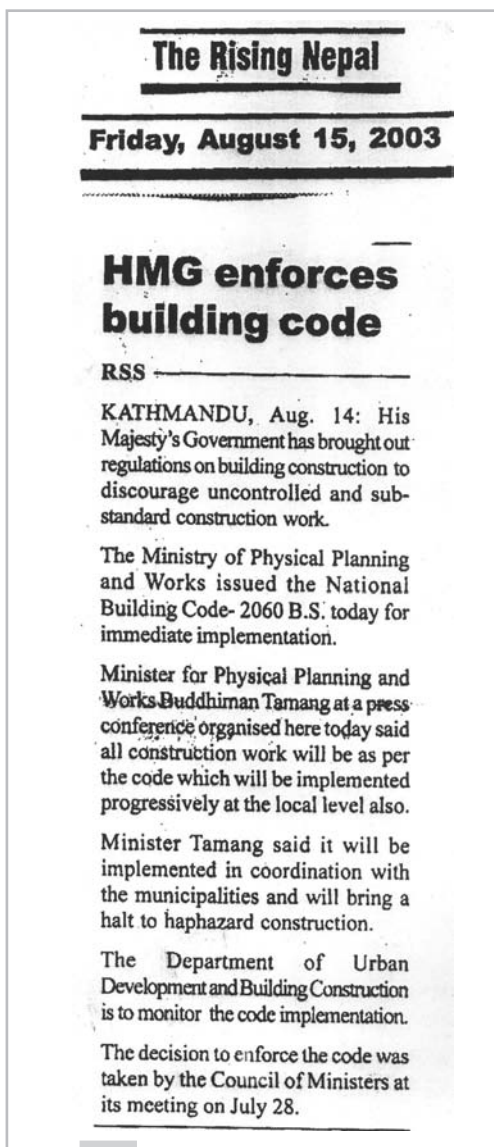


Figure 1.1 : News coverage on Building Code Implementation from "The Rising Nepal"

conditions, occasional glacier lake outburst floods, concentrated monsoon rains associated with unscientific land utilizations. These phenomena induce severe impacts on the vital infrastructures of the nation such as roads, houses, hydropower, irrigation and drinking water facilities, cause loss of agricultural lands, properties and human lives posing a severe threat to the sustainable development of the country. In order to promote prevention and mitigation of these disasters in Nepal, an agreement was signed between Government of Nepal and the Government of Japan on 7 October 1991 for the establishment of Water Induced Disaster Prevention Technical Centre (DPTC) as a joint undertaking of concerned agencies of GoN with the Ministry of Water Resources (MoWR) as leading agency, and the cooperation of the Government of Japan through Japan International Cooperation Agency (JICA) for the initial five years and later extended for two and half years until March 1999.

The objective of DPTC was to strengthen capability of the government to cope with disasters such as landslides, debris flows, soil erosion and flooding through development of technology suitable to Nepal and training of personnel working in these fields.

To institutionalize the objectives and achievements of the DPTC, the Department of Water Induced Disaster Prevention (DWIDP) was established on 7 February 2000 under the Ministry of Water Resources. The then River Training Division of the Department of Irrigation was merged in the organizational structure of the DWIDP to strengthen its institutional capability. Seven Division and five Sub-Division offices were established so as to mitigate the water-induced disasters throughout the country.

Since then, DWIDP has been working towards prevention and mitigation of water induced disasters as well as towards post-disaster rehabilitation and reconstruction.

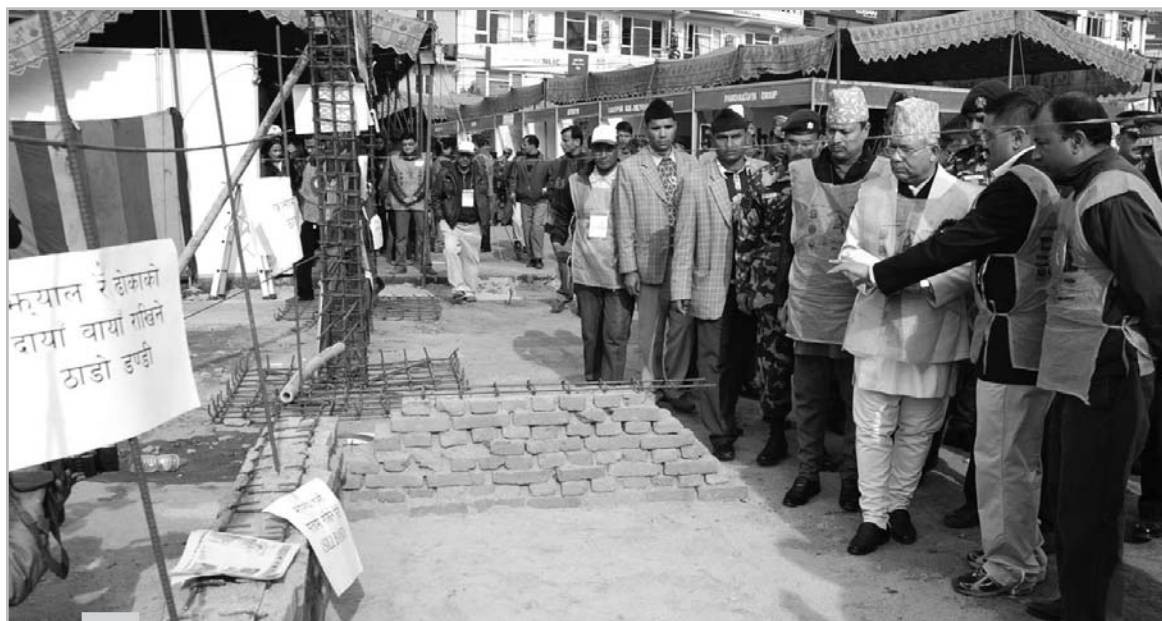


Figure 1.2: Then Prime Minister, Home Minister and distinguished guests observing models on earthquake resistant building construction at Earthquake Safety Day 2010, Lalitpur  
Photo Courtesy: NSET

## Earthquake Safety Day

Raising awareness among people and authorities on impending earthquake risk and on ways to mitigating the risks is a key for reducing the risk. Realizing this, Nepal has been observing every year 15th or 16th of January (2nd day of Magh as per Nepali Calendar) as the Earthquake Safety Day with several earthquake awareness-raising activities. The day is observed in commemoration of the devastation caused by 1934 Nepal-Bihar earthquake which occurred on 15th January 1934. In 1999, Government of Nepal declared the Earthquake Safety Day and established an Earthquake Safety Day National Committee for observing the Day annually throughout the country. ESD National Committee led by Ministry of Home Affairs (MoHA) draws representatives from all emergency response organizations and critical facilities. ESD is observed annually with varieties of awareness activities that extend for many days. The key events are the national meeting, awareness rally, earthquake safety exhibition, symposium, public broadcast of earthquake safety message by the Home Minister; shake-table demonstration of building models with and without seismic safety elements; children essay and painting competitions; earthquake safety walkathon, street drama etc. Numerous publications such as information leaflets, calendars, posters on earthquake safety are distributed to the public. Earlier, the day used to be observed at the central level in Kathmandu only; but now the ESD programs are also organized in several municipalities and district headquarters. It has been realized that the celebration of such a day with awareness raising activities has contributed much to revisit year-long efforts, renew national commitments toward earthquake safety promotion and help raise public awareness.

## Local Self Governance Act 1999

Local Self Governance Act 1999 (LSGA, 1999) gave a momentum to the process of decentralization and devolution of authority. It helped empower the local governments to undertake disaster management activities. LSGA gave the responsibilities in terms of reducing risks associated to disasters and managing the disasters to local governments. This opened up tremendous opportunities for preparing plans, programs and implementing actions to reduce disaster risks at the local level. Some municipalities, VDCs and DDCs started good initiatives such as disaster risk management master planning, training of professionals and staff, implementation of community based disaster risk management programs etc. However, due to the current vacuum in terms of elected representatives, the local authorities have not been able to perform at the required level.

Moreover, other legal tools such as regulations, by-laws etc. to support the implementation of the provisions of LSGA have not been in place, which has hindered the process to a larger extent.

## The Study on Earthquake Disaster Mitigation in Kathmandu Valley (SEDM)

Ministry of Home Affairs (MoHA) and the Japan International Cooperation Agency (JICA) carried out a project “The Study on Earthquake Disaster Mitigation in the Kathmandu Valley, Kingdom of Nepal” (MoHA/HMGN-JICA, 2002) in cooperation with several Nepalese institutions. The study undertook detailed loss estimation for 3 scenario earthquakes. Assessment of potential casualty and damage to infrastructures was done at the municipal ward level. Different surveys were undertaken for assessing the available

resources and constraints. A building inventory comprising 1100 typical buildings representing the valley was prepared. Damage analysis of existing building stock, public facilities and lifeline networks was based on the building inventory. This study also undertook a social structure survey that explored existing social norms that contributed to disaster resiliency of the society. The existing policy and legal environment was also researched .

It ended up with proposing several schemes for making seismic risk coping mechanism operational and sustainable. The following are some key recommendations of the study:

- Build a coordination mechanism by establishing a permanent structure such as National Disaster Council

- Put higher priority on the disaster mitigation and preparedness policies and confirm it in the 5 year national plan
- Empower local autonomous bodies for risk management
- Promote public awareness to earthquake disaster and give support to target groups for resilient capacity on self-help basis

The SEDM proposed generation and implementation of earthquake disaster reduction plans at different levels of the government. It was suggested that the individual disaster management plans should be prepared at each level of government and institutions by the method of full participatory planning by all stakeholders.

## Box 1.2 : Main Recommendations of SEDM

### Mechanisms for Sustainable Development of Disaster Management

Currently Nepal lacks the necessary mechanisms for sustainable disaster management. It is clear that the following steps must be taken to improve the capacity for disaster management in Nepal:

- 1) Establish a strong legal base for a comprehensive risk management system.
- 2) Create sustainable mechanisms for inter-governmental and inter-institutional coordination.
- 3) Ensure that the Tenth Five-Year Plan, currently in preparation, includes plans and funding for firm disaster mitigation measures.
- 4) Promote and strengthen self-governance of local bodies for risk management.
- 5) Promote public awareness on self-protection against earthquake disasters and outreach to targeted groups.

### Need to Maintain Governance

The government, at all levels, is responsible for providing continuity of effective leadership, direction of emergency operations, and management of recovery operations. For this reason, it is essential that governmental entities continue to function during and following a disaster. This requires that they take actions on preparedness such as: preparing plans/manuals to guide initial response; establishing systems for communications/coordination, including an Emergency

Operations Centre; and advising employees of their responsibilities in case of disaster.

Key elements of emergency plans and manuals include the assignment of responsibilities/authority, the establishment of systems for command/control/communications/coordination, and the collection/dissemination of information.

Emergency response/recovery planning should be prepared for prompt/proper decision-making and smooth execution of the decided measures before, during, and after a disaster. The importance of communication for the initial response should be recognised, as well as the importance of the role of the media in communication.

### Protection of Life and Property

Many difficulties are anticipated in the initial stages of the disaster, including search and rescue operations, medical services, cremation, drinking water and food, public health care, security, fire-fighting, management of volunteers, safety inspections of structures and infrastructure, debris removal and disposal, shelter and temporary housing, etc. Due to inadequate response planning and systems for inter-institutional coordination, public onsite services in an emergency are likely to be deficient for the time being. Community involvement and the sense of self-protection by the people are accordingly indispensable.

The logistics to support on-site activities after the occurrence of a disaster is a critical issue. The transportation system must continue to function during and after the occurrence of the earthquake disaster so that the on-site activities of search and rescue and other socio-economic activities can continue to function. Similarly, prompt restoration of electrical service and water supplies to affected areas would play an important role during the initial stages of a disaster. The existing conditions of these and other critical elements of the infrastructure are discussed, identifying the underlying problems. Priority projects to improve the current situation are also presented.

#### The Need to Strengthen the Socio-Economic System

Working towards sustainable development is a natural and necessary companion to working towards effective earthquake disaster management itself, because the ability to deal with earthquake disasters is highly dependent upon the fundamentals of society, economic growth and social stability, all of which are the fruits of sustainable development. Urban society is highly dependent on the socio-economic infrastructure, and any weakness makes it vulnerable to disaster. The vast direct and indirect economic and societal losses caused by disasters can be reduced by reinforcing the infrastructure through sustainable development practices. The fundamental elements of the infrastructure are discussed.

##### (1) Transportation Facilities

The existing master plan studies were reviewed. Proposals for roads, bridges and the airport to improve the access to and mobility inside the Valley are presented.

##### (2) Building Structures

Most of the existing buildings have severe deficiencies regarding earthquake resistance. The report presents, discusses and makes recommendations on the current building construction system, the Draft National Building Code of Nepal, and the defects of individual types of buildings: hospitals, schools and public buildings, and historical buildings.

##### (3) Electric Power Supply Facilities

An evaluation of the master plan studies on the transmission and distribution network in the Valley was performed. Provision of a stable transmission system is proposed in the city core areas of Kathmandu Metropolis. Other recommendations, including preparation and implementation of design manuals for earthquake resistance and training of personnel for an effective technical support system, are presented.

##### (4) Water Supply and Sewerage Facilities

The ongoing Melamchi Project is expected to significantly improve the extremely poor water supply and sewerage conditions. Urgent tasks include preparing design manuals for earthquake resistance

(including for the Melamchi project), securing a water supply distribution system by water tankers, and preservation of existing wells and spouts at the local level.

##### (5) Telecommunications Facilities

The current vulnerability of telecommunications facilities is carefully examined. To create a reliable network against disaster, it is recommended to complete the multiple diversity routing composition as well as to establish emergency communication and broadcasting systems.

##### (6) Urban Structure

Several separate areas within the city centre of Kathmandu should be designated as intensive development areas for disaster prevention by maximising the disaster mitigation characteristics of the urban structure. Securing emergency evacuation routes and preserving evacuation areas in some areas of the city are effective measures that can be applied to Kathmandu. Each of these measures should be implemented to reinforce the city against disasters. Disaster mitigation measures in central Kathmandu will be proposed on a geographic area basis by classifying the central city areas into eight strategic zones based on the characteristics of the urban structure.

#### Recommendations and Proposals

As a result of the study, about one hundred potential programmes were identified for the improvement of earthquake disaster management in Kathmandu Valley. The study team evaluated the programmes from the viewpoints of term, priority and reality.

Fulfilment of all the programmes would require a tremendous amount of time and money. The team consequently selected four projects, which each include several programmes, for urgent implementation. The implementation of the projects will hopefully bring visible results and thus further promote endeavours to achieve the three goals for earthquake disaster reduction.

The four projects are:

- a) Establishment of an Early Earthquake Information System,
- b) Establishment of a Municipality Disaster Management Institution and Exercise,
- c) Building Improvement, and
- d) Establishment of a Comprehensive Database for Earthquake Disaster Mitigation.

Besides the selected projects, it should be noted that there are important and long-term projects with high priority/reality, i.e., the Sindhuli road project aiming at improving access to the Valley, road widening projects for smoother mobility in the Valley, and the Melamchi water supply projects.



## Climate Change Impacts and Adaptation in Nepal

Nepal is a hotspot for geophysical and climatic hazards. The country is highly vulnerable to the potential negative impacts of climate change. Consistent rises in annual mean temperature, less frequent but more intensive rainfall events, increasing frequency and intensity of floods, changes in monsoon on- and offset, increased outbreak of water-borne and vector-borne diseases, growing threat from Glacial Lake Outburst Floods (GLOFs), longer dry spells and drought events, and increasingly stronger storms have already been experienced in Nepal in the past decade. These climate-induced hazards are not only causing damage and loss of human lives and property; they also undermine development progress in Nepal and put the achievement of Millennium Development Goals (MDGs) at risk, including the obligations of and commitments to the climate change regime.

The world is already experiencing the destructive effects of rising global temperatures, altered rainfall patterns and extreme weather. In the short term, such impacts create pressing needs for disaster relief and reactive climate adaptation measures. But medium and long term effects will almost certainly be much more disruptive. Wide-ranging impacts, including on agriculture, ecosystems and human habitation, will continue for decades and many will grow in frequency and intensity (World Resource Report 2010-11).

Faced with this reality, governments, multilateral institutions, civil society and communities must seek to build the resilience of both current and future generations to climate impacts. In doing so they must tailor their responses to the specific characteristics and unpredictable nature of climate change.

There is a general agreement that climate

change impacting Nepal rather disproportionately compared to its size and its own meagre contribution of the green house gases. However, given its location between two rapidly growing economies of India and China, Nepal cannot escape the rapidly increasing influence of climate and global changes. The rapidly retreating glaciers (average retreat of more than 30 m/year), rapid rise in average maximum temperature ( $>0.06^{\circ}\text{C}$ ), erratic rainfalls and increase in frequency of extreme events such as floods and drought like situation are some of the effects Nepal is facing during the last few years. Most of the big rivers of Nepal are glacier-fed and its main resources of water and hydroelectricity will be seriously affected due to the ongoing changes in glacier reserves, snowfall and natural hazards.

An analysis of about 30 years of observed temperature of Nepal has shown that maximum temperatures in Nepal are increasing at an alarming rate (Shrestha et al., 1999). Study carried out by the Department of Hydrology and Meteorology (DHM) shows that the all-Nepal maximum temperature increased by  $1.8^{\circ}\text{C}$  in 32 years between 1975-2006, which is equal to about  $0.06^{\circ}\text{C}$  per year. Such warming is found to be more pronounced in the northern high altitude regions of Nepal. Further, warming in the winter is more pronounced compared to other seasons. The increasing trend of maximum temperature is a dominant feature of the country except for the western middle mountainous region. For minimum temperature, the decreasing trend is observed over the western and west of central mountainous regions and the eastern parts of the country. However, increasing trend is dominant over most of the regions.

Another analysis of daily temperature data for 36 years from 1971 to 2006 using RCLimDex software also shows that both

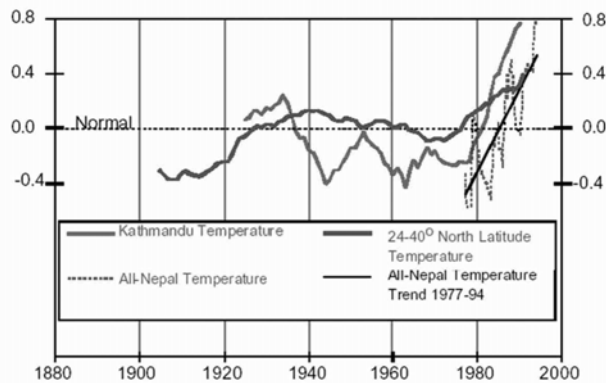


Figure 1.3: Comparison between temperatures in Kathmandu and global and all-Nepal temperature

Annual (Jan-Dec) (Temperature deviation from normal in °C)  
Source: Shrestha et al., 1999

Table 1.2: Regional Mean Temperature Trends for the period 1977-94 (°C per year)

Region	Seasonal				Annual (Jan-Dec)
	Winter (Dec-Feb)	Pre-monsoon (Mar-May)	Monsoon (Jun-Sep)	Post-monsoon (Oct-Nov)	
Trans-Himalayas <sup>a</sup>	0.12	0.01	0.11	0.1	0.09
Himalayas	0.09	0.05	0.06	0.08	0.06
Middle Mountains	0.06	0.05	0.06	0.09	0.08
Siwaliks	0.02	0.01	0.02	0.08	0.04
Terai	0.01	0	0.01	0.07	0.04
<b>All Nepal</b>	<b>0.06</b>	<b>0.03</b>	<b>0.051</b>	<b>0.08</b>	<b>0.06</b>

<sup>a</sup>Trend for 1977-1994

Source: Update after Shrestha et al., 1999

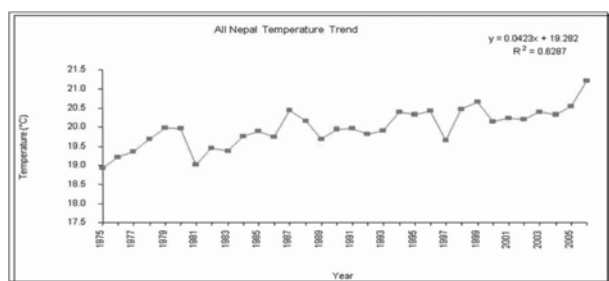


Figure 1.4: All Nepal temperature trend (1975-2006)  
Source: DHM

days and nights are becoming warmer and cool days and cool nights are becoming less frequent (Baidya et al., 2008).

The projection of temperature by Organization for Economic Co-operation and Development (OECD) shows a

significant and consistent increase in temperature in Nepal for the years 2030, 2050, and 2100 across the various models. This analysis also shows somewhat larger warming in winter months than the summer months. The projected change above the baseline average is 1.2° C for 2030, 1.7°C for 2050 and 3.0°C for 2100.

Analysis of precipitation data from station records all over Nepal does not reveal any significant trends. However, an analysis of daily precipitation data for 46 years from 1961-2006 shows an increasing trend in precipitation extremes. About 73% stations (out of 26 total station selected for the study) exhibited an increase in the annual count of days when precipitation is greater or equal to 50 mm.

A recent study projected that doubling of atmospheric carbon dioxide concentration will reduce Nepal’s forest types from 15 to 12, and habitats and ecosystems will be destroyed. Climate change will also affect productivity of natural ecosystems, particularly provision of environmental services.

Nepal has to prepare itself to try and mitigate these effects if possible and if not adapt to



Figure 1.5: Effect of global warming is more acutely manifested in higher altitude (Chhukuang, Mustang)

them to reduce their impacts on our lives and livelihoods. Nepal is largely a mountainous country and current indications are that the mountain regions are more vulnerable due to increased warming trends as well as extreme changes in altitude over small distances. These alarming trends not only make Nepal's major sectors of economy such as agriculture, tourism and energy more vulnerable but also endanger the health, safety and wellbeing of Nepali people.

For a least developed country such as Nepal, adaptation should be the priority. Government of Nepal has prepared National Adaptation Program of Action (NAPA) to Climate Change. It comprises nine priority projects. Well coordinated, quick and serious implementation of NAPA will be extremely important to mitigate and adapt to the growing impacts of climate change in Nepal.

On June 12, 1992, during the Earth Summit at Rio, Nepal signed the United Nations Framework Convention on Climate Change (UNFCCC) treaty. Nepal ratified the treaty on May 2, 1994 which came into effect from July 31, 1994 and Nepal responded immediately with the establishment of

Environment Protection Council (EPC) under the chairmanship of the Rt. Hon'ble Prime Minister with the objective of integrating environmental concerns into the development process. The EPC initiated the process of formulating the national policy on environment and approved the "National Environmental Policy and Action Plan (NEPAP)" in 1994. In November 1996, GON also established Alternative Energy Promotion Centre (AEPCC) under the Ministry of Science and Technology (MoEST). Realizing the importance of impacts of climate change on environment and pertinent issues, the government of Nepal established a separate Ministry of Environment in 2009.

In the policy and legislative front also, Nepal initiated several measures. It brought Sustainable Development Agenda for Nepal in 2003 to guide the sustainable development path till 2017. Other several policies, strategies, and laws which are relevant to the issues of environmental problems and climate change have been put into force. The major national environmental policies include the National Conservation Strategy,

## Nepal holds Cabinet Meeting at Mount Everest



In the picture, there seem Nepal's Prime Minister Madhav Kumar Nepal, center, and members of the cabinet raise hands in favor of a document to highlight the negative impacts of global warming on Mount Everest during a special cabinet meeting at Kalapatthar in Nepal, on 4 Dec 2009. Nepal's top politicians strapped on oxygen tanks and held a Cabinet meeting amid the frigid, thin air of Mount Everest to highlight the danger global warming poses to glaciers, ahead of international climate change talks in COP15.

The government billed the activity as the world's highest Cabinet meeting. The ministers posed for pictures, signed a commitment to tighten environmental regulations and expand the nation's protected areas, and then quickly flew back to capital city.

"The Everest declaration was a message to the world to minimize the negative impact of climate change on Mount Everest and other Himalayan mountains," Prime Minister Madhav Kumar Nepal later said.

Source: [www.msnbc.com](http://www.msnbc.com)

1988, the Nepal Environment Policy and Action Plan, 1993, the Sustainable Development Agenda 2003. The National Climate Change Policy has been prepared and is in the process of finalization. The Interim Constitution of Nepal, 2006, has for the first time, recognized “right to clean environment”, as a fundamental right of the citizens of Nepal. Environment Protection Act, 1996 and Environment Protection Regulations, 1997 are the key environmental

legislations. The other legislations include Soil and Water Conservation Act, 1982; Water Resources Act, 1992; Industrial Enterprises Act, 1992; Vehicle and Transport Management Act, 1992 and Regulations, 1997 (with first amendment in 2004); Forest Act, 1992 and Regulations, 1995; Local Self-governance Act, 1999 and Local Self-Governance Regulations, 1999 and Ozone Depleting Substance Consumption Regulations, 2001.

“Vulnerability to disaster is growing faster than resilience. [...] Disaster risk reduction should be an everyday concern for everybody. Let us all invest today for a safer tomorrow.”

Ban Ki-moon, Secretary-General, United Nations

Message for the International Day for Disaster Reduction



Most of the rural Nepali women has to spend up to half their day collecting water, an impact of climate change. Photo Courtesy: Tear Australia

## National Platform on Disaster Risk Reduction

The Hyogo Framework for Action (HFA) and the subsequent first Global Platform on Disaster Risk Reduction (GPDRR) organized during 5-7 June 2007 have envisioned establishment of National Platform for Disaster Risk Reduction (NPDRR) in each country to provide policy and technical support to the government and also to complement the efforts. In line with the recommendations, National Platform on Disaster Risk Reduction (NPDRR) was established in Nepal in 2008 under the National Directives Act 2018 of Nepal. The platform is headed by the Ministry of Home Affairs (MoHA) and several relevant government agencies, UN organizations and NGOs/INGOs sit as the members. The platform is believed mainly to develop consensus concepts and actions for mainstreaming disaster risk reduction into policy, plans, and programs through advocacy, coordination and analysis; to ensure political commitments; and to provide directions and guidance on disaster risk reduction activities.

## National Strategy for Disaster Risk Management in Nepal 2009

With the broader national vision of making “Disaster-resilient Nepal”, Government of Nepal approved the National Strategy for Disaster Risk Management in Nepal (NSDRM) on October 11, 2009. The National Strategy for Disaster Risk Management is a commitment of the Government of Nepal to reflect the paradigm shift towards enhancing disaster resiliency as part of the fulfilment of the basic right of the people. It also expresses the desire of the people and government of Nepal to reduce disaster risks to an acceptable level for safeguarding their lives, properties, development investments, cultural heritage as well as to mitigate the adverse

impact to the environment from natural hazards thereby contributing to the aspirations of alleviating poverty and improving the quality of life of all Nepali people.

The formulation of policy and legislative procedures on disaster issue in Nepal dates back in early 1980s when Natural Calamity (Relief) Act, 1982 was enacted. With this backdrop, Nepal is considered to be one of the first countries in South Asia to have created a policy and legal environment for disaster risk management. The Natural Calamity (Relief) Act, 1982 did perform a mission to formalize disaster response as a responsibility of the government to provide relief to the victims of the disaster-events, and it designated authorities at the centre and district levels to coordinate the rescue and relief efforts of various response agencies. However, the experience of the past three decades evidenced that this structure is capable to coordinate only small to medium level disasters. The stipulations of the Act and the institutional mechanism it has created were not adequate to manage emergency response during medium disasters such as the Udayapur earthquake of 1988 or the flood disaster in south-central Nepal in 1993.

National Strategy for Disaster Risk Management (NSDRM) has been developed based on the HFA in consultation with the relevant stakeholders across all levels. The Hyogo Framework for Action 2005-2015 (HFA) was hence the beacon throughout the strategy formulation process. Reference to HFA was made not only because it recommends what every country should do for disaster reduction, but also because Government of Nepal had taken part in developing this framework and has made commitments to implement it. Hence, streamlining the National Strategy in line with the HFA is regarded as the most

important approach to be adopted. The strategy is based on the ground realities and identified needs of Nepal. It has tried to capture the opportunities of Disaster Risk Management (DRM) in Nepal in line with the current international understanding, scientific progress and regional initiatives. The strategy is expected to provide the road map for all sectors to prepare sector specific programs for DRM and formulate the necessary policy decisions for facilitating mainstreaming DRM into the development process.

The strategy has identified 29 cross-sectoral priority strategic actions and several sectoral activities for DRM. The cross-sectoral strategies are based on gaps and issues identified and are focused on addressing the identified gaps in particular sectors. They are divided into the five Priorities for Action. The following sectors have been considered:

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

In regard to establishing effective institutional structures, National Council for Disaster Risk Management (NCDM) has been envisioned as the highest level institution to be constituted under chairmanship of Prime Minister. Home Minister is the Deputy Chair and Council Members include ministers, Chief of the Army Staff, Chief of the police departments and representatives of the civil society. The NCDM is responsible for:

- Endorsement of national policies on DRM,

- Approving the national-level & sector-wise DRM plans,
- Guide and oversee management of fund generation and mobilization on Risk Reduction/Mitigation, Preparedness, Response, Recovery, Rehabilitation and Reconstruction; and
- Provide policy guidance for bilateral, sub-regional, regional and international cooperation in the area of DRM.

To work as the Secretariat of NCDM, National Disaster Management Authority (NDMA) has been envisaged. The NDMA is the National focal point for the implementation, facilitation, coordination and monitoring of the strategies of Disaster Risk Management. During and after a national level disaster, the NDMA has responsibility to work on emergency response, recovery, reconstruction and rehabilitation. To be able to discharge this responsibility, the NDMA is to develop necessary strategies, standards and guidelines, and design plans and programmes for capacity building and emergency response.

Also three high level committees are envisaged to constitute at the central level on Preparedness, Search & Rescue and Rehabilitation & Reconstruction with the view to sector-wise activities. The institutional structure also envisages the constitution of a Regional, District and local level Disaster Management Committees (DMC).

### **Proposed Disaster Management Bill, 2009**

The proposed Disaster Management Bill, 2009 is towards enhancing effective management of risk reduction throughout the disaster management cycle-preparedness, mitigation, rescue and relief, rehabilitation and recovery.

The proposed Bill emphasizes on protecting

and securing lives and property with emphasis on critical facilities that impact general public and facilitates management of disasters effectively. The proposed Disaster Management Bill, 2009 calls for replacement of the existing Natural Calamity (Relief) Act, 1982. The salient features of the proposed DM Bill are:

- Disasters are defined distinctly as natural and human induced
- Provision for National Council for Disaster Management (NCDM) to be chaired by Prime Minister of Nepal with clear mandate and functions, duties, responsibilities and authority of the council.
- Proposal to set up National Disaster Management Authority (NDMA) under the NCDM, to act as the focal point for disaster management functions in Nepal from formulation of appropriate strategies and plans to implementation and supervision of disaster management activities
- Clarifies the role, responsibility and functions of security forces including Nepal Army, Nepal Police and Armed Police Force; institutions, industrial sector and private organizations

It is very urgent to pass out the Disaster Management Bill to support the implementation of National Strategy for Disaster Risk Management, which supplements the development of the country and ensures the rights of each individual to safe life.

*(Extracted from Disaster Risk Reduction: An information pack for Constituent Assembly members of Nepal)*

### **Preparation of Disaster Preparedness and Response Plan (DPRP) in Districts**

Ministry of Home Affairs (MoHA) is leading the preparedness initiatives jointly with other Government agencies, UN agencies,

national/international organizations, civil societies, DPNepal etc. As a result of this initiative, National workshop in 2010 recommended 21 points and approved by Central Natural Disaster Relief Committee (CNDRC) for an effective disaster preparedness initiative at district, regional and national levels. One of the recommendations was to make “District Lead Support Agencies (DLSA)” in 67 districts among the national and international agencies with an objective to support DDRC for preparing “District Disaster Preparedness and Response Plan”. It has resulted in very positive feedbacks from all the actors. As a result, more than 60 districts completed the preparation of DPRP including five regional authorities drafted the Standard Operating Procedures (SOP) in 2010. It was realized that these preparedness initiatives have achieved major success in responding the floods and landslides in 2010.

The lessons learned from a series of joint meetings suggested for amending the Guidance Note 2008 to include the multi-hazard scenarios for planning including earthquake as a mandatory to all 75 districts.

### **Nepal Risk Reduction Consortium**

An innovative form of international cooperation has been developed to prioritize and implement key elements of the NSDRM. It is the Nepal Risk Reduction Consortium (NRRC) and its Flagship Programs developed in consultation with the government and other stakeholders.

In May 2009, comprehensive Nepal Disaster Risk Reduction Consortium (NRRC) was launched to support the Government of Nepal in developing a long term disaster risk reduction action plan building upon the new National Strategy for Disaster Risk Management (NSDRM). The NRRC initiated a multi-stakeholder participatory

process with the government and civil society organizations to identify short to medium term disaster risk reduction priorities that are both urgent and viable within the current institutional and policy arrangements in the country.

The NRRC is a unique institutional arrangement, bringing together financial institutions, development partners, the Red Cross / Red Crescent Movement, and the UN in partnership with the Government of Nepal. It bridges the spectrum of development and humanitarian partners, uniting to support the Government of Nepal in developing a long term Disaster Risk Reduction Action Plan building on the National Strategy for Disaster Risk Management (NSDRM). The founding members of the Consortium are the Asian Development Bank (ADB), the International Federation of the Red Cross and Red Crescent Societies (IFRC), United Nations Development Programme (UNDP), UN Office for the Coordination of Humanitarian Affairs (OCHA), UN International Strategy for Disaster Reduction (ISDR) and the World Bank. The US Government and the Humanitarian Aid Department of the European Commission (ECHO) also formally joined the NRRC in 2010. The government has formally established the NRRC Steering Committee, coordinated by the Secretary of Home Affairs including a number of ministries and the consortium partners. A Secretariat was also created to support the work of the Steering Committee and is comprised of the Joint-Secretary and Under-Secretary of MoHA and an NRRC Coordinator.

Based on government priorities and discussions with multi stakeholder groups, the NRRC and government identified five flagship areas for immediate intervention for disaster risk management in Nepal, coordinated by one of the partner organizations:

1. School and hospital safety-structural and non-structural aspects of making schools and hospitals earthquake resilient coordinator (ADB)
2. Emergency preparedness and response capacity (UNOCHA)
3. Flood management in the Koshi river basin (World Bank)
4. Integrated community based disaster risk reduction/management (IFRC)
5. Policy/Institutional support for disaster risk management (UNDP)

The objectives of NRRC are:

- Support the Government of Nepal in developing a long term DRR Action Plan building on the new National Strategy for Disaster Risk Management
- Initiate a multi-stakeholder participatory process with the Government of Nepal and civil society organizations
- Identify short to medium term disaster risk reduction priorities that are both urgent and viable within the current institutional and policy arrangements in the country

The NRRC represents an important development in the disaster risk management of the country. It has enabled the establishment of a coordinated approach to areas of DRR that have been prioritized based on risk assessments, and brings together humanitarian and development actors, essential for a long-term approach. The engagement of the government is another essential factor that allows for national ownership and sustainability. Yet it is too early to state whether it has been a success or not as a model to secure increased funding to preparedness. The flagship areas are progressing at different stages and those with a clear work plan and set of targets have been able to progress faster than others, with the help of financial support from donors and commitment from partners.



## National Emergency Operation Center (NEOC)

The National Emergency Operations Centre (NEOC) was opened on 17 December 2010, by the Minister of Home Affairs and is operated under the Planning and Special Services Division of MoHA. The objective of the NEOC is to work as a coordination and communication point for disaster information across the country, including government agencies and other response and recovery stakeholders.

The NEOC is a standalone pre fabricated building situated at the Ministry of Home Affairs premises in Singha Durbar. The building has been built to earthquake standards and is completely self contained, including multiple back up power supplies. The NEOC's working time is round the clock during the disaster period and never sleeps to get information. It has been running by a nine-member personnel team under the leadership of Under-Secretary.

As part of MoHA's strategy to further develop Nepal's emergency preparedness and response capacity, it is planning to establish District Emergency Operation Centres (DEOCs) in all 75 districts. In the first phase, 11 districts have been selected to setup DEOCs.

### Creation of National Cluster Groups

Following the devastating 1993 floods in south-central part of the country, Nepal established three "Working Groups" for disaster management, this concept of "Working Group" is similar, to a certain extent, to the "Cluster Approach" promulgated by the UN Inter-Agency Standing Committee (IASC) in 2005. It is now globally accepted as an effective UN

mechanism that can help to address identified gaps in response and enhance the quality of humanitarian action by ensuring greater predictability and accountability, while at the same time strengthening partnerships between NGOs, international organizations, the International Red Cross and Red Crescent Movement and UN agencies.

On 18th August 2008, the Koshi River breached an embankment through an eastern retaining wall damaging two dam spurs affecting 8 Village Development Committees (VDCs) of Sunsari and Saptari districts. The impact was obviously massive and hugely aggravated (please refer Chapter 3). The delayed registration process, slow identification of alternative resettlement sites and movement of flood-affected population from India to Nepal led to multiple challenges for the ensuing emergency operation. Distribution of food and non-food items (NFI) were delayed due to the slowness of the registration process and the capacity of host families to support displaced persons became major concerns considering the endemic poverty and vulnerability of the communities themselves. Because of the complex situation, the humanitarian community faced a challenge in responding to the wider emergency needs with limited financial resources. The government's response was initially good and its approach a serious one. A district early-warning system was apparently activated immediately and Army and Armed Police Forces (APF) were soon involved in search and rescue - there was little loss of life. There was a first meeting of the Regional Disaster Response Committee (RDRC) on the same evening as the embankment breached and the first meeting at district level occurred in Sunsari the next day.

While the Humanitarian Country Team (HCT) had already largely been organized and functioning in line with the cluster approach, the UN Humanitarian Coordinator requested formalization of the cluster approach. The Inter-Agency Standing Committee (IASC) endorsed the cluster approach in Nepal focused on the flood-affected areas in September 2008 to provide 'predictable leadership and accountability'. At the national level, Cluster Leads met on a regular basis and coordinated with their

counterparts in the affected districts where the cluster approach was also adopted to manage humanitarian assistance. At district level, cluster meetings were often chaired by government line ministries. Local implementing partners also attended cluster meetings. The cluster approach effectively enabled information sharing and management, monitoring of projects, and assisted in the identification of gaps and/or duplication.



Celebrating ISDR Day 2010, Kathmandu  
Photo Courtesy: DPNet-Nepal

## Global Initiatives and Nepal's Participation

### IDNDR Initiatives in Nepal and its Contribution in Advancing DRM

#### History

In 1987, the General Assembly of the United Nations (Res. 42/169) recognized the importance of reducing the impact of natural disasters and decided to designate the decade of 1990 as the International Decade for Natural Disaster Reduction (IDNDR). The aim of the decade was to foster international co-operation in the field of natural disaster reduction. Subsequently, the UN decided to designate the second Wednesday of October as the International Day for Natural Disaster Reduction (Res. 44/236, 1989). It urged all the countries for implementing the International Framework of Action of the IDNDR (Res.45/185, 1990) and to establish National Committees.

In response to the call by UN, Nepal constituted the IDNDR National Committee in 1990 under the chairmanship of the Hon'ble Home Minister. The committee was further expanded in February 1994. The IDNDR National Committee provided leadership to various initiatives that were geared towards better disaster management and policy and plan formulation. One of key initiatives that was led by IDNDR National Committee was the formulation of National Action Plan for Disaster Management in Nepal in 1994. The preliminary plan was presented during the World Conference on Disaster Management in Yokohama, Japan, 23-27 May 1994.

Beside the IDNDR initiative led by government, Nepal Geological Society, a professional society of geologists, seismologists, geophysicists etc., separately formed NGS-IDNDR Council among the scientists to compliment IDNDR National Committee. Later, in February 1994, as a result of continuous advocacy and joint work

### Box 1.3: Tokyo Declaration for International Decade for Natural Disaster Reduction

"We, the Ad Hoc International Group of Experts for the International Decade for Natural Disaster Reduction, hereby declare the following:

Throughout history, mankind has lived under the threat of natural disasters. Millions of lives have been lost in recent decades, with untold human suffering and property damage as well as setbacks to development efforts. Indeed, the situation is growing worse. Vulnerability to natural disasters is rising due to population growth, urbanisation of industry and infrastructure in disaster-prone areas. But we now have improved capacity to confront the problem. Fatalism is no longer acceptable; it is time to bring the full force of scientific and technological advancement to reduce the human tragedy and economic loss of natural disasters.

This concept is the United Nations General Assembly decision, in its Resolution 42/169 of 11 December 1987, to designate the 1990s as an International Decade in which the world community joins to cooperate on natural disaster reduction.

The Secretary-General of the United Nations, who was asked to develop a framework to attain the objective and goals of the Decade, appointed our committee, the Ad Hoc International Group of Experts. We are 25 scientists and technical experts drawn from throughout the world and representing the spectrum of disciplines engaged in disaster reduction. We will soon submit our report to the Secretary-General, but today we wish to call to the world's attention our common conviction that millions of lives can be saved, hundreds of millions protected from tragedy, and hundreds of billions of dollars saved as a result of the International Decade.

Since our first meeting in Geneva in July 1988, there have been floods in the Sudan and Bangladesh, hurricanes Gilbert and Juana in the Caribbean and Central America, destructive earthquakes in China, India, Nepal and the USSR, and severe drought and locust infestations in Africa. The post-disaster response of the international community has been generous. But observing these and other tragic events has convinced us of the need for increased efforts in disaster planning, preparedness, and prevention.

by NGS-IDNDR Council, the government decided to include four members Nepal Geological Society (NGS), Nepal Engineers' Association (NEA), Department of Mines & Geology (DMG), and Tribhuban University (TU) from the scientific community to the National Committee. The role of NGS-IDNDR Council was visible mainly during the preparation of National Report and National Action Plan to be presented in the Yokohama Conference.

The NGS-IDNDR Council aimed at

providing adequate support to IDNDR National Committee in formulating and executing various hazard reduction national programs as well as increasing the awareness among the people regarding the possibilities of mitigating hazards.

### Major Activities under IDNDR

The NGS-IDNDR Council organized first one day seminar cum workshop on "Geologic Hazards, Environment and Man-made structures" on October 7, 1991 to commemorate the IDNDR Day. Since then,

We believe that the Decade is a moral imperative. It is the first coordinated effort to prevent the unnecessary loss of life from natural hazards. It also makes practical sense. The Decade is an opportunity for the world community, in a spirit of global cooperation, to use the considerable existing scientific and technical knowledge to alleviate human suffering and enhance economic security. In implementing the Decade, the vulnerability of developing countries must be of special concern.

Thus we, the Ad Hoc International Group of Experts, call on;

The People of the world, as well as their governments, to work toward greater security against natural disaster;

The governments of all countries to participate actively in the Decade by educating and training their citizens to increase awareness, by enhancing social preparedness, by integrating disaster consciousness into their development programmes, and by making available the power of sciences and technology to reduce disaster loss;

The United Nations, scientific and technological institutions, nongovernmental organizations, and

the private sector to support international and regional cooperation on disaster-related activities and to contribute to the transfer of disaster-reduction technology, particularly in disaster prone developing countries.

The Decade is an opportunity for action, both immediate and long-term. Specific projects can be implemented immediately to help achieve a safer world. Implementation of the Decade requires commitment of the international community to enhance the level of technical cooperation, particularly with regard to the developing countries. The group calls for all countries to form national committees to plan for and coordinate national efforts. It suggests that the United Nations General Assembly consider the establishment of a unique cooperative mechanism, supported by extrabudgetary resources, that brings together the diverse groups that can contribute to the Decade. It seeks the commitment of the international community to assure the availability of resources to implement this important activity.

The Group is confident that through these actions mankind will capture the promise of enhanced security and prosperity".

## Box 1.4: Excerpts from remarks during first IDNDR day celebration in Nepal

... हामी भौगोलिक र टोपोग्राफिकल दृष्टिकोणले जुन स्थितिमा छौं त्यो खालि वैज्ञानिक र प्रविधिकहरूको मात्र सरोकारको विषय होइन । ... .. हामीलाई थाहा छ कि प्रकृति त्यति छिटो बदलिदैन तर यसलाई मानिसका लागि उपयोगी बनाउन सकिन्छ जसको लागि मनुष्यकै सृजनशीलता आवश्यक हुन्छ । यसरी हेर्दा मलाई लाग्छ हामीले हामी किसिमले ज्ञान हासिल नगरी सुसै छैन जसका लागि नेपालका प्रविधिकहरू समर्थ हुनुहुन्छ र हामीले पाई आएको अन्तर्राष्ट्रिय सहयोग पनि लिनु पर्छ । ... .. अहिले नेपाल पुनः निर्माणको चरणबाट गुज्रदै गरेको बेलामा प्राविधिक प्रशासक र नीति निर्माताहरू र खासगरी राजनीतिक तहमा निर्देशनको आवश्यक हुन्छ, समन्वय हुनुपर्छ, विचारको आदान-प्रदान हुनैपर्छ । ...

Mr. D.N. Dhungana, Speaker, House of Representatives  
Remarks as the Chief Guest during IDNDR National Workshop, October 7, 1991

NGS-IDNDR Council organized such seminar and workshop every year to commemorate the IDNDR Day (2nd Wednesday of October). Table 1.3 provides the list of IDNDR Day programs organized every year (1991-1999).

In addition, several other interaction, professional discussions, training and awareness programs were organized as part of the IDNDR. Celebration of IDNDR Day was the culmination of all activities conducted throughout the year. Such interaction, awareness and training programs were geared towards enhancing knowledge and understanding on the hazards, disasters and risk and help frame a comprehensive concept of disaster reduction in the country.

### Contributions and Impacts

Several awareness and training programs in the form of meetings, seminars, workshops and conferences were organized during the period, which were instrumental in enhancing general understanding on the feasibility of disaster risk reduction. The discourses conducted were capable of improving the understanding on hazards, vulnerabilities, risk and disasters. Coherence in understanding on technicalities of various

hazards such as landslides, floods, erosion, earthquakes was achieved. The activities helped educate and change the psyche of Nepalese engineers, scientists, and professionals on disaster risk reduction and helped to highlight the importance and need of scientific and academic researches on disaster risk reduction in Nepal.

The important achievements and lessons are captured in the National Report of Nepal prepared for the IDNDR Regional Conference, 22-26 February 1999, Bangkok, Thailand. Although Nepal was somehow late in picking up the momentum, the country made great strides towards building national capabilities in disaster management during the concluding Decade. There have been several efforts in the national scale towards meeting the goal of disaster reduction. A national outlook regarding the necessities and ways of disaster reduction was crystallized during the period. This was a big achievement.

Therefore, although the International Decade for Natural Disaster Reduction (IDNDR) came to a close, it was realized that the concept, vision and the types of efforts made by IDNDR should be continued.

**Table 1.3: IDNDR Day celebration (1991-1999)**

Year	Date	Theme
1991	October 7	One day seminar cum workshop on “Geologic Hazards, Environment and Man-made Structures”
1992	October 14	One day seminar on “Geological Hazards and Environmental Problems in Nepal”
1993	October 13	One day seminar on “Geo-scientific Inputs in Natural Disaster Management
1994	October 5	One-day National Meeting cum Seminar on “Geo-scientific Inputs in Preparedness and Mitigation of Natural Disaster”
1995	October 11	One-day National Meeting cum Seminar on “Prevention of Natural Disasters: Challenges to Scientific Communities in Nepal
1996	October 9	One-day National Meeting cum Seminar on “Understanding Our Physical Environment: Key to Natural Disaster Reduction”
1997	October 6	One-day National Meeting cum Seminar on “Natural Disaster Reduction in Nepal: Experience and Challenges”
1998	October 14	One-day National Meeting cum Seminar on “ Natural Disaster Prevention and the Media: Prevention Begins with Information”
1999	October 13	One-day National Meeting cum Seminar on “Prevention Pays”

## Formulation of National Action Plan on Disaster Management in Nepal

The IDNDR National Committee felt the need of preparing a practical and effective action plan on disaster management as previous efforts were concentrated mainly on the rescue and relief operations. The meeting of IDNDR National Committee held on February 10, 1994 formed four core groups, comprising of experts, administrators, security personnel, & academicians,

to prepare a National Action Plan for Disaster Management. The four core groups were related to Disaster Preparedness, Disaster Response, Rehabilitation and Reconstruction, and Disaster Mitigation.

The core groups through a series of meetings and mini-workshops during a period of approximately 4 months prepared a preliminary National Action Plan. The preliminary action plan was prepared based mainly on the recommendations made by

### Box 1.5: Resolution of 1995 IDNDR Day

यो सभा IDNDR Day '95 का दिन निम्न प्रस्तावहरू पारित गर्दछ :

१. IDNDR Day '94 को सभाले पारित गरेका सम्पूर्ण प्रस्तावहरूलाई कार्यान्वयन गर्न सम्बन्धित निकायहरू समक्ष पुनः अनुरोध गर्दछ ।
२. नेपाल सरकार द्वारा प्राकृतिक प्रकोप न्यूनीकरण सम्बन्धित अपनाइएका राष्ट्रिय कार्यक्रमहरू प्रति उत्साहित हुँदै प्राकृतिक प्रकोप न्यूनीकरणका लागि IDNDR NATIONAL COMMITTEE द्वारा तर्जुमा गरिएको NATIONAL ACTION PLAN लाई यथाशीघ्र लागु गर्न नेपाल सरकार समक्ष अनुरोध गर्दछ ।
३. मुलुकको लागि तर्जुमा गरिएको राष्ट्रिय निर्माण संहिता लागु गर्न तर्फ आवश्यक कारवाहीका लागि नेपाल सरकार समक्ष अनुरोध गर्दछ ।
४. प्राकृतिक प्रकोपको संदर्भमा महिला क्षेत्र अति पीडित हुने मात्र होइन, यथार्थमा महिलाहरूले आफ्नो क्याकलापद्वारा प्रत्यक्ष वा परोक्षतः पर्यावरण संरक्षण तथा प्राकृतिक प्रकोप निवारणका साथै प्रकोप पछिको सामान्यीकरण प्रकृत्यामा अती महत्वपूर्ण योगदान गर्दै आएका छन् । तसर्थ प्राकृतिक प्रकोप न्यूनीकरणका सम्पूर्ण राष्ट्रिय प्रयासहरूमा महिलावृन्दको जहनतम योगदानको समुचित उपयोग गर्नका लागि उनीहरूको व्यापक सहभागिता गराइनु पर्छ ।
५. प्राकृतिक प्रकोपले बालबालिकाहरूमा अती तीव्र असर पर्दछ । उनीहरूलाई प्राकृतिक प्रकोपबाट बचाई सुखमय बाल्यकाल प्रदान गर्नु समाजको दायित्व हो । बालबालिकाहरू मुलुकका लागि अति महत्वपूर्ण सम्पत्ति हुन । उनीहरूलाई प्राकृतिक प्रकोप असर न्यूनीकरण सम्बन्धित जानकारी विद्यालय मार्फत दिइएर समाजले दीर्घकालिन उपलब्धि प्राप्त गर्न सक्दछ । प्राकृतिक प्रकोप न्यूनीकरण तर्फ गरिने राष्ट्रिय चेष्टामा यस प्रकारका कार्यक्रममा यथापिन जोड दिनु आवश्यक छ ।
६. नेपालमा प्राकृतिक प्रकोप न्यूनीकरणका लागि अती आवश्यक HAZARD MAPPING तथा RISK ASSESSMENT सम्बन्धित कामहरू गर्न सक्ने तथा उत्पाद न्यूनीकरणका उपायहरू पत्तो लगाई दिनको कार्यान्वयन गर्न सक्ने क्षमता आधारभूत रूपमा विकसित भै सकेको छ । तर ज्ञान, सीपको समुचित उपयोग तथा उपलब्ध जनशक्तिको उपयुक्त परिचालनको क्षेत्रमा निकै धेरै सधारको आवश्यकता देखिन्छ । यस तर्फ आवश्यक ध्यान दिई मुलुकमै उपलब्ध वैज्ञानिक तथा प्रविधिकहरूको उचित उपयोग गर्नका लागि सम्बन्धित सम्पूर्ण निकायहरूमा अनुरोध गरिन्छ ।

### Box 1.6: Excerpts from remarks during first IDNDR day celebration in Nepal

... There is another hindrance also. The official national term for Natural Disaster is "दैवी प्रकोप" which is largely a misnomer. I think that it has been wrongly taken up. Literally it means "Godly very great anger". At the present level of knowledge of various natural phenomena I don't think we still should continue calling it "Anger of God". The case here is not this. The question may not be only the wording, but the effect of the wording. Etymology itself, I feel, is hindering against our efforts. So I call upon all of you to refrain from using this word "दैवी प्रकोप" for describing Natural Disasters or Natural Hazards. It should no longer be tolerated because this is what IDNDR calls to fight against. .... The management of natural disaster should include four steps prediction, assessment of risks, preparedness plan and management of disaster itself. Till now the focus is only on the post disaster relief operation and clearing up only. This is wrong and against IDNDR concept. The focus should be shifted from post-disaster to pre-disaster activity ..."

Mr. Amod Mani Dixit, Co-ordinator NGS-IDNDR Council  
Remarks during IDNDR National Workshop, October 7, 1991

the Country Workshop (October 31-3 November 1993) and National Conference (4 November 1993) on Disaster Management. The plan also referred to the existing Comprehensive Plan for Disaster Management in Nepal. This preliminary plan was presented to the World Conference on Disaster Management, Yokohama, Japan, 1994.

Later, the IDNDR National Committee felt the need of incorporating Yokohama Strategy in National Action Plan and simplifying the preliminary draft in order to adopt a more practicable and implementable Action Plan on Disaster Management. Hence, IDNDR National Committee finally prepared an Action Plan on Disaster Management on July 13, 1995 and submitted it to Nepal Government for its approval. Later, the Government of Nepal on February 18, 1996 endorsed this plan as the

"National Action Plan on Disaster Management in Nepal".

While implementing the plan, with a view to make it easier and more effective, some amendments were made by IDNDR, National Committee on 29 Sept. 1996 which included:

- The executing agency for Flood Hazard Mapping and establishment of Flood Forecasting & Warning System is to be the Department of Hydrology & Meteorology instead of Department of Irrigation.
- As a part of Disaster Mitigation Action Plan, policies on – (i) prevention & preparedness, (ii) participation of NGOs, private sector and local communities and (iii) incorporating environmental impact study in development plan, has to be carried out by Ministry of Population and Environment instead of CDRC;

### Box 1.7: Components of National Action Plan 1996

#### A. National Action Plan on Disaster Preparedness

The national action plan on disaster preparedness presented in the form of a matrix indicated priority item group, activities, the time schedule and the executing agencies with specific cooperating agencies.

The recommended activities involved the formation of appropriate institutional arrangements in terms of National Disaster Management Council at policy level, a National Disaster Management Centre at the central executive level and various disaster management committees at regional, district and village level for effective implementation. The plan also included the enactment of appropriate legislation with specified responsibilities to concerned agencies. The action plan also proposed the incorporation of disaster management as multi-sectoral activities in the five year development plan. The emphasis had been given to the preparation of hazard assessment and mapping of the recurring disasters in Nepal like earthquake, flood, landslides, GLOFs etc. The activities further specified the selected areas in this concern so as to attain the objectives in the remaining part of the decade.

Several arrangements had been recommended

in the context of capacity building at local level such as Public Awareness Programmes, Rehearsal, Drills, and Stockpiling of emergency relief materials. The environmental & geological studies had been prioritized.

#### B. National Action Plan on Disaster Response

As the activities of disaster response start only after a disaster has struck in certain area, the Action Plan was prepared as a part of preparedness for actual response operations. This action plan was prepared with the assumption that about 15000 families (with an average of 6 members in a family) would be affected by disaster every year. Considering this size, the items and activities included in this action plan should be carried out so as to build the capability of disaster management by the end of 2000 A.D. In this context equipment necessary for disaster response activities had been recommended.

The Disaster Response Action Plan included following activities:

- Evacuation, Search and Rescue
- Communication and Transportation
- Temporary Settlement
- Health, Nutrition, and Sanitation:

while Ministry of Land Reform & Management has to be the co-operating agency for (i) the preparation of land use plan, (ii) rehabilitation plan and (iii) reduction programmes.

- To monitor the execution of the action plan, a Monitoring and Evaluation Committee comprised of representatives from Ministry of Home Affairs, National Planning Commission, Ministry of Finance, Ministry of Water Resources, Ministry of Industry (Department of Mines and Geology), Nepal Red Cross Society and Nepal Army has been constituted.

The action plan was an ambitious document. Even though, the Government accepted the plan as a planning document and committed towards its fulfilment, it still was in the form of a wishful "shopping list" rather than an actual action plan since it did not spell out the required mechanism for its implem-

entation, monitoring, updating and co-ordination. However, the sheer fact that such a document prepared and accepted for implementation was itself a great step. The country came out of the traditional fatalistic approach towards natural disaster and aspired to interact with the disasters by being prepared towards it, by adapting mitigation measures.

It should be noted that several of the items listed were already being implemented by the line agencies and departments of the Government. The efforts made jointly by the UN-DMT and the international community in co-operation with the Government in creating Working Groups to prepare working plans and guidelines for disaster-response could serve as the model for the future course to be taken for other aspects for disaster management such as mitigation and rehabilitation/reconstruction.

### C. National Action Plan on Disaster Reconstruction and Rehabilitation Action

The action plan called for the development of standard damage assessment format for all types of natural disasters with formation of a permanent damage assessment team at central as well as local level. There is also recommendation on compiling and disseminating the information on extent of damages. The action plan also included rehabilitation and reconstruction planning with emphasis on creating permanent committees for such activities centrally and locally. Concept of sectorwise expert group to review the information of damage assessment and to prepare guidelines for rehabilitation and reconstruction works was introduced.

It was also envisioned to implement income generating programmes for sustainable rehabilitation. For that, feasibility study was thought to be conducted to find out the local trends and availability of local resources. A special directive for loans to the disaster victims with subsidized interest rates was also recommended. The action plan also emphasized the need of carrying out regular capability assessment and inventory preparation at various levels including the resources of local community and NGOs.

### D. National Action Plan on Disaster Mitigation

The Action Plan recommended the identification and recognition of the major natural hazards by the government for proper management and also for the direction of effective mitigation measures. The need of allocating funds in national budget for disaster management and mitigation programme was emphasized. Also, it was conceptualized to form special disaster cell in the organization of every key disaster related agency.

From the strategies of IDNDR World Conference 1994, following activities had been included in the Action Plan.

- Risk assessment for development planning
- Policies on the role of NGOs, local community, private sector and also policies on peoples' participation especially women and socially disadvantaged groups.
- Incorporation of Environment Impact Assessment for disaster reduction in development planning.
- Promotion of regional and sub-regional co-operation between countries exposed to same types of hazards.
- Establishment of documentation centre on disaster reduction activities.



## 2005 Kobe World Conference and its relevance to Nepal

World Conference on Disaster Reduction (WCDR) was organized in Kobe, Hyogo, Japan, from 18 to 22 January 2005. The Conference was to take stock of progress in disaster risk reduction accomplished since the Yokohama Conference of 1994 and to make plans for the next ten years. The conference was attended by delegates from government and non-government organizations from 168 countries including Nepal. The conference adopted a 10-year plan to make the world safer from natural hazards.

The WCDR was composed of three main processes, Intergovernmental segment; Thematic segment; and Public Forum. The Intergovernmental segment, with delegations from more than 160 Member States, provided the venue for delegates to make general statements on the issues of disaster reduction. The Thematic Segment was formatted to complement the discussions on the programme outcome at the intergovernmental level. The public forum, open to the general public and Conference participants, consisted of Workshops, Exhibition booths, and Poster Sessions.

The following four documents are the main outcome of the World Conference on Disaster Reduction. The four documents representing a strong commitment of the international community to address disaster reduction and to engage in a determined, results-oriented plan of action for the next decade are the outcomes of the conference.

1. Review of the Yokohama Strategy and Plan of Action for a Safer World
2. Hyogo Declaration
3. Hyogo Framework of Action 2005-2015: Building the Resilience of Nations and Communities to Disasters
4. Common Statement of the Special Session on the Indian Ocean Disaster: risk reduction for a safer future

Out of the four documents the Hyogo Framework of Action (HFA) is a global blueprint for disaster risk reduction efforts during the next decade. Its goal is to substantially reduce disaster losses by 2015 – in lives, and in the social, economic, and environmental assets of communities and countries. Therefore, the priorities of HFA are as follows:

- Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation.
- Identify, assess and monitor disaster risks and enhance early warning.
- Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
- Reduce the underlying risk factors.
- Strengthen disaster preparedness for effective response at all levels

These five priority areas of HFA have been guiding the disaster risk management efforts in Nepal.

A total of 19 professionals from different government (MoHA, MoHP, KMC) and non-government (NRCS, NSET, ICIMOD, ITDG) organizations attended the WCDR from Nepal. The professionals from Nepal made presentations and key note addresses in several sessions during the conference. Nepal's exposure to this conference was highly beneficial in terms of aligning the country to the global understanding on DRM express Nepal's commitment towards effective DRR and also to bring the experiences and lessons from other countries around the world. The HFA documents have been effective tools in getting policy guidance for subsequent policy discussions in Nepal.

## Asian Ministerial Conferences

The Asian Ministerial Conferences on Disaster Risk Reduction organized every two years since 2005 at Asian Governments' initiative, represent unique opportunities for

Ministers in charge of disaster risk management from the Asia and Pacific region to reaffirm their commitment to Hyogo Framework for Action (HFA) implementation and to exchange valuable experiences on successful practices and innovative approaches in implementing HFA's five priorities for action at the national and local levels.

The First Asian Ministerial Conference on Disaster Risk Reduction, organized by the Government of China (Beijing, September 2005), adopted the Beijing Action for Disaster Risk Reduction to promote the newly-adopted HFA and to seek Asian Governments' commitment and actions to implement disaster risk reduction, including through the strengthening of existing key regional cooperation mechanisms.

The Second Conference (New Delhi, India, November 2007) reaffirmed Governments' commitment to HFA and agreed to expand further the biennial Asian Ministerial Conference on Disaster Risk Reduction as the Regional Platform with participation of the National Governments, regional and sub-regional organizations, UN Agencies, and other stakeholders including the civil society, scientific and technical organizations, the private sector and the media.

Adopting the Kuala Lumpur Declaration, the Third Ministerial Conference was successfully convened by the Government of Malaysia (Kuala Lumpur, December 2008) and the overarching theme of the Conference was "Multi-stakeholder Partnership for Disaster Risk Reduction in the Asia and Pacific region," with a particular focus on Public Private Partnership for Disaster Risk Reduction and community-based disaster risk reduction activities.

The Fourth Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) was successfully convened in Incheon, Republic of Korea, on 25-28 October 2010

and the overarching theme of the conference was "Disaster Risk Reduction for Climate Change Adaptation", with a particular focus on 1) the convergence of DRR and climate change adaptation and 2) available information technology and green technology. Government of Nepal has been participating in all ministerial conference. The participation helped much to gain from the dialogue at regional level and also to contribute.

## Global Platform for Disaster Risk Reduction

The Global Platform for Disaster Risk Reduction is a biennial forum for information exchange, discussion of latest development and knowledge and partnership building across sectors, with the goal to improve implementation of disaster risk reduction through better communication and coordination amongst stakeholders. It is for government representatives, NGOs, scientists, practitioners, and UN organizations to share experiences and formulate strategic guidance and advice for the implementation of the HFA.

The Global Platform is managed by the UN International Strategy for Disaster Reduction. It is the world's foremost gathering of stakeholders committed to reducing disaster risk and building the resilience of communities and nations. A core function of the Global Platform is to support the implementation of the Hyogo Framework of Action. The Global Platform for Disaster Reduction was established in 2007 and takes place every two years.

This first session of the Global Platform for Disaster Risk Reduction held in Geneva, Switzerland, 5-7 June 2007 was convened on the basis of guidance contained in the resolution of the General Assembly on the ISDR that calls for the adoption by governments of the Hyogo Framework and that recognizes the Global Platform as a

successor mechanism to the Inter-Agency Task Force for Disaster Reduction.

National practitioners and other stakeholders have repeatedly expressed the desire to have a mechanism through which they can exchange their experiences in disaster risk reduction and access information on how other countries addressed particular challenges in the implementation of the Hyogo Framework. The Global Platform has been set up to serve this need, and it is expected to become the main global forum for all parties involved in disaster risk reduction, namely governments, UN agencies, international financial institutions, regional bodies, civil society, the private sector, and the scientific and academic communities. It will provide advocacy for effective action to reduce disaster risks, will expand the political space devoted to the issue, and will contribute to the achievement of the Millennium Development Goals particularly in respect to poverty reduction and environmental sustainability.

Nepal has been participating in the Global Platform and benefitting much for the international practices in policies, plans and programs for disaster risk reduction.

### Views from the Frontline

Views from the Frontline (VFL) is an action-research project undertaken by civil society stakeholders in conjunction with government bodies. It aims at measuring progress towards implementation of the Hyogo Framework for Action (HFA) at the local level through the participation of different stakeholders

across developing countries and regions. The main goal of 'Views from the Frontline' is to support the effective implementation of the HFA to build the resilience of vulnerable people and communities at-risk to disasters. This independent review is being coordinated by the Global Network for Disaster Reduction (GN) and implemented by civil society actors. It seeks to complement the biennial national level HFA Monitoring and Progress Review being facilitated and coordinated by the UN-ISDR.

The first edition of VFL in 2009 showed that Disaster Risk Reduction and the progress of implementation of HFA at local level in Nepal are in the preliminary phase and are not up to the mark. 2009, presentation of views from over 7000 respondents from 48 countries made a major impact at the UN 'Global Platform for Disaster Risk Reduction', and at the local level, where dialogue, collaboration and action have been promoted. VFL 2009 showed that progress in establishing national policies and legislation had not generated widespread changes in local practices. Based on this, VFL2011 was focused on local governance, which is critical to effective implementation of policy facilitation and provision of necessary resources; leading to the HFA achieving real impact on the ground, where people at risk live, eat and work. VFL 2011 was initiated in November 2010 in Nepal. The findings and conclusions of the current study, of which Nepal is a part, is prepared with the aim of presenting the local stakeholders perspective at global level.

"...Building a culture of prevention is not easy. While the costs of prevention have to be paid in the present, its benefits lie in a distant future. Moreover, the benefits are not tangible; they are the disasters that did NOT happen.

"Kofi Annan, «Facing the Humanitarian Challenge »  
Towards a Culture of Prevention", UNGA, A/54/1

## Initiatives by Civil Society Organizations

### Establishment of Disaster Management Section in NRCS

The Nepal Red Cross Society (NRCS) has been involved in disaster response since its inception in 1963. It represents as an ex-officio member in Central, Regional and District level Natural Disaster Relief Committees headed by Minister of Home Affairs, Regional Administrator and Chief District Officer respectively. The NRCS plays auxiliary role to the government of Nepal and it has been actively involved in formulating and implementing national level disaster management policies, strategies, plans and programs. In addition, it has been intensively involved in strengthening and institutionalizing Disaster Risk Reduction (DRR) activities in Nepal.

Besides its continued engagement in rendering response services, NRCS started disaster preparedness activities through strengthening and expanding network of warehouses in 1975. NRCS started Community Based Disaster Preparedness initiatives in 1997 and since then it has been implementing Community Based Disaster Risk Reduction programs aiming to contribute towards building resilient communities to be prepared for, cope with and respond to disasters.

Taken global, regional and national plans and priorities into consideration, the NRCS has developed its' five year development plan, DM policy, Disaster Management Strategic Framework for scaling-up its' Disaster Management initiatives throughout the country. The prevailing DM policy has clearly given mandate for NRCS in all components of the DM cycle particularly in i) Disaster Risk Reduction, ii) Disaster Response and iii) Post Disaster Recovery activities. The DM strategic mission of NRCS is to deliver quality services targeting to most vulnerable population and scale up its' interventions for building safer and more resilient communities by mobilizing its'

nationwide networks in partnership with communities and other stakeholders. The Disaster Management Strategic Framework (2010-2015) of NRCS covers four main strategic directions such as i) Disaster Management Planning, ii) Disaster Risk Reduction, iii) Response for natural Disasters and Population Movement and iv) Recovery for Natural Disasters and Population Movements and additional three enabling directions such as i) Organizational Preparedness, ii) Coordination and Partnership and iii) Advocacy.

The NRCS is the only organization that has its' own institutional set up such as National Headquarter at central level, Regional Coordination Committees in each of all five regions, District Chapters in each of all 75 districts and 1,339 Sub-chapters at Municipal/VDC levels. Besides, it has been managing 12 warehouses in different strategic locations in the country. It has trained human resources at the headquarters and district level in national, regional and global DM competencies such as Field Assessment and Coordination Team (FACT), Emergency Relief Unit (ERU), Regional Disaster Response Team (RDRT), National Disaster Response Team (NDRT), District Disaster Response Team (DDRT), First Aid, First Aid trainers, Search and Rescue (CADRE/LSAR), Dead Body Management, WASH, Shelter, PSP and RFL. The National Disaster Response Framework has given specific mandate to NRCS for responding to emergencies

The NRCS has been implementing Disaster Risk Reduction Programmes targeting to vulnerable communities. NRCS has also been actively engaged in the Nepal Risk Reduction Consortium as the member of steering committee and participating in different flagships as the member of advisory committees. In an average, NRCS provides relief services to 7,000 to 10,000 families affected by floods, landslides, fires, epidemics and earthquake in an annual basis. As and when needed, the NRCS provides sector specific relief services such as emergency health, WASH, Shelter etc in time of disaster. (For detail, [www.nrcs.org](http://www.nrcs.org)).

## Establishment of NSET and Implementation of KVERMP

Few key professionals who worked during the response after 1988 earthquake realized that there is tremendous lack of awareness among the common people and policy/decision makers about the earthquake risks of Nepal and the possible ways to mitigate it.

Also, there is significant gap in terms of preparation of knowledge about safer construction practices. They also realized that the huge tasks of awareness raising and technology promotion can not be done by government institutions only. Hence, the need of a civil society organization to support government in this direction was felt. With this realization, the group of professionals which included seismologists, university professors, civil engineers and journalists through a meeting held on June 18, 1993 founded National Society for Earthquake Technology-Nepal (NSET). The main purpose of establishing the organization was “to foster the advancement of science and practice of earthquake engineering and technology for mitigating the earthquake risk and increasing the seismic safety, to enhance professionalism, professional engineering and scientific ethics, and to further the objectives of the International Association for Earthquake Engineering as applicable to Nepal”.

Later in 1998, NSET formulated its vision, mission and strategic objectives to further act more effectively towards achieving the goal of the organization. NSET has vision to achieve “Earthquake Safe Communities in Nepal by 2020”.

NSET implemented its first and remarkable project Kathmandu Valley Earthquake Risk Management Project (KVERMP) during September 1997 - December 1999 in association with GeoHazards International

(GHI), as the Nepal national project of the Asian Urban Disaster Mitigation Program (AUDMP) implemented by the Asian Disaster Preparedness Centre (ADPC).

KVERMP included a wide variety of activities aimed at beginning a self-sustaining earthquake risk management program for Kathmandu Valley. Project components included:

- 1) development of an earthquake scenario and an action plan for earthquake risk management in the Kathmandu Valley,
- 2) a school earthquake safety program, and
- 3) awareness raising and institutional strengthening.

The project was implemented with strong participation by national government agencies, municipal governments, professional societies, academic institutions, schools, and international agencies present in Kathmandu Valley in advisory committees, various workshops, seminars, interviews and joint programs.

The major accomplishment of the project was development of an earthquake damage scenario and an action plan for reducing the seismic risk of the valley. The action plan was a consensus document depicting roles and responsibilities of all concerned institutions in managing the seismic risk of Kathmandu. School Earthquake Safety Program (SESP) was another major accomplishment. It established technical and social feasibility and also the affordability of seismic improvement of school buildings. SESP is now established as a widely accepted concept which not only helps build the school buildings stronger, but also serves as an awareness raising tool that ultimately makes the entire community safer against earthquake. Training of masons in earthquake safe construction and disseminating the earthquake safety information to children, teachers, parents and community

## Box 1.8: Earthquake scenario of Kathmandu Valley

A simple loss estimation study for Kathmandu Valley was conducted as part of the Kathmandu Valley Earthquake Risk Management Project (KVERMP). This loss estimation study examined what the consequences would be if the 1934 earthquake shaking were to occur in modern day Kathmandu Valley. The next earthquake to severely damage Kathmandu Valley will not have the same magnitude and location as the 1934 event. However, it is quite reasonable to assume that the next large earthquake to affect Kathmandu Valley will have approximately the same shaking pattern within the valley due to soft soil beneath the valley's surface.

Some results of KVERMP's loss estimation study are presented below to help clarify the extent of the problem that Kathmandu Valley faces. This loss estimation is not a forecast of what will happen in the future, and should be viewed only as a tool to help make decisions about reducing Kathmandu Valley's earthquake risk.

### The Loss Estimation

The loss estimation study indicates that massive damage can be expected to Kathmandu Valley's buildings, structures and population if the shaking of 1934 were to repeat.

### Damage to Buildings

A rough estimation of damage to buildings was conducted by KVERMP using information about typical construction types found in Kathmandu Valley which was collected and analyzed while developing the Nepalese building code. As many as 60 percent of all buildings in Kathmandu Valley are likely to be damaged heavily, many beyond repair. Bhaktapur, which suffered the worst damage in 1934, has historically suffered more than the rest of the valley in earthquakes, possibly because of its soil conditions. As many as 75 percent of all buildings in Bhaktapur are likely to be heavily damaged.

### Damage to Transportation Network

In addition to building damage, it is estimated that almost half of the bridges in the valley could be impassable, and that 10 percent of paved roads will have moderate damage, such as deep cracks or subsidence. In addition, many of the narrowest streets in the valley will be blocked by debris from damaged buildings. The city of Bhaktapur may not be accessible from Kathmandu or Lalitpur because of road and bridge damage. The bridges connecting Kathmandu and Lalitpur to each other

are also at risk of liquefaction induced damage. Tribhuvan International Airport is surrounded by liquefaction prone areas. This means that the airport may be isolated from the rest of Kathmandu Valley, limiting emergency aid from outside of the valley.

### Damage to Utilities

Approximately 95 percent of water pipes and 50 percent of other water system components (pumping stations, treatment plants, etc.) could be damaged seriously. Almost all telephone exchange buildings and 60 percent of telephone lines are likely to be damaged, requiring significant to moderate repair to be operational.

Approximately 40 percent of electric lines and all electric substations are likely to be damaged. It could take one month after an earthquake for electricity and telephone utilities to be operational. Water systems will require much more time to repair. It is estimated that most parts of the valley will be without piped water supply for several months and several areas could remain without service for over one year.

### Deaths, Injuries, and Homelessness

Death and injury expectations are similarly shocking. Simply applying the percentage of the population killed or injured in the 1934 earthquake to the population of the valley today results in an estimate of 22,000 deaths and 25,000 injuries requiring hospitalization. Applying more recent earthquake casualty figures from cities comparable to Kathmandu Valley results in an estimate of 40,000 deaths and 95,000 injuries in Kathmandu Valley's next major earthquake.

An additional 600,000 to 900,000 residents of Kathmandu Valley are expected to be left homeless by the earthquake due to damaged buildings or fear of being in their homes. The existing government medical facilities in Kathmandu have a total of about 2,200 beds, most of which are full under non-emergency conditions. An additional 3,500 patients could be accommodated on floors or outside space around hospitals. In California and Japan, earthquake shaking on MMI IX are generally believed to make at least 50 percent of hospital beds unusable, due to structural problems (building collapse) or non-structural problems (e.g. fallen bookshelves or loss of electrical power). There will be a major shortage of space for medical treatment in Kathmandu Valley.

Source: Earthquake Scenario of Kathmandu Valley, NSET 1999

at large are the strongest parts of SESP which is found as the start of a self replicating process. The KVERMP also helped institutionalise the seismic safety consideration with several policy shifts - at NSET's request, the government designated January 15 as the Earthquake Safety Day, in recognition of the occurrence of the last earthquake to strike the valley on January 15, 1934.

The KVERMP achievements provided enough motivation for the municipalities of Vyas, Dharan and Banepa to develop their worst case earthquake damage scenario which served as the basis for developing action plans for ERM and subsequent implementation.

### **Establishment of Disaster Preparedness Network-Nepal**

The need for establishing a network of organizations those working in aspects of disaster risk management was realized in 1996; and hence the organization was informally established in 1996 by a group of 13 non-government organization. Later, in March 1998, a charter for the establishment of Disaster Preparedness Network-Nepal (DPNet-Nepal) was prepared and in October 1998, 14 NGOs signed the charter formally establishing the organization.

Disaster Preparedness Network-Nepal (DPNet-Nepal) was envisioned as a loose association of individual organizations within the development sector in Nepal, which are concerned with disaster management.

Since, the formal establishment in 1998, it organized several networking, awareness and training events. During the course of time, sometimes it was very active and sometimes not very much.

Until 2007, DPNet-Nepal worked as a loose network of organizations. In 2007, it was formally registered with the Social Welfare

Council of the Government of Nepal as per the Organization Registration Act. There were 30 members of the network when it was formally registered with the SWC.

The network aims to assist individuals and organizations to prepare for, and respond to and manage disaster should it strike. DPNet-Nepal works closely with Government of Nepal through its agencies, which are concerned with disaster preparedness and management. It complements the effort of these agencies to inform and prepare organizations and communities to deal effectively with disasters. DPNet-Nepal is concerned with natural disasters such as earthquake, floods, droughts and landslide. It will also cover disasters such as epidemic, flood and fire that occur often in towns and villages.

DPNet-Nepal aims to assist and works closely with the Government institutions but as facilitator to Disaster Preparedness activities in Nepal. Thus, DPNet-Nepal allows and encourages promoting effective coordination and communication as well as developing knowledge management with its all stakeholders in Nepal.

Thus DPNet-Nepal has been instrumental in establishing strong linkages among the disaster related organization through networking approaches. It also has been contributing towards building of capacities of member organization through mutual assistance and learning organization of networking and sharing meetings, workshops, awareness-raising events, advocacy meetings and some key works that DPNet-Nepal has been doing.

### **Disaster Management Network Nepal (DiMaNN)**

The National Disaster Management Network Nepal (DiMaNN) is a network that consists of the organizations working

## Box 1.9: List of DPNep-Nepal Member Organizations

### Government

- 1 Armed Police Force Disaster Management Cell
- 2 Department of Hydrology and Meteorology
- 3 Department of Mines and Geology
- 4 Department of Soil Conservation and Water shade Management
- 5 Department of Water Induced Disaster Prevention
- 6 Ministry of Agriculture and Cooperatives
- 7 Ministry of Education/ Curriculum Dev. center
- 8 Ministry of Environment
- 9 Ministry of Science and Technology
- 10 Ministry of Health & population
- 11 Ministry of Home Affairs
- 12 Ministry of Local development
- 13 Ministry of Physical planning and works
- 14 Ministry of Water resources
- 15 Nepal Army Disaster Cell
- 16 Nepal Police(Operation section)
- 17 Department of Urban Development and Building Construction
- 18 Kathmandu Metropolitan City office
- 19 National Planning commission

### INGOs

- 1 Action Aid Nepal
- 2 ADRA Nepal
- 3 Care International Nepal
- 4 CARITAS Nepal
- 5 Mercy Corps
- 6 Oxfam GB Nepal
- 7 Practical Action Nepal
- 8 International Center for Integrated Mountain Development (ICIMOD)
- 9 Save the Children Alliance
- 10 South Asia Partnership Nepal (SAP Nepal)
- 11 Terre des Hommes
- 12 The Lutheran World Federation Nepal (LWF Nepal)
- 13 UN/OCHA
- 14 UNICEF
- 15 United Mission To Nepal
- 16 United Nation Development Programme
- 17 World Health Organization, Emergency and Humanitarian Action (WHO)
- 18 World Vision International Nepal
- 19 Handicap International
- 20 Center for International Studies and Cooperation

### NGOs (within Kathmandu Valley)

- 1 17 Ward DMC (Disaster management Committee)
- 2 Centre for Disaster Management Studies

- 3 Centre for Disaster Studies (IOE)
- 4 Centre for Environment and Disaster Management
- 5 Community Development forum
- 6 Department of Water Induced Disaster Prevention
- 7 DEPROSC- Nepal
- 8 ECO-Nepal
- 9 FOPAD
- 10 Kirtipur Volunteer Society
- 11 National Disaster Risk Reduction Center, Baneshwor
- 12 National Institution for Disaster Survivors
- 13 Natural Disaster Management Forum (NDMF)
- 14 Nepal Christian Relief Services
- 15 Nepal Geological Society
- 16 Nepal GIS Society
- 17 Nepal Landslide Society
- 18 Nepal Red Cross Society
- 19 Nepal Scouts National Headquarters
- 20 National Society for Earthquake Technology - Nepal (NSET)
- 21 School For Shelter and Environment
- 22 Friends Service Council Nepal (FSCN)
- 23 Trust Nepal
- 24 Food For Health
- 25 Focus Aid Nepal
- 26 Jagaran Media Nepal
- 27 RRN

### NGOs (outside Kathmandu Valley)

- 1 Disaster Management Federation Nepal Damak-10, jhapa
- 2 CDM-Nepal, Butwal-11
- 3 FAYA Nepal, Dhangadhi, FAYA Marg, kailali
- 4 Koshi victim Society, Rajbiraj, Saptari, Nepal
- 5 Ratauli Yuba Club, Janakpur-7, Zeromile
- 6 Rural Service Society, VDC Kabilasi-9 Gaira Bazar, Sarlahi
- 7 RWUA, Haripur, Sarlahi
- 8 Women and Children Development Forum (WCDF), Hetauda-4
- 9 Women, Children and Environmental Center, Hetauda-2
- 10 Sahmati, Nawalparasi
- 11 Social Service Center
- 12 OCCED
- 13 SOCOD Nepal, Lamjung
- 14 Nepal National Social Welfare Association
- 15 Nepal Environment and Education Development Society (NEEDS Kanchanpur)
- 16 Peacewin, Bajura
- 17 Janaki Mahila Jagaran
- 18 Bikalpa, Nawalparasi



in disaster management sector stationed in various geographical areas to mobilize local, natural and human resources working as an agent of social change.

DiMaNN has network members in twenty two districts of Nepal. The Network works in a grass root level and this has given a chance of deeper understanding of the people's concern of disaster issues and its interconnections with cross cutting issues with different developing activities like education, health and sanitation, drinking water, etc. An effective organization of program with good impact is possible through this network for the community people. Therefore, it is very much necessary to sensitize & aware concerned stakeholders, people in disaster issues, & the capacity building of NGOs, CBOs, advocacy, lobbying, for influencing policies at national level. DiMaNN has been envisioned to contribute on that cause.

### **National Network of Community Disaster Management Committee (N-NCDMC)**

National Network of Community Disaster Management Committee (N-NCDMC) is a community led loose network organized to establish the right of disaster affected people and to build the risk resilient communities through awareness, capacity building and policy advocacy ensuring participation in both government and private agency's planning and implementation. People from highly vulnerable and/or affected communities to different natural hazards have organized themselves in Committees that work together to reduce the risk in their communities.

### **Nepal Geological Society (NGS)**

Nepal Geological Society (NGS) was formally established in 1980 with the objectives to develop and promote the

research and application of geological sciences to the national development, foster high professional standard among its members, and promote and protect the professional interests of earth scientists of the country and also to be active in protection and conservation of environment and in reduction of natural disaster. Presently, the Society has over 440 members encompassing almost all the geoscientists of Nepal as well as many geoscientists of other countries who are actively engaged or interested in the geological research of Himalaya-Tibet region. In this regard the Nepal Geological Society is more than just a national society. It has over one third of its members from this region and overseas.

The society is also gradually fulfilling a role of a regional geoscientific organization. It is hoped that the Society may be able to help develop a better networking of the scientists of this region and overseas and foster an atmosphere for a more effective regional and international scientific cooperation in the field of researches in the Himalayan earth sciences.

### **Nepal Landslide Society (NELS)**

Nepal Landslide Society (NELS) is a national non-governmental and non-profit professional scientific organization. Nepal Landslide Society (NELS) aims at contributing to the reduction of loss of life and property due to landslides, glacial lake outburst flood (GLOFs), erosion, floods and so on through study and research on related science and technology to mitigate and prevent such disasters. NELS intends to undertake measures to raise awareness through related institutions, enhance professional and scientific qualities of experts and organizations working in this field, and to help landslide-affected communities with rescue and relief work. Nepal Landslide Society provides access to elements that are

essential to the professional growth of scientists at all levels of expertise and from all sectors: academic, government, business, and industry. It has a common purpose to study the mysteries of our planet and share scientific findings related with natural disaster. Its main activities include fostering the human quest for understanding landslides and related phenomena through research and study, catalyzing new scientific ways of thinking about natural disasters, and also applying knowledge and insight to human needs and aspirations and stewardship of the countermeasures against such disasters.

### **The Society of Hydrologists and Meteorologists - Nepal (SOHAM-Nepal)**

The Society of Hydrologist and Meteorologist-Nepal (SOHAM-Nepal) is solely an autonomous professional organization of Hydrologist and Meteorologist in Nepal. SOHAM-Nepal came into existence on 23rd March 2001 on the auspicious occasion of the World Meteorological Day under the name of “Nepal Association of Hydrologist and Meteorologist” (NAHAM). An ad-hoc committee under the chairmanship of Prof Suresh Raj Chalise was formed. On 13th December, 2001, NAHAM was renamed as SOHAM-Nepal by a meeting including several distinguished Hydrologists and Meteorologists from various organizations of the country.

Main objectives of SOHAM are to Promote studies and researches in the field of hydrology and meteorology in Nepal; help academic and professional upliftment of Nepalese hydrologists and meteorologists and protect their rights; establish contacts with concerned national and international organizations towards development of mutual benefit; develop involvement of national professionals related to hydrology

and meteorology towards overall development of the country; promote contacts, solidarity and professional ethics among hydrologists and meteorologists; and conduct research independently or in collaboration with national and international institutions, publish materials related to this, as well as conduct consultancy services.

SOHAM-Nepal has been serving the nation since its establishment through its member’s expertise, ideas and efforts in various relevant issues like climate change, global warming, snow/glacier, water resources etc. At present, more than 145 professionals have been associated with SOHAM-Nepal. The general assembly is the highest body of the society for preparing its rules and regulation. Apart from this, an executive committee is also formed to run the society through general election. Initially, the period of executive committee was for two years but it was changed to three years since fourth executive committee. The society publishes Journal of Hydrology and Meteorology SOHAM (For detail: [www.soham.org.np](http://www.soham.org.np)).

### **Nepal GIS Society**

Nepal GIS Society (NEGISS) is a non-profit forum of GIS professionals and users in Nepal registered under the Government of Nepal on July 22, 1995. The inception of the Society is attributed to the felt need of GIS professionals for a common forum for advancing the use and application of GIS technologies in Nepal and for sharing professional experiences in addition to dedicating to larger mandate of engaging on advocacy for optimized management of spatial data resources among others.

Nepal GIS Society is formed with a clear objective of furthering the use and application of GIS and spatial data analysis technologies in the country as an aid to ensuring sustainable human development and mobilization of our resource bases.

GIS technologies offers great functionalities for processing spatial information and deriving knowledge that is more holistic. The fact remains however that Nepal is still at formative stage in terms of using GIS technologies to solve developmental challenges and linking the resourcefulness obtainable through judicious application of GIS to strategies implemented to solve socio-economic problems faced by the country. A mechanism facilitation networking among GIS user and professional seemed to hold a lot of potential to create synergies in GIS arena in the country.

In addition to this, Nepal GIS Society also assume advocacy roles putting forth the need to avoid duplication of effort, developing standards and ensuring commitment for data sharing and tailoring GIS applications to meet local level development challenges.

### **Center for Disaster Studies**

The Centre for Disaster Studies was established in 2003 AD in the Institute of Engineering (IoE). The centre has an objective of working for management of disaster in the country. It is trying to do this by offering short term courses, carrying out research and consultancy works in the beginning. This center is now supporting and assisting Master's degree course in Disaster Risk Management in the IoE.

### **Association of International NGOs**

The Association of International NGOs (AIN), formed by INGOs working in Nepal in September 1996, is an important actor in the development sector of Nepal as it has been implementing various people-centered development programmes throughout the hills, mountains and Tarai areas. Recognizing the growing need to work in a country prone to Natural Disaster and several emergency situation, AIN is committed to expand its

resources on behalf of all disadvantaged people in Nepal, especially those vulnerable to Natural Disaster and continues to engage with the Government, donors, various sectors of the civil society, NGOs and poor and excluded people on these issues.

AIN Task Group on Disaster Management (AIN-TGDM) is a working group focusing on Emergency and Disaster Management. Formed in 2002, as an integral part of AIN Knowledge Management matrix AIN-TGDM has been continuously updating and sharing the issues and updates within its member organizations and has been taking responsibility to develop understanding on conceptual and operational aspects of emergency and disaster issues in Nepal.

### **DIPECHO Projects in Nepal**

In recognition of Nepal's need to tackle the problem of disaster risks and mitigate their impacts on people's lives and livelihoods, the European Commission began to provide financial assistance to Nepal when it released its First DRR Action Plan in 2003. On 15 June 2009, DIPECHO launched its Fifth Action Plan, which emphasizes the need for initiating a wide array of community-based disaster preparedness and DRR interventions, including developing a disaster management and risk reduction legal framework, implementing disaster education, constructing small-scale mitigative infrastructures, coordinating among agencies, conducting research, developing early warning systems, and building capacity. The projects under DIPECHO's Fifth Action Plan involve eight partners, cover 18 districts, and ran to December 2010.

Key Interventions were Awareness Raising; Capacity building & Preparedness (Trainings – Search & Rescue, Basic First Aid, PVA, CBDM, etc, Assistive Devices provision/preposition, Community based Early Warning Systems, Disaster preparedness

plan/Community & VDC action plans, Simulation/mock drills, LSAR Equipments, First Aid kits, Exchange visits); Institutional linkages and advocacy; Small Scale Mitigation; and Coordination, joint collaboration, sharing lessons. The main focus was on promoting replicable community centric initiatives to enhance risk resilience that include establishing community based early warning systems, awareness generation, capacity building, skill development, leadership, institutional strengthening, people led advocacy, life skill training, small scale mitigation and localized material support to help people help themselves.

DIPECHO has built awareness, trained volunteer base as well as improved structural safety through retrofitting. These schools are now acting as models for efficient safety measures. Numerous schools have been covered across various districts. Thousands of students are oriented on earthquake safety.

Mock drills were conducted, a practice still being continued in many of the schools.

Risk profiling exercises were conducted through participatory methods like Hazard Vulnerability Capacity Assessment (HVCA), Participatory Vulnerability Capacity

Assessment (PVCA), Participatory Vulnerability Assessment (PVA) etc. in all project locations. Contingency plans and DRR plans developed in many districts. Such positive initiatives validate increasing demands for institutionalization of DRR within development plans. The National Strategy for Disaster Risk Management was supported under DIPECHO IV. The School curriculum to include DRR into national curricula was initiated under DIPECHO III. DIPECHO also provided strategic support to DPNep-Nepal under DIPECHO III and IV and also to initiatives that have national relevance and impact.

### Developing DRR Terminologies in Nepali

The process of defining and redefining accurate and pervasive meaning of disaster related Nepali words & phrases etymologically as well as based on contextual & transformational dynamics and also adopting newer concepts and terminologies from Global arena helps enrich disaster vocabulary and consequently enhances the level of awareness and understanding as well. National Society for Earthquake Technology – Nepal (NSET) has been engaged in developing and adapting Disaster

#### Box 1.10: Disaster related Keywords interpreted, developed and adapted by Dhulikhel Workshop 2008

क्र.सं	अंग्रेजी शब्द	प्राविधिक शब्द/निकर्चौल गारिष्का नेपाली शब्द	क्र.सं	अंग्रेजी शब्द	प्राविधिक शब्द निकर्चौल गारिष्का नेपाली शब्द
१	Hazard	प्रकोप	११	Relief	राहत
२	Disaster	विपद्	१२	Fore Shocks/Pre-shocks	पूर्वकम्प
३	Risk	जोखिम	१३	After shocks	परकम्प
४	Vulnerability	संकटासन्नता	१४	Retrofitting	प्रबलीकरण
५	Exposure	सम्मुखता	१५	Reinforcing	सबलीकरण
६	Capacity	क्षमता	१६	Mitigation	अल्पीकरण
७	Resilience	उत्थानशीलता	१७	Reduction	न्यूनिकरण
८	Resistant	प्रतिरोधी	१८	Earthquake "Go Bag"	भुईँचालो "ठटपट भोला"
९	Recovery	पुनर्लाभ	१९	Shaking Table	कम्पन मञ्च
१०	Response	प्रतिकार्य	२०	Duck, Cover and Hold	घुँडा टेकी गुँडुल्की, ओत लागी समात

related concepts and terminologies in Nepali language with the view to standardize & enrich Nepali vocabulary and also enhance common understanding on those amongst Nepali communities.

Initially, during 2002-2004, NSET carried out extensive work on gathering and compiling Disaster Vocabulary comprising numerous Nepali words in use in the areas of Hazards, Disasters and Risk Reduction and also acquiring certain words from different languages with an idea to assimilate those with Nepali linguistics. The conceptual construct was initiated and raised with the NSET in-house efforts and continued with the WSSI fellowship. Well known consultants from Nepali linguistic fields Mr. Madan Mani Dixit and Dr. Devi Prasad Subedi worked in this endeavor and come up with almost finalised form. The draft has been reviewed several times by senior experts and professionals from different layers of core as well as peripheral linkages. It has been developed only in soft copy and final prints could be made possible with couple of consultative meetings/ workshops and peer review processes.

As there was felt an acute need of transforming contemporary global concepts & terminologies in DRR to integrate and fit into Nepali wisdom and practices, NSET in association with Ministry of Home Affairs and with the support from ActionAid Nepal organized a two-day residential workshop of well known Linguists, Litterateurs, Media-persons and government & non-government professionals in DRR fields in Dhulikhel, Kavre during January 18-20, 2008. The workshop was organized as an additional event within Earthquake Safety Day celebration with the view to "Developing Consensus on Selection/Etymology of Nepali Words Pertaining to Disaster Risk Management". It was the first multi-stakeholders' activity of this kind held in Nepal that worked out intensively to clarify

the concepts and build consensus on the Etymology of Nepali words pertaining to Disaster Risk Reduction. The uniformity & standardization in use of disaster terminologies in Nepali language has been enhanced referring the outcomes of the workshop. National Strategy for Disaster Risk Management in Nepal which has been endorsed by Government of Nepal in 2009 stresses in use of common DRR terminologies including those evolved or adapted by Dhulikhel Workshop.

### Sensitizing Constituent Assembly Members on DRR

Nepal is one of the acknowledged 'global hotspots' for disasters. The increasing frequency and intensity of disasters have been adversely affecting this Himalayan country. Whereas there has been increasing efforts to address disasters through appropriate mechanisms, including adoption of National Strategy for Disaster Risk Management (Oct, 2009), there is also a growing concern that there is a need to further strengthen the DRR framework in Nepal, so as to insure the development investments and arrest erosion of social, economic and environmental assets due to a variety of disasters that pose danger to the lives and livelihood of the people.



Figure 1.6: Constituent Assembly Members at the sensitization workshop

One of the key measures identified by DRR stakeholders in the country is to inform the policy makers of the country. Thus, through a path breaking initiative, key DRR stakeholders including Ministry of Home Affairs, partners of the DIPECHO program under European Commission Humanitarian Aid department, United Nations Development Program in Nepal, Oxfam GB, Association of International NGOs, DPNet-Nepal, Nepal Red Cross and NSET decided to join hands together to design, develop and distribute 'Disaster Risk Reduction Tool Kit' to inform and sensitize the constituent assembly members on disasters, risks and need for increasing

attention and framework to address disaster risks. Through a consultative process, the Disaster Risk Reduction Tool Kit was developed which is a professionally designed information pack on disaster risk reduction, specially designed to inform constituent assembly members on DRR, sensitize the policy makers on disaster issues and solicit their informed involvement and leadership to strengthen DRR framework in Nepal. The Tool Kit comprises of overview of disasters in Nepal, NSDRM, existing legislation on disaster management, HFA, need for strengthening DRR framework through an inclusive approach addressing special needs of differentially vulnerable

### Box 1.11: Addressing Disaster in Periodic Plans

Disaster Management Programs was first included in the 10th national plan (2002-2007) of the government of Nepal. Chapter 17 emphasized on the irrigation and water induced disaster control, whereas chapter 22 deals on population, environment and natural and human induced disaster management. Both chapters reiterate the priority on policy formulation, strengthening institutional mechanism, risk assessment, information collection and dissemination regarding the disaster management. Both chapters also emphasized on the low costs disaster resilience construction practices.

Similarly, the Three Year Interim Plan (2007/08-2009/10) devoted separate chapter (chapter 26) on natural disaster management. The interim plan emphasizes on policy formulation, strengthening institutional mechanism, EWS, coordinated approach for DRR and linking disaster management with climate change. It is hoped that this attempt would be a landmark in the history of Disaster Management.

The plan has set up its vision to minimize social and economic loss and damage caused by disasters. The main objective of plan is to promote the security of life and property from the impact of natural disasters through sustainable, environment-friendly and result oriented development by making disaster management

practices efficient, competent, strengthened and effective.

Develop and apply environment-friendly systems in development and construction works, appropriate information flow and pre-disaster preparedness for the mitigation of risks of natural disaster, strengthen collaborative works between the government, non government and private

sector for rapid response and recovery are the major strategies of the plan. The plan has listed the programs of formulation of national strategy, awareness raising, preparedness for effective response and recovery, study and research, risk and hazard zone mapping, stockpiling of relief and rescue materials, and enhancement of involvement of local bodies.

Current 12th three year development plan (2010/11-2012/13) has also devoted separate chapter for disaster management issues. This plan addressed disaster management issues more comprehensively. 12th three year development plan set its disaster management goal to achieve goal of Hyogo Framework for Action by 2015. Long term goal of the plan is to develop disaster resilient Nepal. Moreover, mainstreaming disaster risk reduction, institutional and legal reform and preparedness for better response are the strategies of this plan.

people, disaster map of Nepal, disaster fact sheet and proposed flood early warning strategy as a key DRR measure for Nepal.

DRR Partners in Nepal conducted series of Workshops to sensitize Constituent Assembly (CA) Members on DRR in 2010. The program was organized jointly by Humanitarian Aid Department of European Commission, Australian Government-AusAID, ActionAid and Co-Action Nepal in association with Oxfam, DPNet-Nepal and Eco-Nepal. Such an initiative has been believed to produce and propagate substantial dynamism in accelerating national level policy formulation processes and developing effective plans and programs at various levels. Participating CA Members were found highly concerned over issues of disaster risks and their management.

### **Mainstreaming DRR in Nepal's Education System**

Disasters can be reduced substantially if people are well informed about measures they can take to reduce vulnerability - and if they are motivated to act. ActionAid Nepal paid efforts to mainstream DRR education in school curriculum as part of project which ran from October 2006 to February 2010. The Disaster Risk Reduction through School (DRRS) project aimed to provide relevant information on disaster risks and means of protection in formal, non-formal and informal education and training activities. There was no holistic book that could be used to teach students about DRR in the classroom. There were very limited resources available. After this intervention, Curriculum Development Center of Nepal Government revised three compulsory subjects - social studies, science and health, population and environment - for grade nine and ten, rewriting the textbooks to integrate DRR education. Also process of developing teacher's guide and training teachers have been initiated. Positive results have seen

students learning about causes and effects of disasters, disseminating the knowledge among their community, and exploring local solutions to disasters. (Jnavaly S., 2010)

### **Study on Strengthening Legal Preparedness for International Disaster Response**

It is a common practice nowadays that countries suffering from large-scale disasters receive international support for disaster response. Nepal has also been getting supports from neighbouring countries and other international organizations during major disaster events. However, receiving and managing the international assistances are complex and challenging.

There are numbers of relevant provisions contained in different national laws, however, they are not specifically targeted towards receiving international assistance in care of a large disaster. Instead, ad-hoc decision are made during the need to provide legal ground for receiving such international assistance. Therefore, a need was felt to dense required legal basis for receiving and managing international assistance during large disasters. In this view, Nepal Red Cross Society (NRCS) conducted a study on strengthening legal preparedness within the scope of International Disaster Response Law (IDRL) in Nepal. The study reviewed existing legal provisions and made recommendations on improving/ strengthening it. In 2007, the International Federation of Red Cross and Red Crescent Societies (IFRC) developed the IDRL guidelines (Guidelines for the Domestic Facilitation and Regulation of International Disaster Relief and Initial Recovery Assistances). The IDRL guidelines are a set of recommendations to governments on how to prepare their disaster response laws and plans for the common regulating problems in international disaster relief operations. The study was primarily based on the IDRL guidelines.

## Box 1.12: Findings and Recommendations of IDRL Study

### Key Findings

- There are currently strong legal mechanisms for controlling corruption, fraud and unlawful diversion of international relief and initial recovery assistance.
- Information sharing mechanisms for early warning within the country and between neighboring countries are yet to be properly established.
- Improving the access to the sea and ensuring cooperation with transit states is essential for Nepal, a country which is landlocked and disaster prone.
- The roles of domestic actors need further clarification, and attention needs to be paid to increase their capacity and resources in order to meet their mandates.
- The existing legal provisions for obtaining temporary legal status, obtaining working visas, recognizing professional qualifications, importing telecommunication equipment and medicines are too time-consuming for the disaster context.
- While the Government of Nepal is seen as being liberal in the implementation of current laws in the disaster context, no mechanism has been established so far to ensure the speedy registration of assisting humanitarian organizations and the coordinated provision of legal facilities.

### Core Recommendations

- Define conditions and procedures for appealing for and accepting international assistance;
- Include minimum standards for the delivery of relief and recovery assistance based on international codes of conduct and standards;
- Contain provisions on early warning as an important component of disaster risk reduction. Reference may also be made to bilateral sharing of information with neighboring countries and regional arrangements through the SAARC;
- Describe conditions and procedures for terminating international assistance.
- Clearly describe the roles and responsibilities of domestic actors in disaster response, ensuring that such duties are commensurate with their authority and resources;
- Establish mechanisms for cooperation between assisting actors and government authorities (to be developed in consultation with humanitarian actors);
- Establish a fast track system for the registration of humanitarian organizations that addresses visa arrangements, recognition of professional qualifications, provision of temporary legal status and the importation of relief and early recovery goods (the provision of such facilities should be conditional upon organizations meeting certain eligibility requirements based on paragraph 4 of the IDRL Guidelines and, where possible, the registration of these organizations should be made in advance of a disaster);
- Provide for permission to be granted quickly for transportation, exemption of taxes, authorization of the use of telecommunication equipment and radio frequencies, and the lifting of restrictions on the importation of relief and recovery related goods and equipment;
- Establish minimum standards for relief goods and their packaging, as well as methods for the disposal of unused or unwanted goods.

## Summary

The past three decades have witnessed tremendous amount of policy level interventions, inclusion of DRR in national level plans, programs and several cases and examples of disaster risk reduction and preparedness efforts. The general awareness of people of the communities, and professionals at policy and decision making level has significantly increased. Capacities

to plan and implement mitigation and preparedness actions have been improved. In summary, the environment has become more conducive for taking the concepts of disaster risk reduction to a new height with more focused and widened scope of works. The current need is to make the legal environment better by promulgating the new act as envisioned in the NSDRM which will pave a new national highway for mainstreaming DRM in Nepal.



## Timeline: Disaster Risk Management in Nepal

1970s and early 1980s	Realization of need for systematic disaster management during the disaster events such as Landslides and several other disasters of 1970s, Bajhang Earthquake, 1980
1982	Promulgation of Natural Calamity (Relief) Act 1982 (NCRA)
1984	UNDP study about threats of disaster and the need for foreign assistance conducted
1987	Establishment of Special Disaster Unit (SDU) in Ministry of Home Affairs
1988	<b>Udayapur Earthquake of magnitude 6.5</b>
1989-1992	Institutional Support to Disaster Preparedness and Relief begun
	NCRA 1982 amended
1990-1993	Policy and Technical Support to Urban Sector (PTSUS- UNDP/UNCHS Project NEP/88/054) initiated
1990	Formation of IDNDR National Committee
	Formation of NGS-IDNDR Council
	Strategy for Training on Disaster Management prepared
1991	Beginning of IDNDR Day Celebration in Nepal
	Comprehensive Disaster Management Plan Prepared
	Establishment of Disaster Prevention Technical Center (DPTC) in Nepal
1992	Second amendment of NCRA (1982) ratified
	Nepal signed the UNFCCC treaty during the Earth Summit at Rio
1993	Training of government officers by the government in collaboration with UNDP/DHA held
	First World Seismic Safety Initiative (WSSI) Workshop held in Bangkok
	<b>Flood of South Central Nepal</b>
	Three sectoral working groups (Health, Logistics, and Food & Agriculture) established for the response of 1993 flood
1993/94	Training on disaster management conducted by USAID and ADPC, Bangkok organized at the request of MoHA
1994	Formulation of Nepal National Building Code
	Formulation on National Action Plan on Disaster Management
	Establishment of NSET I for supporting government in reducing earthquake risk in Nepal.
1996	National Action Plan on Disaster Management endorsed by government
	Disaster Management section was setup at Nepal Red Cross Society (NRCS)
	Establishment of Disaster Preparedness Network-Nepal (DPNet-Nepal) for supporting coordination between government and non-government sectors
	Disaster Management Capacity Building Program of UNDP initiated

Government Initiative
  Initiative by Civil Society
  Global Initiative
  Disaster Event

1997	Kathmandu Valley Earthquake Risk Management Project (KVERMP) launched as national project under the Asian Urban Disaster Mitigation Program of Asian Disaster Preparedness Center
1998	Government of Nepal declared Magh 2 (15 or 16 January) as National Earthquake Safety Day (ESD)
	Building Act adopted by the Parliament
	Kathmandu Valley Earthquake Risk Management Action Plan was finalized
	Disaster Management Section in Kathmandu Metropolitan Office was set up
1999	First Earthquake Safety Day (ESD) celebrated
	Prime Minister released the Kathmandu Valley Earthquake Scenario and Risk Management Action Plan
	Local Self Governance Act promulgated
2000	Department of Water Induced Disaster Prevention (DWIDP) established
	Kathmandu Valley Earthquake Risk Management Action Plan Implementation Project started
2001	First DIPECHO project launched in Nepal
	Department of Narcotics Control and Disaster Management established
2002	Emergency Preparedness and Disaster Response Plan for the Health Sector drafted
	Study on Earthquake Disaster Mitigation in the Kathmandu Valley (SEDM), carried out in cooperation with the Japan International Cooperation Agency (JICA)
	First ever mass casualty drill was organized involving the emergency rescue responders and hospitals
	Seismic vulnerability assessment of 14 hospitals undertaken with Ministry of Health and WHO
	Asian Seismological Commission 2002 held in Kathmandu
2003	Disaster Impact Assessment (DIA) of development projects made mandatory in the Tenth National Plan
	GON decides mandatory implementation of Building Code
	Lalitpur Sub Metropolitan City started mandatory implementation of Nepal National Building Code (first municipality to initiate the process)
	Pre-Positioned Emergency Rescue Stores (PPERS) established in eight communities in Kathmandu Valley and the local volunteers were trained
	DesInventar system introduced in Nepal with assistance of UNDP/BCPR, inventory of natural disasters of the country for the last 33 years (1971-2003) prepared and analyzed
	RADIUS established in Kathmandu Metropolitan City as a planning tool in cooperation with UNESCO

Government Initiative
  Initiative by Civil Society
  Global Initiative
  Disaster Event

2004	NSET received Tech Museum Award in Microsoft Education category for the innovative Shake Table Technology
	Kathmandu Valley Earthquake Preparedness Initiative (KVEPI) started jointly by American Red Cross, Nepal Red Cross Society and NSET as a preparedness and capacity building program in 10 locations of Kathmandu Valley under OFDA support
2005	Nepal Participated in the World Conference on DR (WCDR-Hyogo Conference) held in Kobe, Japan
	Second Core Member Meeting (CMM II) on “International Framework for Development of Disaster Reduction Technology List on Implementation Strategies - Disaster Reduction Hyperbase” for Asia-Pacific Region was organized in Nepal
	First Asian Ministerial Conference on Disaster Risk Reduction, organized by Government of China in Beijing, China
2006	Community Based Disaster Management Program (CBDMP) initiated
	Curriculum Development Center (CDC) started integrating disaster issues in school curricula
2007	Drafts of acts, policies and strategies on disaster management in Nepal prepared
	MoHA promulgated Relief Standard for disaster affected people
	Global Platform for Disaster Risk Reduction established in Geneva, Switzerland
	Disaster Risk Reduction at the National Level in Nepal (DRRNLN-II) implemented by UNDP
2008	National Platform for Disaster Risk Reduction (NPDRR) established
	Cluster Approach first endorsed and adopted by IASC in Nepal
	<b>Koshi Flood Disaster</b>
2009	National Strategy for Disaster Risk Management endorsed by GON
	Nepal Risk Reduction Consortium Launched
	<b>Jajarkot Diarrhea Outbreak</b>
2010	National Emergency Operation Center (NEOC) established at the national level
	The Making Cities Resilient: 'My City is getting ready!' campaign, launched in May 2010 by UNISDR – Nepal is one of the signatory country

Government Initiative
  Initiative by Civil Society
  Global Initiative
  Disaster Event

“One of the lessons learnt from the tsunami is that thousands of lives and billions of dollars could have been saved had adequate disaster reduction strategies been in place.... I urge all stakeholders to implement the Hyogo Framework for Action, and to do it now now”

Bill Clinton, Special Envoy for Tsunami recovery, 2005



सुरक्षित गडि शहरको लागि एकताबद्ध रही  
**ISDR DAY - 2010**  
**SUNDARIJAL OPEN SCOUT CREW**  
 13<sup>th</sup> October, 2010  
 -Event Coordination by-

MAKING CITIES RESILIENT: MY CITY IS GETTING READY  
**ISDR DAY - 2010**  
**Solidarity for safer Cities: Safer Schools and Hospitals**  
**MADAN BHANDARI MEMORIAL SCHOOL**  
 13<sup>th</sup> October, 2010

**अन्तर्राष्ट्रिय प्रकोप जोखिम न्यूनीकरण दिवस - २०१०**

Event Coordination by:

In Collaboration with:

Celebrating ISDR day 2010, Kathmandu  
 Photo Courtesy: DPNet-Nepal

# CHAPTER 2: DISASTER DATA ANALYSIS FOR 2010



Landslide on the only road to several districts of Far Western Nepal  
Photo Courtesy: [nyayahealth.wordpress.com](http://nyayahealth.wordpress.com)

## Disaster Data Analysis for 2010

### Disasters in Year 2010

In general, according to DesInventar data, the most common type of disaster in the country is epidemic, followed by landslides and flooding (Table 2.1). The greatest loss of life is due to epidemics in last four decades (1971-2010). During this period, more than 30,000 people lost their lives by all hazards. In terms of loss in housing, about 400 thousand houses were either destroyed or damaged. The trend of disaster types also suggests the increasing ratio of hazard events as well as their impacts. The recent decades have higher ratio of disaster impact in terms of loss of lives and building damage.

In the similar way for the year of 2010, DesInventar Database of Nepal has recorded a total of 1,551 data cards i.e. number of disaster events occurred within the country. During this period, 834 deaths, 473 injuries, 143,000 affected (Table 2.2) population were recorded. This figure shows

average 2.3 deaths per day for 2010, whereas economic loss due to these events caused 10,735.7 million Nepalese Rupees (NRs). Notable is the fact that about 47 percent of deaths were caused by human induced (other category) events (i.e. accident, boat capsized, biological, others etc.) whereas 19 per cent by weather related events, 16 percent by epidemiological events, 8 per cent by landslides, and 3 percent by floods (Figure 2.1). The Figure 2.1 also shows that fire is most frequently occurring disaster event which account for 25 per cent of data cards disaster occurrence, followed by floods (12 percent) and epidemics (8 percent).

The loss due to several hazard types varies differently. Hydro-meteorological and epidemics caused the highest deaths in the country for the year of 2010. In terms of affected population, flood is the highly extensive event affecting about 100 thousand people.

Table 2.1: The most lethal hazard types and their impact in Nepal 1971-2010.

S.N.	Hazard Type	Number of records/events	Number of deaths	Number of injury	Affected population	Destroyed Houses	Damaged Houses
1	Epidemics	3413	16521	43076	512967	-	-
2	Landslide	2705	4327	1446	555607	18249	13690
3	Flood	3377	3899	461	3665104	93807	86504
4	Fire	4936	1293	1097	252074	70118	1832
5	Thunderstorm	1034	986	1810	6668	320	368
6	Accident	1000	969	359	2137	5	415
7	Earthquake	95	873	6840	4539	33708	55312
8	Cold wave	320	442	83	2393	-	-
9	Structural Collapse	389	404	596	2016	1170	623
10	Boat Capsize	135	269	124	410	-	-
11	Other events	2651	999	1335	928331	4985	9738
	<b>Total</b>	<b>20055</b>	<b>30982</b>	<b>57227</b>	<b>5932246</b>	<b>222362</b>	<b>168482</b>

Source: DesInventar, 2011

Table 2.2: Loss of human lives and property due to disasters in 2010, Nepal.

Hazard Types	No. of records/ events	Impact on Human Lives				Loss of Building	
		Deaths	Injuries	Missing	Affected	Destroyed	Damaged
Flood	191	27	1	23	99,526	1,611	6,093
Landslide	148	67	52	21	17,832	396	255
Fire/ forest fires	378	61	65	-	10,773	2,131	90
Epidemics	128	130	3	-	2,202	-	-
Other Hydro-meteorological	267	161	200	5	10,675	89	1,657
Other	439	391	152	97	2,017	32	358
<b>Total</b>	<b>1,551</b>	<b>837</b>	<b>473</b>	<b>146</b>	<b>143,025</b>	<b>4,259</b>	<b>8,453</b>

Source: DesInventar, 2011

## Disaster Occurrences in 2010

Table 2.1 shows that fire, landslide, flood and epidemics are the most frequently occurring hazard types in Nepal for the last four decades. For year 2010, fire is the most extensively occurring hazard followed by hydro-meteorological events. Still floods and landslides are highly occurring hazards. These number of records of hazards represent the

extensiveness (covering larger areas) of the hazard type throughout the country. This extensiveness of the hazard types can also be associated with the impact on agriculture, health, livelihoods etc.

During the past decades, in general the trend of disaster events has a significant increase, especially in recent decades, the number of disaster events has significantly

### Box 2.1: Major Disasters in the Year 2010

#### Flood/Landslides

As in the previous year flood and landslides triggered by heavy rainfall wrought havoc in various parts of the country as well displaced hundreds of families.

Incessant monsoon rains have resulted in flash floods, inundation and landslides in 43 districts across the country. All five regions of Nepal were affected by the floods and landslides, according to the Ministry of Home Affairs (MoHA). In the Eastern Region, Sankhuwasabha, Udayapur, Taplegunj, Ilam, Jhapa, Morang, Sunsari, Saptari districts were affected, whereas in the Central Terai Sindhuli, Dolakha, Dhading, Dhanusa, Sarlahi, Chitwan, Makawanpur, Rautahat, Parsa were most affected. Likewise, in Western Region, Syangja, Kaski, Tanahu, Baglung, Myagdi, Parbat, Gulmi, Nawalparasi were affected and in Mid-West region, Rukum, Dang, Pyuthan, Bardiya, Banke, Jajarkot, Dailekh, Kalikot, Dolpa and in the Far-

West Region, Bajura, Achham, Kailali, Kanchanpur, Daddeldhura were most affected by floods and landslides.

(Nepal Floods and Landslides Situation Report, Issue No. 02, 06 September 2010)

#### Floods

More than 70 families had been displaced due to floods in several parts of the Jhapa district in June 2010. Areas including Duwagadhi, Mechinagar, Dhajjan, Jyamirgadi, Goldhap and Chandragadi in the eastern part of the district have been the hardest hit. Floods had also affected Baigundhura and Topgachhi in the west. Thirty eight families have been displaced and another 243 affected ward number 1,2,3,4 and 5 of Duwagadi VDC alone due to floods in Hadiya and Fulbasa rivers. The displaced families were sheltered at Shanti Primary School and Puhantu Janajyoti Secondary School. They had been provided with food and clothes by neighbours. Most of the displaced families are either Santhal or Rajbanshi. Likewise, 33 families had been displaced from Chandragadi-3 and 4 after the swollen Hadiya river entered human settlements. The



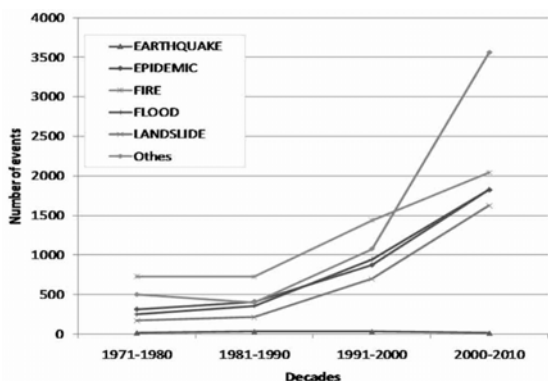


Figure 2.1: Trend of hazard occurrence in past decades in Nepal, 1971-2010.

Source: DesInventar, 2011

increased and the impact on people and property as well. The reason behind this can be associated with the improved mechanism of reporting of disasters and the increased awareness in disaster reporting of media.

### Loss of Life Due to Disasters

Deaths, injuries and affected population are the commonly accepted and highly important indicators of the direct impact

displaced had been kept at Pashupati Secondary School. Similarly, 55 huts inside Goldhap Regugee Camp had been inundated by water from Deunia river. Armed police force and Nepal Police had been mobilised for rescue in the camp. A few families in Mechinagar and Jyamirgadi had also been displaced by the swollen Ninda river while most of the schools in Mechinagar remained closed. Several bighas of land in Topgachhi-7, 8 and 9 and a few

of natural disasters. During the year 2010, disaster events caused 837 deaths, 473 injuries and 143 thousand population affected throughout the country. These were caused due to floods, landslides, fires, epidemics and other weather related events.

### Loss according to physiographic region

Table 2.3 shows the effects of disaster on people according to physiographic and development regions. The highest proportion of disaster occurrence and death is in Eastern Development Region; followed by Central Development Region.

Flood events are frequent and have largest effect in the populated areas of hills and Tarai. Landslides are also very frequent and common in hill areas.

Epidemiological events are common in all regions. Lack of good health facilities in remote areas is one of the most prominent causes of epidemiological events and high impacts to the people.

houses in Mahabharta had been inundated by Kamal River.

(Data source: Various news papers)

In Udayapur, a total of 420 families had been affected by flooding from Triyuga river and Badrwa khola. 250 families from Tapeswari; 100 families from Triyuga municipality and 70 families from Tribeni have been affected by the floods. One person has been found dead and one is still missing and 13 families of Triyuga municipality were displaced.

According to NRCS-Rautahat, a total of 560 families were affected in the district (Harsaha - 80 families; Bahardurpur - 30 families and Banjaraha- about 450 families) by the swollen Bagmati and Lal Bakaiya rivers. In Sarlahi, about 120 householdsof Nayabasti located in Karmaiya (Bagmati river barrage side) were affected by water logging and two houses have been completely damaged.

Inundated area of Duwagadhi by Ninda Khola  
Photo Courtesy: Raju, Nagarik Daily Newspaper



Table 2.3: Disaster effects on Human Population, 2010

Development / Physiographic Region	No. of records / events	Human Population			
		Deaths	Injuries	Missing	Affected
<b>Eastern Development Region</b>					
Hill	137	52	57	19	17,942
Mountain	73	14	21	6	7,652
Tarai	248	105	19	7	26,489
<b>Central Development Region</b>					
Hill	179	94	81	19	8,572
Mountain	47	44	35	10	595
Tarai	136	85	51	10	11,569
<b>Western Development Region</b>					
Hill	219	96	93	31	4,732
Mountain	13	5	0	1	1,452
Tarai	70	56	18	4	35,747
<b>Mid-western Development Region</b>					
Hill	142	84	38	10	2,685
Mountain	25	25	8	8	598
Tarai	94	82	6	3	6,210
<b>Far-western Development Region</b>					
Hill	39	29	11	5	1,005
Mountain	47	31	16	4	2,259
Tarai	82	35	19	9	15,518
<b>Total</b>	<b>1,551</b>	<b>837</b>	<b>473</b>	<b>146</b>	<b>143,025</b>

Source: DesInventar, 2011

Hundreds of houses of Mandi area (4 VDCs) in western Chitwan district were inundated by the floods. The area has been totally cut off from the district headquarters and other places. Rescue workers had not been able to reach the area by land. According to local sources, on 24 August, at least two people were washed away by the river and another two were missing. More than 200 families were completely displaced and required the camp facilities.

(Nepal Floods and Landslides Situation Report, Issue No. 01, 25 August 2010)

In Morang, over 500 families were displaced due to floods in various rivers. At least 50 families in Itahara VDC were driven out due to the flooded Bakraha River. Some 300 families had been affected by the flood. A 15 year old girl from Itahara-5 died after being swept away. The Bakraha river also displaced 60 families at Khame Jhoa in Madhumalla. Urlabari-7 and Belbari-3 were also hit by floods. A large area of farmland at Kamalakhoch region of Sindhuli district has been flooded by the Kamala and Tawa rivers. The swelling Narayani river in Nawalparasi district posed a risk to 12 VDCs of the Gandak region.



Local people crossing the road cut by Ratu Khola  
Photo Courtesy: Rabindra, Kantipur National Daily

Heavy rain in Chure range provoked flood in Ratu river in Mahottari that inundated few houses and intruded nearly 50 meters road in Nepal-India boarder side of Bhitthabazar. 4 people swept were rescued from 200 meters.

The impact on human mortality is caused by major four types of hazard events (epidemics, fire, landslides and floods) in all regions. Epidemics and fire events, mainly of anthropogenic in origin, are most frequent in the Terai region, and are concentrated in particular months (seasons); whereas landslides occur in hill region in monsoon season. The seasonal calendar for the floods and landslides clearly depicts that these are rainfall triggered events.

### Seasonality of Disasters and its Impacts

Disaster related human deaths and other losses show similar seasonality as that for disaster occurrence with concentrations during the months of April to August (Figure 2.2). July and August stand out as the two months in which the death toll appears to be about 3 times higher than the average for the year. The concentration of death patterns during these months also correlates with the affected population.

Figure 2.2 confirms it by showing March-

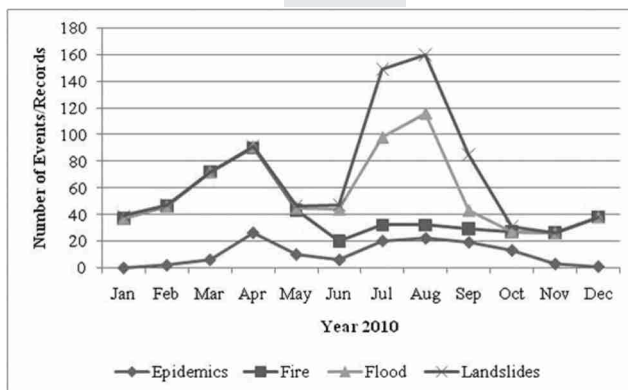


Figure 2.2: Seasonality of occurrences of selected hazard types by month

Source: DesInventar, 2011

June and also July to October as two main period for epidemics. The figure clearly depicts two peaks for major hazards concentrating in April for epidemics and fire events whereas July and August for flood and landslides. Similar can also be seen for impact on building damage (refer DesInventar database for the pattern of this seasonality for previous years in more detail, [www.desinventar.net](http://www.desinventar.net)).



Inundated Boarder Security Post of Armed Police Force (APF), Mahendranagar  
Photo Courtesy: Chitrang Thapa, Kantipur National Daily

There was one human life lost reported from Kailali due to flood. Nearly 200 families got displaced in the district. Building and land of Saraswati School had been damaged. Around 80 houses got flooded in Mahendranagar Ward No 8. Also boarder security post of Armed Police Force got inundated.

The raising Mahakali River also breached its

embankment and entered the human settlements.

(Data source: Various news papers)

### Landslide

There were several cases of landslides across the country claiming 67 casualties and affecting more than 17, 00 people (DesInventar, 2010).

The most affected districts were Taplejung - Sadewa VDC displacing 18 families, 3 casualties, Khamlung VDC, Bajura, Jajarkot, Dolakha, Dhading, Syangja, Kaski and Illam districts. The Shankhuwasabha landslide displaced 280 people of 56 families as the rain triggered landslide at Shikhuwakhola VDC's ward no. 4, 5 and 6 swept away 12 houses in the district on June 2010. The landslide had also demolished the suspension bridge over Newa River connecting ward no. 4 and 5 of the VDC. It had also caused harm to the VDC building, Kalika Secondary school and Balkanya Primary School. As the people fled the scene early, there was no human casualty.

The highest numbers of casualties has been

Table 2.4: No. of buildings damaged and destroyed by different type of disasters in Nepal, 2010

Hazard Types	No. of records/ events	Building Destroyed	Building Damaged	Total (Destroyed & Damaged)
Flood	191	1,611	6,093	7,704
Landslide	148	396	255	651
Fire/forest fire	378	2,131	90	2,221
Epidemics	128	-	-	-
Hydro-meteorological	267	89	1,657	1,746
Other	439	32	358	390
Total	1,551	4,259	8,453	12,712

Source: DesInventar, 2011

## Building Destruction and Damage by Disasters

More than 12,000 buildings were either destroyed or damaged by natural disasters during the year 2010 (Table 2.4). This is a huge loss for any country, especially for a weak economic country like Nepal. Damage and destruction of buildings could be used as an important proxy for the estimation of direct disaster losses. Therefore, it is

necessary to analyze the building damage and destruction in more details.

Table 2.4 shows the occurrence of natural disasters events with the impact on buildings. Floods, landslides, fire and forest fire stand out as the main contributors of disaster related losses of buildings. Weather related events also cause building damage at a significant level.

According to the data for 2010, out of the



Landslide in Kaski  
Photo Courtesy: Kantipur National Daily

reported from Dolakha with nine deaths, seven from Dhading, and five each from Syangja, Kaski and Jajarkot districts due to landslides.

Landslides in various parts of the hilly areas have further obstructed roads and affected transportation. For eg; The vehicular movement



Displaced family in Bhirkot, Dolakha  
Photo Courtesy: Ramesh, Nagarik Daily Newspaper

was halted along the Mechi Highway's Ilam-Phidim section on August after landslides at Gumbadanda of Pauwasartap VDC-7 of Panchthar district blocked the road. The landslide of Mugling- Narayanghat Section obstructed Prithvi Highway. Similarly the vehicular movement was also obstructed in some parts of Dhankuta and Sankhuwasabha

total buildings damaged and destroyed, about 33 percent were destroyed completely. Among this some 61 percent building loss were caused by flood, followed by fire (17%), hydro-meteorological events (14 %) and landslides (5%) (Figure 2.3). The ratios of buildings destroyed and damaged could be used for shelter response planning. The ratio varies for different disasters. Further, average ratio of building damage per event is 1: 8.2; in other words each event causes damage of more than 8 building.

## Economic Loss due to Disasters in year 2010

An estimation made by Consortium Evaluación de Riesgos Naturales - América Latina (ERN-AL, 2011) for the economic loss due to disasters in Nepal using the DesInventar database show losses caused by hydro-meteorological events have been equal or greater than US\$ 1 million at least 5 times per year, more than US\$ 10 million at least once every 2 years and more than US\$ 100 million at least once every 39 years.

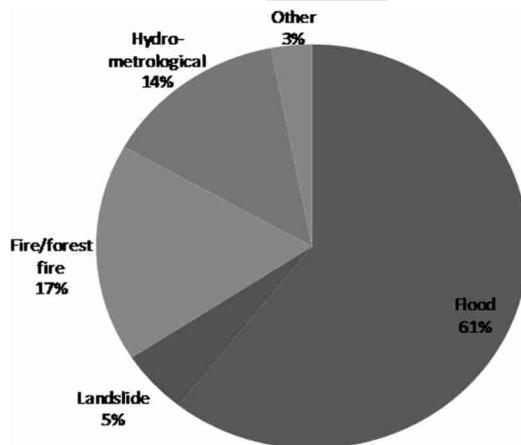


Figure 2.3: Effect of natural disasters in building damage by hazard types 2010

Source: DesInventar, 2011

Whereas for all hazards, the losses account equal to or greater than US\$ 1 million at least 6 times per year, US\$ 10 million at least twice every three years and US\$ 100 million at least once every 13 years (GAR Country Report, 2011).

Economic losses due to small, medium and

districts for one day due to the landslides.

The incessant rain triggered landslides and obstructed several rural hill roads in Gulmi district. Landslide in Ghamir VDC engulfed 47 years old Chhote Darji. He was rescued alive and sent to Mission Hospital Palpa for the treatment. Floods in Hugdikhola, Letekhola and Lumdikhola has obstructed road along Ridi-Rudrabeni-Wamitaksar section. Also the reports of landslides disturbed passage from Tamghas to Simaltari, Purkot Daha, Shantipur, Ridi Balkot and also Sandhikharka.

Landslide at Koralkhola section of Dr. KI Singh Highway has affected passengers travelling from Dadeldhura to Doti. Karnali Highway also got badly affected.

### Epidemic

In the year 2010 the greatest loss of life was due to epidemic claiming 130 deaths throughout the country.

Following the monsoon rains (June-July) and a contamination of drinking water sources, diarrhoea cases were on the rise in several



Landslide affected Dr. KI Singh Highway in Dadeldhura  
Photo Courtesy: Mohan Shahi, Kantipur National Daily

districts. Eight diarrhoea-related deaths have been reported in Banke, five in Dang and four in Gorkha districts. In Nepalgunj, Banke district, *Vibrio Cholerae* has been detected in 14 out of 21 stool samples from patients suffering from diarrhoea. Over 1200 cases were reported and treated at the three major hospitals in the city.

large disasters are very significant. In terms of direct economic loss (reported and estimated), a total of NRs 10,735 million for the period of 2010 was estimated (in year 2010 price index). Of this 3, percent corresponds to destruction of buildings while 53 per cent corresponds to hectares of damaged agricultural land and forest. This is equivalent to about 1 percent of the country's annual development budget (Fiscal year 2067/68)- 2009/2010.

Table 2.5 shows calculated and reported values of disaster loss. The table compares the economic loss due to disaster events with total GDP of the country. About 1 percent of GDP can be seen as the direct loss due to disasters during the year 2010. This figure does not include the indirect economic impacts of disasters in sectors like agriculture, health, education etc.

Apart from this (calculation based on DesInventar database), the Ministry of Home Affairs (MoHA/GoN) and

## Methodology for Calculation of Economic loss

The calculation of direct economic losses due to disasters has been estimated with the procedure followed by DIMS Nepal (DesInventar, 2005). The major attributes considered for the calculation were: 1) reported direct loss in monetary form (Nepalese Rupees - NRs), 2) the loss of buildings (building destruction and building damage), 3) road damage, 4) loss of agricultural land, and 5) loss of livestock. The calculations are based on average market price of the assets in year 2010.



Treatment to patients of diarrhoea laying on the floor in Bheri Zonal Hospital, beds were over occupied  
Photo Courtesy: Janak, Kantipur National Daily

According to DPHO Banke, the main reason behind the increased number of diarrhoea cases were polluted water sources and water supply lines, the contamination of water as a result of the recent floods, the lack of a proper drainage

system and the lack of personal and environmental sanitation awareness in the society.

### Fire

In the year 2010 Fire (fire/forest fire) was one of the most frequently occurring disaster events claiming 61 deaths in the year and affecting more than 10,000 people across the country. Fire has wreaked havoc in several districts, destroying hundreds of houses and properties worth millions of rupees.

Some of the major fire incidents were that of Aurahi-6, Siraha, where four persons were injured and 75 houses were gutted in a fire. According to the police, property worth Rs 1 crore was destroyed in the fire. The fire was brought under control this evening with efforts from locals, police and army personnel and a fire tender from Lahan municipality. In yet another incident in Hakpada-6, Siraha, twenty-six houses were destroyed in a blaze on Saturday along with one casualty in the incident.

Department of Water Induced Disaster Prevention (DWIDP) database has also produced estimated value of disaster loss in the year 2010 as NRs. 1,398.19 million. The estimated loss due to floods landslides, and avalanches has been presented as NRs. 3,829.35 million. (DWIDP, 2011: 20).

Comparing with other database such as EM-DAT compiled by CRED, Nepal does not record any significant disaster event in 2010

attracting international concern. Although, year 2010 has not recorded intensive disaster event (see Box 2.1 for extensive and intensive disaster risks) like Koshi Flood (of 2008), or any earthquake events; however, the total loss scenario shows equivalent to 1 percent of GDP is lost by small and medium sized disasters (of extensive in nature), which is very significant for country like Nepal. The indirect loss has not been considered in calculation of economic loss. The majority

**Table 2.5: Loss due to all types of disasters compared to gross domestic products**

Sector of Loss	Total Loss in Million NRs.	% of GDP of year 2010*
Building Destruction	494.38	0.042
Building Damage	131.29	0.011
Road	0.48	0.000
Agriculture Land	8300.73	0.708
Livestock	20.09	0.002
Total Sectoral	8946.96	0.763
Reported Monetary Loss	1788.79	0.153
Total Loss	10735.75	0.916

\*Total GDP for year 2010 is NRs. 1171.9 billion, Source: Economic Survey of Nepal, 2011  
Source: DesInventar, 2011



Fire in Hakpada-6 of Siraha district  
Photo Courtesy: Dev Narayan Shah, Kantipur National Daily

In Kapilvastu, three persons were killed and 30 injured in a fire that also gutted 150 houses and sheds of 70 families in Ganeshpur-7, Gedawajod, of Kapilvastu.

The Duhabi, Sunsari fire that broke out in the morning destroyed 40 houses at Duhabi Village development Committee (VDC) of Sunsari. The fire started from 4 am suddenly and gutted

down 40 houses of 15 families. Police said that property worth Rs. 10 million was destroyed in the fire. The fire had damaged Rs. 400,000 property and six houses were gutted down on Wednesday.

During the dry season, many incidents of outbreak of fire had taken place at the eastern Banke causing a loss of huge amount of property and houses. Around two weeks ago, one person died and one hundred houses were gutted in

of events in this year are small and medium sized.

In terms of reported direct loss, the trend has been found increasing every decade (Figure 2.4). The reason behind this could be better reporting as well as increased vulnerability of the properties, especially increasing fire events.

### Loss in terms of Intensive and Extensive Disaster

Extensive disaster is mainly characterized by frequently occurring, low and medium intensity disasters, whereas intensive disaster are those infrequent, high intensity and very concentrated spatially. Extensive disasters are main caused for damage to property whereas, the intensive disasters are main contributor for higher mortality. Not only in developing countries, extensive disasters are major contributor to mortality in developed countries (GAR, 2010). However, small disasters are local in its extent and frequent with notable accumulated social

the worst case of fire in Narinapur

In Udayapur, fire broke out at Galfadiya of Tapeshwori VDC-1 on Sunday, killing Kamala Khatri, 26, and razing 15 houses and sheds.

In Sindhuli, 17 huts and cowsheds were destroyed when a blaze engulfed Bekhataadi of Tinkanya VDC-1 Police said property worth seven million rupees was destroyed there.

Fifty houses were gutted in a fire in Lohajara VDC of Saptari destroying property worth Rs 5 million and rendering 18 families homeless.

In Dang/Banke, three persons were killed in the fire while more than 50 houses were burnt to ashes. Similarly sixty-seven huts of landless people were gutted in fire in Bandarjhula of Ayodhyapuri-9, Chitwan. The fire that had started in the houses from 4 pm on Friday was brought under control only on Saturday noon.

In Dhankuta, the forest fire, which had spread in Thapchuwa, destroyed seven houses causing the loss of property worth NRs. 1 million and

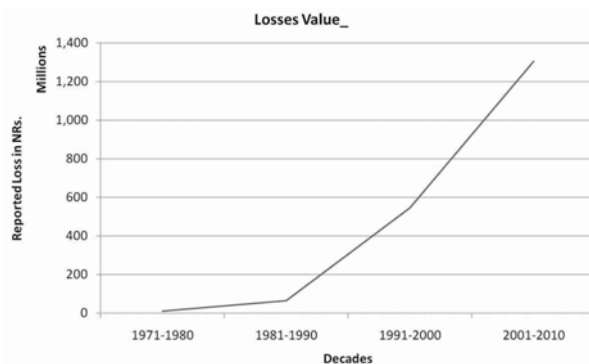


Figure 2.4: Trend of reported loss value in DesInventar Database for Nepal 1971-2010, by decades

Source: DesInventar, 2011

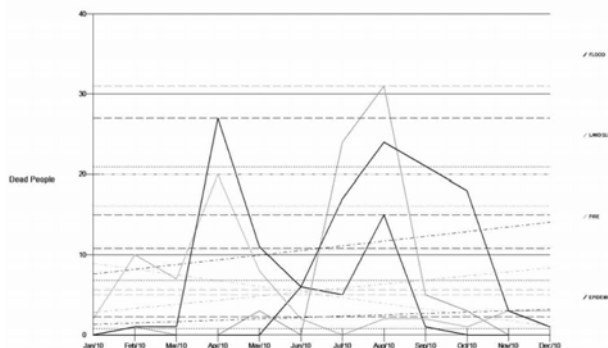


Figure 2.5: Major peaks of impact in terms of deaths due to intensive disasters in 2010

Source: DesInventar, 2011

even claimed two lives. Similarly five houses were gutted in a fire in Kandbari municipality-5, Sekaha in Sankhuwasabha destroying property worth NRs. 7 million.

In Rautahat, 16 houses in a Muslim village of Malhiniya Tole in Rajpur Tulsu VDC were destroyed in a fire. Four houses were also destroyed in a fire in Bharouliya of Swathi VDC in Nawalparasi.

In Rolpa, one person was killed and 12 injured in a fire at Gaurigaun in Rolpa. Fire that started from Bachchapaile community forest was out of control and around 54 houses were destroyed and more than 600 villagers were affected.

In Gaighat, the wildfire that broke out in the Khanbu Community Forest in Khanbu VDC of Udaypur destroyed four houses and cowsheds.

There were various other cases of spreading of wildfire that have destroyed hundreds of hectares of forestland in Parbat, Bhojpur districts, , Bandevi and Dharampani forests in Palpa., Sankhuwasabha, Sindhuli and Tehrathum districts.



## Box 2.2: Extensive and Intensive Risk

Extensive risk is "the widespread risk associated with the exposure of dispersed populations to repeated or persistent hazard conditions of low or moderate intensity, often of a highly localized nature, which can lead to debilitating cumulative disaster impacts". The extensive risk is mainly a characteristic of rural areas and urban margins where communities are exposed to, and vulnerable to, recurring localised floods, landslides storms or drought. It is often associated with poverty, urbanization and environmental degradation.

The Intensive risk is "associated with the exposure of large concentrations of people and economic activities to intense hazard events, which can lead to potentially catastrophic disaster impacts involving high mortality and asset loss". This is mainly a characteristic of large cities or densely populated areas that are not only exposed to intense hazards such as strong earthquakes, active volcanoes, heavy floods, tsunamis, or major storms but also have high levels of vulnerability to these hazards.

Source: 2009 UNISDR Terminology on Disaster Risk Reduction, United Nations <http://www.unisdr.org>

effects. The year 2010 shows one peak for each major hazard for flood, landslides, and fire and two peaks for the epidemic. April and August are major two peak months for epidemics (Figure 2.5).

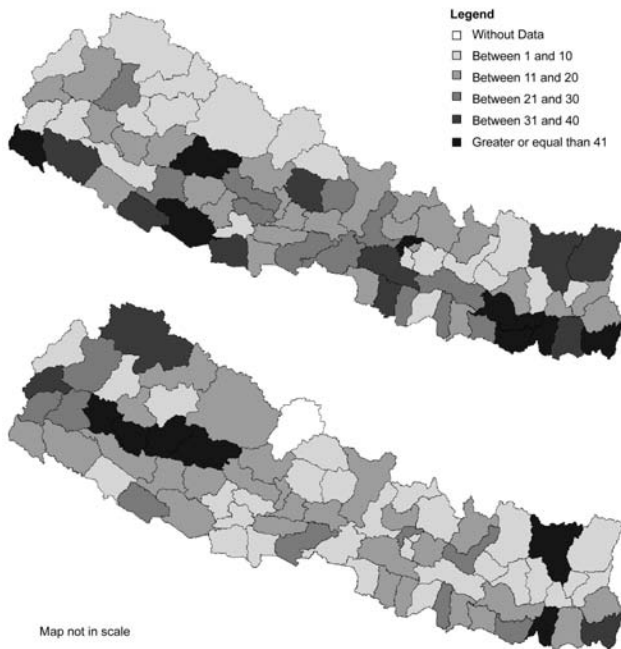
### Comparison of 2010 with Disaster Data of 2009

According to the Centre for Research on the Epidemiology of Disasters (CRED), 6 disaster events have been recorded in 2009 and only 4 disaster events have been recorded in 2010 in Nepal. All these event are recorded as per the criteria as set by CRED on EMDAT (see [www.emdat.be](http://www.emdat.be) for more detail of criteria and data). This number is lower as compared to the previous years. In EMDAT, total human life loss has been recorded as 459 for year 2009, in which the large part is accounted by epidemics ie. more than 68 % (314 caused by diarrhoea) followed by flood events (117), coldwaves and landslides. During 2009, most affected districts were Achham, Baitadi and Bajhang in Far-Western development region of the country for epidemics and for floods Kailali, Kanchanpur and Dang districts. During year 2010, though the death toll has been lower than in 2009, but still there were some casualties resulting from epidemics (73 in 2 epidemic events) and flood (150 in 2 flood events).

On the otherhand, the DesInventar database, shows about 1600 records for both years. The loss of human lives is 1944 for 2009, and 839 for the year 2010. Distribution of human live losses by district are presented in Figure 2.6. This shows that the number of losses is still unreported in such international records due to the reporting system or the criteria set. In terms of affected people, and loss of properties the similar inconsistencies can be found. In both major disaster databases (international and national) the pattern of the loss in terms of casualties, affected population and building losses shows slightly decreasing trend in 2010 in comparison to 2009.

In terms of economic loss, as reported in the DesInventar database, economic loss due to disasters in Nepal in year 2010 was NRs. 1,788.79 million where as the loss value for the year 2009 was NRs. 947 million. The year 2010 has 53 % more reported loss than the year 2009 (see desinventar data), in which flood caused the highest of human live losses (Figure 2.7).

One of the most important attribute of the economic loss is damage and destruction to buildings. In 2009 there were more than 1000 buildings either destroyed or partially damaged, and slightly more than 600 buildings were destroyed or partially



Map not in scale

**Figure 2.6: Loss of human lives by districts during 2009 (above) and 2010 (below)**

Source: DesInventar, 2011

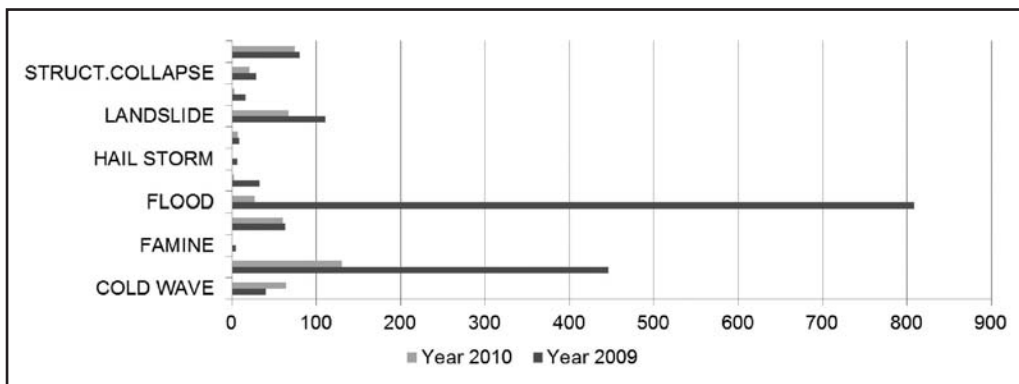
damaged in the year 2010. In both years fire and flood events are the major cause of loss. In terms of reported loss value due to these particular events about NRs. 36 million has been reported for the year 2009, and about NRs. 30 million has been reported for 2010. The year 2009 has more reports and higher loss records for landslides.

The number of people reported affected (143,000 per year) remained stable in 2010, compared to the previous years in average. However, the number of affected people for year 2009 is about 377 thousand. This depicts that the year 2010 has significant low reports and thereby low level of human lives loss as compared to the year 2009. The year 2009 has significant level of reports on human casualties due to epidemics mostly from Tarai region of the country.

### Comparison of 2010 with disaster data of past 5 year's

Along with the increase in occurrence of disaster events, there is also a high increase in the average annual losses in the year. From 2005 up to 2007, there was moderate growth trend of disaster occurrence and associated human death. After 2007, the trend has shown excessive increase in both occurrences of disaster events as well as casualties. During this period, the drastic change in the pattern of disaster deaths is caused due to floods and landslides. Notable is the fact that the overall scenario of deaths and building destruction is dominated by small and medium sized events which also have high impact on losses in aggregate.

Annual time-series distribution of the effect of disasters on human deaths is shown in



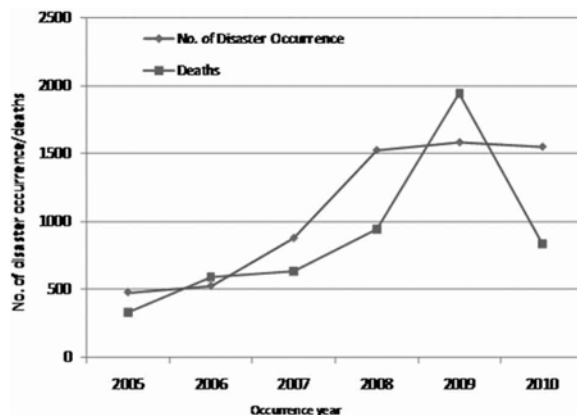
**Figure 2.7: Loss of human lives due to major disaster events in Nepal in year 2009 and 2010.**

Source: DesInventar, 2011

Figure 2.8. This figure shows that the years 2008, 2009 and 2010 consisted the most severe episodes of human deaths. There were significant damage and destruction to buildings in 2008, 2009 and 2010. These years were characterized by high rainfalls and excessive occurrence of floods and landslides.

**Figure 2.8: Annual time series distribution of disaster occurrence and human deaths, 2005-2010**

Source: DesInventar, 2011



## Disaster Information System in Nepal

The Ministry of Home Affairs (MoHA) is the apex authority for collection and dissemination of disaster data in Nepal. Primarily, collection of disaster related data, especially those pertaining to deaths, injury and building damages is done by the office of the Chief District Officer (CDO) through its police network. The data is then reported to Disaster Management Section of MoHA, where the data is consolidated and released selectively. The MoHA disaster database records location, deaths, injury, loss of livestock, damage to buildings, land and other infrastructures (road sector, bridge, water supply, electricity) etc. Main purpose of MoHA database is to coordinate with national and international organizations to carry out works related to relief operation. Since 1993, the Department of Water Induced Disaster Prevention (DWIDP) has been publishing the MoHA data on disasters due to floods and landslides.

For large scale disasters, damage assessment is usually done by relevant specialized agencies such as Ministry of Agriculture, Epidemiology and Disease Control Division (EDCD), Department of Roads etc. The Ministry of Agriculture carries out the damage assessment for the purpose of rehabilitation of the agricultural land and crops, especially those damaged by floods and landslides. Similarly EDCD, Department of Health Services (DHS) of Ministry of Health is tasked with controlling the epidemic events throughout the country and also to record the effects of epidemic events. The EDCD database is therefore focused on health issues. The Department of Roads (DoR), collects data related to damage of road sector, targeting program on repair and maintenance of roads.

The government agencies, notably, the Department of Hydrology and Meteorology (DHM) conducts regular field monitoring using nationwide network of hydrologic and climatologic monitoring stations. The Department of Mines and Geology (DMG) conducts earthquake monitoring using its 21 short period seismic stations evenly located in a network that is spread over the country. While these data are important for understanding the nature of particular hazard types, they are important also to organize relief and rehabilitation. Usually these agencies make the information for dissemination to public.

Department of Water Induced Disaster Prevention (DWIDP) collects data on various types of water-induced disaster events such as soil erosion, landslides, debris flow, flood, bank erosion etc. including GLOFs and other monsoon rains associated disaster events (DWIDP, 2011).

Nepal Red Cross Society (NRCS) collects disaster data aiming the evaluation of relief to disaster victims. NRCS collects data from the affected areas using its nationwide network of district chapters and local circles. It collects and collates information from others sources too. For example, NRCS collaborates with Nepal Police in collecting damage data.

Hazard events occurred in Nepal for the period after 1971 have been also recorded and maintained in a database by National Society for Earthquake Technology - Nepal (NSET). Details of events and their impacts on human lives, properties are recorded in DesInventar System and are available in the DesInventar database. This database has served as an important tool for various analysis.

NSET with financial and technical support from United Nations Development Programme (UNDP) in the year 2003 endeavored to establish a systematic data inventory of natural disaster events in Nepal. A standard data collection format was developed and used to capture the data from different sources and entered into the "DesInventar System". The effort concluded preparing comprehensive database of all disasters occurred during 33 years (1971-2003). Later, NSET continued to update the data on regular basis with its own resources for subsequent years. Up to date data is available in the DesInventar database.

DesInventar<sup>1</sup> is an inventory system, to register data about characteristics and effects of diverse types of natural disasters, from global or national scales and/or local level. This includes a software system with two main components a) DesInventar module - which is a relational and structural database through which the data is fed by filling in predefined fields and b) DesConsultar module that allows access to the database by queries that may include relations among the diverse variables of effects, types of events, causes, sites, dates,

etc. including queries with tables, graphics and thematic maps. This was developed and successfully implemented by The Social Studies Network for Disasters Prevention in Latin America (LARED).

The DesInventar Database of Nepal collects the information from published print media (i.e. daily newspapers) on daily basis. The information is refined with different level of verification. The attributes of such of the date includes - (hazard) type, cause, occurrence date, administrative location of the event. In addition to this, the system collects information on the impact of hazard event with information on number of deaths and injury (casualties), number of housing destroyed and damaged, number of affected population. The impact of event is also recorded.

Nepal DesInventar database includes attributes on the identified 27 types of hazard. As per their source of origin, these hazard types as they appear in the system are further categorized broadly into six categories of the events for the present purpose of categorization (Table 2.6).

In the database, different types of losses are recorded, as a) reported loss due to particular event, which is directly mentioned in the source of information, and b) calculated loss which is an estimate of the total value of property/infrastructure losses associated with each event.

1 For details on the conception, methodology and use of DesInventar see: [www.desinventar.org](http://www.desinventar.org), especially the methodological and user manuals presented there. Consult also the work of LA RED-OSSO for UNDP-ISDR. Comparative Analysis of Databases de disasters EmDat-DesInventar for more detail January 2003, at [www.desenredando.org](http://www.desenredando.org). For DesInventar Database of Nepal, see: [www.desinventar.net](http://www.desinventar.net) or [www.nset.org.np](http://www.nset.org.np)

## Global Database

The emergency events database known as EM-DAT maintained by Centre for Research on the Epidemiology of Disasters (CRED) has been the only comprehensive global database on disaster events. It contains essential core data on the occurrence and impacts of disasters worldwide dating from 1900 to the present. Main objectives of this database are to assist humanitarian action at both national and international levels; to rationalize decision making for disaster preparedness; and to provide objective basis for vulnerability assessment and priority setting.

This database collects any disaster information using the criteria at least one of the following fulfilled: a) 10 or more people reported killed, b) 100 or more people reported affected, c) declaration of a state of emergency, d) call for international assistance. Large-scale disasters always dramatically and immediately attract attention of people and institutions including humanitarian agencies and media. An example of such event is Koshi Flood of 2008 in Nepal which fall within the criteria by CRED and is included into the database.

Table 2.6: Events categories as per the Hazard Type

Hazard Type	Events (as appeared in DesInventar Database of Nepal)
Earthquake	Earthquake
Epidemics	Epidemics, Plague
Landslides	Landslide, Avalanche
Hydro-meteorological	Cold wave, Drought, Famine, Hailstorm, Heat wave, Heavy rains, Rains, Snow storm, Storm, Strong wind, Thunderstorm
Floods	Floods, GLOFs and flash floods
Fire	Fire and Forest fires
Others	Boat capsize, Explosion, Panic, Pollution, Structure collapse, Biological, and Others

Source: DesInventar, 2011

On the other side, numerous medium and smaller-scale disasters occurring in every country which do not meet such (as mentioned by CRED) criteria are always missing from such database in many cases and also do not attract so much of attention of governments. This can be seen in Nepal's case too. For example, EM-DAT has no record of disaster event in Nepal for 2010, but Nepal DesInventar Database collects a significant amount of data related to small and medium scale disasters at local level. The cumulative impact of such small and medium sized disasters could be quite significant for any country or region which remain unnoticed in the global database. The DesInventar database captures all types of disaster events of all sizes.

### Discrepancies in Disaster Data

The discrepancies in the data from different databases maintained in Nepal are mainly due to the differences in coverage and extent of disasters, standards used in data collection system, definition of disaster events and criteria used and most importantly the purpose of data collected. Majority of data comes from relief and rescue provided by government and other humanitarian

purposes. The data for the use for reconstruction and rehabilitation purposes are least collected. For example, the data collected in the districts by DDRC and NRCS mechanism are focused on humanitarian and relief purposes whereas DWIDP data is more oriented towards reconstruction and mitigation purposes.

On the other hand, criteria and standards used by data collector are also the major contribution of these discrepancies. There is lack of common standards for disaster data collection in terms of its format as well as with stated objective of the collection mechanism. The same dataset is considered to be good for relief as well as for reconstruction and rehabilitation but not very meaningful for other purposes. Due to these variation, the data induce problem for wider use.

DesInventar System also has some crucial limitations. Gorkhapatra National Daily is taken as the conclusive source for the early period and specific government records (MoHA and DWIDP reports) for recent years. Therefore, the accuracy of the findings largely depends on the accuracy of data source. Number of data-cards does not

reflect the number of events. Natural events with same nature are generalized. For example: debris flow is included into landslide and all types of transferable disease affecting community are included into epidemic. The qualitative losses are calculated with the current general valuation of the losses to find out the overall losses. Hence, the loss values may not be absolutely true in terms of monetary value.

By using standardized and comprehensive database management system in disaster data collection, this discrepancies can be minimized for much wider use by all stakeholders. The incompatibility among disaster databases can also be minimized and the data can be made more meaningful.

## Conclusions

The DesInventar database has been serving as a significant source of information on disasters in Nepal for the period of 1971 onwards. This gives an important and comprehensive information for historical events occurred in Nepal as reported in different media sources. Primarily, the present report has evaluated the disaster scenarios and losses from the DesInventar of database. The impact of disasters were evaluated in terms of tangible losses including human casualties (deaths and injury), affected population, impact on housing (building destroyed and damaged), loss of livestock, loss of agriculture land/crop and reported direct loss. The secondary losses due to

events has not been evaluated. The calculations for economic loss has been made based on the direct physical losses and compared to the GDP of the country for 2010.

During the year 2010, though the database has not recorded large disaster events as previously occurred like Koshi Flood of 2008 in eastern Nepal and diarrhoeal outbreak Mid-Western and Far-Western districts however, this year still records large number of deaths and significant impact on economy. About 1 percent of GDP is recorded lost by disasters of varied intensities. The disasters recorded during this year were flash floods, inundation and landslides throughout the country as a result of incessant rains after 21 August 2010, fire events in April destroying about 500 houses in different part of the country, and epidemics and cold waves were very frequent in months of January, April and August.

The data has given significant oversight for the dominance of small and medium size events as well as associated economic loss. Estimation and comparison shows one of the good application of such data for various sector of disaster risk reduction with improved understanding in DRR. The data has also been used for pioneering applications in risk assessment (for example applying the methodology used in the GAR 2009) and also it has helped to prioritize disaster risk reduction planning at different levels in the country.

Table 2.7: Economic losses due to disasters, 2010

Development/ Physiographic Region	Losses Value (NRs.) (compared to the GDP at current price of the year 2009/10, value 1183 billion NRs)											
	Building Destruction	% of GDP	Building Damaged *	% of GDP	Road Damaged	% of GDP	Agriculture and Forest Damaged (Ha)	% of GDP	Livestock	% of GDP	Reported Monetary	% of GDP
<b>Eastern</b>												
Hill	30,747,500	0.003	6,181,550	0.001	-	-	290,470,000	0.025	264,000	0.000	261,239,000	0.022
Mountain	11,023,000	0.001	654,900	0.000	-	-	0	0.000	3,120,000	0.000	50,350,000	0.004
Tarai	194,592,000	0.017	34,346,650	0.003	-	-	4,012,550,500	0.342	900,000	0.000	730,124,000	0.062
<b>Central</b>												
Hill	96,652,500	0.008	2,104,400	0.000	-	-	112,704,500	0.010	5,652,000	0.000	29,780,000	0.003
Mountain	2,711,000	0.000	272,800	0.000	-	-	6,150,000	0.001	96,000	0.000	31,750,000	0.003
Tarai	17,393,000	0.001	2,474,850	0.000	-	-	744,572,500	0.064	888,000	0.000	58,385,000	0.005
Kathmandu Valley	2,748,000	0.000	1,483,050	0.000	-	-	0	0.000	0	0.000	149,073,000	0.013
<b>Western</b>												
Hill	14,517,500	0.001	2,827,200	0.000	480,000	0.000	97,082,250	0.008	6,132,000	0.001	144,884,752	0.012
Mountain	792,000	0.000	8,800	0.000	-	-	7,375,000	0.001	216,000	0.000	108,404,000	0.009
Tarai	28,433,000	0.002	20,269,950	0.002	-	-	2,294,250,000	0.196	36,000	0.000	37,850,000	0.003
<b>Mid Western</b>												
Hill	28,438,500	0.002	1,615,800	0.000	-	-	67,545,000	0.006	348,000	0.000	27,091,000	0.002
Mountain	5,632,000	0.000	136,550	0.000	-	-	150,000,000	0.013	1,800,000	0.000	20,490,000	0.002
Tarai	18,798,000	0.002	7,091,100	0.001	-	-	271,855,250	0.023	312,000	0.000	133,932,000	0.011
<b>Far Western</b>												
Hill	9,198,000	0.001	2,660,600	0.000	-	-	0	0.000	36,000	0.000	2,800,000	0.000
Mountain	24,112,000	0.002	360,800	0.000	-	-	600,000	0.000	0	0.000	150,000	0.000
Tarai	8,587,500	0.001	48,797,150	0.004	-	-	245,575,000	0.021	288,000	0.000	2,485,500	0.000
<b>Total</b>	494,375,500	0.042	131,286,150	0.011	480,000	0.000	8,300,730,000	0.708	20,088,000	0.002	1,788,788,250	0.153

\*GDP data, Nepal for the year of 2010/11 were used for the estimate  
Source : Economic Survey, 2010/11, Vol.1, CoN, MoF July 2011



Floods and landslides caused by torrential monsoon rains in the Southern districts of Banke, Bardiya, Dhanusa, Siraha and Saptari  
Photo Courtesy: [www.wfp.org](http://www.wfp.org) / WFP/James Giambrone



# CHAPTER 3 : IMPACTS AND LESSONS OF MAJOR PAST DISASTERS



People stranded as the road washed away by the Koshi Flood, 2008  
Photo Courtesy: <http://bordernepal.wordpress.com>

## Impacts and Lessons of Major Past Disasters

### The 1988 Udaypur Earthquake

#### Event Scenario

In August 20, 1988 after 54 years of the occurrence of the great Bihar-Nepal earthquake, Nepal was hit by another earthquake of medium size (Magnitude: 6.5 Richter scale) at 04 Hrs. 55 Min. local time. It rocked the entire Eastern and part of the Central Development Regions. Its epicentre was at Udaypur, about 160 km southeast of Kathmandu. It lasted about 40 seconds affecting 22 districts. The epicentral intensity was found to be VIII MMI in Katari, Dharan and Dhankuta which suffered a higher order of damage. Structural damage and other effects were seen in intensity zone VII and VI also. There were 6 major aftershocks with magnitude greater than 4 Richter scale. The common ground effects that were observed are surface faulting and ground fissuring, landslides, liquefaction, lateral spreads, ground oscillation and sand boils. (Dixit, A. M. & Koirala, A, 1989).

#### Human Casualty

The quake left 721 people dead and 6,553

people injured (1657 seriously injured and 4896 minor injured). The earthquake claimed 668 lives in Eastern Development Region and 53 in Central Development Region. Highest death toll was seen in Sunsari district with 138 followed by Panchthar and Udayapur district. (Thapa, N., 1988)

#### Sector wise Loss (Direct)

The estimated total direct economic loss was 5 billion NRs (JICA 2002). The damage in dollar value was to housing (\$78.5 million), followed by roads and bridges (\$62.4 million) and schools (\$32 million). The total direct estimate of damage was \$ 172 million (Kreimer, A. & Preece, M., 2002).

#### Damage to Housing and other buildings

The earthquake left more than 460,000 persons homeless. A total of 64,174 private houses were damaged among which 21,976 were completely damaged and 42,198 were seriously damaged which could not be used further. 468 public buildings, 790 Government buildings, 158 Village

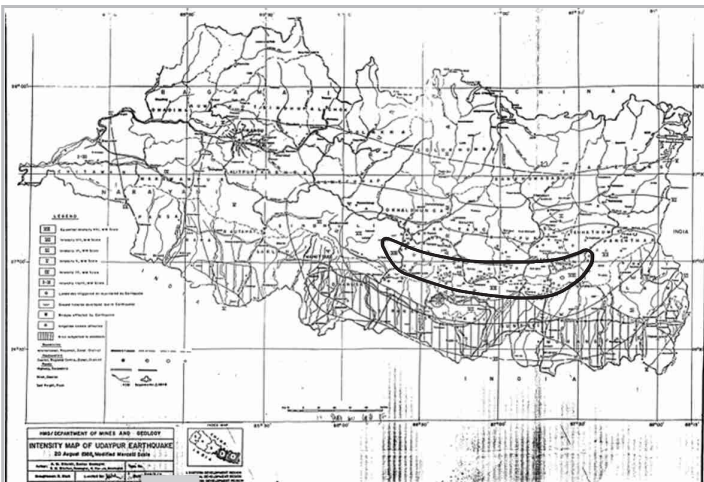


Figure 3.1: Earthquake intensity map  
 Source: Department of Mines and Geology

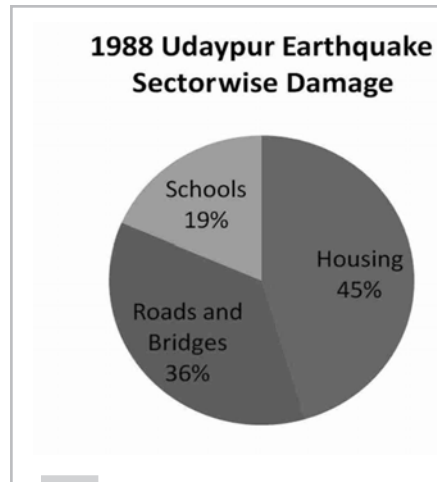


Figure 3.2: Sectorwise loss  
 Source: Thapa, N., 1988



Figure 3.3: Building damage in Naya Bazar of Dharan

Panchayat buildings and 150 religious sites were damaged. Similarly, 346 schools were completely damaged while 604 schools were seriously damaged which could not be used further. (Thapa, N., 1988)

Regarding damage to buildings, the following facts were observed

- Adobe type of buildings collapsed extensively in the middle belt of Eastern Terai.
- Mud mortared stone masonry buildings in the hilly region sustained heavy damage structurally.
- Old 2-3 storey brick masonry buildings sustained serious cracks in the walls.
- Cement mortared brick construction and RC frame structures performed rather fairly well.
- Landslide and ground fissuring were partly the causes of damage of buildings in Lower intensity zones.

### Livestock loss

It was reported that the earthquake took the life of about 1566 cattles throughout the country with 1341 in Eastern Development Region and 225 in Central Development Region. (Thapa, N., 1988)

### Roads Damage

Damages to roads were mainly due to liquefaction, ground fissuring, landslides and embankment failures. About 1.5 Km road segment of Dharan-Dhankuta Road section of Koshi Highway was breached near Bhedetar, Dhankuta district due to debris slide and rockfall. Traffic was closed for several months. Similarly road embankment failure and ground fissuring due to liquefaction was seen in Biratnagar-Dharan road section of Koshi Highway. A 100 m. long stretch of the gravel road of Mahendra Highway-Dhanusha road near Sarsa village, Dhanusha district was seen damaged with a subsidence of 30 cm due to the causative phenomenon of liquefaction, ground fissuring, embankment failure. The road was repaired by filling and compaction. Similarly, a 300 m. long stretch of Mahendra highway-Katari road near Phulbaria Village, Siraha



Figure 3.4: The damage of road in Koshi Highway

district and a 250 m. long stretch of road embankment of Mahendra Highway-Gaighat road near Kadamaha, Siraha district showed slumping and fissuring. Subsidence in several segments in 10-30 Km of Phidim-Taplejung road was seen near Bharepa, Panchthar district due to debris slide. The road was

closed for several months. (Dixit, A. M. & Koirala, A, 1989)

### **Bridges and Culverts**

Displacement of individual spans of the multispanded bridges was noticed in many rivers. A shortening of the bridge by 17 cm. was monitored at Gehri Bridge which had a span of 20.7 m. A majority of the culverts in Kamala-Biring Khola stretch of the Mahendra Highway showed conspicuous displacement of approach slabs on either abutment by the earthquake which was accompanied by a settlement of 10-25 cm. Development of cracks (3-5 cm wide) with relative displacement and undulation of the individual blocks of causeways were noticed at the crossings of Bagaha river in Dauri village, Gaighat road and at the Mauli river crossing of Mahendra Highway. Development of tension cracks were observed in the abutments of the bridges across Urikhola, Ratuwa and Mawa rivers. Reinforced Concrete (RC) resting pad on each of the three piers of a four-span bridge in Duhabi River showed shear failure. The bridge was pushed into the left abutment by some mm. In some bridges, displacement was seen along construction joints. (Dixit, A. M. & Koirala, A, 1989)

### **Irrigation Canals**

Many hill irrigation canals in intensity zones VIII-VII were breached or covered by the induced landslide and others started leaking along the ground fissures developed by the seismic loading. Of the irrigation canals in Tarai, only the Kamala west main canal showed horizontal longitudinal crack along the side wall and longitudinal fissures in the bed while the minor canal from tube well No. 4 of Bhagwanpur village of Siraha district was damaged due to shearing and tensioning at several places. Similar effects were seen in other lined canals in Tarai. (Dixit, A. M. & Koirala, A, 1989)

### **Dug and Tube Wells**

Almost all of the dug wells within the liquefaction zones in the Terai region experienced the phenomena of sand intrusion which filled them up partially or wholly with sand resulting into water spilling over the brim. The water was muddy for many subsequent days which led to a shortage of clean drinking water in the villages. A good majority of the hand tube wells within the area started flowing without being pumped. It lasted for several days in many cases. In the eastern part of Siraha district many of the bamboo borings of depth 6-12 m. driven to tap artesian water for irrigation got plugged for the whole depth by the intruded sand. Deep tube wells (Depth 100 m.) bored for tapping ground water for irrigation in Bhagwanpur village of Siraha district was ejected but by several cm. damaging the foundation and connecting shaft to the driving engine. (Dixit, A. M. & Koirala, A, 1989)

### **Indirect Impact**

According to CBS Statistical Yearbook 1995 and Economic Survey, the Ministry of Finance, 1995, the total hazard loss due to disaster was NRs. 6,099 million which is 23.69 % of GDP (The GDP was NRs. 25,749 million) and 64.69% of Development expenditure (The Development expenditure was NRs. 9,428 million) in the year 1988 when the country was struck by eastern Nepal earthquake. The effect was seen in subsequent year as well. In 1989, it was 15.34% of GDP and 33.84% of Development expenditure. Three percent (about \$14 million) of the 1989 fiscal year's development budget was allocated for reconstruction and rehabilitation.

### **Relief Effort**

The government of Nepal mounted an initial relief operation for the affected areas, coordinated by the Ministry of Housing and

Physical Planning (MHPP). Constitution of a Central Earthquake Affected Areas Reconstruction and Rehabilitation Committee (CEAARRC) under the chairmanship of the Minister of Housing and Physical Planning, responsible for coordinating the programme was done. Government undertook needs assessment and mobilized Army, Police, Nepal Red Cross and Local Government and Rastriya Panchayat (parliament) representatives to provide relief. This relief included care for the injured, financial compensation to individuals and communities, and some materials for emergency shelter. Government formally decided on 24 August to request international relief assistance. Donors were advised to contribute cash grants to procure emergency items. Medicine and food was the first priority and second priority items comprise: heavy duty plastic sheeting blankets, cloth (not used clothing), tents/temporary shelter, gabion wire, corrugated iron sheets, polyethylene pipes, mobile hospitals and ambulances. As a result, donation of NRs. 47,202,861.16 from foreign countries and of NRs. 42,848,410.71 from internal organizations and individuals were received. According to UNDR0 Situation Report, the contributions made from UN system to GoN was US\$ 76,000 and that from NGOs was US\$ 465,800 while that from different governments was US\$ 2,242,992 (UN Department of Humanitarian Affairs)

### Relief Money

Government provided relief money of NRs 2,000 for a death, NRs 1,000 for loss of a house to the earthquake affected people. A total of NRs. 62,152,900 (NRs. 1,442,000 for death and NRs. 60,710,900 for loss of a house) was distributed to those people. (Thapa, N., 1988)

### Food Distribution

Government provided 40 kg of rice per

family for the affected families. In Sunsari district, it was increased to 80 kg per family having more than 5 members in the family whereas it was reduced to 20 kg per family in those districts which were less affected. 25,842.64 kg of rice amounting to NRs. 24,850,000.00 was distributed in total. (Thapa, N., 1988)



Figure 3.5: Relief materials distribution

### Medicines

About 103 medical doctors were sent from Kathmandu to affected areas of Eastern Development Region. 5542.60 kg medicines were distributed in Eastern Development Region and Sindhuli district of Central Development Region. Medicines amounting to NRs. 2,192,646.18 were received from Home Ministry, Health Ministry, World Health Organizations, foreign countries, different organizations and individuals. 5305.50 kg medicines amounting to NRs. 11,820,780.73 were distributed to earthquake affected people. (Thapa, N., 1988)

### Shelter

Plastic sheets for emergency shelter were provided immediately by GoN. 271,448 Plastic sheets amounting to NRs. 10,109,796.71 were distributed for the affected people. Apart from plastic sheets, 481 Shade traps, 22,155 blankets, 427 ground

sheets, 20,073 utensils, 27,130 clothes, 80 trousers, 48 rolls of tarpaulin along with nylon ropes, folding beds, and corrugated iron sheets were also distributed to support the shelter response. (Thapa, N., 1988)

### Recovery and Reconstruction Efforts

GoN requested support from the donor community including International Development Association (IDA) for housing and the Asian Development Bank for road reconstruction. Government together with United Nations system and interested donors, worked on identification of post-disaster needs. Preliminary requirements were pre-fabricated housing construction components, cement, iron rods, bailey bridges. UNDP/UNDRO provided technical assistance. The government approached various donor agencies for grant and loan assistance to carry out the recovery and rehabilitation works. The ADB provided emergency assistance in reconstructing roads, bridges and public buildings damaged in the earthquake. The World Bank through IDA provided a loan of NRs. 1,062,400,000 equivalent to US\$ 41.5 million to GoN for Nepal Municipal Development and Earthquake Emergency Housing Reconstruction Project in which a housing reconstruction component was appended to the already appraised Municipal Development Project. (The World Bank, 1997)

The Recovery and Reconstruction phase started from September 20, 1988. The policy adopted by the government was the preference for loan rather than grant assistance to the affected households, even though World Bank guidelines permit emergency relief to be in the form of grants. GoN launched a comprehensive program of reconstruction and rehabilitation on September 22, 1988. The Nepal Earthquake Affected Areas Reconstruction and Rehabilitation Project (EAARRP) was one

of them to execute a credit and technical assistance program for reconstruction of earthquake damaged houses. Projects included the Housing Loan Program and the smokeless stove ('chulo') and improved latrine ('charpi') construction. MHPP was assigned overall responsibility for coordination of the national reconstruction rehabilitation effort. House reconstruction loans were implemented by the three major Nepalese Banks-RBB, NBL and ADB. Under the EAARRP Project Office, there were two regional offices and 27 district offices each headed by a district engineer, some 254 overseers and sub overseers for the housing reconstruction program in the affected districts. They were all given initial training in basic earthquake resistance technology for housing. Based on the location of the house, there were three types of loans: Rural loans maximum of NRs. 10,000, District Center loans maximum of NRs. 20,000, and Nagar Panchayat or urban loans maximum of NRs. 50,000. The repayment terms were a) First Rs. 5,000: 1% interest for 8 years with a 2 year grace period on principal and interest, b) Second NRs. 5,000: 10% interest for 8 years with a 2 year grace period on principal only and c) Above NRs. 10,000: 15% interest for 8 years with a 2 year grace period on principal only (Robert Merrill Padco, Inc., 1990). To give loan recipients the opportunity to make adequate choices about disaster-resistant construction, they were required to walk through demonstration houses built near the lending banks. The models emphasized simple, cost-effective, earthquake-resistant features such as bonding at the corners, securing gable walls, and providing lintels over openings and secure roof structures. In district headquarters and urban areas, it was mandatory to incorporate such features (Kreimer, A. & Preece, M., 2002). Disbursement of loans was being done in two instalments, which in the majority of cases were equal. First instalment

was based on field verification by the Panchayat Chairman and Ward Chairman or member. To ensure proper use of the loan and to motivate builders to adopt earthquake resistance measures, technical verification by the Project's District Engineer or Overseer was a requirement for the second instalment. (Robert Merrill Padco, Inc., 1990)

The housing loan programme was completed within two years, i.e., on the end of Fiscal Year 2047/048 (1991). As only those who were listed in the Relief booklet were eligible for the loan, all the affected families could not be covered by the relief operation. Concerns were raised by various district committees on this shortcoming. In order to accommodate those who were inadvertently left out by the relief team, the central committee decided to grant authority to each district committee to select additional families to the limit of 7% of the original number of listed families in the district. Thus, in total about 70,000 families were expected to benefit from the loan programme based on the information, about 78% of the total families obtained either the first or both installments. About 54% of these receiving first installments had obtained second installments as well. 51,778 households were served out of this amount. 5,369 homes were built under the supervision of the project technician and which have some measures of earthquake resistant features (The World Bank, 1997). The number of grants allocated for latrine construction and smokeless stoves was less than one-quarter of the appraisal estimate of 55,000 households mainly because of the insufficient effort to raise public awareness of the value of such facilities. (The World Bank, 1997)

A survey of 1% of loan beneficiaries (500 households) carried out in 1993 showed that 97% of them used the loan to rebuild their

homes. 84% built entirely new houses because of the extent of damage to their original homes. Only a small minority were reported having received adequate guidance/training from the Project Unit in construction techniques, although the majority incorporated some strengthening features to increase earthquake resistance. (The World Bank, 1997)

In 1992, GoN decided to convert housing reconstruction loans of NRs. 5,000 into grants, and waive repayment of the first NRs. 5,000 of those with loans up to NRs. 10,000. Low income borrowers accounted for 23551 loans with a total waived value of NRs. 15,368,848. Those whose loans exceeded NRs. 10,000 did not get any such concession. In the budget of Fiscal Year 2052/53 (1995/96) NRs 10,000,000 was set aside for the purpose of waiving the loan amount of NRs 5,000 for the loanees who have received the loans not more than NRs 10,000 (The World Bank, 1997). Due to this waiver, loanee of more than NRs 10,000 also expected the same. Those who were not granted any relief felt that they have been unfairly treated and should have at least benefited from the waiver on their first NRs. 5,000 of borrowings. The commercial banks continued to hold these non-performing assets while being theoretically liable for the corresponding repayments to GoN, the borrowers were unable to sell the assets they used as collateral at the time of borrowing. Therefore, only few loanees repaid the loan and hence the repayment of the outstanding loans was extremely poor.

EAARRP also established a separate School Rehabilitation Unit (SRU) and recruited about 500 skilled masons/carpenters to supplement EAARRP field staff of engineers and overseers. Designs for typical school buildings were being prepared by the architectural section of the EAARRP implementation unit. The community



participation tradition was maintained in the proposed project. Construction was undertaken on the basis of agreements with the respective Village Panchayats or School Reconstruction Committees. It completed the construction of 15578 classrooms by 1996.

The project was completed on schedule on June 30, 1996. In total US\$ 23.4 million were disbursed by IDA to GoN. Despite some drawbacks, the outcome of the Earthquake Emergency Housing Reconstruction Component was judged to be satisfactory from the government side because about 300,000 people benefited from loans to reconstruct their homes. The funds were disbursed rapidly and there were few cases of misuse of loans. The efforts, dedication and achievements of the project staff in assisting the affected families in rebuilding their homes by providing financial and technical support and make them adopt improved or earthquake restraint construction technique to safeguard building against future earthquakes was recognized by UNCHS/Habitat which awarded the Project its Scroll of Honor in 1993.

### Lessons learned

Every disaster is an opportunity to learn something. This earthquake showed that the current building construction practice was not strong enough to resist even moderate earthquakes. Consequently, it drew the attention of the government for the need of changes and improvement in current building construction practices in Nepal which led to the formation of National Building Code.

Regarding housing loan, experts think that it was a mistake to only partly convert emergency relief from loans into grants because of the precedent that it had set. It would have been simpler and better to have offered modest grants to all genuine victims

right from the start, with top-up loans available for those requiring larger sums for house reconstruction (The World Bank, 1997). Drawing on the foregoing, some of the significant lessons learned from the housing loan programme which could be used in a nationwide housing loan programme are as follows:

- a. Affordability - Due to the emergency nature of the project, no affordability criteria were taken into account for loan eligibility. The recipients had to be on the original relief list and had to be citizens of and live in Nepal. Because of this, the affordability criterion was not taken into consideration while issuing the loan. Any future housing loan programs would have to be based strictly on the ability and willingness of borrowers to repay the loan.
- b. Subsidy - The programme was substantially subsidized in order to reach the rural poor. If an expanded program was to be financially viable, any subsidies would have to be applied judiciously, quantified and placed on the budget.
- c. Repayment Schedule – Banks did not treat the housing loan as commercial loans. There were no repayment schedules calculated. All the banks and the people knew that the loan had to be repaid within eight years. None of the banks calculated the effective interest rates for each type of loan. Moreover, records were not summarized by type and size of loan. Therefore, knowledge of amounts and dates for the repayment of the loan as well as the grace period of principal and the due date of interest are mandatory to the bank branches and loanee for any loan programme to be self sustaining. Corrective action must also be taken in the loan programme to encourage the habit of repayment, especially of interest during the grace period on district centers and urban loans.

d. Loan Recovery – There was political pressure from local Panchayat politicians to certify second installments and/or ‘chulo/ latrine’ grants which did not allow the technicians to work on their own. Moreover, they encouraged people

not to pay the loan. So, it can be said that loan recovery was not enforced or was highly politicized. If loan recovery would be not enforced or would politicize, it will set precedence for any future loan programme.

### Box 3.1: Post 1988 Diary

Important Dates	Event
August 20, 1988	Earthquake of 6.5 Richter scale hit Nepal, the epicenter being Udaypur
August 24, 1988	GoN requested for international relief assistance
September 22, 1988	Comprehensive program of Recovery and Reconstruction launched-EAARRP started
April 7, 1989	Agreement between GoN and IDA for Municipal Development and Housing Reconstruction Project
1989	Credit granted for Earthquake School Rehabilitation Program
1990-92	Political change, dissolution of Nagar Panchayats and the appointment of interim municipality boards prior to elections in mid- 1992
July 1991	Housing Loan Program completed
1992	GoN decided to convert housing reconstruction loans of NRs. 5,000 into grants, and waive repayment of the first NRs. 5,000 of those with loans up to NRs. 10,000
March 1995	A large part of the credit SDR 5.51 million was cancelled by IDA in March 1995 due to
1996	NRs 10,000,000 was set aside by GoN for the purpose of waiving the loan amount of NRs 5,000 for the loanees who have received the loans not more than NRs 10,000
February 27, 1996	Schools Rehabilitated Unit of EAARRP completed the construction of 15578 classrooms
June 30, 1996	Earthquake School Rehabilitation Program completed Earthquake Affected Areas Reconstruction and Rehabilitation Project (EAARRP) completed

## The 1993 Flood of South-Central Nepal

### Event Scenario

Unprecedented high intensity precipitation (cloud burst) occurred in the upper part of the Mahabharat Range of Makawanpur and Dhading districts, covering three major watersheds- 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 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 (Figure 3.6).

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 by this rainfall.

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-Marín Khola). The total precipitation recorded in the Hariharpur area within 24 hours was more than 500 mm. High intensity precipitations 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.

Flooding/landslide disaster of 1993 is a periodic extreme event, and it is not so unlikely or uncommon. Such events have occurred in the past. It is estimated that such huge destruction was caused by a 78-year precipitation event (Dhital et al. 1993).

### Direct Loss and Damage Human Lives

Nearly 160 persons from these areas died. VDCs' located far down in the Rapti Valley were

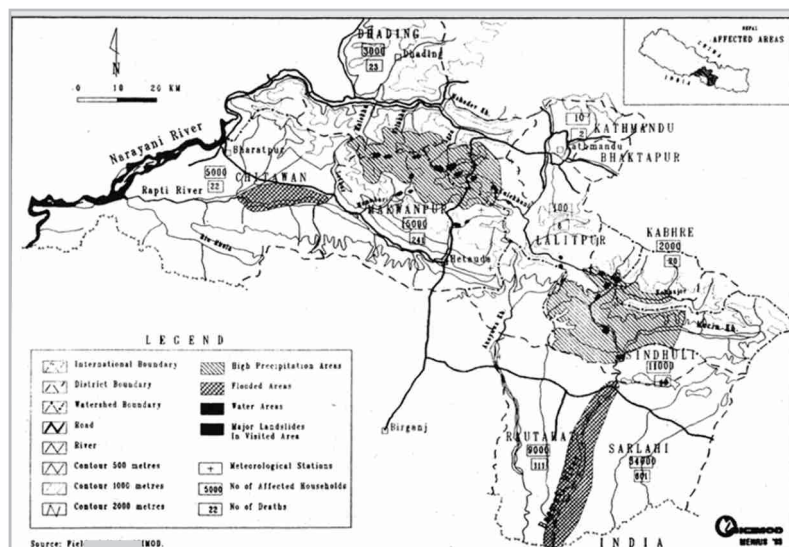


Figure 3.6: Area affected by landslides and flood disasters during high intensity rainfall of July 19 -20, 1993

Source: Dhital et al. 1993

Table 3.1: Losses due to infrastructure damage/failure

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

Source: Khanal 1996, Chhetri and Bhattarai 2001

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 Nibuwater in Makawanpur district, were affected, and 33 persons were swept away by the floods on the Rapti River.

By the second rain further 1,600 families in Kavre District, 11,000 families in Sindhuli District, and 4,000 families in Makawanpur District were affected. 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.

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 and about 1500 people died.

## Roads

- 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.

- 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 damaged 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 31 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 Kulekhni 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 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, 1993.

Table 3.2: Infrastructure Damage in July 1993 in Nepal

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

FMIS: Farmer-managed Irrigation System

Source: Khanal 1996

Table 3.3: Estimated loss of lives and property from landslides and floods of 19-22 July 1993

Sn.	Loss of Lives & Property	Quantity/Unit
1	Dead	1,336 persons
2	Missing	201 persons
3	Injured	110 persons
4	Families affected	85,451 families
5	Houses destroyed	18,322 no
6	Houses damaged	20,721 no
7	Public buildings lost	452 no
8	Land loss	57,013 ha
9	Livestock loss	25,628 no
10	Roads destroyed	366 km
11	Number of bridges destroyed	213 no
12	Dam destroyed	34 no
13	Number of Irrigation Channels destroyed	620 no
14	Total Estimated Loss of Property	NRs 4,901 million

Source: Chhetri and Bhattarai 2001

### Other Infrastructures

Almost all the bridges located over the rivers originating from the Mahabharat Range (area of high intensity rainfall) were swept away by the floods.

Bagmati barrage, located about 20 km downstream from the area of high intensity

precipitation was badly damaged and numerous irrigation, transportation systems, and other infrastructure were also destroyed.

### Agriculture

About 60,000 ha of land got damaged (Table 3.3).

## Box 3.2: July 1993 Floods and Landslides of South Central Nepal

The south-central part of Nepal experienced unprecedented floods, landslides and debris flows following an incessant rainfall lasting 19-21 July 1993. Maximum rainfall recorded was 540 mm in a day with the night time rainfall of 65 mm/hour. The disaster was followed by another event of floods and landslides on the 8-9 August 1993. The total effect of the two events was 1,460 people dead or missing, 73,606 families seriously affected, 39,043 houses destroyed fully or partially, about 43,330 ha of cultivated land washed away or covered with debris, 367 km of roads damaged, 213 bridges, including six concrete bridges on

national highways, 38 large to small irrigation schemes, 452 school blocks hospital and government offices etc. were destroyed within the couple of days. Vital supplies to the capital city, Kathmandu was virtually cut off for more than a month because of the road breaches and damage to the bridges. Damage to the Kulekhani hydropower system, consisting of two power plants and providing 40% of the national power production resulted in heavy load shedding which affected not only the normal life of the population but also adversely affected the whole of the national economy (UNDP, 1997)

Table 3.4: Damage due to Flood and Landslide in July 1993

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

Source: Annual Disaster review, 1993, DPTC.

### Economic Loss

Estimates place the losses from this single event at about 5 billion NRs. (Chhetri and Bhattarai 2001).

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).

### Indirect Impact

Due to the 1993 flood/landslide, 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.

### Secondary Effects

The next largest loss due to disaster was 16.17% in 1993 which again was the 1993 landslide and flood disaster year (CBS

Statistical Yearbook 2006 and Economic Survey, the Ministry of Finance, 1995, 2006).

### Lessons learned

The main lessons learned as compiled by A. Dixit (1996) are:

- **Preparedness and Early Warning**

The extreme weather event was sudden and any effective warning could not be issued. Moreover, there was no preparedness at any level. The lack of communication was very severely felt as different rumors added to the confusion.

The necessity of installing floodwarning system along the main rivers, especially at such large infrastructure as the Kulekhani dam; as well as establishment of proper communication system between two infrastructures e.g. Kulekhani Dam and the Barrage of the Bagmati Irrigation Project located downstream in the same catchment, was

felt acutely, notably because the initial rumour suggested the sudden release of water from the Kulekhani Dam for its safety was the main cause of the flood which reached the Terai during the night time. The government has initiated some action in this line.

- **Rescue and Relief**

Response was again immediate from all quarters. The Central Natural Disaster Relief Committee became active and the government launched a massive relief and rescue operation, mobilizing the army, the police and the non-government organizations such as the Nepal Red Cross for rescue and relief. Local communities were also involved for providing assistance to the government efforts. The Natural Calamity (Relief) Act was activated for the declaration of disaster area. A Regional Disaster Relief Centre was established in Hetauda for providing the necessary co-ordination in relief activities. The Royal Nepal Army flew surveillance missions over the affected areas for initial damage assessment. This helped verification of the conflicting information on the damages. Subsequently, the government fielded various technical teams as for health, shelter, water and sanitation to provide a more detailed assessment of damage.

The government made an international appeal for support and the UN Resident Coordinator was requested to assist in the co-ordination of the international community's disaster-relief efforts. Relief materials poured in from various countries and international organizations. Available institutional resources were mobilized to manage the distribution of the relief materials to the affected.

The response to the flood disaster was much better managed than during any of the previous disasters in Nepal. Continuous building up of the

institutional capacity of the Special Disaster Unit, the experience gained from the 1988 Udaypur Earthquake, and a very effective role played by the UN-DMT in providing co-ordination as well as technical support, the continual institutional capacity building of the Nepal Red Cross and its limited but very effective preparedness in terms of construction of ware houses and storage of food /relief materials etc. were the contributing factors. Similarly, the Army and the Police could play increasingly better role. The Government was able to develop strategies for an effective management of the disaster-relief operations which consisted in monitoring of the disaster-relief operations by teams including representatives from international communities, in inviting the international personnel to the Government team managing the Disaster Relief Unit in the Ministry of Home; and sending a special team from the centre to verify damage statistics and to take necessary actions to improve the disaster response efforts. Representatives of different political parties were involved in the disaster-relief operations. Local activists were also involved in a greater way.

Transparency in disaster-relief operations was thus maintained than any time previously. However, the need to strengthen the national capability in terms of preparedness and co-ordination was very acutely realized. This aspect still demands greater attention given the fact that the government is much constrained financially and foreign assistance will continue to play much role in future disaster response. For instance, it became quite evident that the limited logistical capability of the Government needed to be strengthened and an effective co-ordination mechanism should be developed for ensuring a smooth management of the relief supplies



coming to the country from international donors. Similarly, a system of disaster assessment needs to be developed and strongly implemented not only for developing a correct damage scenario, but also for an effective implementation of the disaster response works.

Given the Government's request for help to co-ordinate the international community's disaster-relief efforts, the UN Disaster Management Team (UN-DMT) has been actively involved in working with the Government to develop plans for reacting to future disaster situations including providing assistance in the co-ordination of the disaster relief efforts. A co-ordination mechanism concerning logistical management has been developed jointly by the UN-DMT and the Government which would be initiated should a disaster take place. Working Groups on Health and Food have been formed which include representatives from the Government and the international community based in Nepal. Manuals have been prepared for Logistics, Health and Food aspect in order to ensure greater effectiveness of disaster response works. All these were achieved and the manuals are prepared based on the experiences gained during the 1993 Floods.

- **Rehabilitation and Reconstruction**

The Government constituted a Central Disaster Rehabilitation and Reconstruction Coordinating Committee which was assigned with the task of preparing a damage assessment report upon which a rehabilitation and reconstruction program was drawn. The National Planning Commission (NPC) was given responsibility for managing the reconstruction and rehabilitation phase.

Provision of financial assistance to the affected population for reconstruction, initiation of low-cost housing, restoration

of the damaged infrastructures including the hydropower system and the bridges etc. were carried out with the involvement of the line agencies of the Government and with support from international donor/funding agencies.

One of the examples of rehabilitating the flood affected people was the construction of 1800 dwelling units in Sukhiya Pokhari of Sarlahi, Mangalpur and Santapur of Rautahat District and Madanpokhara of Makwanpur District. These 1800 housing units were constructed with the financial assistance from Tzu Chi Foundation a Buddhist Charity organization based in Taiwan and were provided free of cost to the beneficiaries along with a conditional ownership title restricting them to sell the property before 25 years of occupation. A brief description of the project is presented in the following pages.

### **Rehabilitation of flood victims of 1993 in Sarlahi, Rautahat and Makwanpur Districts**

#### **Introduction**

National and international institutions working in the affected areas offered various options to rehabilitating the flood victims. One such program was executed by Tzu Chi Foundation, a Buddhist charity organization based in Taiwan. One basic housing unit with two rooms a small kitchen and a detached toilet was provided to 1800 families in four different locations. 60 Housing units accommodating 10 household families in each unit was constructed in Sukhiya Pokhari of Sarlahi district. 150 duplex blocks for 300 families in Mangalpur and 250 duplex units for another 500 families in Santapur were constructed in Rautahat District. Similarly another 200 duplex units for 400 families were constructed in Madanpokhara of Makwanpur District.

### Building Plan

The basic plan of the housing unit had a small verandah, two moderately sized rooms and a small kitchen. There was a small toilet for each housing unit detached to the main building. Each housing unit also had a small kitchen garden. The housing units were provided with wide access roads and approach to the main road. The Figure 3.7 drawing shows the dimensions of a typical duplex unit used to house the flood victims.

Nepal government provided the land for the housing program, Tzu Chi foundation provided the construction cost. The housing project was completed within 18 months by employing two A Class contractors. Thus this rehabilitation program for the victims also became the largest housing program ever executed in Nepal in a very short time.

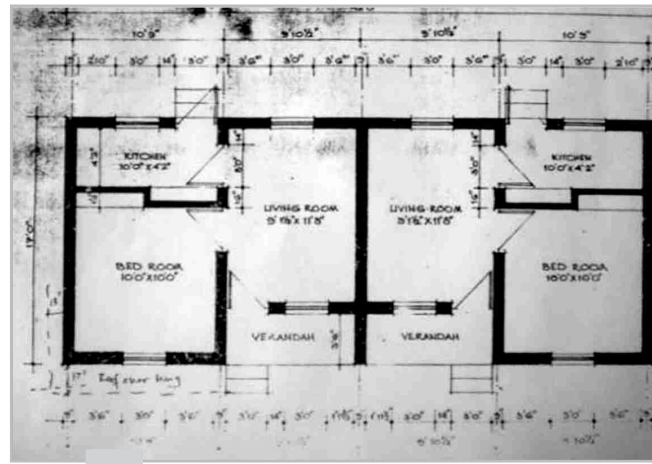


Figure 3.7: Floor plan of a typical duplex unit providing basic housing for two families in Mangalpur

### Construction Technology

The buildings were constructed with boulder stone masonry in mud mortar in the foundation. Brick masonry in cement sand mortar was used in the superstructure. Precast RCC lintels were used over the doors

and windows. Molded steel frames were used for the doors and windows. The doors had paneled shutters and the window glass shutters. The colored CGI roofs were supported on steel tubular rafters and battens. The (figure 3.8 - 3.13) photographs were taken in Mangapur of Rautahat District while they were under construction.



Figure 3.8: Stone Masonry in Foundation



Figure 3.9: Weakness in building construction



Figure 3.10: Brick building under construction



Figure 3.11: Pre Cast RCC lintel above the opening



Figure 3.12: Improper bonding of masonry units



Figure 3.13: Detached toilet blocks for the houses

## Construction Quality

The quality of construction of the buildings as observed during construction in Mangalpur of Rautahat District was not to the standards. The reason behind may be that the construction had to be completed in a short time. The other obvious reason may be lack of proper supervision and monitoring. The quality might have been better if the potential beneficiaries were employed in the construction work.

## Vulnerability to disasters other than flood

Despite the low quality of construction due to many reasons the buildings may be strong enough to bear the vertical load. In a way this has been proved because they are erect since the completion in 1995 and have stood for the last 17 years. But they are highly vulnerable to horizontal loads like high speed wind and earthquakes. The housing units clearly lack basic seismic resistant features like vertical reinforcement and horizontal bands. The CGI sheet roofing of three of the housing units during construction and

19 housing units after the flood victims occupied the buildings were blown in Sukhiya Pokhari of Sarlahi District by a moderate intensity of wind. Sukhiya Pokhari had blocks of row housing with 10 units in a block. The improper breath to length ratio might have been a major reason for this damage apart from the proper anchorage of the roofing system to the wall. The colonies seemed to be safe from flood as all the four settlements are located in areas less prone to frequent flooding. Very limited use of timber and use of other non combustible construction materials makes them safe from fire, also.

Three settlements in Sukhiya Pokhari, Mangalpur and Santapur observe very high temperature in summer and extremely cold temperature in the winter. Instances of few deaths every year by hot wave in the summer and cold wave in the winter are very common in these areas. The use of CGI roofing sheet without any provision for the insulation made the dwelling unit uncomfortable. Almost all the household have constructed additional shades with the materials that they can afford. The shades were mostly

constructed with wattle and daub wall and thatch roof. These shades are cool in summer and warm in winter. The addition had come up not only because of the comfort but also because of the space requirement. Whatever may be the reason behind this but the settlements are now vulnerable in case of fire.

### Housing delivery system

This project basically had two major objectives. One of them was to construct 1800 housing units in the given time and the other was to select and settle the flood victims in the new settlement. There were no major problems reported in fulfilling the first one but meeting the second objective faced major challenges.

The affected population raised a question on the selection of the beneficiaries. It was known that the affected population was not satisfied with the selection process. They opined that there was larger mass left who were more severely affected than those who were allotted the housing units. They wanted the selection criterion to be more specific and transparent. There were heavy protest during the allocation and it was delayed months keeping the victims in temporary shelters even after the buildings were ready to occupy.

### Water supply and sanitation

The other issue was of drinking water. The settlement in Mangalpur neither had an existing drinking water supply scheme nor the implementers made a new scheme. The water required for construction was also transported from Bagmati river around 2 kilometers from the site. The inhabitants were compelled to bring the water they required from either the Bagmati river 2 kilometers away or the irrigation canal nearby for years after they were settled. This made them very difficult to use the toilet blocks. Even after a year of occupying the houses

the toilets were used either as a fire wood store or a goat shed.

### Employment

The affected population who finally settled in the newly constructed buildings spread across the bank of river Bagmati from Nunthar to the border of India which stretches across more than 40 kilometers. This created the problem of employment for daily hand to mouth maintenance. It was not possible for the bread earners to travel to and from the original employment location nor there were any opportunity of alternative employment within the walking distance from the new settlement. This forced the family members to break into two living areas. The bread earners of the family started living in temporary huts in their original location and the new house was only for old people and children s who could not work. Even the elderly and the children could have gone to their original location but this was stopped by the compulsion of the government which did not allow them to sell the new property within 15 years from the date the ownership was transferred. All the 1800 housing units were occupied in the initial months but as time passed many of them left their houses locked and started settling in the place where they could get work to earn their bread. It was said that they started selling their property unofficially. It is very much likely that almost 50% of those allotted the buildings might not be living in the house any more.

### Conclusions

- The project implemented with the financial assistance of Tzu Chi Foundation has been the first largest housing project ever included in Nepal till 1995 providing permanent shelter to the people affected from disaster, though the number of families rehabilitated is very small in comparison to the affected mass.

- Providing the housing units free of cost and without any participation in the construction and housing delivery system lead to decreased sense of ownership by the occupants.
- Addition of shades constructed with wattle and daub walls and thatch roof has considerably decreased the outlook of the settlement and highly increased the vulnerability to fire disasters.
- Some of the beneficiaries have settled elsewhere either leaving the houses locked or informally sold the property as they were not allowed to formally sell it to others within 25 years of the date of awarding the owner title.
- Lack of employment opportunity within the nearby location except in Madanpokhara of Makwanpur district became the main reason for the victims to settle elsewhere.
- It is much better to rehabilitate the victims in the vicinity of their original living areas as far as possible. This process may take more time but it will be sustainable and the beneficiaries will not feel as stranger in her / his own residence.
- The beneficiaries must be considered as one of the major stakeholders instead of treating them as “poor helpless victims” and try to spoon feed them. These people can very well participate in the selection process of the beneficiaries with an agreed selection criterion. Further they can work in the construction of the buildings being built for them at least as unskilled laborers. Training them on the building construction process would facilitate them to construct their own buildings and at the same time acquire additional skill for livelihood. In this case such rehabilitation endeavor should be considered as a process and not an objective oriented project.

### Lessons for the future

The lesson from this project is to establish community based disaster risk management committees and capacitate them to implement disaster preparedness and response at the local level. Apart from that the following lessons can be drawn from the experience of this rehabilitation for the disaster affected people;

- Such project could have contributed to income generation activity in a great deal if local materials like “khapsda” the traditional clay tiles instead of CGI sheets were used for roofing. Various income generating programs could have been coupled with the rehabilitation program in association with the NGOs/ INGOs working in the area.

**Table 3.5 : Families affected and the number of housing constructed by Tzu Chi Foundation**

District	Family affected	Houses Collapsed	Families rehabilitated by Tzu Chi Foundation
Makwanpur	14748	3010	400
Sarlahi	16812	16708	600
Rautahat	14644	6411	800
Total	46,204	26,129	1,800

## The Koshi Flood 2008

### Event Scenario

Nepal had a devastating flood in 2008 in eastern region due to heavy monsoon rains in Koshi River Basin, one of the largest river basin among the major three river systems in the country. On 18 August, the Koshi River breached an embankment through an eastern retaining wall damaging two dam spurs, roughly 10 Km north of the East West Highway, affecting 8 VDCs - Kusaha, Laukahi, Ghuski, Sreepur, Haripur, Narshimha, Madhuban and Basantapur of Sunsari and Saptari Districts. Additional flooding on 29 August affected further 4 VDCs.

### Direct Loss and Damage

#### Human Casualties

The data on loss and damage differ with different sources. According to UNESCO field survey a total of 6183 households, 40% of the households in these 12 VDCs were affected. Another estimate shows a total number of 7306 households affected in the VDCs of Shreepur, Haripur and Paschim Kusaha. Source of CDO Office, Sunsari, shows a total of 7584 displaced families. Almost all the households in Haripur and Shreepur were affected. The percentage of affected households decreases with the increase in the distance from the breach site.

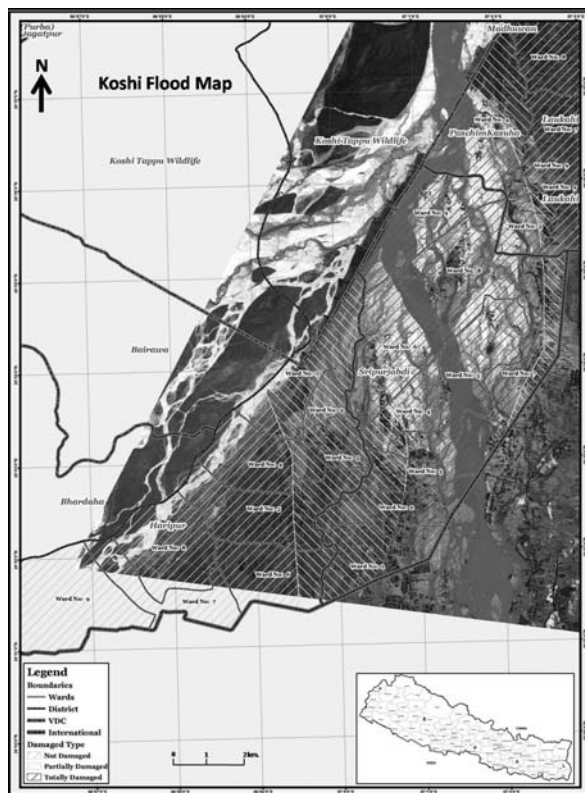


Figure 3.14: Koshi Flood Map

Source: UNOCHA, 2008

Table 3.6 presents the total number of population and households.

There was only one fatality reported from the flooding. However, the number of deaths reached 55, mostly in the shelter camps (CDO Office, Sunsari). UNESCO field survey reported total of 40 deaths, of which 18 were female and 6 were children. Many of them had died due to diarrhea. The total number of injured people was 2350 of which 898 were female and 816 were children.

Table 3.6: Number of households and population figures for the affected VDCs

Number of households and population figures for the affected VDCs	Total number of households	Total number of population	Number of household affected	% of affected household
	18238	109817	6183	33.9

Table 3.7: Number of deaths and injuries

Number of deaths and injuries	Death				Injury			
	Male	Female	Children	Total	Male	Female	Children	Total
	16	18	6	40	636	898	816	2350

Source: UNESCO, 2009

## Housing and Building

Many property including houses, sheds, public buildings and temples were swept away and destroyed. In addition to these, 8 rice mills and 23 seller mills were damaged. Table 3.8 shows the damage to building property from the flooding.

Table 3.10 shows the estimated loss of household goods. Those losses were confined to three VDCs.

## Infrastructures

The estimated loss of infrastructure such as road, bridges and culverts is shown in Table 3.11. About 7 km of metalled road, 126 km of graveled road, 131 km of earth road and 82 km of trails were damaged. Similarly 6 bridges and 67 culverts were also damaged by the flood.

The East West Highway which is the country's main transport corridor remained impassable for three months hampering movement of agricultural product from the Eastern Tarai to other parts of the country; as 17 km was damaged including 1 km

completely washed away at three different points and about 4 km submerged in flood water (ADB, 2008c; IASC, 2008; Pathak, 2008). The Koshi flood destroyed 12 km of Mahendra Highway in different parts of Sunsari district. 13 km of culverts, irrigation channels got flooded. Nepal Army Barrack and office of Koshi Tappu Wild Life Reserve had been inundated. (Kantipur Daily, 2065 Bhadra)

Also, damage to underground optical fibre, phone lines and installations resulted in telecommunication problems in landline and mobile phone for two days (ADB, 2008; IASC, 2008; Pathak, 2008).

In regards to electricity supply, five towers of 132 KV and about 117 Km of transmission lines were damaged by the flood. Similarly 60 KV transmission lines was also damaged. Transmission lines even in the downstream area in the far south and eastern parts were damaged.

## Agriculture

Land: Over 5985 Bighas of rice paddy, sugar

Table 3.8: Damage to properties

Loss of/damage to properties	House (no)		Sheds (no)	Public Building	Temples	Rice Mills	Seller Mills
	Pakki	Kachchi					
	230	3167					

Table 3.9: Extent of damage to cultivated land

Extent of damage to cultivated land	Total land area in Bigha	Totally damaged land area in Bigha	Partially damaged land area in Bigha	Ponds	Canal
	8207	3764	4443	89	73

Table 3.10: Loss of household goods in number

Loss of household goods in number	Khat	Daraj	Radio	TV	Cycle	Motor bike
	3288	1075	1490	225	3150	11

Table 3.11: Damage of roads and trails

Loss/damage of roads and trails	Road (km)				Trail (km)	Bridge (no)	Culvert (no)
	Metalled	Graveled	Earth	Total			
	7.4	126	131	264.4			

Source: UNESCO, 2009

cane, corn and jute land got destroyed by the flood along with 89 ponds and 73 canal. Almost all the cultivated lands in the three VDCs namely Haripur, Shreepur Jabadi and Paschim Kusaha were damaged by the flood. Large parts of cultivated land were covered by a thick layer of sand and gravel.

Another estimate of damage to land shows a much higher area of nearly 8200 Bighas damaged by the flood, in only four VDCs. Nearly 46% of the area was totally damaged and the remaining 54% was partially damaged.

**Crops:** A huge quantity of standing crops got damaged and there was loss of grain stored in the houses because of the floods (Table 3.12). The standing crops were paddy, sugarcane and jute. The quantity lost reported from 39800 quintal of sugarcane to 79214 quintal of rice and 2170 quintal of jute. Similarly, the loss of stored grains reported as 4940 quintal of wheat to 5427 quintal of maize and 635 quintal of potato.

**Fruits and Vegetables:** The loss of fruits from the flood is shown in the Table 3.13. The loss of fruits was also confined to three

VDCs, namely Haripur, Shreepur Jabadi and Paschim Kusaha.

Table 3.14 shows the estimates of vegetables damaged by the flood. The estimated loss is substantial. Again, Haripur, Shreepur Jabadi, Paschim Kusaha and Ghuski were affected most.

**Livestock loss:** The flood also damaged and destroyed livestock and productive assets, such as agricultural tools and machinery. Table 3.15 shows the number of livestock lost due to the flood. The loss of fish was considerable even in the downstream areas such as Kaptangunj and Sahebgunj. A total of 55000 domestic animals were affected and 20000 displaced.

### Direct Economic Loss

UNESCO estimated the loss incurred in monetary value and it shows that there was a loss of about 3773.6 million rupees (Table 3.16). Land value comprised nearly 64% of the total loss, followed by livestock, food, crops and houses. This estimate was based on the losses in only four VDCs and did not incorporate the loss of other household

Table 3.12: Loss of crops in 2008 Koshi flood

Loss of crops in quintal	Paddy	Wheat	Maize	Potato	Sugarcane	Jute
	79214	4940	5427	635	398100	2170

Table 3.13: Loss of fruits in 2008 Koshi flood

Loss of fruits in quintal	Mango	Jack fruit	Banana	Guava	Litchi
	4620	2370	300	100	500

Table 3.14: Losses of vegetables in 2008 Koshi flood

Losses of vegetables in quintal	Pumpkin	Bottle gourd	Cucumber	Pointed gourd	Chilli	Aborigine	Okra	Arum
	1601.5	40219	102	31015	10000	1200	10	30

Table 3.15: Number of livestock lost in 2008 Koshi flood

Number of livestock lost	Cow	Buffalo	Goat	Chicken	Duck	Pig	Fish
	1000	1180	7306	22047	2000	300	303500

Source: UNESCO, 2009



goods, infrastructure and services. So the total loss seemed to exceed this estimate.

## Indirect Impact

**Electricity supply:** Damage of 60 KV and 132 KV transmission line with 5 towers caused disruption of electricity supply for 2 to 4 weeks.

**Water supply:** The water supply system was also affected up to 4 weeks. Disasters exacerbated problems of water contamination, leading to an increase in water-borne diseases such as cholera and diarrhea.

**Telecom:** The communication networks were disturbed by flood for two days. Nepal Telecom Mobile network was working but it got disturbed time and often. Mero mobile services, a private telecom facility worked fairly good. Internet connection worked sporadically.

**Market:** The 2008 Koshi flood was reported to have a significant upward impact on commodity prices, particularly of onions, potatoes and fire-woods (IASC, 2008). At the same time, the price of some goods declined due to supplier side problems. The price of perishable food items such as bananas and vegetables dropped sharply in areas east of Koshi while it increased in western and north eastern feeder markets because of the closure of the East-West Highway (IASC, 2008; WFP, 2008).

The flood was associated with an increased incidence of pestilence and crop disease as well with further adverse implications for crop yields.

**Food insecurity:** Koshi flood contributed to food insecurity by massively destroying the crops and agricultural land.

**Schools:** Koshi flood disrupted the education of some 23,000 school students including both displaced students and students of the host schools where the displaced were sheltered (Acharya & Aryal 2008). There were 61 schools and 9950 students affected by this flood. Out of 61 schools 17 Community schools (6885 students), 13 Boarding schools (1000 students), 6 Madarasa (1585 students), 25 Child Development Centers (480 students) were affected. 21 schools and 1 campus of district headquarter were closed for setting of the camp. Total 20000 students were affected due to setting up of the camp.

**Flow of Goods and Services:** The flow of people and goods ceased completely for a period of 30 to 220 days. Previously more than 3600 vehicles used to shuttle every day on the East-West Highway. Similarly the supply of drinking water and electricity was completely disrupted for up to 220 days in many places. Industries were closed for up to 220 days (Table 3.17).

Hale of the Industries of Sunsari Morang corridor were closed by the flood resulting

Table 3.16: Estimated monetary loss in 2008 Koshi flood

S. No	Properties	Loss in Rs	%
1	House and shed	60454080	1.6
2	Land	2422400375	64.2
3	Livestock	319247508	8.5
4	Crops	176641475	4.7
5	Food	190844448	5.1
Total		3773603836	100

Source: UNESCO, 2009

in the daily loss of NRs. 10 crore. It also disturbed the goods supply to other parts of country like Kathmandu, Butwal, Pokhara and Narayanghat.

### Early Warning and Preparedness

A sort of partial Early Warning System was established in Koshi Flood of 2008. Rising of water level in the river due to continuous rain was quite noticeable prior one week. The information was being aired regularly by local radio Saptakoshi FM. When spur cutting started, people were alerted and advised to leave the place. This was one day before the event and when the event occurred people were able to evacuate though with limited belongings. DDRC immediately got activated in communicating and coordinating with GOs, I/NGOs, UN agencies for rescue and relief. No fatality occurred due to flooding.

### Rescue and Relief

The Government took the lead role in response operations through DDRCs and CDOs by coordinating between local authorities and the line ministries.

On 4 September 2008, the Government

## Box 3.3: Secondary Effects of Koshi Flood

The macroeconomic consequences of the 2008 Koshi and far-western floods

The Koshi and far-western floods resulted in an estimated NRS 2.3 billion (US\$29.2 m) direct damage to assets and a further NRS 3.6m (US\$44.8m) indirect damage, together equivalent to 0.6% of projected GDP for FY 2008-2009. However, the impact of the floods was fairly localized and, assuming relatively rapid restoration of infrastructure and reclamation of agricultural land, it was expected that the floods would have a very limited impact on macroeconomic performance. In consequence, the GDP growth forecast for the year was only revised down from 7.0 to 6.7%, and the agricultural GDP growth forecast from 4.5 to 4.1%, following the floods. Growth in the nonagricultural sector was also expected to be 0.2 percentage points lower than previously forecast, due to the impact of damage to transport and communications infrastructure on manufacturing activities and trade.

The floods were expected to have a minimal impact on prices, given their relatively limited effect on overall agricultural production coupled with supply alternatives from India. Meanwhile, adverse impacts on the balance of trade, relating to higher inflows of imports for reconstruction purposes and to resolve supply disruptions resulting as a consequence of damage to the East-West Highway, were expected to be offset by sustained growth in inflows of remittances and tourism earnings (Source: ADB, 2008).

Table 3.17: Number of days when the flow of goods and services were closed

S. No	Name of the VDCs	Traffic flow	Water supply	Electricity	Trade	Industry
1	Haripur	180	200	220	150	150
2	Shreepur Jabadi	180	200	220	150	220
3	Paschim Kusaha	200	200	200	200	200
4	Ghuski	200	0	20	30	20
5	Basantapur	30	0	15	30	15
6	Laukahi	220	7	30	30	30
7	Narsimha	30	15	15	30	15
8	Ramgunj Sinuwari	45	15	15	30	15
9	Devangunj	45	15	15	30	15
10	Sahevgunj	40	15	15	30	15
11	Madyaharsahi	40	15	15	30	15
12	Kaptangunj	40	15	15	30	15

Source: UNESCO, 2009

declared a State of Emergency in 10 VDCs in Sunsari and 1 VDC in Saptari, making it easier for CDOs to take prompt actions as needed. At the regional level, the Saptakoshi Disaster Management Coordination Cell was established to monitor and direct the DDRCs. At the central level, CNDRC, chaired by the Ministry of Home Affairs, oversaw the response effort and prepared the return strategy plan for the Koshi flood-displaced people in December 2008.

The work of the international humanitarian community in both regions was being coordinated through a cluster system formalized on 9 September 2008. Clusters were established for health - WHO; nutrition - UNICEF; water, sanitation, and hygiene - UNICEF; food assistance - WFP; education - UNICEF and Save the Children; protection - OCHA with a subgroup on child protection (UNICEF); camp coordination and camp management - IOM; and emergency shelter - IFRC. The clusters coordinated by the UNOCHA responded to the needs of flood-affected people. The World Bank funded two barges to provide temporary transport to cross the Koshi River. National and local

### Box 3.4: Prompt activation of DDRC & CNDRC

The DDRC of Sunsari met on 18 August after getting the information of flood. The CDO and LDO also met with political parties though they were not the member of DDRC. The DDRC sent an assessment team to assess the nature and extent of the event and informed MoHA/CNDRC requiring assistance from the center.

The Central Natural Disaster Relief Committee (CNDRC) meeting headed by the PM Pushpa Kamal Dahal held on 19 August, declared National emergency and directed to mobilize the entire state machinery for the relief effort.

The Government further appealed to all people, organizations and international community to generously extend financial and material help for carrying out the relief and rehabilitation operation on 21 August.

NGOs and NRCS played a critical role in the immediate response in Sunsari and Saptari districts, working closely with UN agencies. The role of NRCS had largely been to facilitate the distribution of relief materials obtained from government agencies and development partners. (ADB, 2009)

Almost all the Humanitarian agencies sent their staff in the affected areas to provide direct assistance like Action Aid in vulnerable groups, DPNet in coordination and information sharing with civil society, UNDP on transportation of rapid assessment teams, medical teams, medicines, search and rescue kits, emergency response items both food and NFI.

The Government of India, which is responsible for maintenance of the Koshi barrage and embankment under the Koshi Project Agreement, responded by providing NRs 320 million as immediate reliefs to flood-affected people in Saptari and Sunsari districts.



Figure 3.15: People seeking for temporary shelter after 2008 Koshi flood

## Need Assessment

The DDRC constituted and deployed teams to assess the loss of property and other resources. NRCS carried out Damage and Need Assessment. Oxfam, Caritas and DEPROSC Nepal completed initial rapid assessments using IASC-IRA tool. WFP assessed initial food needs and damages to food crops. MoHP, WHO and UNFPA carried out rapid health assessment. UN OCHA carried out initial assessment of the situation in Saptari and other areas. Child protection and education assessment was done by child related agencies.

## Supply of Food and Non-food Items

Initially immediate food needs were being met with donations of ready to eat foods from the Government, INGOs, NGOs, UN and local civic organizations. Later on WFP made resources available for feeding up to 30,000 people for two weeks. All the people staying in the camps received some of the other kind of food. But the need to provide the necessary level of calorie received not much attention. Some displaced people living outside the camp did not receive the food especially those who had not left their house with the fear of losing their property. Though there was no shortage of food, the distribution especially outside the camp was problematic. There was looting of the food intended for distribution on 19th August in Lauki. Some relief suppliers wanted to distribute the relief but were not able to do so due to the absence of a suitable mechanism of identifying the genuine disaster victims. Later identity cards were issued to solve the problem (DPNet, 2008). ACT International and LWF Nepal provided ready-to-eat food such as beaten rice, puffed rice and noodles to 3,583 people from 552 households (LWF Nepal, 2008).

Similarly, non food items (NFI) such as blankets, tarpaulin, plastic buckets/ jugs were also distributed to the affected people.

## Box 3.5: Quick Initial Rescue and Relief

The response of the Government in terms of rescue operation was quick and efficient. Security forces were deployed for rescue and to control the side cutting using the sand filled sack. Similarly Koshi Victim Society (KVS) in Saptari were mobilized for rescue and distribution of relief materials. People have been rescued from roof and tree tops. More than 5,500 people were rescued using 3 Army Helicopters, 10 rafting boats, 3 ordinary boats, 4 elephants from the adjacent Koshi Tappu Wild Life Reserve and nylon rope 18 pieces of air filled Tube within three days. According to the Nepal Army, 2,500 people were rescued by ground on 19 August. 417 people were airlifted from roof and tree tops by 9:30 am on 20 August.

The Sunsari chapter of NRCS mobilized its local volunteers for distribution of relief materials for humanitarian response. The NRCS handed over the management of its relief materials warehouse to LDO in Inaruwa for distribution on 21 August. The small local stakeholders were fast in the response (Baral, M., 2009).

## Shelter

Locations of those displaced slowly coalesced into four distinct categories over the first month: those living with host families, camps established in higher areas east of the new Koshi flow, camps established in Saptari district and finally camps extending south of the embankment breach along a narrow strip of land between the embankment and the usual flow of the Koshi (Kellett, J, 2009). A total of 328 shelters were built in the Jhumka camp, followed by 245 shelters in the Lauki camp. Additional shelters were subsequently built in other places (ADB, 2009). All the displaced persons received some or the other kind of emergency shelter even though not confirming to the Sphere requirements. Most of the shelters were created in the existing Schools and it hampered the education of the students. (DPNet, 2008). Oxfam completed 4,199 shelters and supported 890 Bamboo frames, Oxfam and NRCS further distributed heavy-duty

Tarpaulin for winterization. 29 temporary shelters were set up surrounding or in the Inaruwa Municipality and campus, schools, Madarasa in different parts of laukahi.

### Medicine

Children in particular suffered from pneumonia due to the supply of a rather thin mat. There were also few incidences of diarrhea and cholera along with eye disorder such as Conjunctivitis. Nepal Red Cross Society initiated setting up of the health camp for flood victims. Similarly District Health Office Sunsari, BP Koirala Institute of health Science Dharan, Birat Nursing Home, Novel Medical Collage, Nepal Army, Rotary Club provided health services. Some

Committees were formed in order to take responsibility for care of WASH facilities, camp cleanliness and encouraging safe hygiene behaviors. A total of 12 Oral Rehydration Treatment (ORT) corners and Health Information Centers were established where Community Health Volunteers (CHVs) distributed Oral Rehydration Solution (ORS) and disseminated information related to public health and hygiene promotion. Altogether 2,328 people got benefited from the information provided and 321 diarrhea patients were treated with ORS. Likewise 1,540 education sessions were organized by the PHP volunteers and supervisors on different areas of hygiene

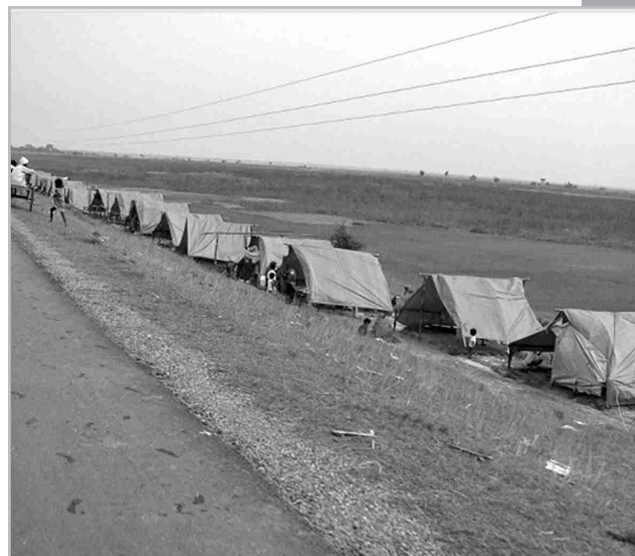
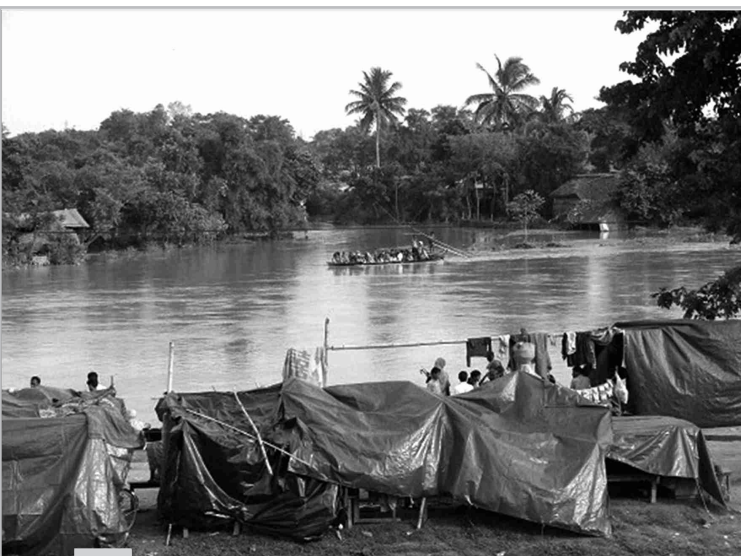


Figure 3.16: Shelter, storm and struggle for life after 2008 Koshi flood

camps were opened for the distribution of medicines. One of them was the Pragatisheel Samuha which was seen to be distributing the necessary drugs for the flood victims in collaboration with the District Health Office in Lauki (DPNet, 2008).

### Water, Sanitation and Hygiene (WASH)

A total of 584 Public Health Promotion

promotion. With the view to raise public awareness, 48 street dramas were performed. World Vision International (WVI) installed hand pumps for safe drinking water at the temporary shelters and conducted arsenic testing. It also installed 24 temporary toilets at the shelters and some emergency toilets. UNICEF gave trainings on the use of aquatab and provided it for 600 families.

## Recovery

The majority of Koshi flood-affected displaced households returned to their area of pre-flood origin. However, the flood displaced households from the heavily sanded areas were with limited shelter, access to basic facilities including drinking water, sanitation facilities, adequate shelter or livelihood support. Therefore various packages were brought for the affected people in recovery phase.

### Food Security

**Cash-for-Food:** The DDRC Sunsari provided Cash-for-Food for the Koshi flood affected families from Shreepur 1-9 and Paschim Kusaha 3, 4. Total of 5,139 households received the Cash-for-Food, conducted during 27 April - 10 May, 2009. DDRC provided the Cash-for-Food with the norms of NPR 1,000 per family member to households with less than five members, families with more than five members received a lump sum of NPR 5075.00. (UNOCHA, 2009)

**Food for work - Development Project Service Cener (DEPROSC-Nepal/WFP partner NGO)** implemented schemes on Food-for-Work (FfW) in the areas of 4 VDCs – Paschim Kusaha, Shreepur, Haripur and Lauki. The total benefited households were 3,612 HHs. Most of the running schemes included Rural Road Rehabilitation and some new road constructions, community fish ponds, Hume Pipe maintenances, culvert maintenances, check dam construction and deep land filling. (UNOCHA, 2009)

### Return Package

A total of 7,343 families applied for the Government Return Package and a total of 2,438 families (Green zone: 1,680, Yellow zone: 758 families) from the flood affected area received the sum, as of 13 May 2009. (UNOCHA, 2009)

## Government Compensation Package

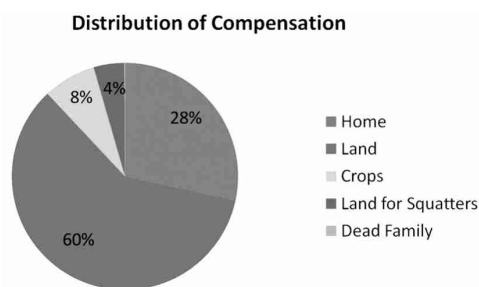
Ministry of Home Affairs approved a total of NRs. 1 billion 60 Crore 82 Lakhs 96 Thousand 5 Hundred to compensate flood damaged buildings, land and crops, as well as funds for two Kattha of land for the landless households and compensation for deaths that occurred in camps. (UNOCHA, 2009), see Table 3.18 for more details.

### Health Service in Return Areas

Under the inadequate provision of health services, children, pregnant women and elderly were particularly vulnerable to the harsh weather conditions; Flood-affected families commonly suffered from sand in the air (from winds), cough and fever, eye infections, diarrhea, skin infections (UNOCHA, 2009). Therefore health services were provided in returns areas as well.

### Livelihoods and Income Generation (LIG)

In Sunsari District, USAID/Nepal Flood Recovery Program (NFRP) conducted 16-



**Figure 3.17: Distribution of compensation after 2008 Koshi flood**

Source; MoHA, 2065 BS

month training program starting from November 2009 and spanning in three crop cycles. A total of 1,067 participants were divided into 192 producer groups and by late January the programs distributed all seeds, nursery sets and integrated pest management kits. Demonstration plots totaling 270 hectares were planted for the first crop cycle with a variety of high value

Table 3.18: Details of Compensation after 2008 Koshi flood

S. No	Title	Details	Amount
1	House Types	Thatch roof	NRs. 50,000
		Zink	NRs. 100000
		2 story	NRs. 200000
		Pakki	NRs. 1 lakh per room
2	Land	Red area	5 lakhs per bigaha
		Damaged land by main stream	6 lakhs per bigaha
3	Crops	Paddy	Per man (40kg) NRs. 600
		Wheat	Per man 850
		sugarcane	Per man 230
		Jute	Per man 1000
4	Squatters (1422)	1 squatters	2 kattha
5	Dead family compensation	1 person	25000 (dead in camp)
			1000000 (dead by flood)
6	Others	Return to origin places program	50,000 per person
		Land treatment	75000 per bigaha
7	Livestock	livestock loan	50,000 (interest less)

Source: UNOCHA, 2009

crops such as onion, chili, cucumber, squash, pumpkin, okra, long bean and hybrid maize. It installed 10 irrigation sets for producer groups with an agreement to pay for 25% of the installation cost. (USAID Nepal, 2010)

Face Board (A partner NGO of MEDEP/UNDP) formed a total of 35 entrepreneur groups comprising vegetable farming, shuttering, rickshaw, saloon, cream separation, brass band etc in return areas and provided skill-based trainings. Micro-Enterprise Development Program (MEDEP) provided pump set/boring pump at 2 per group and installation support in Haripur VDC. Plan Nepal conducted boutique training for 20 participants. (UNOCHA, 2009)

### Infrastructure

USAID-NFRP constructed 8 bridges and culverts in Sunsari and rehabilitated 3 important sections of local roads. These

projects directly benefitted an estimated 7,364 households and improved the quality, accessibility and resilience of over five kilometers of local roads – equating to a complete rehabilitation of 20 percent of all roads affected by the flood (approx. 25 km). (USAID Nepal, 2010)

### Water, Sanitation and Hygiene (WASH)

UNICEF supported for decommissioning of WASH facilities from the vacated camps. Save the Children through its implementing partner, UPCA Nepal, established WASH facilities in schools in the returned area (water points, toilets etc) and mobilized 22 Female Community Health Volunteers (FCHVs) in 3 VDCs for intensifying awareness in sanitation and health. As the flood affected area is the arsenic zone, agencies willing to implement WASH projects (tube wells) in return area needed to coordinate with Water Supply and Sanitation Division Office (WSSDO) for

arsenic tests. WSSDO distributed hand pumps in the Internally Displaced Person (IDP) returned area of Haripur, Shreepur and Paschim Kusaha VDC to meet the immediate need of drinking water. (UNOCHA, 2009)

### Health and Nutrition

Women's Rehabilitation Center (WOREC) with support from Plan Nepal provided fresh milk for infants under-two year from various camps. District Health Office (DHO) and Biratnagar Eye Hospital worked to address the eye infection situation in returned areas. DHO mobilized a health workers team as mobile team in the flood affected area for health check up, general treatment and follow up. Counseling in health and hygiene in affected areas was carried out regularly through a number of methods which included

- Regular household visits by community health volunteer (CHV)
- Poster distribution
- Street drama
- Rally using play cards and banners
- Demonstrations (hand washing and ORT preparation/treatment)
- WASH Information Centre and ORT Corner (operational 6 hours per day)
- Weekly education sessions targeted to children in the protection "safe space"

### Education

The District Education Office (DEO), with support from District Child Welfare Board (DCWB), UNICEF, Save the Children/UPCA, WVI, and Center for Community Development (CECOD) conducted 'Admission Campaign' in Sunsari with special attention to four flood affected VDCs of Haripur, Shreepur, Paschim Kusaha and Lauki during 26 April - 8 May. 3schools (BP Kishan Primary School-Paschim Kusaha 4,

BP Madan Primary School-Shreepur 9 and Janata Primary School-Shreepur 5) which were completely damaged during flooding were reconstructed. (UNOCHA, 2009)

### Agriculture and Livestock

The Saptakoshi Flood Rehabilitation Agriculture and Livestock Service Office (SFRALSO) distributed 4500 packets of vegetable and 4200 packets of Mung seed. It conducted the Soil fertility status test after flood testing 1,000 sample soil. It also conducted Livestock Health Camps and provided the required medicines for the treatment of livestock. Cattle feed distribution work was done from 12 May by District Livestock office, Sunsari/FAO in return areas. 60 farmers groups were formed to establish a Goat Procurement Fund. (UNOCHA, 2009)

### Shelter/housing

The resettlement project funded by UNDP/UN-HABITAT, for landless families affected by Koshi Flooding provided permanent housing. Additionally, it helped to remove the psychological burden of being squatters. The government provided 2 kattha (676 sq m) of land to each family. The houses in the planned settlement were constructed at low cost basis and more resistant to natural hazards. Focus was more in use of locally available materials and technology. The treated bamboo and adobe was promoted, with emphasis on disaster risk reduction through appropriate settlement planning and housing design.

### Livelihood trainings

UN-HABITAT trained to construct houses at low cost basis and more resistant to natural hazards with focus in use of locally available such treated bamboo and adobe. Different agencies provided training on clean water and sanitation as well.



## Reconstruction and Rehabilitation

### Nepal Government Budget

On the budgetary front, the Government earmarked NRs2 billion for rehabilitation of the Koshi flood victims. Donations from individuals and private organizations were collected through the Prime Minister's Flood Relief Fund. (ADB, 2009)

### Embankment and Spur

The Government of India rehabilitated the damaged embankment Indian government diverted the Koshi River as usual way by built up three coffer dam in 26th January. Spur no. 11 and 12 has built up by Nepal and India (ADB, 2009).

### Road

The Government of India rebuilt 12 km of roads damaged segment of the East–West Highway

### Health

Relief-Government of Nepal established temporary 10 bed hospital in Rastriya Nimavi School in Laukahi.

### Drinking water and Sanitation

Similarly, the World Vision, constructed toilet, tube well in the shelter camp. Department of Irrigation (DOI) built up 1000 shallow tube well in shelter camp.

### Agriculture

With ADB grant, DOI reconstructed irrigation project in the damaged area of Pashim Kushaha and Haripur. Similarly, DOI also reconstructed the damaged irrigation canal in Sunsari through Sunsari - Morang irrigation project. Ministry of Agriculture removed the sand from the agrarian land.

### Shelter

UN-HABITAT built 235 houses including the squatter families.

## Box 3.6: Reconstruction and Rehabilitation after 2008 Koshi flood

ADB provided \$ 25,600,000 grant for Emergency Flood Damage Rehabilitation Program to be conducted on 3 districts- Sunsari, Kanchanpur and Kailali. The Closing Date of the project is 31 December 2012 and is still an ongoing project. The objective of the Project is to restore economic activity in the Project Districts and improve the livelihood of the people affected by the 2008 monsoon floods in the eastern and far western regions of Nepal. (ADB, 2009) The Project in Sunsari District includes the following parts:

#### Part A: Agriculture

- (i) Distribution of seeds, fingerlings, compost, and basic farm equipment;
- (ii) Provision of extension services, training for farming on sandy soil, and social mobilization activities;
- (iii) Rehabilitation of fishponds, agriculture collection centers, and market places.

#### Part B: Irrigation

- (i) Reconstruction and rehabilitation of surface irrigation systems including the improvement of head works, canals, drains, aqueducts, gates, outlets, and inlets, canal service roads, culverts and small bridges; and (ii) Rehabilitation of shallow tube wells.

#### Part C: Water Supply and Sanitation

- (i) Construction of 4 small overhead water supply systems and installation of about 3,500 shallow tube wells in Sunsari District;
- (ii) Design and implementation of a health and hygiene education and awareness program;
- (iii) Construction of household level latrines; and (iv) Implementation of a community mobilization program.

#### Part D: Roads

Construction of the Koshi Bridge at Chatara.

## Lessons learned

### Strengths

#### Preparedness

- Availability of Contingency Planning (CP) in some clusters particularly in shelter
- Endorsement of cluster approach by the government and humanitarian agencies
- Partial establishment of Early warning system. No human fatality from the flood
- Coordination mechanism through OCHA among the humanitarian agencies

#### Response

- Prompt activation of DDRC and CNDRC
- Quick initial rescue and relief
- Presence of Humanitarian actors right from the beginning
- Congruency among the cluster partners
- Sharing of responsibilities and accountabilities

#### Recovery

- Good coordination than in the previous disasters
- Mutually agreed Nepal Standard set
- Risk and vulnerability assessment carried out
- Frequent cluster interaction with delineation of responsibility
- Linked with comprehensive reconstruction and rehabilitation activities

### Issues and Challenges

#### Preparedness

- No pre-designated evacuation sites
- No pre-identified land for camp settlement
- Absence of pre-positioning of shelter kits
- Partial application of Contingency Planning
- Unclear role and responsibility of technical line agencies
- No vulnerability assessment of public buildings which could be used for evacuations

- Absence of appropriate registration system caused delay in executing relief efforts
- No orientation training in cluster planning particularly in emergency shelter in DUDBC/division office
- No provision of emergency budget to procure relief materials for emergency shelter
- Inadequate partnership development between government agencies and the humanitarian agencies in pre-disaster phase

#### Response

Trigger of information by media and official channel, in both top down and bottom up approach and informal international inquiry mainly from India.

- Gaps in information flow
- Inadequate initial rescue facilities
- Shortage of Human Resources in earlier phase
- Use of schools for emergency shelter problematic
- Varied standards
- The relief items in shelters and NFI, food provided were of varied standards ranging from highest to lowest quality.
- Disposal of dead animals
- Damage and needs assessment

#### Distribution mechanism

Long time taken in developing the distribution mechanisms. The selected site was too far from the displaced location raising property security problem mainly the cattle and making drainage and access road was costly.

- Poor Shelter materials
- Camp management was a great issue in Koshi flood in terms of SPHERE and other standards and cluster approach
- Absence of single operating centre like EOC at district
- Persuading DUDBC to provide financial assistance for winterization of shelter

## Areas for improvement

- Identification of evacuation sites for emergency shelter such as host families, open spaces/land, public buildings including schools
- Supporting mechanism to host families needs to be established. People taking shelter in the host families in Koshi flood was 15 -20%
- Vulnerability assessment of public buildings is to be done to accommodate large no of people during emergency
- Using schools for emergency shelter more than a week is to be avoided
- People taking spontaneous emergency shelter in open spaces like road sides, river banks needs to be relocated into temporary camps at the earliest
- Emergency shelter camp location needs to be identified
- Standardization of assessment tools (formats etc) for shelter and clear assessment process to be defined
- Integration of shelter materials and NFI, livestock, livelihood and other thematic cluster
- Coordination among various stakeholders- government, humanitarian actors, locals, line agencies, national and district levels,
- Clear cut roles and responsibilities of all shelter stakeholders
- Information sharing mechanisms among agencies
- Capacity assessment of various organizations at various levels, national as well as local
- Strong data base of disaggregated data to respond the various needs of the people effectively during emergency
- Standardization of shelter kits
- Pre-positioning of shelter materials at strategic places
- Collaboration of all (government, civil society, NGOs, external partners, and clusters (NFI) for planning and preparedness
- EOC center needs to be established at central level as well as the district level
- Damage assessment format needs to be developed and endorsed by all agencies
- Information management mechanism needs to be developed



Flood victims wade through flood water to a safe zone in Sunsari district after the Koshi river dam collapsed  
Photo Courtesy: EPA

## The 2009 Jajarkot Diarrhea Outbreak

### Event Scenario

An outbreak of Acute Watery Diarrhea (AWD) that began in early May 2009 affected more than 58 thousands of population in the Districts of the Mid Western Region and Far Western Region of Nepal. Diarrhea related deaths continue to be reported though the trend in death numbers was decreasing. According to the Ministry of Health and Population (MoHP), about 206 VDCs of 20 districts were affected by the diarrhea. The most affected was Jajarkot district followed by Rukum. A significant number of people also got treated during the outbreak.

### Direct Loss and Damage

#### Human Casualties

According to the Ministry of Health and Population (MoHP), the cumulative death toll from diarrhea related causes was 314 deaths in all VDCs of diarrhea affected districts, till 23 August 2009. The most affected was Jajarkot district (153 deaths). Rukum also suffered with 48 deaths. The number of people treated was 58874.

The details of the cumulative number of treated and deaths since 1st May 2009 to 23 August 2009 are given in the Table 3.19.



Figure 3.18: Diarrhoea outbreak in mid west and far west region  
 Source: MoHP, 2009

Table 3.19: Details of the cumulative number of treated and deaths since 1st May 2009 to 23 August 2009

S. No	District	Affected	No. of Health	No. of People	
		VDC	Camp	Treated	Death No.
1	Jajarkot	30	51	25476	153
2	Rukum	23	23	12705	48
3	Dolpa	7	7	501	7
4	Rolpa	9	6	664	6
5	Salyan	4	2	526	6
6	Dailekh	32	18	6842	25
7	Bajura	4	4	122	6
8	Dadeldhura	3	2	153	5
9	Doti	20	6	1344	10
10	Surkhet	17	9	4492	14
11	Kanchanpur	3	1	288	1
12	Pyuthan	3	2	250	2
13	Makwanpur	1	1	137	0
14	Dang	1	1	61	0
15	Achham	22	8	5396	21
16	Bajhang	2	1	757	7
17	Baitadi	16	2	443	8
18	Dhading	1	0	103	0
19	Kailali	8	3	89	4
20	Sarlahi	1	1	40	2
	Total	206	148	58874	314

Source: MoHP/EDCD/WHO

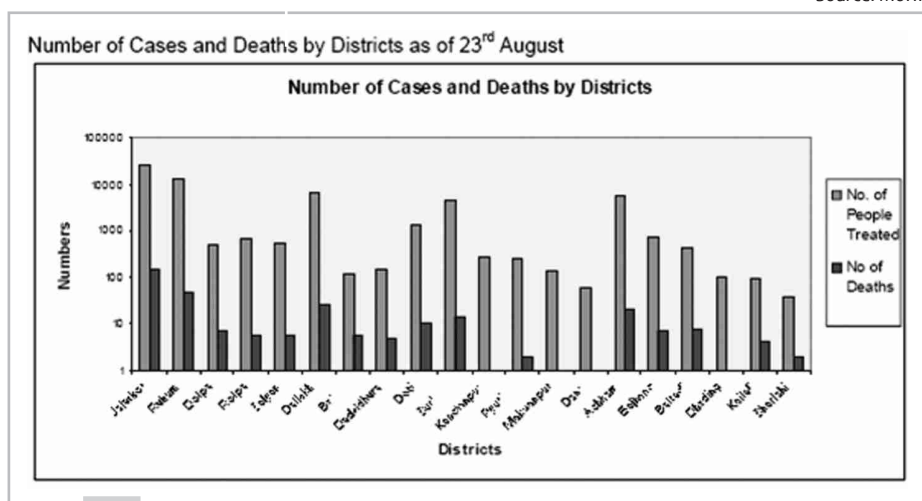


Figure 3.19: Number of cases and deaths by districts

Source: HoHP/EDCD/WHO

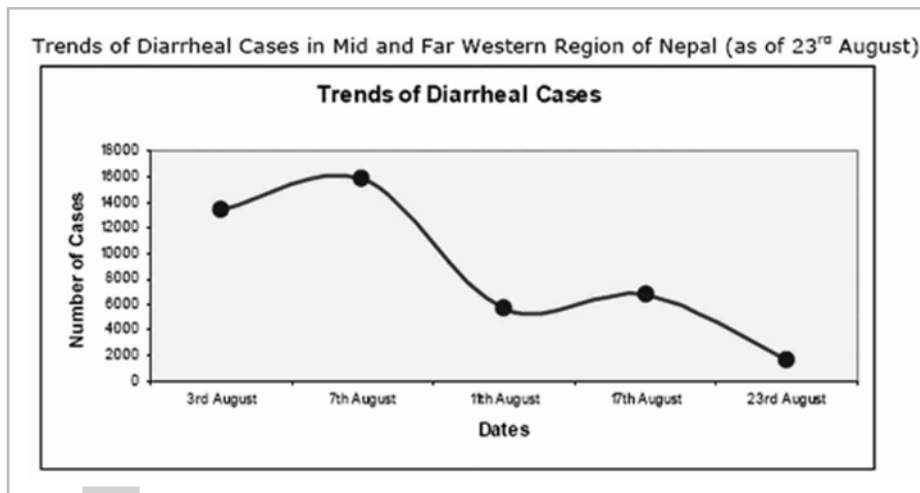


Figure 3.20: Trends of diarrheal cases in mid and far western region of Nepal  
Source: MoHP/EDCD/WHO

## Response

The MoHP/Epidemiology and Disease Control Division (EDCD) took lead in the response at the central level. The District Public Health Offices (DPHOs) in the various Districts were leading the response to the diarrhea outbreak at the district level.

GoN announced a Short Term Plan and Long Term Plan for the diarrhea affected areas in Mid and Far Western Regions. Short-Term Plan included approaches to surveillance, case management, outbreak confirmation, prevention and control, and immediate response.

Epidemiology and Disease Control Division (EDCD), World Health Organization (WHO), International Nepal Fellowship (INF), Nepal Family Health Program (NFHP), Helvetas and CARE Nepal supported with health workers. MoHP, EDCCD, WHO, Nepal Red Cross Society (NRCS), UNICEF, Development Project Service Center (DEPROSC), Nepal Water for Health (NEWAH), Save the Children, MERLIN, and Adventist Development and Relief Agency (ADRA) Nepal provided medical supplies.

## Health

Respective DPHO mobilized Health Posts and Sub-Health Posts-medical staff, including Female Community Health Volunteers (FCHVs) and Maternal Child Health (MCH) workers to provide medical support. Political Party members also provided support to the affected communities including health camps. Besides distributing medicines and mobilizing health workers, health awareness campaigns were also launched in those districts.

As part of surveillance, EDCCD/MoHP alerted DPHOs and Regional Health Directorate to enhance the surveillance activities. WHO distributed surveillance forms to the 15 Surveillance Medical Officers (SMO) located in the affected areas, as well as to the case management protocols. Weekly reports were submitted based on information collected on a daily basis in the affected VDCs. International Federation of Red Cross and Red Crescent Societies (IFRC) activated its internal global system to provide alerts to donor and relief partners.

At the central level, NRCS formed working team for the AWD issues comprised of



**Figure 3.21: Treatment of diarrhea patient  
Khagenkot Health Post, Jajarkot**

Photo Courtesy: Dr. R. Kafle

health coordinator as technical leader supported by the communication and health practitioner of the different departments such as DM Department and Procurement Section while Disaster Management Department took lead of the entire operation.

The Lutheran World Federation (LWF) supported health workers in Dailekh, Dadeldhura and Surkhet.

WHO sent a surveillance officer to Surkhet to assist with the surveillance in the region.

### Surveillance

- EDCD/MoHP, alerted all District Health Offices and Regional Health Directorates to enhance the surveillance activities in order to recognize any unusual events related to diarrheal diseases.
- WHO assisted EDCD and districts on setting up the surveillance system with the support of partners on the ground.
- Outbreak Medical Officer in Rukum assisted DHO on surveillance and outbreak management.
- NPHL sent laboratory technician to Jajarkot for further collection of samples/specimens.

### Logistics and Supplies

- WHO provided 4 additional diarrheal disease kits, 3 to go to the Mid Western Development Region and 1 for the Far Western Development Region.
- Save the Children handed over 1,512 bottles of Ringer Lactate, drugs for treating 200 persons and 2000 packets of ORS to the DHO of Jajarkot district. The agency also supported an additional 10,000 packets of ORS to Rukum district and 2,000 ORS packets to Dailekh district.
- LWF provided 12,000 ORS, 400 health kits, 12,000 aquatabs, and 8,800 soaps each to Dailekh, Surkhet and Dadeldhura.

### Water, Sanitation and Hygiene (WASH)

The WASH Cluster response in Jajarkot was coordinated by Water Supply and Sanitation Sub Divisional Offices (WSSDO). It aimed to reach 100% of the households through multiple mobilized volunteers. The WASH Cluster agreed on common messaging for hygiene campaigns. Partners and multiple community volunteers were mobilized with hygiene promotion materials and how to use ORS and water treatment agents.

WSSDO, DHO, NRCS, UNICEF, DFID, GTZ, USAID, DEPROSC, Hospital and Rehabilitation Centre for the Disabled Children (HRDC), Youth Awareness Raising Center Nepal (YARCN), NEWAH supported by Concern Worldwide, ADRA Nepal, Paschim Pailla, and the National Health Education Information and Communication Centre (NHEICC) supported hygiene promotion in Jajarkot and Rukum Districts. Similarly there were responses in Surkhet, Dailekh, Rolpa, Doti and Dadeldhura by various agencies; including Oxfam, LWF, youth groups were mobilised for distribution of chlorine tablets, hygiene promotion, cleaning of water

sources and villages, chlorination of water system.

UNICEF along with DHO, NRCS, WSSDO, DEPROSC and National Health Education Information and Communication Centre (NHEICC) designed and developed additional standard messages and disseminated the information throughout Jajarkot district through flex chart and general information booklets

- In Surkhet district, the NRCS chapter distributed water purification liquid in 1000 HH together with DFID/CSP.
- In Rukum district, the NRCS chapter distributed 5,500 bottles of water purification liquid and 8000 satchels of ORS. NRCS HQ dispatched 20,000 poster on health and hygiene. NRCS HQ technical team in the field oriented 100 volunteers particularly on WATSAN and mobilized in the rural areas for the awareness, evacuation of the patients and demonstrating water treatment. The chapter further mobilized volunteers for the 16 VDC for the awareness raising purpose.
- In Salyan district, the NRCS chapter mobilized 94 volunteers for the awareness raising (IEC distribution, message flow and how to use PYUSH), two people in each VDC. NRCS chapter also assisted VDC to establish the working committee in the four most affected VDC, lead by the VDC secretary.
- In Dadeldhura, LWF mobilized volunteers to create awareness related to personal hygiene and public health. The

volunteers educated households on maintaining personal hygiene, use of water treatment agents, ORS preparation and promotion of safe human excreta disposal.

## Nutrition

Nutrition related information materials were incorporated into the WASH information campaign, including the message on the importance to continue to provide nutritious food to sick children with nutrition surveillance in various districts.

## Protection

The Protection Cluster developed a child protection and nutrition checklist to assess the impact of the diarrhea outbreak on children as marginalized and low socio-economic status people were the most affected by diarrhea, according to DPHO data. Similarly, psychosocial care were required for children and surviving family members from diarrhea affected families and there was also need for specialized care

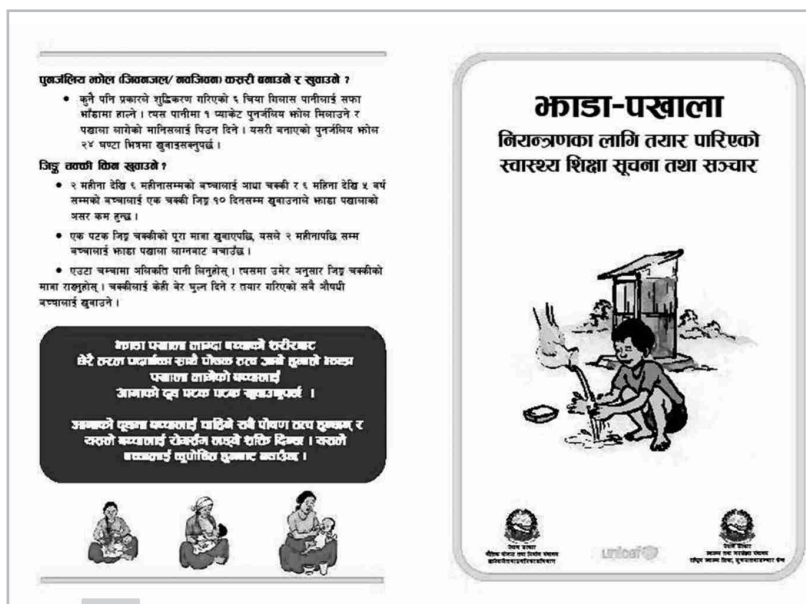


Figure 3.22: IEC materials to raise awareness in WASH/UNICEF  
Source: GON/UNICEF



to pregnant and lactating women affected by diarrhea.

### Coordination

The Ministry of Home Affairs, Ministry of Health and Population, and the Ministry of Physical Planning and Works and humanitarian UN agencies had a series of joint meetings to streamline the coordination among the different groups.

- **District Level Coordination:** There were regular coordination meetings under the District Disaster Relief Committee (DDRC), chaired by the Chief District Officer (CDO) in DHQ where the head of the government line agencies discussed the ongoing response, identify the gaps and plan the future response accordingly. On 1 August, the Minister for Health and Population chaired the all-party meeting in Jajarkot DHQ. The meeting reviewed the diarrhea outbreak response activities and requested all sections of the society for additional support.
- **Central Health Coordination Meeting:** Health Cluster had a central level coordination meetings to continue to set up the surveillance system and monitor data and identify the communication channel for relaying surveillance data
  - o Health cluster members were to identify stocks that can be mobilized immediately and inform WHO
  - o WHO was to collaborate with the MoHP in prioritizing the stocks to be mobilized by army helicopter
  - o UN OCHA facilitated weekly Operational IASC meetings in Kathmandu to provide a multicluster forum discussion on the approach and response to the diarrhea outbreak
- **Regional Health Coordination meetings:** Regional Health Coordination Team meeting chaired by MoHP outbreak focal point to review the situation, discuss on

gaps and find out possible ways forward to response.

- **Prevention Coordination:** On 2 August, the Ministry of Home Affairs (MoHA) issued letters to CDOs in the western regions to emphasise the importance of conducting DDRC meetings in response to disasters, as well to coordinate DDRC meetings to discuss prevention approaches to the diarrhea outbreak.

### Response per District

- In Jajarkot district, Save the Children trained and mobilized 567 volunteers for distribution and training on the use of ORS at the household level.
- In Jajarkot district, NRCS chapter mobilized 18 volunteers for the household level awareness through IEC materials and distributing on-spot ORS and water treatment tablets. The team also helped the affected families by providing evacuation service for the medical treatment. NRCS district chapter distributed 100,000 water treatment tablets and 1000 ORS. Similarly, 100 tarpaulins and 100 blankets were distributed to the health care centers. 50 stretchers were kept standby in regional warehouse Nepaljung. NRCS assigned two volunteer each for 9 VDC.
- In Sindhuli district, NRCS Kalpabrikshya sub chapter assisted Kalpbrishya PHC to operate emergency health facilities in the affected area. DP unit (Sahan and Dhamile) functioning under the NRCS supported CBMHRR program also sent their 9 member team (volunteers) to the affected site to assist the health camp and evacuating people to the health centers for the further treatment.
- In Rukum district, NRCS chapter helped the operational unit (hospitals) to set-up emergency treatment units by providing blankets and tarpaulins.
- In Rukum district, Save the Children trained and mobilized 819 volunteers for

distribution and training on the use of ORS at the household level.

- In Rukum district, the Human Development and Community Services (HDCS) agency provided medical services in remote villages of Rukum. The medical personnel of the outreach program were deployed from the HDCS-run hospital based in Chaurjhari.
- In Dailekh district, Save the Children trained and mobilized 441 volunteers for distribution and training on the use of ORS at the household level.
- In Surkhet district, the NRCS chapter mobilized 80 volunteers for the assessment and awareness actions. The peoples in the affected village fled to the city centers and took shelter in schools. The chapter distributed 20 blankets and 5 tarps to the 35 families taking shelter in school.
- In Kailali district, the NRCS chapter conducted awareness campaigns in the affected VDC and broadcasted radio messages for one and half months against diarrhea through the FM Radio in local language.
- In Pyuthan district, the NRCS chapter conducted orientation program to its volunteers to be deployed to the affected areas for the awareness campaign. NRCS chapter mobilized 98 volunteers in that area.

### Funding

The Ministry of Health and Population mobilized NRs. 27,000,000 worth of medicine to the diarrhea affected areas.

UNICEF mobilized US\$ 93,330 from internal funds to respond for the diarrhea outbreak response. US\$ 82,560 for WASH activities and US\$ 10,770 for Health related activities.

The Nepal Red Cross Society (NRCS) from its in-country partners and partner National

Red Cross Societies supported the amount of NRs. 19,655,212 to fund its operation in response to the diarrhea outbreak. The budget was based on a preliminary proposal, and the operation funded through contributions from the Finnish Embassy, Swiss Development Corporation (SDC), UNICEF, the Austrian, Belgian, Luxembourg and Swiss Red Cross Societies.

Save the Children Nepal supported US\$100,000 to cover the funding gap for the Save the Children planned activities to the diarrhea outbreak. Save the Children channeled US\$10,000 from regular programs for the diarrhea outbreak response. Save the Children received US\$ 3,000 from Save the Children Headquarters and US\$ 15,000 from the Halady Murchy Fund, Save the Children US, for the diarrhea response, to support activities in line with the GoN Short-Term and Long-Term Plans.

### Challenges & Gaps

Access to diarrhea affected areas and communication due to the difficult terrain and bad weather conditions remained a constraint for the delivery of emergency medical services as well as monitoring the supplies to the population in need. Enhancing the need for better surveillance was also a great challenge due to the continuing monsoon season which expedited the spread of the disease to other districts.

- **Transportation:** Transportation of supplies from the centre/district headquarters and from District Headquarter to the VDCs remained a challenge. The diarrhea affected villages were remote, in some areas it took five days to reach from District Headquarters (DHQ). Weather conditions also hampered air services
- **Logistics coordination:** In Jajarkot, the logistics base was located at Chourjahari airstrip in Rukum District, four hours

walk from DHQ. And there was a lack of coordination between the logistic centre in Chourjahari and DHQ due to communication constraints

- Access: The majority of affected areas were difficult to access, requiring days of walking, and therefore it was difficult to transport required medicines and relay timely information
- Telecommunications: Nepal Telecom GSM mobile was only available from 1000hrs to 1600hrs. The CDMA telephone was static during the evening. There was limited communication with areas located outside District Headquarters, which had negatively impacted on timely information sharing. It was difficult to track supply and demand
- Electricity: There was no electricity in District Headquarters. Solar power was required for the telephone battery, laptop and other electrical equipment, including CDMA mobile phones
- Staff Supplies: The deployed health teams needed to carry sufficient supplies, including water and food – as the majority of the areas were food insecure

### Key Health Gaps

- Access to health facilities for affected population in remote areas
- Access to affected areas for the health staff. Some areas were only accessible by foot, which prolonged the time to get the supplies to the household level
- Health information management system needs to be strengthened
- Gathering of medical supplies at road drop-points/plane drop-points needs to be managed
- Logistics constraints for the delivery of medical items to remote affected areas

Medicines were delivered by helicopter into the District and transported to affected areas by porters and mules

### Key WASH gaps

- Lack of water purification tablets in the affected areas. Chlorine solution remained a gap, with 30,000 households requiring chlorine solution, particularly in Rukum
- Logistics of WASH supplies to remote affected areas. Some areas are only accessible by foot, which prolongs the time to get the supplies to the household level
- Dried Water Source-As the majority of springs and the water sources dried up due to lack of rainfall during and the winter drought people were compelled to drink and fetch the contaminated water available elsewhere
- Coordination of the response at the local level remained a challenge

### Issues

- Informal Sector Service Centre (INSEC) and Consumer's Rights Protection Forum (CRPF) raised concern over the quality of food distributed by WFP since mid April to mid July in the Mid and Far West areas affected by the diarrhea outbreak claiming that the food was inedible. They also raised concern over the report made public by the government stating the quality of food distributed by WFP was good.
- The activities of various organizations were not harmonized. There was a need to harmonise and come up with a coordinated approach to control the epidemics
- The care of the orphan children including other vulnerable was also an issue in the changing context.



A doctor from AMDA- headquarter treating the Diarrhea affected child, Jajarkot, 2009  
Photo Courtesy: amdainternational.com

# CHAPTER 4: GOOD PRACTICES ON DISASTER RISK MANAGEMENT



Community people engaged in vulnerability capacity assessment & mapping, Humla  
Photo Courtesy: NSET 2009

## Good Practices on Disaster Risk Management

World Conference on Disaster Reduction (WCDR) held in Kobe, Japan in 2005 adopted a global blueprint for disaster risk reduction known as Hyogo Framework for Action (HFA). The Hyogo Framework assists the efforts of nations and communities to become more resilient to, and cope better with the hazards that threaten their development gains. Its overarching goal is to build resilience of nations and communities to disasters, by achieving substantive reduction of disaster losses by 2015 – in lives, and in the social, economic, and environmental assets of communities and countries. The HFA offers five areas of priorities for action, guiding principles and

practical means for achieving disaster resilience for vulnerable communities in the context of sustainable development.

Since then, there have been more organized efforts on DRR under specified HFA priorities in Nepal both at national as well as community level. Such efforts which we can more accurately recognize as “Good Practices” are scattered all over the country. Amongst such many efforts, some are gathered in this chapter with the view to share and explore the possibilities of replication in many other parts of the country. These are few good examples and we can see number of similar but distinct concepts and experiences from different parts. But the need is how we can replicate & scale up such efforts?



Figure 4.1: Street Drama on Disaster Awareness performed in Kathmandu, ISDR 2010

Photo Courtesy: NSET

Name of the Case Study/Practice

## Disaster Preparedness and Response Planning

Theme/Disaster/Disaster Phase

Governance/Mutlihazard/Preparedness

Geographic Location

75 districts throughout Nepal

### Good Practice Detail Description

Nepal faces a myriad of hazards. Different hazards such as flood, landslides, fire, storm, cold wave and epidemics are causing enormous loss of lives and properties in Nepal every year. The entire country from East to West is highly prone to earthquake disaster and already faced several small to mega earthquake disasters in the past.

Disaster preparedness activities are therefore important as a precursor for a more effective humanitarian response and for reducing humanitarian caseloads during disasters. Experience confirms that an effective humanitarian response at the onset of a crisis is heavily influenced by the level of preparedness planning of responding agencies, as well as the capacities and resources available at all levels.

Nepal should therefore be prepared in case of emergencies and disasters to protect its people from personal injury and loss of lives and protect property from damage. Emergency and Disaster Preparedness is one important component of Disaster Risk Reduction. It consists of actions intended to increase the coping capacity of districts and make them more resilient to disasters.

Considering the facts, Ministry of Home Affairs (MOHA) has started the preparation of Disaster Preparedness Plans at national, regional and district

levels in the past few years. MOHA is leading the preparedness initiatives jointly with other Government Agencies, UN Agencies, National/International Organizations, Civil Societies, DPNet etc.

As a result of this initiative, National workshop in 2010 recommended 21 points and approved by Central Level Natural Disaster Response Committee (CNDRC) for an effective disaster preparedness initiative at district, regional and national levels. One of the recommendations was to make “District Lead Support Agencies (DLSA)” in 67 districts among the national and international agencies with an objective to support District Disaster Relief Committee (DDRC) for preparing “District Disaster Preparedness Plan”. It has resulted in very positive feedbacks from all the actors. As a result, more than 60 districts completed the preparation of Disaster Preparedness Plan including five regional authorities that drafted the Standard Operating Procedures (SOP) in 2010. It was realized that these preparedness initiatives have achieved major success in responding the flood and landslide affected people in 2010.

DPR Plan is to be developed further in all 75 districts and humanitarian agencies supposed to play important roles of District Lead Support Agency (DLSA) as usual. Further to this DDRC would take the lead role jointly with District Development Committee for all necessary supports required for



preparing DRR Plan in the districts.

The Disaster Preparedness and Response Plan (DPRP) aims to minimize human casualties and loss of properties due to disasters. The plan specifies the actions needed to address each of the disaster preparedness issues and to achieve the goals, who/which organization will complete each action and under what timeline. The plan hence includes who is going to do what and by when and in what order for the disaster response & preparedness.

A Guidance Note 2011 has been formulated for preparing the Disaster Preparedness and Response Plan. This note was prepared from the feedback of all the humanitarian partners. The taskforce was formed under the leadership of Under Secretary/Disaster Management Section/MOHA with the representative from UN Agencies, Nepal Red Cross Society, Association of INGOs in Nepal Task Group on Disaster Management (AINTDGM) and DpNet-Nepal.

### Objective

To develop Disaster Preparedness and Response Plan (DPRP) for all the 75 districts of Nepal in order to minimize loss of human lives and properties caused by disasters

### Beneficiary Population

All the Nepali People

### Lesson Learnt

- Inter-Agency coordination is inevitable but demands high level of commitment.
- Major Stakeholders can play less effective role in the absence of defined provision/mandate to work on disaster preparedness.

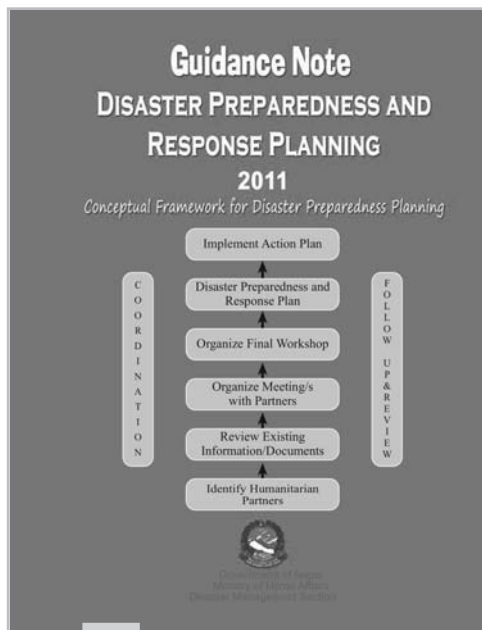


Figure 4.2: Guidance note on DPRP

- Central level coordination needs to be more effectively trickled down or replicated at district level.

### Replication Potential

Disaster Preparedness and Response Plan (DPRP) has been envisioned to be prepared for all the 75 districts of Nepal. Also, this is not just one-point activity. Timely updates on the DPRP is very much required.

### Publication

Guidance Note: Disaster Preparedness and Response Planning 2011

### Implementing Agency

Ministry of Home Affairs/Government of Nepal

Name of the Case Study/Practice

## Early Warning System - Forewarned is forearmed

Theme/Disaster/Disaster Phase

Enhance Early Warning/Flood/Pre-disaster

Geographic Location

Kailali District

### Good Practice Detail Description

During the flood of September 2008, the water came so fast that it was chest-high only four minutes after it first entered the Mohana riverside communities. But the communities followed the warning and evacuation plans which they had developed and practiced beforehand. When the water of the Mohana River started to rise on 20 September, the sirens were sounded at 3 A.M. The Disaster Preparedness Committee (DPC), the Early Warning System (EWS) committee and the Search and Rescue (S&R) team together managed to evacuate the people on time. The communities lost fewer lives (in fact, none at all) and significantly less property than surrounding communities, but surrounding communities also benefited from the EWSs as the project communities spread the word.

Prior to the project intervention, there was no systematized EWS, and people relied on their “instinct,” visible flooding upstream and flood-related smells and sounds which resulted in heavy loss of lives and property every year. Early warning systems (EWSs) thus reduced vulnerability by providing individuals and communities with the information they need to act in a timely and appropriate manner to avoid flood-related risks. The project Kailali Disaster Risk Reduction Initiatives (KDRRI) implemented by Mercy Corps Nepal, in partnership with the Kailali District Chapter of the Nepal Red Cross Society (NRCS Kailali) with support from DIPECHO built effective, integrated systems that included not just the physical infrastructure but also provisions for technical monitoring and warning, and steps to increase public awareness.

EWSs involved monitoring upstream points

and passing information and when flood and rainfalls levels make it necessary, warnings to downstream communities. The project formed EWS sub-committees in each community to provide accurate information. It worked on building the capacity of the committee members to understand the significance of river and rainfall levels.

The project put in place the communication equipment, used gauges to measure river and rainfall levels and record their trend. Wooden posts with yellow (warning-get ready) and red (danger-need to evacuate) bands were installed along riverbanks.

Local FM radio were used for broadcasts to disseminate warnings, the project also provided CDMA telephones to link the upstream recorder stations with downstream communities as well as with the Department of Hydrology and Meteorology (DHM) field office in six communities bordering the Mohana River in the far-western Terai – namely Lalitpur, Mohanpur, Shivaratnapur, Bisanpur, Manikapur, and Jokahiyapur.

The project communities further prepared evacuation plans incorporating early warning and performed simulations.

During the monsoon season, data collection has been devised to record at hourly intervals, 24 hours seven days a week. Historical data from previous monsoon seasons has formed the basis for identifying critical water levels and rainfall thresholds. When these levels are exceeded, a warning is disseminated through various channels, including local FM radio stations, telephones, megaphones and handoperated sirens. DHM’s cooperation ensures the effectiveness and sustainability of the EWS and enables communities to

link into the DHM's forecasting division, which monitors the arrival of the monsoon, the duration of rainfall, flood estimates, and other useful information. Data from the DHM's nine hydrological stations and six metrological stations along the Mohana River and its tributaries are incorporated into the operation of the EWSs.

An EWS design and management committee was formed under the chairmanship of the district chief engineer. Its main responsibility is to maintain the communication system, support the recorders and ensure that communication equipment continues to function. District authorities, the press, the security forces, the NRCS, DHM and other local DRR stakeholders are represented in the committee. Encouraged by its positive experience during the 2008 monsoon season, the project hopes to expand Community-based EWSs across the entire Mohana watershed.

The project thus played an important role in the establishment of EWSs. Prior to its intervention, locals had very little knowledge about how floods occurred and how they could protect themselves. Now, people understand how floods occur, how much rainfall upstream will cause flooding in their area, what action should be taken, how to get warning information and how to prepare effective evacuation plans.

### Objective

To reduce the risk of flooding and help communities to prepare for and respond to floods to decrease their dependence on external aid

### Beneficiary Population

Six communities bordering the Mohana River in the far-western Terai – namely Lalitpur, Mohanpur, Shivaratnapur, Bisanpur, Manikapur, and Jokahiyapur of Kailali district

### Lessons Learnt

- Systems must be set up in accordance with the demand for information
- As weather patterns grow increasingly more unpredictable, the period allocated for the recording of rainfall and water levels should be extended

on either side of the usual dates for the onset and end of the monsoon

- It is essential to use existing resources, structures and technology rather than setting up parallel systems

### Replication Potential

It is a successful initiative of community-based disaster risk reduction and can be easily replicated and developed elsewhere

### Publication

Community-Based Disaster Risk Reduction – Good Practice (Kailali Disaster Risk Reduction Initiatives)

### Implementing Agency

Mercy Corps Nepal, Kailali District Chapter of the Nepal Red Cross Society (NRCS Kailali), DIPECHO



Figure 4.3: Water level-gauge installed at the river bank

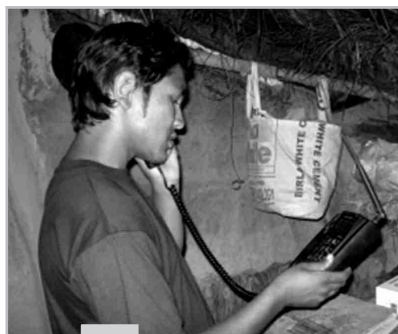


Figure 4.4: Communicating using an upstream recorder

Name of the Case Study/Practice

## Establishing Community Based Early Warning Systems in Nepal

Theme/Disaster/Disaster Phase

Enhance Early Warning/Flood/Pre-disaster

Geographic Location

Chitwan and Nawalparasi

### Good Practice Detail Description

There was no formal system of watching the river during periods of high water. Water ingress was not observable in many places, due to the lie of the land and dense vegetation during the monsoon period. Flood waters often entered houses before people were even aware that there was a threat, making it impossible to save anything. In addition, as due to the prevalent rainfall patterns, floods tended to come at night, many people lost sleep during the high water periods, due to stress and worry.

This made the communities very much keen on the project being carried out by Practical Action towards strengthening the capacity of communities to manage early warning systems to reduce the impacts of floods. The project components such as; Setting up of Formal “watch and warn” rotas, or full time watchmen paid during the critical flood periods to watch on behalf of everyone; Identifying the Sites giving the best view of both the river and the community and establishing the form of warning which everyone could understand were highly convincing and agreeable for the community.

In 2002 as a part of its pilot project, Practical Action erected an observation tower and siren system in Bhandara, Chitwan. The project was implemented to assess the potential and opportunity for purely local level observation and warning of flood with its objectives set very much within the operational and security environment prevalent in 2002. Specifically as government institution were finding it increasingly difficult to operate in many rural locations, the deteriorating security environment further made it imperative that whatever systems were established they be community

managed and independent of outside support. Construction of the tower and provision of siren systems were managed by Practical Action while site identification, land purchase, community mobilization, awareness raising and establishing a user committee were the responsibility of the community.

In expanding its program, Practical Action chose to remain in the same geographical area extending downstream, west, to the communities of Piple, Jagatpur and Meghauri on the Rapti river in Chitwan, and then to Pithauli, Kolhuwa and Parsauni on the Narayani river, in Nawalparasi. Within these communities approximately 34,500 individuals now benefit from the setting up of the EWS and other project activities, with the latter including the distribution of 70 life jackets and other life saving equipment, construction of 15 boats, 6 bridges, 9 spurs and dykes, and 6 shelters, as well as a broad range of public awareness and education activities including poster and leaflet distributions, FM broadcasts, street theatre, song and dance competitions and schools activities.

Chitwan and Nawalparasi are among the most flood prone districts in Nepal, appearing high on the lists of loss and damage each year. Towers were erected in 5 out of the 6 communities targeted, incorporating design improvements influenced both by previous learning and ideas generated within the new project area. Experience suggested reliance on mains electricity was unwise, so alternative sources of warning were discussed. Study revealed no existing ‘indigenous’ warning systems - which was not unexpected given that most communities were made up of migrants and flood was a recent phenomena

- nor that any locally manufactured hand sirens or warning systems were available. As such it was agreed to opt for 'stand alone' electrical siren systems.

By the monsoon of 2007, systems were completed in all five locations. The "watch" component was managed differently in each community, but a common warning system was agreed throughout the area, as a result of an inter-community exchange program. The first sounding of a siren indicated that communities should prepare, while the second one meant that they should evacuate. So far sirens were only transmitted so the communities established relay systems reliant on volunteers going door to door to pass on warnings received. Evacuation in all locations was further assisted by other components of the program such as the improvement of bridges and provision of boats.

Genuine intra-community warning systems were established to which the siren was only a trigger. There is now additional time for people to gather members, valuable assets, live stock and stored food. The system has proved robust when external sources and information has failed. Communities have felt empowered and increasingly there is now less fatalism about floods and inevitability of the destruction that they bring.

### Objective

To strengthen the capacity of communities to manage early warning systems to reduce the impacts of floods

### Beneficiary Population

Residents of Chitwan and Nawalparasi district

### Lessons Learnt

- Investment in EWS is a cost effective use of limited resources where risk can be anticipated and measured
- High tech/high cost systems are not only inappropriate but unsustainable. Use of local resources both cuts costs and ensures greater ownership
- Systems should provide information, not warnings per se. Making information intelligible and user friendly are fundamental to any system
- Users of information should be active participants in systems, not beneficiaries of them. Systems must be established

which put users first and at their centre

- Systems should be based on the principal of "demand for", not "supply of" information
- Successful EWS are the product of effective person to person communication and efficient social networks. Communication technologies merely complement these
- Systems should dictate the technology and not technology the system

### Replication Potential

Practical Action and its partners believe that their activities in piloting EWS in Nepal have highlighted the applicability, cost effectiveness, utility and its high replication potential in other areas.

### Publication

Early Warning Saving Lives

Implementing Agency

Practical Action

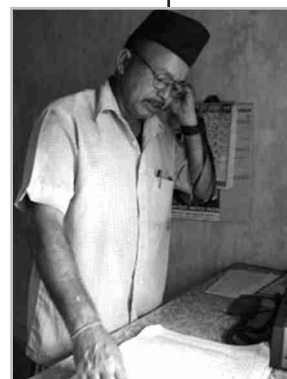


Figure 4.5: One of the Installed tower, Local resident informing on the gauge reading



Figure 4.6: Local resident practicing on the siren

Name of the Case Study/Practice

## Promoting Safer Construction Practice- Training the masons in Nepal

Theme/Disaster/Disaster Phase

Knowledge Management-Technology Transfer/Earthquake/ Pre Disaster

Geographic Location

Throughout Nepal under various programs

### Good Practice Detail Description

Construction of residential buildings in a developing country like Nepal is primarily carried out by the informal sector, mostly the owner/builders. The prevailing construction practice does not incorporate earthquake resistant components and the existing housing stock is highly vulnerable to earthquakes. This shows a clear need of producing more trained masons by skill upgrading of the practicing masons as well as the newcomers in the construction sector.

Masons are the key actors who translate designs into reality, especially in developing countries where more than 90% of the buildings are non-engineered, and the masons are commonly serving as the “best technical hands” available for building construction. Therefore, masons need to be aware of the technology they are working with in order to ensure optimum, efficient and effective use of the building materials and the construction processes.

NSET in its quest of promoting safer construction practice began training masons several years ago with the objective of making them aware of the techniques used for risk-reduction with a full understanding of “why” and “how”.

NSET started providing On-the-job training and classroom lectures for the masons during the School Earthquake Safety Program (SESP) in 1999. As it was observed that the Mason training was very effective and the impact was remarkable with high replication potential, Mason training became the

integral part of the school safety program. However, the coverage – was very small as there were only few schools in SESP. Realizing the vital role of masons in earthquake resistant construction Mason Training evolved as an independent activity during 2003 as a part of Municipal program being implemented by NSET.

At present, the 5 day mason training program of NSET, which combines classroom training with hands-on field exercises, has become very popular in Nepal and abroad.

The positive impact of the Mason Training can be clearly observed at three major levels; in the community, in the attitude of the masons trained and the most important is in the construction quality and safety level of the buildings reconstructed. The community members have now a better understanding and faith on the construction technology introduced. This acceptance on the technology and availability of the skilled human resources will certainly result in better sustainability of the technology.

The masons, who were initially confused and reluctant to the technology, are now confident on their work. Their performance has been much better. The trained Masons have also been trying to implement earthquake resistant construction techniques in their communities. The organized efforts of masons have led to the creation of masons group and the group are now advocating for safer construction practice.

The fact that trained masons are paid better wages than those who are not trained and have a good reputation in society suggests that people's attitudes toward safety have changed considerably.

It is obvious that increased awareness and enhanced capacity of masons help implementing building code effectively and practically. Making decision at the top level alone is not sufficient, there should be sufficient number of capable professionals in the field as well for the successful implementation of concept. Meanwhile, bottom-up approach is powerful for effective building code implementation. But at the same time, strong policy support and environment is indispensable for such activities. With multi dimensional efforts, it is not too far to achieve the goal of earthquake safe constructions even in weak economy like Nepal.

### Objective

- To upgrade local craftsmen's skill in quality construction and develop skillful working human resources in earthquake resistant construction
- Start mitigation and preparedness through training and awareness at community level

### Beneficiary Population

All the potential house- owners, community

### Any Lesson

Trained manpower required for earthquake resistant construction technology

Increased awareness and enhanced capacity of masons help implementing building code effectively and practically

Making decision at the top level alone is not sufficient for the challenge of implementation

Bottom-up approach is powerful for effective building code implementation

### Replication Potential

Mason training is effective and impact was remarkable. The methodology is cost-efficient with high replication potential. The procedures developed by NSET has been adapted and used by government and other organizations working in earthquake risk reduction.

### Publication

- Earthquake Resistant Construction of Building Curriculum for Mason Training (Guidelines for Training Instructors), 2005

### Implementing Agency

National Society for Earthquake Technology, Municipalities, Department of Urban Development and Building Construction (DUDBC)

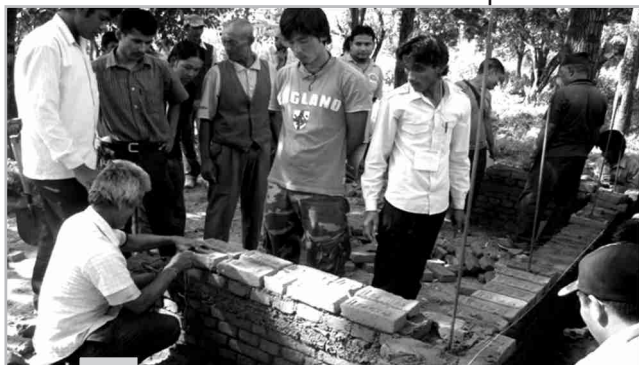


Figure 4.7: Practical demonstration in the field



Figure 4.8: Participants involved in group work

Name of the Case Study/Practice

## Building Code Implementation in Dharan Municipality

Theme/Disaster/Disaster Phase

Risk Reduction/ Earthquake/Pre-disaster

Geographic Location

Dharan, Sunsari

### Good Practice Detail Description

Dharan is one of the municipalities which have effectively implemented the building code in recent years.

It took almost a decade for Dharan to recover from the effect of the devastation caused by the 1988 earthquake of 6.5 Magnitude. The quake left behind questions like: what are the major problems in the current construction practice? How can this poor construction practice be changed into a good construction practice?

Further the study carried out under the Dharan Earthquake Risk Management Project (DERMP) implemented by NSET outlined the aftermath of the probable earthquake and the vulnerability scenario of the municipality. It showed that almost 60% of the municipal area is expected to bear a damage of MMI IX scale and almost 40% of the area is expected to bear a damage of MMI VIII scale. It also showed that 40% of the total building stock could be damaged and severe effect in critical lifeline facilities.

This made Dharan Municipality to come up with the strategies towards minimizing the existing risk in the municipality such as; conduct series of trainings and awareness programs and Implement building code as soon as possible.

On the occasion of Earthquake Awareness Day on August 22, 2007 (Bhadra 5, 2064 B.S.), Dharan municipality in the presence of government officials and all the stakeholders announced its plan to implement NBC in all of its building permit process.

The first year of implementation of building code was mainly focused on the improvement of municipal drawings submitted by the client for building permit purpose. The municipality was mainly focused

on submission of detailing rather than calculations and main emphasis was given on the implementation of Category C (MRT) of the Code. The second year of implementation of building code was focused on field implementation. The municipalities made several requests and appeals to the people for constructing safer buildings. Several mobile clinics were also conducted.

To speed up the process, municipality brought about the Licensing system to the local builders and masons in the third year of implementation of building code. Receiving a 4 days earthquake resistant construction training conducted by the municipality was a pre-requisite for the local builders and masons to be qualified for the professional license issued by the municipality.

In order to make a check on the system the municipality enforced punishment system to those local builders and masons who tend to ignore the provisions of building code. The punishment system was divided into 4 levels.

1. Warning if found ignoring the provisions of building code deliberately for the first time.
2. Suspending for a period of 2 months if the same person is found ignoring the provisions of building code deliberately for the second time
3. Blacklisting and making it public if the same person is found guilty of ignoring the provisions of building code deliberately for the third time
4. Delisting from the municipal list and cancelling the license if the same person is found guilty of ignoring the provisions of building code deliberately for the fourth and final time.

Further to motivate those local builders and masons who are doing well and following the building code a provision of reward was made.



Annually on the occasion of the Earthquake Awareness Day they were rewarded with a cash prize, certificate and their names are made public.

These efforts led to the establishment of Separate unit for Building code and Earthquake Safety within the organizational framework of the municipality. Drastic positive change in building drawings has been seen which has been replicated in one or the other way in the field as well. Almost all the new houses (nearly 75%) have been constructed following most of the criteria of NBC. Involvement of masons and technicians in building construction has increased due to their involvement in building permit system and licensing system. Follow-up even after the issuing the permit has made the house-owners stick to the drawings to the drawings. Professional Associations of masons, contractors and consultant technicians have been formed.

#### Objective/Methodology

- To effectively implement the building code in Dharan municipality
- To reduce the earthquake risk in Dharan Municipality

#### Beneficiary Population

Residents of Dharan Municipality and the surrounding area

#### Lessons Learnt

- MRT should be more elaborated and extended to other cases
- Implementation of Mandatory Rule of Thumb (MRT) in the least should be confirmed by Ministry of Local Development (MoLD) by introducing it in Minimum Conditions Performance Measures (MCPM)
- Support from government and other bodies is necessary to sustain the program
- Screening and selection should be done prior giving trainings to local masons
- Promotional scheme to local masons and contractors should be introduced
- Submission of Design Calculations should be made compulsory for Category BB Buildings
- Submission of Stress and Eccentricity calculation should be made compulsory for Category CC Buildings
- Competency in structural designing for the consultants should be increased giving

computer aided designing trainings like SAP

- Due attention to Retrofitting should be given along with the new constructions for old cities like Dharan

#### Replication Potential

- High Replication Potential
- Building Code Implementation in Nepal is not so easy due to various factors. However, it could be accomplished and as well replicated if there is a good coordination between the implementing agencies and the stakeholders as in the case of Dharan Municipality.

#### Implementing Agency

Dharan Municipality



Figure 4.9: Concerned Stakeholders jointly announcing the building code implementation



Figure 4.10: Constructing Sill and Lintel bands has become popular in Dharan

Name of the Case Study/Practice

## Child Centered Disaster Risk Reduction

Theme/Disaster/Disaster Phase

Risk Reduction/ Multihazard/Predisaster

Geographic Location

Sunsari District / July 2010 – October 2011

### Good Practice Detail Description

The flooding of the Koshi River in 2008 devastated Sunsari District in Nepal displacing 7000 families and creating a great humanitarian crisis. The fact that so many children saw their rights to survival, education and protection compromised underscored an important point: to secure the wellbeing of children before, during, and after a disaster, more needs to be done than simply provide humanitarian aid after a natural hazard wreaks havoc on a community ill-prepared to cope. Plan Nepal assumed the role of one of the lead agencies in the response effort.

Embracing the principles of the Hyogo Framework of Action and the Nepal Government's Disaster Management Strategy, Plan launched its Child-Centred Disaster Risk Reduction (CCDRR) Project in 2010 supported by Irish Aid in Mahendranagar, Harinagara and Barahachhetra village development committees (VDCs) in Sunsari District in partnership with Human Development and Environment Protection Forum (HUDEP). The wards and VDCs were selected with input from the district's development and disaster relief committees and with due consideration to their exposure and vulnerability to hazards.

With the participation of both child and adult stakeholders, each of the three schools in the project area—Harinagara Higher Secondary School in Harinagara, Basanta Ritu Secondary School in Mahendranagar, and Kausika Lower Secondary School in Barachhetra—developed a contingency plan after conducting a Hazard-Vulnerability-and-Capacity Analysis (HVCA) which assessed

potential risks, including damage to school infrastructure, furniture, and learning material and time lost due to closure. Each plan adhered to the principle of 'DRR through schools' not 'DRR in schools' so that they could accommodate a wide variety of issues, all of which put children at their centre. Schools have started to implement these contingency plans, renovating toilets and clearing, leveling, and fencing school grounds to reduce the risk of snake bites, accidents, and incursions by domestic and wild animals.

At the community level, the project conducted initiatives to make sure that the knowledge and skills people acquired during trainings could be translated into action and to increase people's confidence in their capacity to manage disasters; in addition to the six street drama performances, there were three showings of the project's DRR documentary, and six drills in earthquake, fire and flood procedures.

The drills and simulations helped to fill gaps in people's knowledge about DRR and to translate skills and knowledge into practice at the individual, family and community levels.

Even though this project was of short nature and a pilot initiative, it has generated many interesting findings and learning.

### Objective/Methodology

The objectives of the project were; to increase the capacity of local governments and the Sunsari District Disaster Relief Committee (DDRC) to prepare for and respond to disasters using a CCDRR approach, and to increase the capacity of children, youth and local communities to prepare for, respond to, and militate against potential disasters.

## Beneficiary Population

The project directly benefited 30,892 people of 6121 households

## Lessons Learnt

- Local participation is vital to the success of the project. This project's DRR activities were conducted in partnership with local people, and local ownership was actively encouraged. Local community members were given significant roles such as DRM ambassadors, and in general were involved in the entire DRM cycle. Often, they bore full responsibility for the success or failure of activities.
- An important aspect of this project was to contribute efforts towards better governance systems, both locally and nationally. Local disaster management committees (LDMCs) have been established to institutionalize government systems at local village level. Furthermore LDMC involvement also increased during the implementation phase of the project.
- Investing in building local school capacity should be prioritised in future projects as schools are excellent conduits for knowledge sharing and dissemination.
- The programme has highlighted a ground-level willingness to address school safety, and it could be effective to implement a 'right-to-safe-schools' campaign, advocating in coordination with local health posts and parents teachers associations for first aid boxes and fire extinguishers in each school, as well as repairing of unsafe structures and prioritise earthquake resistant construction.
- The provision of life-saving equipment increases the value of trainings. Providing essential equipment not only increased participants' interest but also enhanced their confidence and self-esteem. For example conducting real life search and rescue simulations using life jackets and ropes caught the imagination of participants, and encouraged more people to get involved in training.
- For scaling-up local capacity on child centered disaster risk management, the inclusion of vulnerable groups should be prioritized.

## Replication Potential

Plan Nepal and its partner believe that CCDRR approach can be replicated with any CBDRM initiative. More specially, the CCDRR approach can be applied under Flagship 1 School Safety Program

## Publication

A project evaluation and Learning document - available from Plan Nepal

## Implementing Agency

Plan Nepal Kathmandu



Figure 4.11: Practice on the flood response technique



Figure 4.12: Students performing Duck, Cover & Hold on

Name of the Case Study/Practice

## DRR Income Generation Program (IGP)/Community Based Disaster Risk Reduction Program

Theme/Disaster/Disaster Phase

Underlying Risk Factors/Multihazard/Pre-Post Disaster

Geographic Location

Illam, Jhapa and Panchtar districts

### Good Practice Detail Description

Nepal Red Cross has been working with 25 communities in Illam, Jhapa and Panchtar districts in eastern region of Nepal to reduce the risk of disasters since 2006. The program, which is supported by the British Red Cross, trains community members in disaster management. This involves setting up teams to prepare communities for disasters, such as floods and landslides. It also includes training people in first aid, as well as establishing emergency funds for responding when a disaster strikes. As a result, all 25 participating communities have received relevant training and set up DRR units, implemented mitigation projects, established emergency funds and trained DM groups.

The communities the Red Cross is working with in eastern Nepal are poor and therefore particularly vulnerable to a number of disasters including river floods, fires and snakebites. They have faced these disasters for many years as they did not have any knowledge or skills on disaster preparedness or disaster mitigation, rescue, relief or even basic pre warning systems. There was no social cohesion in their community, which made coordination very difficult. The situation changed when the community was selected by NRCS for the Community Based Disaster Risk Reduction program. Before the program started in the community, the community preferred to wait for others to try and solve their problems. The arrival of the DRR program introduced a different approach

to addressing disaster. The DRR unit encouraged the community to come to gatherings and through these meetings, they became aware that if they worked together, they could do a lot to solve their problems.

As part of the DRR program, the Red Cross also provided the committees with NRs.15,000 each for increasing the economic capacity within the community. The emergency funds were used to provide income generation loans for people affected by disasters who lost their means of making a living.

The loan was very helpful for the needy people as the bank didn't lend loan without a guarantor and others overcharge on interest. The loan under DRR Income Generation Program was affordable for repayment and thus was beneficial for the people.

The Red Cross further equipped the community with essential skills as they were provided with various trainings such as First Aid and Disaster Management. From these trainings, the communities have received knowledge and skills on Disaster Preparedness and Mitigation, Basic First Aid, Emergency Coordination and Communication. The DRR program has thus increased awareness of the community about disasters and social harmony in their community.

### Objective

- To increase the awareness level of the community towards DRR

- To equip the community with essential skills on DRR
- To support the community to uplift their livelihood through various income generation program

### Beneficiary Population

More than 15,000 Communities of the three districts

### Replication Potential

The program has a very high replication potential and is being replicated to other communities in order to increase the disaster resilience of the communities

### Implementing Agency

Nepal Red Cross Society (NRCS), British Red Cross



Figure 4.13: Kitchen Gardening in one of the DRR implemented communities, Panchthar



Figure 4.14: Murdirmaya Tumbapo and her husband with their buffalos, which they were able to buy with a helping hand from the DRR program

Name of the Case Study/Practice

## Developing and Implementing Emergency Response Plan of a Bheri Zonal Hospital in Nepal

Theme/Disaster/Disaster Phase

Risk Reduction/Earthquake/Pre-disaster

Geographic Location

Banke district

### Good Practice Detail Description

Hospitals would be among the first institutions to be affected after a disaster, natural or human induced. Because of the heavy demand placed on their services at the time of a disaster, hospitals need to be prepared to handle overwhelming huge workloads.

Despite the very critical role in disaster, hospitals in Nepal are not prepared to respond to the predicted disaster situation. Seismic vulnerability assessments of 19 major hospitals showed 80% of the hospitals will be out of function in a major earthquake. Bheri Zonal Hospital located in Nepalgunj, Banke district, the largest referral government hospital in the mid western region providing services to more than 100,000 people of the mid and far western region of Nepal per year, is amongst those most vulnerable to earthquakes. The cause of non-functionality of the hospital is not only attributable to structural components, but also non-

structural and functional components. Realizing this, a comprehensive emergency response plan of the hospital was developed, followed by implementation of key activities under the project Developing and Implementing Disaster Preparedness Plan in Bheri Zonal Hospital. The project broadly covered and focused

on awareness and capacity building in making the hospital safer and enabling it to cope with the pending disaster.

The project conducted a detail vulnerability assessment of structural and non-structural safety of Bheri Zonal Hospital in early 2010. The project was implemented by NSET with funding support from European Commission's Humanitarian Aid Department (ECHO) through Action-Aid Nepal (AAN) under DIPECHO V together with Bheri Zonal Hospital (BZH). Based on the assessment report, preparation of comprehensive emergency response plan of the hospital and implementation of key activities to support the plan together with non-structural mitigations was chosen by the hospital management in consultation with Action Aid and NSET. With support from Handicap International (HI), the issues of accessibility were also included while preparing the emergency response plan as well as during implementation of activities to support the plan as far as possible.

Towards making the Bheri Zonal Hospital prepared for emergencies various activities were implemented such as; Assessment for functionality of the hospital (Structural, Non-Structural and Functional) was carried out, orientation and interaction program was organized on disaster preparedness planning, Emergency Response Plan with Spatial Map was prepared and as suggested by the assessment report, non-structural mitigation measures were also carried out in the hospital.

In addition, works listed as Priority I such as putting sirens in four key locations around the hospital complex, construction of two emergency exit gates, two channel gates to guide the patient flow, clearing and planting



Figure 4.15: Spatial Plan for Emergency Response Scenario -1, Bheri Zonal Hospital

of grass in the garden area to maintain as a lawn for allocating an overflow of patients, making and fixing of sign boards for quarters and the main entrance gates of the hospital, were carried out.

For Strengthening of critical life line facilities, as suggested by the vulnerability assessment, lifeline facilities including the generator and pump house, were strengthened by demolishing the existing one and reconstructing the housing and providing shelter for the generator. They were constructed incorporating earthquake resistant elements, to ensure they remain functional during post-disaster.

Development of hospital disaster response plan is not an end in itself and it is imperative to test the plan, therefore orientation training and Hospital Disaster Preparedness Drill program was developed as a continuing effort to help Bheri Zonal Hospital undertake effective and efficient drills specifically for emergency preparedness and response.

#### Objective/Methodology

The overall goal of the project was to strengthen the mass casualty management system in BZH to ensure the prompt and sufficient performance of the hospital after a disaster building an effective, efficient and inclusive response mechanism

#### Methodology

The various methodologies carried out in BZH to improve its functionality during a disaster, are as follows;

Coordination and Interactions with Various Stakeholders

Reference of Relevant Documents

Application of Hospital Incident Command System (HICS)

#### Beneficiary Population

More than 100,000 people of the Mid and Far Western Region of Nepal

#### Lessons Learnt

Planning is possible, even in busy operating hospital

Involvement of Hospital Staff in Planning and Implementation was effective

Application of new concept is challenging and requires patience

Integration with other programs was Cost effective

Regular practice of Triage is important

Continuous training for the staff needed

Linkage of Disaster Store with Emergency Store is necessary

Mass Casualty Management is not all technical Drill was a learning experience for nursing students

Drill should to be conducted on regular basis

#### Replication Potential

This was a pilot project primarily developed to design and build a replicable model that can be used in future hospital safety-related programs, whilst also demonstrating and advocating for a higher level of hospital safety in the country as per the first Flagship Program (a consortium developed by the donors and endorsed by GON for Disaster Risk Management in Nepal).

As gleaned from the works of BZH and the lessons learnt, all approaches and methodologies were found to be highly effective and can be replicated with project-specific alterations in other health institutions in Nepal in future

#### Implementing Agency

Action-Aid Nepal (AAN) and Bheri Zonal Hospital (BZH), under the DIPECHO V, National Society for Earthquake Technology-Nepal (NSET), Handicap International (HI).

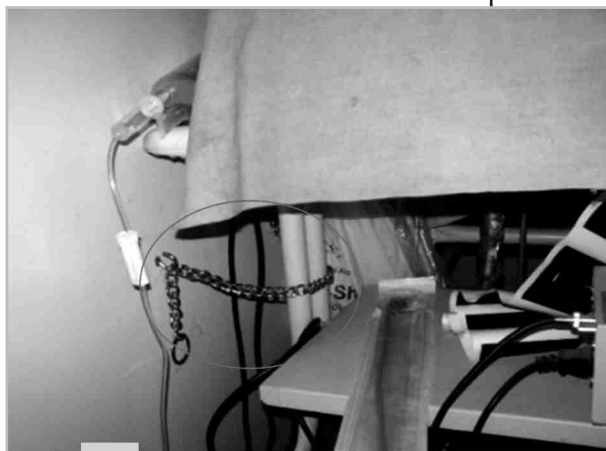


Figure 4.16: Nonstructural Mitigation work at the hospital

Name of the Case Study/Practice

## School Earthquake Safety Program (SESP)

Theme/Disaster/Disaster Phase

Disaster Preparedness/Multi-hazards/Preparedness

Geographic Location

Throughout Nepal

### Good Practice Detail Description

Despite the high risk of earthquakes, school construction in Nepal has largely ignored issues of structural safety and they are built very informally just like common residential buildings. Over 66 percent of the valley's public schools are likely to collapse if they were to experience intensity IX shaking. Estimated casualty figures for a scenario earthquake of MMI IX shaking during school hours in Kathmandu Valley are: 29,000 deaths (students, teachers and administrative staff-12%), 43,000 seriously injured (18%), total collapse of school buildings (66%), partial collapse (11%), and 23% of the buildings will suffer from minor to moderate damage.

The findings led NSET to advocate for School Earthquake Safety Program (SESP) in Nepal, which has been very successful in terms of developing appropriate technical methodologies and a procedure for community-based implementation. The effort has demonstrated technical, economical, political and socio-cultural feasibilities of enhancing earthquake performance of about 300 public schools in Nepal located within the Kathmandu Valley and in districts located

at various physiographic regions of Nepal from the high Himalayan settlements to the plains of Terai in the south. However, there are more than 32,000 public and private schools in Nepal, and the challenge is to scale up the process of enhancing earthquake safety of schools for which institutionalization of the concept of

SESP is necessary.

NSET pioneered the School Earthquake Safety Program (SESP) in 1997 when it was included as a direct component of Kathmandu Valley Earthquake Risk Management Program (KVERMP) with the initiative of making schools safer against earthquakes that not only protects school children, but educates communities to protect themselves

Schools are source of education (awareness) and also a tool to make people aware about safety from hazards. Students, teachers, parents and the members of the management committee are the active agents who help widen the outreach of the earthquake safety measures. The earthquake resistant school building stands there as stimulator to change the current construction practice. School students are good conveyers of information from school to individual households. In this sense, school could be considered as ignition point to change traditional practices to seismically safer construction practice of society. Apart from its educational usage, schools are also used as community meeting places and emergency shelters during disasters. The importance of making school buildings earthquake resistant is obvious. In the early years SESP was limited to seismic retrofit design and involvement of the concerned communities in the implementation of the school building seismic reconstruction or seismic strengthening. Later, SESP gradually developed into a social movement as the centre of earthquake risk management.

In the School Earthquake Safety Program, NSET encourages the local community to establish a School Earthquake Safety Committee (SESC), with several sub-committees, at each SESP site. Because of the involvement of a very wide section of communities and institutions, SESP has proven to be a strong awareness raising activity.

The School Earthquake Safety Program



Figure 4.17: Students observing the retrofitting work in one of the selected school



consists of three closely inter-knit sub-components, namely, (1) Training of masons, (2) Training of teachers, parents and students on earthquake preparedness and preparedness planning, and (3) seismic retrofit or earthquake-resistant reconstruction of public school buildings. NSET carries out survey, design and assists the construction committee to implement the construction. Usually, the local masons are engaged in the construction; contractors are avoided.

NSET also provides construction supervision. During construction, the masons and technicians are provided with the Hands-on training on earthquake resistant construction. Further the school teachers, students and the surrounding community are oriented on earthquake safety. Emergency Response Plan of the school is developed including training of teachers, parents, children and the community for the drill to be performed based on the plan.

Thus the program has been very successful in promoting community participation in all components of program activities and to raise earthquake awareness significantly.

#### Objective/Methodology

The main goal of the project is to gradually ensure that school children in seismic regions go to earthquake-safe schools and that local communities build their capacities to cope with earthquake disasters. To achieve the goal, the SESP program has the following principal objectives:

- To assess the structural and non structural vulnerability of public school buildings
- To identify and implement measures to reduce the identified vulnerabilities
- To raise awareness of earthquake risks and preparedness
- Help schools develop and implement School Earthquake Preparedness Plan

#### Beneficiary Population

Students, teachers and the surrounding community of the selected schools

#### Lessons Learnt

- Schools are the best point of entry for propagating disaster risk reduction at community level
- School Earthquake Safety Program is a complete program
- SESP is a platform to produce/develop appropriate technology
- Management model in SESP can be used in any community development work as a model for community-based initiatives

- Transparency plays vital role in community-based programs
- Best indicator of success of technology transfer is replication of the process.
- Training program for mason is an essential part for a successful School Earthquake Safety Program
- Retrofitting is an affordable solution for Nepalese Schools

#### Replication Potential

School Earthquake Safety Program is a complete program to make schools safer and also reach communities with the message of earthquake safety promotion. SESP approaches are well established and approved. Despite concept being widely accepted and even replicated at various levels, there is a huge potential to scale up the effort with extensive replication so as to cover thousands of schools in Nepal and the region.

Additionally, the masons trained during the program are now spreading the technology of earthquake-resistant construction in their communities and replicating the technology while constructing new buildings. They are also training other masons. Thus the process of replication (replicating the construction methods employed in school building to construct their private houses) would multiply in future to set a new technological culture in construction.

#### Publication

Hand-Book for Seismic Resistant Construction and Retrofitting of School Buildings in Nepal Training Manual for School Based Earthquake Preparedness Program

#### Implementing Agency

National Society for Earthquake Technology-Nepal (NSET) in partnership with many Agencies/ Organizations



Figure 4.18: Students participating in the earthquake drill program

Name of the Case Study/Practice <b>Disaster Preparedness for Safer Schools (DPSS)</b>	
Theme/Disaster/Disaster Phase Preparedness/Earthquake-Multi-hazard / Pre-disaster	
Geographic Location Nuwakot, Bhaktapur	
<p><b>Good Practice Detail Description</b></p> <p>Schools in Nepal and the region are highly vulnerable to different kinds of disasters. Disaster awareness and preparedness at the schools is very low. There is urgent need of disaster preparedness in vulnerable schools in Nepal. Realizing this need, Nepal Red Cross Society (NRCS) and NSET with the funding support from American Red Cross (ARC) implemented the program “Disaster Preparedness for Safer Schools in Nepal (DPSS)” to increase disaster awareness and improve the disaster safety of schools and communities through awareness, training and capacity building activities. The program was implemented in 50 schools from two districts ( Bhaktapur and Nuwakot) of Nepal during the period of Nov 2009 to Oct 2010. DPSS is further envisioned as a regional program to be implemented in few disaster prone countries of Asia on the basis of experiences &amp; lessons learnt during first phase.</p> <p>The program included development and adaptation of training curricula on school based disaster preparedness, delivery of training courses, preparation and implementation of school earthquake preparedness plans, disaster preparedness drills, community awareness and establishment of links between city/community preparedness plan and school preparedness plan. Various activities such as 5-day course on School Based Disaster Preparedness Training of Trainers (SBDPTOT), 3-day course on Basic Disaster Management Training (BDMT), 4-day course on Basic First Aid Training (FA), 4-day course on -Light Search and Rescue Training (LSAR) and 3-day course on Disaster Preparedness Planning/Vulnerability &amp; Capacity Assessment Training (DPP/VCA) were conducted. Also, various activities were implemented on Disaster Risk Reduction and Preparedness such as Vulnerability and Risk Assessment,</p>	<p>Formation of Student Disaster Safety Clubs, Strengthening of Junior/Youth Red Cross (J/YRC), Preparation and implementation of School Disaster Preparedness and Response Plan, Support for Students’ Summits in districts, School Disaster Preparedness Drill, in 20 Schools, Developing Handbook on School Disaster Preparedness, and etc.</p> <p>Secondly, with the objective to increase disaster awareness of communities, various Awareness Campaigns were carried on, like the orientation sessions to parents, community people and the leaders on concepts of hazards, disasters, preparedness and mitigation; Disaster Safety Rallies and also production and dissemination of relevant publications.</p> <p>Third area of activities under this program focused on assisting institutionalization of disaster safety concepts through Involvement of key government and non-government institutions of education sector in the program; Program Advisory Committee at Central Level; District and local level stakeholder meetings; Preparation of draft National Strategy for institutionalization of Disaster Preparedness in Schools as well as Dissemination and Advocacy.</p> <p>A total of 8,402 people got benefitted through numbers of disaster preparedness and risk reduction activities implemented in the DPSS program. 93 trainings on Disaster Preparedness and Disaster Risk Reduction were conducted and 20 communities and 50 schools of the program district were benefitted through risk reduction and preparedness activities. As an outcome of the training activities five different training curricula on disaster preparedness was developed.</p> <p>Now the program partners are implementing second phase of the program “DPSS2” in both the districts Nuwakot &amp; Bhaktapur and also expanding to Rasuwa district.</p>

## Objective

- Improve disaster safety of public schools through increased hazard awareness; improved disaster management skills among school children, teachers and parents; and by establishing proper disaster preparedness and response systems
- Increase disaster awareness of communities through disaster awareness and training programs and campaigns using schools as entry point
- Assist to institutionalize disaster safety concepts into regular education system by developing and assisting in implementation of national strategies for wide-spread application of concepts, approaches and methodologies to enhance disaster safety of entire education system throughout the country.

## Beneficiary Population

The communities, students, teachers and Red Cross volunteers of the program area

## Lessons Leant

- Mobilization of JYRC, Red Cross Volunteer seems very effective to aware community
- JYRC, School teacher and Management committee of Schools can take lead role to implement the preparedness activity
- Involvement of security forces help to make smooth coordination with community
- Some more intervention required to involve community for preparedness activity
- Capacity building activities required for local government staff for sustainability of program
- Involvement of NSET reinforced the smooth implementation procedure and built up the technical capacity of NRCS

## Replication Potential

Wide incorporation of local stakeholder, government partners during implementation of the initiation demonstrated the model as a sustainable and replicable one to other schools and community. Further high level of community acceptance of the conducted activities has showed that it has a high replication potential.

Second phase of the program “DPSS2” now being implemented in 3 districts is an example

of its continuation and replicability.

## Publication

Curricula for - School Based Disaster Preparedness ToT (SBDToT, 5 Days),  
Basic Disaster Management training (BDMT, 3 Days)

Light Search and Rescue Training (LSAR, 4 Days),

Vulnerability Capacity Assessment/ Disaster Preparedness Plan training (VCA/DP, 3 Days),

Program Operation Guidelines for DPSS

## Implementing Agency

Nepal Red Cross Society (NRCS), National Society for Earthquake Technology (NSET), American Red Cross (ARC)



Figure 4.19: School Emergency Evacuation Plan painted on walls of school building



Figure 4.20: Students demonstrating and practicing Duck Cover and Hold during school earthquake drill

Name of the Case Study/Practice

## Community Based Disaster Risk Management in Nepal (CBDRM-N)

Theme/Disaster/Disaster Phase

Disaster Preparedness/Multi-hazards/Preparedness

Geographic Location

Kathmandu, Lalitpur, Alapot VDC

### Good Practice Detail Description

Realizing that neighborhoods and communities are the first ones to help each other during any major disaster situation, NSET has implemented community based earthquake/disaster risk management programs in different communities of Nepal. Community Based Disaster Risk Management in Nepal (CBDRM-N) is one of those interventions. With the funding support from Lutheran World Relief (LWR), NSET implemented program in Alapot Village Development Committee, Ward No.12 of Lalitpur Sub-Metropolitan City (LSMC12) and Ward No.18 of Kathmandu Metropolitan City (KMC18) during 2010-2011.

The program implementation begun with the number of multi-stakeholders meetings in program communities separately to formulate Ward/VDC level Disaster Risk Management Committees (DMC). The concept was to pilot institutionalization of DRM efforts at the lowermost administrative units in line with Local Self-Governance Act (LSGA) 1999 and as envisioned in National Strategy for Disaster Risk Management (NSDRM)-2009. With the participation of multiple sectors, DMC was formed in each of the three program communities to be led by Head of Ward or VDC.

The program was initiated with a 5-day training program on Community Based Disaster Risk Management conducted for the representatives of the three Disaster Management Committees (DMC) and the concerned authorities. The idea was to impart knowledge and skills in community frontiers and also enhance quality of DRM activities in the community to carry on. The trained persons are now capable of planning and implementing Community Based Disaster Risk Management initiatives.

Disaster Risk Management Committees (DMCs) planned for series of community level orientation programs to raise the public awareness on DRR/DRM.

The three DMCs with technical assistance from NSET, organized a 3 day training program on Participatory Hazard, Risk, Vulnerability and Capacity Assessment (PHRVCA) for 30 local volunteers in each of the program communities. The trained volunteers along with other members of the community carried out the participatory Hazard, Risk, Vulnerability and Capacity Assessment of their locality. On that basis, the Disaster Risk Management Master Plan has been developed for each Ward or VDC. The prepared master plan was shared and endorsed by the community stakeholders in presence of the local government officials. Pilot activities were implemented in schools and health centers. An orientation program on DRR was conducted in each selected school and the School Based Community Disaster Preparedness Plan was prepared. In addition, Disaster Response Plan was developed in each program community. Non structural vulnerability reduction works were carried out in the selected schools and primary health centers.

Further, to upgrade the skill of the practicing masons of their community a five day training program for masons on Earthquake Resistant Construction Technology was organized by each DMCs.

In this program concept, all the activities have been designed so as to enhance disaster resiliency through local initiatives on right based approach. Also, stress is on networking among CBOs and other civil society organizations on policy development and sharing best practices in disaster risk management framework.

The concerned authority has endorsed the DMCs as an entity within formal structure of the Metropolitan City and Village Development Committees.

### Objectives

- Enhance community capacities in mainstreaming community based disaster risk management
- Build and facilitate school based disaster management plan in targeted schools which interconnect with nearby community/CBOs and health institutions
- Establish 3 local health institution based disaster management plan as hubs for emergency response and emergency health preparedness at the local level
- Enhance the disaster safety of the community by implementing structural and non-structural vulnerability reduction activities in all 3 communities
- Enhance skill on right based approach and the networking among CBOs, and other civil society organizations on policy development and best practices sharing in disaster risk management framework
- Institutionalize the Disaster Risk Management (DRM) initiative at 3 local government and social institutions by prepositioning of emergency rescue supplies

### Beneficiary Population

Communities of KMC Ward No 18, LSMC Ward No 12 and Alapot VDC

More than 3,500 persons actively participated in the CBDRM-N project activities and gained direct benefit with enhanced access to knowledge, skill and hands on experience.

### Lessons learnt

- Continuous mass awareness campaign is very much essential
- Explaining complex concepts of disaster risk reduction in a simple language pays
- Combination of Local wisdom and modern knowledge in Disaster Risk Management is a must for Effective Risk Assessment and Reduction
- Transparency brings interest, involvement and ownership
- Community Based Disaster Risk Reduction Initiatives should be “Community Paced”
- Developing and improving risk assessment tools are very important

### Replication Potential

The methodology is cost-efficient and replicable.

The procedures developed by NSET has been adapted and used by other organizations working in disaster risk reduction. It is very much clear that all the 4000 Village Development Committees should be facilitated to form Village level Disaster Risk Management Committees and implement the Disaster Risk Reduction Activities in each village to make the Nepali community resilient to disasters.

### Source / Publication

Reports by NSET

### Implementing Agency

National Society for Earthquake Technology-Nepal (NSET), Lutheran World Relief (LWR)



Figure 4.21: Communities attending orientation lecture on earthquake safety



Figure 4.22: Participants performing practical exercise during the LSAR training

Name of the Case Study/Practice

## Local level Disaster Management Committees – Effective Vehicles for reducing disaster risk (Community Based Disaster Risk Management)

Theme/Disaster/Disaster Phase

Preparedness/Multihazard/Pre-disaster

Geographic Location

Banke, Makwanpur, Rasuwa and Kathmandu

### Good Practice Detail Description

In the previous years, DRR efforts did not occur at the local level; decisions were made higher up and were imposed on local communities, ignoring the fact that these decisions might be inappropriate for the local context. The misconception that dealing with disaster is the duty of the government and that locals can do nothing on their own to manage disaster prevailed, because there were no organized DMCs, discussions about disaster risks and ways to cope with them were limited.

The Project Disaster Risk Reduction through Schools (DRRSP) implemented by Action Aid Nepal facilitated PVAs (Participatory Vulnerability Assessment) and interactions at the school and community level revealed that there were many gaps in the DRR knowledge and practices of local people. One of those gaps was the lack of an institution responsible for disaster-related activities. To address this gap, socially inclusive Disaster Management Committees (DMCs) were formed at the school and community levels in the project implemented districts of Banke, Makwanpur, Rasuwa and Kathmandu. DMC members learned many life-saving skills through trainings in first aid, search and rescue, fire fighting and other issues in an effort to build their capacities to respond to disaster. Emphasis was given to the institutional development of these DMCs, grooming them to assume the role of 'risk minimisers'. Under the leadership of DMCs, communities drafted community-based disaster preparedness and contingency plans in order to promote for sustainable DRR at the local level.

Once local-level DMCs had been established and strengthened, it was easy for various disaster actors to realize their respective roles

and responsibilities. The fact that DMCs were socially inclusive helped to ensure the equal participation of men, women and marginalized groups in reducing the risks of hazards, eliminating social vulnerability and building disaster-resilient communities. Women, who were once largely absent from development endeavors, are now in the forefront and are well represented in decision-making process.

The establishment of DMCs has made it easier to provide services to those groups of affected people who were previously left unaided during disasters. DMCs also make communities more responsive because with the transparency of their actions they establish upstream and downstream linkages and, increase the willingness of every family to participate in DRR. Because DMCs have made local-level resource mobilization possible, communities can now respond to disaster risks immediately. DMCs mobilize local resources and create awareness about people's ability to act on their own, thereby empowering them. Since it is almost impossible to respond effectively without funds, all the DMCs have established emergency funds which can be drawn on in times of need to provide immediate relief before external support arrives. Not only have DMCs promoted local-level DRR, but they have also empowered communities. Getting involved with a DMC helps people overcome their shyness and lack of confidence. Communities with DMCs have a positive self-image and are able to project that image publicly. For example, under the leadership of its DMC, Bageshwori VDC, Banke, constructed a safe shelter which it rents out to others to conduct meetings and other programmes. The income is deposited in the community's emergency fund.

DMCs provide good coordination, whether of resources or ideas and therefore maximize a

community's ability to respond to disasters and to reduce disaster risks. They coordinate among governmental agencies, NGOs, School Management Committees (SMCs), Community leaders and Parent Teacher Association (PTAs) to insure that DRR activities are collective efforts. They are also able to secure and mobilize external support easily. For example, the DMC in Matehiya, Banke, working in coordination with the Red Cross, Matehiya VDC, Banke DDC, the District Disaster Relief Committee, and BEE Group, was able to raise NRs. 260,000 for 25 fire-affected families. This DMC is also linked with the district level Network for Disaster Affected People. DMCs have also served as a platform to promote interactions and discussions among students, teachers and guardians about new DRR issues as they arise and to share the good practices adopted by communities other than the six project communities with a view towards replicating them. DMCs also prepare contingency plans for disaster preparedness, and their knowledge about resource generation is strong.

#### Objective/Methodology

- To promote disaster resilient communities
- Enhancing community capacities in mainstreaming community based disaster risk management

#### Beneficiary Population

Communities of Banke, Makwanpur, Rasuwa and Kathmandu

#### Lessons Learnt

- DMCs ensure that all local-level stakeholders will be represented in all DRR endeavors as they are socially inclusive
- As DMCs promote accountability among stakeholders, they increase the effectiveness of DRR efforts
- Since the plans and programs of DMCs are transparent, they find it easy to generate resources both internally and externally, even small contributions can help communities respond to disasters immediately after they occur
- DMCs should be further equipped with the skills and knowledge they need to mobilize resources for DRR
- DMCs advocate and lobby in favor of the disaster affected, particularly the most vulnerable among them

- DMCs also ensure that decision-making is based on the will of all stakeholders and promote a culture of harmony and unity which fosters the collective and comprehensive handling of disaster risks

#### Replication Potential

Different hazards require different interventions, but an integrated, multi-stakeholder approach is the basis of this initiative, and this can be successfully applied in different communities and contexts. As such, it can be replicated in other hazard prone areas and at national level. This requires raised awareness and understanding of disaster risk reduction among political parties and government, and government officials working in different line offices.

#### Implementing Agency

Action Aid Nepal/ DIPECHO



Figure 4.23: DMC Meeting



Figure 4.24: DMC member orienting the community

Name of the Case Study/Practice

## Pre-Monsoon Workshops: Effective Tool to Enhance National as well as Local Preparedness Planning for Flood Response

Theme/Disaster/Disaster Phase

Disaster Preparedness/Flood/Pre-disaster

Geographic Location

Throughout Nepal

### Good Practice Detail Description

Nepal is prone to a number of disasters, but the most frequent and certain to occur is flood and landslides during the monsoon causing heavy loss every year. Such disasters results not only in loss of life but also retards the national development process. Both the government and non government sectors in Nepal are working jointly and in collaboration to reduce the risk of disasters and provide effective response.

Pre-Monsoon Workshops, organized each year in Nepal to measure the level of preparedness and also make organizations prepared for response, is one good example of DRR in Nepal which has a national impact. Nepal Center for Disaster Management (NCDM) with the support from I/NGOs and UN Agencies initiated to organize Pre-Monsoon Workshop in 2002 and continued till 2006. From 2007, DPNet-Nepal and NCDM are jointly organizing the workshop. Following the workshop at national level, preparedness workshops are also being organized in districts and also in some communities.

These workshops have been instrumental for effective and coordinated response during the disaster. Some part of plain land area in tarai is inundated every year during the rainy season in Nepal putting the life and livelihoods of poor and vulnerable communities living near the river banks at stake. This kind of workshops has been able to map the resources and also prepare informal contingencies for the probable response. It is equally helpful to share the

responsibilities and make a coordinated plan in case of disaster.

The Pre-Monsoon Workshops at Central and District Level in 2008 had positive impacts during response in major floods-Koshi Flood and Western Nepal Flood in 2008. The preparedness planning enhanced the coordination, communication and collaboration among government institutes, local bodies and agencies. The Pre-Monsoon Workshops were organized at Central Level and at District Level in 46 districts by Co-coordinating with District Disaster Relief Committee (DDRC). The workshop also adopted Initial Rapid Assessment (IRA) tools, endorsed draft National Standard Response Kits (food, Hygiene, shelter and education), formed Community Disaster Response Team and Cluster wise Pre Disaster Task Force in some districts and communities along with mapping of resources and capacity of institutions.

The wide appreciated coordinated response during the Koshi Flood in 2008, August can be attributed as an outcome of regular pre monsoon workshop at national level and likewise preparation in district level. Though the national as well as local preparation was for regular types of flood and there was no contingency scenarios set in a scale flood occurred in Koshi areas, the response remained quite effective. DDRC took the lead for response coordination and UN OCHA facilitated response and other relief agencies supported the government in response. Cluster approach, spontaneously started to work in place, which made IASC to approve cluster approach at national



level. The district level preparedness planning in leadership of DDRC ensured the lead role of local government during the response also. Integrated Initial Rapid Assessment Tools were used within first 48 hrs and later on Cluster specific survey/assessment has been conducted to design the Cluster response plan. Very enthusiastically, government took the lead role for each cluster. Even some of the departments who are not the member of DDRC, like department of education lead the education cluster. The response, not only from the eye of outsiders, also in a view of the affected communities was very good. These increased coordination and predictable response in such crisis in Nepal, in general is a result of continuous effort of stakeholders for better cooperation and collaboration for DRR in Nepal and the workshops especially organized for this purpose like pre monsoon workshops are playing a vital role to boost the coordination and collaboration.

### Objective/Methodology

To share lessons learned from last year's disaster response activities and preparedness and make an effective district level plans for the better response and preparedness activities for the coming year's monsoon disaster

### Beneficiary Population

Communities of the flood prone area

### Any Lesson

The preparation of common tools like Multi Cluster Initial Assessment Tools and Guidelines and acceptance of the tools through this kind of workshops among the stakeholders will help for better information and data management for effective and efficient response in future disasters.

### Replication Potential

These workshops have been instrumental for effective and coordinated response during the disaster. Such practice needs to be replicated in order to boost the

coordination and collaboration among the various DRR stakeholders. Further the Government of Nepal has already endorsed the 'Guidance Note for District Disaster Preparedness Planning Workshops.

### Publication

Guidance Note for District Disaster Preparedness Planning Workshops

### Implementing Agency

Ministry of Home Affairs/GON, NCDM, DPNet-Nepal



Figure 4.25: Distinguished guests at the dias during the workshop

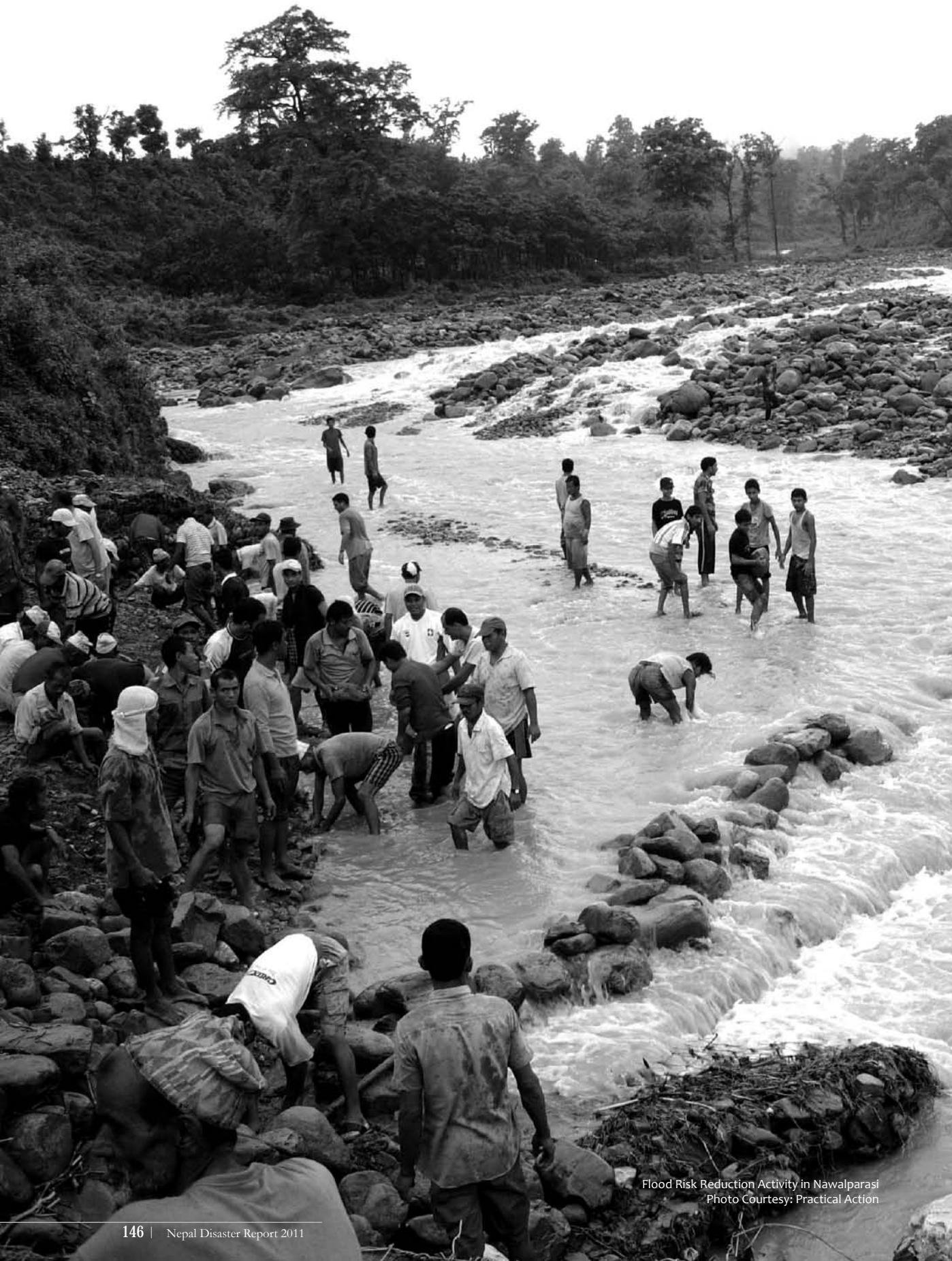


Figure 4.26: Participant of the workshop



A drill simulation done in city core-area of Kathmandu  
Photo Courtesy: DPNet-Nepal

# CHAPTER 5: THEMATIC DISCUSSION ON ECONOMICS OF DISASTERS



Flood Risk Reduction Activity in Nawalparasi  
Photo Courtesy: Practical Action

## Thematic Discussion on Economics of Disasters

### Background

Frequently occurring small, medium and large disaster events in Nepal cause casualty of thousands of human lives and destruction of physical assets worth hundreds of millions of rupees every year. In addition, indirect socio-economic impacts due to human casualties and damages of infrastructures are also enormous. This has eventually caused direct negative impact on development and economy of the country. A significant proportion of GDP is also lost every year due to natural disasters.

The several socio-economic impacts of disasters can be categorized as direct losses, indirect losses and secondary effects.

- Direct losses are the physical damage to capital assets, including buildings, infrastructure, industrial plants, standing crops, grain stores, livestock and social infrastructure, as well as loss of human life and injury and estimated economic loss.
- Indirect effects relate to disruptions to the flow of goods and services stemming from these direct losses, including, for instance, reduced output, loss of earnings and job losses.
- Secondary effects concern both the short- and long-term broader socio-economic impacts of a disaster, such as those on GDP growth, fiscal and monetary performance, the balance of payments, foreign reserves, indebtedness and the scale and incidence of poverty.

The direct loss caused by the disasters is obvious and easy to determine. However, the direct losses can lead to a wide array of indirect and secondary effects which are often intermingled and dare difficult to determine. For instance, crop losses can result in higher commercial and/or food aid

import requirements, with potential implications for the balance of payments and levels of official foreign reserves. Prices may be forced up, particularly where food staple shortages are exacerbated by disruptions to the transport network, in turn fuelling inflation and affecting poor households disproportionately.

The following sections of this chapter discuss on economic impacts of disasters which had gone through over the years in general.

### Damage and Losses

#### Human Lives

The impact of disasters on human lives varies year-by-year. Based on the disaster data compiled by MoHA and DWIDP, an average of 797 people killed annually due to disasters during 1983-2010 (MoHA 2004, DWIDP, 2010) (Table 5.1 and Figure 5.1). A total of 22,302 people were killed by all types of disasters. Significant proportion of human casualty (around 52%) is due to epidemics. Landslides and floods are other major contributors in the total human loss. The loss of lives due to landslides and floods alone was 279 per year for the same period.

Another disaster database, the DesInventar Database compiled by NSET which captured the data related to disasters since 1971 shows even more number of deaths during the period (Table 5.2). The human death during the period of 40 years (1971-2010) is 30,982 which make an annual average death of 775. From this data also, it can be seen that the significant proportion of death (more than 52%) is caused by epidemics. Other major causes of human casualty are floods and landslides (combined 27%). The low

Table 5.1: Loss of lives due to various disasters in Nepal from 1983 to 2010

Year	Flood & Landslides	Fire	Epidemics	Windstorm Hailstorm & Thunderbolts	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	128	20	2	0	0	318
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	83	65	951	49	0	12	0	1160
1998	273	54	840	23	0	0	0	1190
1999	193	39	1207	22	0	5	0	1466
2000	173	37	141	26	0	0	0	377
2001	196	26	154	38	1	0	0	415
2002	441	11	0	6	0	0	0	458
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
2006	114	3	0	15	-	-	-	132
2007	216	9	3	40	-	6	-	274
2008	134	11	10	16	-	0	-	171
2009	135	35	462	7	-	2	-	641
2010	240	69	36	70	-	-	-	415
Total	7,809	1,334	11,461	773	727	127	71	22,302
						Average of 28 years		797

Source: MoHA, 2004; DWIDP 2010

proportion of human casualty by earthquake (around 3%) is due to the fact that during this period, no large earthquake occurred; only one major event of 1988 occurred. The segregated data for period 1983-2010 from DesInventar database shows more average annual casualty rate of 950 deaths per year (Table 5.3).

In terms of affected population, flood events are the major contributor (Table 5.2). Around 62% of the total disaster affected population is due to floods. Floods affect annually around 125 thousand people. Annually, around 150,000 - 200,000 people are affected due to different disasters (Table 5.2 and 5.3).

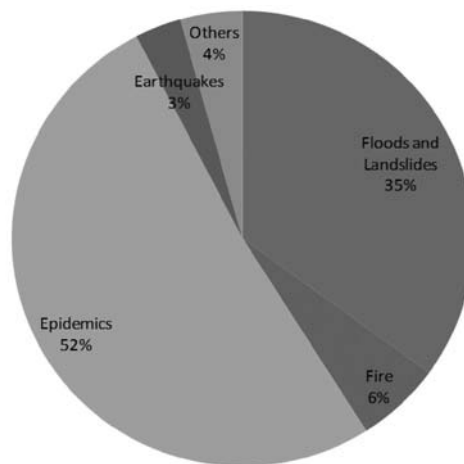


Figure 5.1: Percentage of loss of life due to various types of disasters in Nepal during 1983-2010

Source: MoHA 2004, DWIDP 2010

Table 5.2: Human death due to disasters during 1971-2010

Year	Flood	Landslide	Other Hydro-metrological	Fire and forest fires	Epidemics	Earthquakes	Others	Total
1971	34	68	37	4	151		17	311
1972	5	94	21	6	42		5	173
1973	23	23	22	16	92		38	214
1974	71	24	14	13	383	-	2	507
1975	15	19	32	11	158		28	263
1976	-	149	15	93	41		6	304
1977	17	57	13	13	47		15	162
1978	10	39	37	11	349		25	471
1979	15	29	10	52	522		12	640
1980	8	85	21	13	144	125	27	423
1981	130	62	7	11	34		14	258
1982	3	206	8	12	454		-	683
1983	72	106	15	7	282		10	492
1984	167	89	15	23	775		22	1,091
1985	35	25	4	14	104		47	229
1986	8	86	12	17	160		6	289
1987	38	30	5	7	25		17	122
1988	20	165	10	10	266	744	112	1,327
1989	31	130	33	26	104		28	352
1990	52	35	22	9	388		6	512
1991	45	27	46	23	948		8	1,097
1992	2	31	23	51	891		-	998
1993	1,169	256	70	25	253	1	38	1,812

Year	Flood	Landslide	Other Hydro-metrological	Fire and forest fires	Epidemics	Earthquakes	Others	Total
1994	7	57	58	52	985	-	16	1,175
1995	24	190	72	101	766	-	5	1,158
1996	73	215	58	117	665		19	1,147
1997	54	40	100	78	1,058	-	1	1,331
1998	131	197	51	20	748		7	1,154
1999	139	131	47	39	1,044		9	1,409
2000	79	118	50	40	403		18	708
2001	49	270	90	57	1,400	2	34	1,902
2002	158	455	38	14	223		11	899
2003	64	223	173	37	462	1	11	971
2004	77	47	171	27	744		39	1,105
2005	14	17	83	16	134		69	333
2006	52	104	94	40	267		39	596
2007	45	88	129	20	227		127	636
2008	128	162	124	72	217		242	945
2009	808	111	155	97	446		329	1,946
2010	27	67	160	61	130		392	837
Total	3,899	4,327	2,559	1,355	1,6532	873	1,437	30,982
Average for 40 years	97	108	64	34	413	22	36	775
Total for 28 years (1983-2010)							26,573	
Average for 28 years (1983-2010)								949

Source: DesInventar, 2011

Table 5.3: Summary of effects on human lives due to disasters during 1971-2010

Hazard	Deaths	Missing	Injuries	Affected
Flood	3,899	663	461	3,665,104
Landslide	4,327	605	1,446	555,607
Other Hydro-metrological	2,559	887	3,514	910,073
Fire and forest fires	1,355	596	1,135	268,342
Epidemics	16,532	-	43,076	513,017
Earthquakes	873	-	6,840	4,539
Others	1,437	659	755	15,564
Total	30,982	3,410	57,227	5,932,246
Average of 40 years	775	85	1430	148,300

Source: DesInventar, 2011



Table 5.4: Summary of Effects of Human Lives due to Disasters during 1983-2010

Hazard	Deaths	Missing	Injuries	Affected
Flood	3,568	447	443	3,526,011
Landslide	3,472	537	1,233	544,566
Other Hydro-metrological	1,908	877	2,687	314,218
Fire and forest fires	1,100	38	937	212,644
Epidemics	14,115	-	41,408	500,851
Earthquakes	748	-	6,592	4,539
Others	1,662	497	1,153	605,923
Total	26,573	2,396	54,453	5,708,752
Average of 28 years	950	86	1,945	203,884

Source: DesInventar, 2011

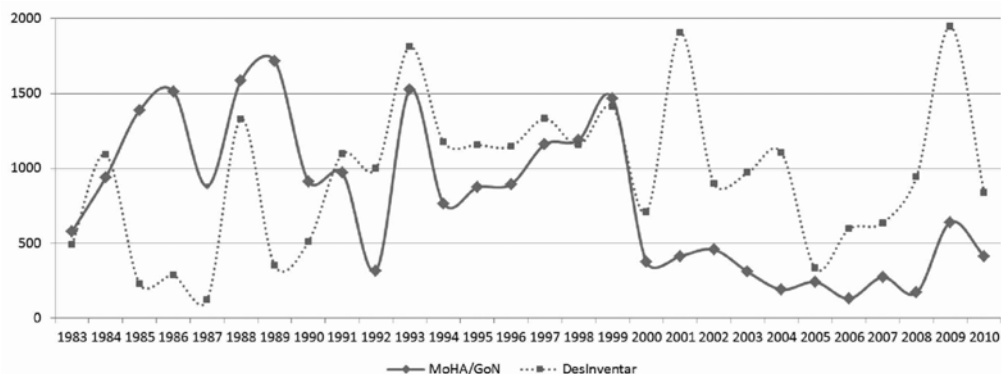


Figure 5.2: Loss of human lives in Nepal due to disasters 1983-2010, as reported in two databases (MoHA and DesInventar)

While comparing data from two major databases (MoHA/DWIDP and DesInventar) for the same period (1983-2010), the DesInventar data under-reports till 1990, whereas after 1990, the DesInventar data reports higher level of damage and casualties (Figure 5.2). It is common to see that the reason behind this could be the growing awareness of media in reporting small and medium size events.

### Damage of Properties

MoHA/DWIDP database provides a picture of damage of private and public properties due to disasters during the period 1983-2010. DesInventar database, whereas,

provides a comprehensive picture of damage and loss of properties during 1971-2010.

According to MoHA/DWIDP database, total livestock (different kinds of livestock) loss during the period of 28 years is 82,172 (Table 5.5) with an annual average loss of 2,935. Likewise, the damage of buildings is 417,002 with annual average damage of 14,900 buildings. Total agricultural land affected is 117,967 hectares with annual average area affected 4,200 hectares. Total 6,640 numbers of various public infrastructures including health facilities, government offices were lost during the period with an annual average of 240.

**Table 5.5: Damage of properties and Estimated Economic Loss (Value in 2010) due to Disasters during 1983 – 2010**  
(Million NRs.)

Year	Loss of Livestock (No.)	Houses Destroyed (No.)	Land affected (Ha.)	Damage in Public Infrastructures (No.)	Estimated loss (Million NRs.)	Value of losses in 2010
1983	248	12			240.00	1,974.38
1984	3,547	10,597	1,242	869	49.00	378.84
1985	3,399	7,166	1,355	436	23.00	167.49
1986	6,566	3,370	1,315	436	23.00	147.35
1987	1,852	36,220	18,858	421	2,005.00	11,363.18
1988	2,788	108,801		4,365	6,099.00	30,833.49
1989	4,240	7,648			4,172.00	19,353.44
1990	867	6,352	1,132		139.00	619.56
1991	642	5,510	283	39	43.00	174.86
1992	1,586	13,997	135	66	52.00	175.20
1993		21,911			5,189.00	16,197.44
1994	1,329	3,234	392		184.00	542.90
1995	2,053	10,275	41,867		1,933.00	5,303.58
1996	2,480	30,014	6,063		1,579.00	3,955.40
1997	1,191	4,825	6,063		410.00	947.46
1998	1,179	15,082	327		1,230.00	2,620.03
1999	650	4,304	182		509.00	964.48
2000	1,017	6,886	889		1,141.50	2,092.54
2001	665	6,103			526.55	936.13
2002	2,126	19,856	10,078		525.56	907.32
2003	1,125	6,819	2,360		989.93	1,631.43
2004	888	4,818			341.09	545.09
2005	955	3,169			387.21	592.70
2006	10,098	3,765	3,397		392.31	553.03
2007	21,861	37,984	514		1,928.55	2,555.42
2008	7,066	13,864	21,315		1,633.28	2,008.53
2009	228	1,050		5	420.25	458.40
2010	1,526	23,370	200	3	1,398.19	1,398.19
Total	82,172	417,002	117,967	6,640	33,563.42	109,397.87
Average Annual Loss during the period (2010 Value)						3,907

Source: DesInventar, 2011

A more comprehensive data is provided by DesInventar data for the evaluation of damage of properties (Table 5.6 and 5.7). Discussion on the damages are presented in the following paragraphs:

#### a) Housing/buildings

A total of 222,362 houses were completely destroyed and 168,482 were damaged by

different disasters during 1971-2010 (Table 5.6). Around 46% of the total damage of buildings is due to floods, around 23% due to earthquakes, 19% due to fires, and 8% due to landslides.

Annual distribution of building damage is presented in Table 5.7. Years 1980 and 1988 show very high damage figures which are mainly due to two episodes of earthquakes:

the 1980 Bajhang earthquake and 1988 Udayapur earthquake. There are several other years, in which the number of building damage is very high; particularly the high figures in the years 1993 and 2008 are mainly due to the flood of south-central Nepal and Koshi flood respectively. All other years comprise series of smaller, medium and few larger disaster events.

### b) Agricultural land and forest

Agricultural land and forest are damaged, destroyed or washed away by various disasters every year particularly by floods and landslides. Earthquakes also cause landslide, liquefaction and ground ruptures which ultimately result damage to land. The DesInventar data includes such damage and loss of agricultural land and forests. The permanent losses of land as well as the loss of crops are considered. The agricultural land washed away due to flood events is generally recovered after few years, however, this has not been considered in the data.

Accordingly to the data from DesInventar, a total of 986,560 hectares of land have been damaged lost during past 40 years (Table 5.6). Major proportion (almost 94%) of land loss is due to flood (24%), landslide (2%) and other hydro-meteorological (68%) disasters. In other hydro-meteorological disasters, it is mainly drought events which caused loss of agricultural crops during the period.

### c) Livestock

Total 754,288 numbers of different livestock were lost during the 40 years period due to various disaster events. Annual average livestock loss is around 19,000. Major proportion of livestock loss is due to frequent flood events (around 71%). Another major contributor for livestock loss is fire and forest fire, which caused around 15% of total livestock loss.

### d) Roads

A total of 710 km of different types of roads have been damaged or washed away by different disasters during the past 40 year period. Landslides are the major cause of such damage of roads, around 51% of total damage of roads is due to landslide. Another significant proportion is due to hydro-meteorological disasters, the primary hazards being floods, storms, and heavy rainfall again causing the land movements; this contributes for 46% of the total loss.

### e) Education and medical facilities

A total of 2,881 numbers educational facilities, primarily school buildings were lost during the 40 years period. 24 numbers of health facilities were also lost during the period. These figures seem to be very low compared to the actual cases. This is due to the fact that such public buildings are generally reported under the classification of housing/building; most of the time, they are not separately reported.

**Table 5.6: Damage of Private and Public Properties due to disasters during 1971-2010**

Hazard	Buildings		Agricultural Land and Forest (Ha)	Livestock (No.)	Public Infrastructures		
	Destroyed (No.)	Damaged (No.)			Roads (affected in meters)	Education centers (No.)	Medical Facilities (No.)
Earthquake	33,708	55,312	-	2,215	-	2,461	1
Flood	93,807	86,504	232,095	536,369	53,358	63	3
Landslide	18,249	13,690	22,288	10,486	364,937	76	6
Fire and Forest Fire	71,930	1,834	10,789	115,532	3,025	72	8
Other Hydro-Meteorological	3,419	10,101	669,604	9,897	275,200	195	6
Others	1,249	1,041	51,785	79,789	12,540	14	-
<b>Total</b>	<b>222,362</b>	<b>168,482</b>	<b>986,560</b>	<b>754,288</b>	<b>709,060</b>	<b>2,881</b>	<b>24</b>

Source: DesInventar, 2011

Table 5.7: Year-wise Damage of Private and Public Properties due to disasters during 1971-2010

Hazard	Buildings		Agricultural Land and Forest (Ha)	Livestock (No.)	Public Infrastructures		
	Destroyed (No.)	Damaged (No.)			Roads (affected in meters)	Education centers (No.)	Medical Facilities (No.)
1971	131	142	500	1,335	-	2	-
1972	771	86	397	340	-	1	-
1973	1,957	160	1,404	709	500	-	-
1974	2,615	859	17,347	1,431	1,045	1	-
1975	2,051	36	1,292	723	-	4	-
1976	4,957	448	30,404	1,714	2,050	1	-
1977	1,347	462	12,877	299	-	-	-
1978	3,132	75	345	959	3,960	-	-
1979	2,061	68	778	695	-	-	-
1980	14,348	13,650	16,818	10,881	-	68	1
1981	1,246	1,004	9,537	687	-	1	-
1982	1,039	37	1,614	6,894	-	1	-
1983	1,384	1,207	1,448	399	598	20	-
1984	2,568	485	5,429	2,892	16,040	6	-
1985	1,475	63	-	1,067	-	5	-
1986	1,160	21	223	392	-	1	-
1987	1,041	6,115	2,365	804	-	6	-
1988	23,202	41,182	1,003	1,446	2,000	2,388	-
1989	4,813	1,377	7,898	669	-	4	-
1990	1,209	1,366	1,791	91	-	2	-
1991	1,392	202	243	100	350	4	-
1992	6,225	79	77,993	442	450	1	-
1993	21,249	21,673	90,485	25,165	25,224	2	1
1994	3,175	517	157,688	766	160,000	15	-
1995	9,685	15,898	23,622	2,409	-	-	-
1996	19,638	13,923	6,849	2,995	-	6	-
1997	4,549	1,046	80,668	26,414	50	-	-
1998	15,978	477	3,975	1,035	495	6	-
1999	4,046	697	3,022	1,101	-	4	-
2000	3,038	1,810	36,580	1,125	3,072	9	3
2001	6,308	2,350	51,920	28,672	200	12	-
2002	14,059	5,479	12,561	4,593	2,780	3	-
2003	1,974	761	72,634	2,395	271,062	27	2
2004	1,641	3,339	37,480	101,993	141,025	26	2
2005	1,449	539	15	1,484	44,320	20	-
2006	1,927	8,512	72,746	1,297	15	-	-
2007	9,456	1,466	5,696	499,566	80	31	1
2008	16,029	3,293	89,568	8,853	33,420	67	9
2009	3,761	9,125	38,902	7,782	24	104	4
2010	4,276	8,453	10,444	1,674	300	33	1
Total	222,362	168,482	986,560	754,288	709,060	2,881	24

Source: DesInventar, 2011

## Economic values of damage and losses

Economic values of all damage and losses have been calculated (DesInventar, 2011). Year-wise economic loss values due to damage of different properties are presented in Table 5.8. The loss values are calculated first for the 2004 prices of the properties and then they are converted to current prices (2010 prices) using the Price Index for different years.

Based on the calculations, the current value of damages to all types of properties is around 937,252.682 million Nepali Rupees. In other words, around 937 billion Nepali Rupees worth of properties were lost during the period of past 40 years. This makes an average property loss of 23,431.317 million NRs. every year. The Gross Domestic Product (GDP) for the year 2010 is 1,183 billion NRs. (Economic Survey, 2011). If we compare this loss with the GDP, we find around 2% of GDP is lost every year due to disasters.

The years 1988, 1993 and 2008 again show a greater value of economic losses due to the major intensive disasters during these years.

Losses due to floods have major contribution to the total economic loss. Floods cause around 70% of the total economic losses (Table 5.9 and Figure 5.3). The second largest contributing hazard is drought, which cause 9% of the total loss. Likewise, other hydro-meteorological disasters cause 8%, landslide 5%, fires 4% and earthquakes 2% to the total loss.

According to the MoHA/DWIDP database, Table 5.5, the economic loss values during the period of 1983-2010 shows that the

highest economic loss occurred in the year 1988; the loss during the year was around 6 billion Nepali Rupees and the value of the loss in year 2010 is 30.83 billion. This huge economic loss was mainly due to the devastation caused by the 6.5 magnitude earthquake of eastern Nepal, as well as due to a series of flooding events in the same year. The year 1993 also shows a huge economic loss, this loss was mainly due to the severe flooding of the South-Central Nepal. The loss value during this year is around 5.2 billion Nepali Rupees and the value of this loss in year 2010 is around 16.2 billion. The impact of loss during 1988 earthquake was also very large, the economic loss was around 6.83% of the GDP of the year; the GDP of the year was 89.27 billion Nepali Rupees. Likewise, other years with significant GDP losses were 1987, 1989 and 1993; in these years the losses were 2.61%, 4.03% and 2.61% respectively.

Current value (in 2010) of Total losses during 1971-2010 (Million NRs.)

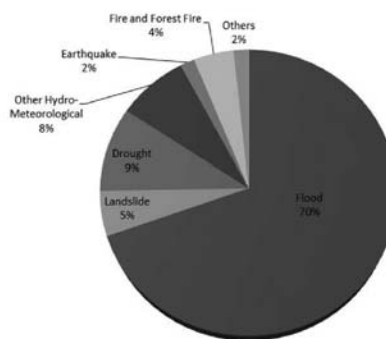


Figure 5.3: Proportion of economic losses due to different hazards in the total economic losses during 1971-2010

Source: DesInventar, 2011

Table 5.8: Year-wise economic value of damages (in Million NRs.)

Year	Economic Value of Destroyed houses	Economic Value of Damaged houses	Economic Value of Loss on Agricultural Land and Forests	Economic Value of loss of Livestock	Economic value of Road damage	Sum of Total Damages (Value of damage in the year 2004)	Sum of Current value (2010) of losses	Reported loss (NRs)	Current value (2010) of Reported loss (NRs)	Current value (2010) of Total losses (Million NRs.)
1971	17,558	1,317	250,000	16,020	-	284,895	455,286	0.862	20,657	475,943
1972	138,031	3,102	808,630	4,080	-	953,842	1,524,322	4,710	111,403	1,635,725
1973	355,964	6,684	1,191,420	8,508	2,000	1,564,576	2,500,327	3,709	76,785	2,577,112
1974	653,058	22,383	22,763,800	17,172	4,180	23,460,592	37,492,047	11,581	202,866	37,694,913
1975	437,601	0,803	3,590,020	8,676	-	4,037,999	6,451,631	6,147	93,036	6,544,667
1976	807,899	18,582	18,228,950	20,568	10,500	19,086,498	30,501,867	43,056	661,690	31,163,558
1977	202,956	10,313	3,365,605	3,588	-	3,582,462	5,725,083	2,807	41,489	5,766,572
1978	830,041	2,084	655,500	11,508	21,916	1,521,049	2,430,767	13,380	178,277	2,609,044
1979	501,126	1,369	1,420,060	8,340	-	1,930,894	3,085,736	17,632	226,507	3,312,242
1980	3,458,884	347,954	7,520,220	130,572	-	11,457,630	18,310,279	10,495	124,006	18,434,285
1981	231,756	27,763	6,097,095	8,244	-	6,364,857	10,171,590	6,552	68,524	10,240,114
1982	217,392	0,376	1,418,214	82,728	-	1,718,710	2,746,647	52,640	497,594	3,244,241
1983	162,830	29,298	2,454,320	4,788	2,301	2,653,536	4,240,579	30,644	252,094	4,492,673
1984	457,469	5,055	2,579,585	34,704	96,170	3,172,983	5,070,700	41,812	323,272	5,393,971
1985	216,063	2,246	-	12,804	-	231,113	369,338	39,501	287,643	656,981
1986	189,348	0,352	368,433	4,704	-	562,837	899,462	257,369	1,648,873	2,548,335
1987	200,651	57,598	4,493,500	9,648	-	4,761,396	7,609,121	42,703	242,013	7,851,134
1988	5,375,194	955,821	1,723,324	17,352	11,000	8,082,690	12,916,835	28,452	143,840	13,060,675
1989	561,732	29,755	12,979,515	8,028	-	13,579,030	21,700,459	128,460	595,911	22,296,370
1990	150,110	34,298	1,888,870	1,092	-	2,074,370	3,315,022	22,616	100,808	3,415,830

Year	Economic Value of Destroyed houses	Economic Value of Damaged houses	Economic Value of Loss on Agricultural Land and Forests	Economic Value of loss of Livestock	Economic value of Road damage	Sum of Total Damages (Value of damage in the year 2004)	Sum of Current value (2010) of losses	Reported loss (NRs)	Current value (2010) of Reported loss (NRs)	Current value (2010) of Total losses (Million NRs.)
1991	218.139	6.116	381.260	1.200	1.750	608.464	972.379	88.142	358.436	1,330.815
1992	688.500	1.784	14,607.915	5.304	2.400	15,305.903	24,460.151	191.259	644.389	25,104.540
1993	2,326.517	283.903	72,296.601	301.980	125.520	75,334.520	120,391.052	1,134.301	3,540.715	123,931.767
1994	654.935	8.285	24,754.493	9.192	800.000	26,226.904	41,912.852	97.608	287.995	42,200.847
1995	2,251.743	406.010	42,318.832	28.908	-	45,005.492	71,922.653	2,130.795	5,846.266	77,768.919
1996	4,926.054	354.945	6,690.365	35.940	-	12,007.304	19,188.707	395.301	990.230	20,178.937
1997	1,046.025	24.514	14,896.797	316.968	0.195	16,284.499	26,024.032	489.260	1,130.625	27,154.657
1998	3,731.467	4.583	4,768.060	12.420	1.560	8,518.089	13,612.640	383.163	816.175	14,428.815
1999	743.141	14.576	4,131.095	13.212	-	4,902.023	7,833.855	565.016	1,070.624	8,904.479
2000	502.179	42.494	27,578.042	13.500	6.502	28,142.717	44,974.485	742.962	1,361.961	46,336.446
2001	856.437	46.023	31,990.417	344.064	0.320	33,237.260	53,116.005	1,509.258	2,683.244	55,799.249
2002	1,584.922	78.265	22,280.897	55.116	12.090	24,011.290	38,372.109	2,842.002	4,906.420	43,278.529
2003	247.245	12.777	40,666.537	28.740	944.237	41,899.535	66,959.066	512.863	845.211	67,804.277
2004	195.496	37.222	46,371.464	1,223.916	519.002	48,347.999	77,262.828	1,406.425	2,247.588	79,510.417
2005	187.812	11.795	7.125	17.808	231.160	455.700	697.543	142.590	218.263	915.806
2006	364.546	207.767	4,832.387	15.564	0.024	5,420.288	7,640.867	487.352	687.010	8,327.877
2007	2,300.098	33.018	718.240	5,994.792	0.128	9,046.276	11,986.734	633.128	838.924	12,825.657
2008	1,748.567	59.664	63,705.381	106.236	12.523	65,632.371	80,711.385	2,939.139	2,507.631	83,219.015
2009	549.053	132.878	2,019.385	93.384	0.038	2,794.738	3,048.474	947.044	1,033.027	4,081.500
2010	494.376	131.286	8,300.730	20.088	0.480	8,946.960	8,946.960	1,788.788	1,788.788	10,735.748
Grand Total							897,551.871	39,700.811		937,252.682
							Average value of damage in each year (at 2010 price)			23,431.317

Source: Desinventar, 2011

Table 5.9: Major Hazard-wise Economic Value of Damages (in Million NRs.)

Year	Economic Value of Destroyed houses	Economic Value of Damaged houses	Economic Value of Loss on Agricultural Land and Forests	Economic Value of Loss of Livestock	Economic value of Road damage	Sum of Total Damages (Value of damage in the year 2004)	Sum of Present value (2004 to 2010) of losses	Reported loss (Million NRs)	Current value of Reported loss 2010 (Million NRs)	Current value of Total losses in 2010 (Million NRs.)
Flood	16,255.821	1,618.081	393,518.190	6,436.428	278.642	418,107.163	640,681.023	6,109,827	11,788.544	652,469.567
Landslide	3,581.910	272.512	23,156.202	125.832	1,501.850	28,638.305	45,523.184	931.823	2,162.573	47,685.757
Drought	-	-	58,811.085	-	-	58,811.085	89,322.240	11,700	18.280	89,340.521
Other Hydro-Meteorological	758.315	185.118	42,383.762	118.764	971.800	44,417.758	69,779.367	2,833,148	4,739.511	74,518.878
Earthquake	8,201.349	1,312.018	-	26.580	-	9,539.947	15,245.490	22.834	72.771	15,318.261
Fire and Forest Fire	11,797.375	43.525	660.866	1,386.384	4.840	13,892.990	21,425.977	9,329.426	20,826.785	42,252.762
Others	188.135	23.800	8,582.977	957.468	48.864	9,801.244	15,574.590	52.765	92.346	15,666.936
Total	40,782.904	3,455.055	527,113.081	9,051.456	2,805.996	583,208.492	897,551.871	19,291.522	39,700.811	937,252.682

Source: Desinventar, 2011



## Damage and loss Vs. Investments

Assessment of Economics of Disaster Risk Reduction, famously known as the Ex-ante and Ex-post Investment Estimates in DRR, was carried out in Nepal by the National Society for Earthquake Technology - Nepal (NSET) in 2009 with the support from Global Facility for Disaster Reduction and Recovery (GFDRR) of the World Bank. The study analysed the data on investments by different organizations during the period 1998-2008 (NSET, 2011). The study considered investments from mainly four types of organizations, namely the government organizations, donor agencies, UN system and few INGOs.

The analysis revealed that a total of approximately 1.1 Billion USD has been spent in different stages of different hazards in Nepal during last 11 years (1998 – 2008); of which around 60% (681.568 million USD) is direct investments and 40% (402.875 million USD) is indirect investments. Out of the total 681.568 million USD direct investments, 603.204 million has been spent on different planned activities for response, recovery, rehabilitation, reconstruction and pre-disaster mitigation and preparedness; and 78.364 million for ad-hoc response activities.

Out of the total direct and indirect investments, almost 50% of the total has been spent on mitigation, preparedness and response to the epidemics (health sector) amounting to 566.200 million USD. Rest 50% covers other remaining disasters. This is an obvious result in Nepal since significant proportion of the government budget is spent in health sector for providing basic health services to the people and preventing various epidemiological diseases.

After epidemics, another major proportion is spent on landslides and floods: 158.200 million (total of flood alone is 34.453 and landslides, flood combined is 123.747).

A significant amount 332.717 million has been spent on mitigation, preparedness to general response, relief covering the entire hazards; not clearly identified as focused to any specific hazard. This mainly includes the post-event relief, (mostly cash for relief and reconstruction), to the people through District Administration Offices under the Ministry of Home Affairs (MoHA), and programs linked with preparedness and mitigation under different ministries.

### Ex-ante and Ex-post investments:

- If we consider both direct and indirect expenses, the ex-ante investments seem to be extremely higher than the ex-post investments: ex-ante 841.806 million USD and ex-post 242.637 million USD.

#### Ex-ante and ex-post investments

The resources executed by agencies and programs ahead of disasters considered as ex-ante and those expenditures that happen after the disasters considered as ex-post.

#### Ex-ante and ex-post investments by origin and by final purpose

The total ex-ante and ex-post investment data on the basis of the origin of investments (i.e. the

resources executed by agencies and programs ahead of disasters considered as ex-ante and those expenditures that happen after the disasters considered as ex-post) is a bit different than the investment data based on their final purpose (i.e. prevention, mitigation, preparedness considered as ex-ante and rescue, relief, reconstruction, rehabilitation considered as ex-post).

- In terms of direct expenses, total ex-ante investment is 466.799 million USD and total ex-post investment is 214.769 million USD. Out of the total direct expenses, 306.657 million USD is spent on epidemics alone.
- Total ex-ante investments on all other hazards is 160.142 million USD and total ex-post investments is 214.769 million USD. This gives the realistic trend of the ex-ante and ex-post investments.
- Total government ex-ante investments based on origin is 237.387 million USD and ex-post is 117.536 million USD whereas, based on final purpose these investment figures are 145.943 and 208.980 million USD respectively.

The trend shows that the ex-ante investments has been more or less increasing every year at an average rate of 12.63% whereas, the same of ex-post has been unevenly fluctuating with an average increase rate of 22.62% (Table 5.10 and Figure 5.4). The ex-ante investment is more predictable than the ex-post investments.

Ex-ante investments increased at 7.4% per year for the last decade, and ex-post disaster spending grew more than twice as fast per year at a rate of 18.4%. This later rate masks wide imbalances across years. For instance,

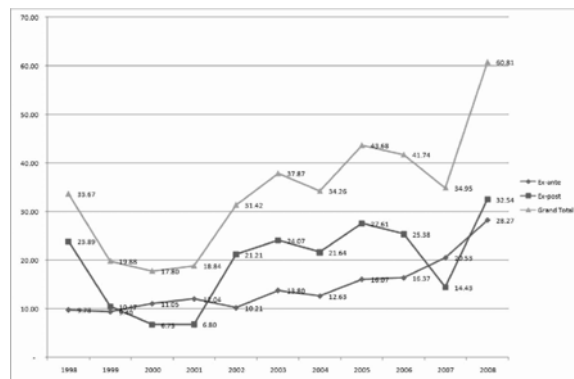


Figure 5.4: Trend of ex-ante and ex-post investments in Nepal

Source: DesInventar, 2011

post-disaster financing grew more than two hundred percent between 2001 and 2002, and remained almost unaltered for the following two years. In contrast, the incremental changes experienced by ex-ante investments over time make at least more predictable the amount of resources that could be earmarked for this purpose.

Post-disaster expenses were moderate in 2007 after five consecutive years of expenditures above-the-average. And yet, last year's floods and landslides led to the highest outlay for the entire period analyzed

Table 5.10: Ex-ante and ex-post investments in Nepal during 1998-2008 (in million US Dollars)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Ex-ante (Direct Gov+ Other Agencies)	9.783	9.401	11.053	12.04	10.208	13.8	12.625	16.07	16.368	20.526	28.268	160.142
Ex-post (Direct Gov+ other Agencies)	23.886	10.474	6.746	6.802	21.211	24.067	21.638	27.607	25.376	14.425	32.537	214.769
Total Loss	137.027	86.902011	395.657721	448.2879	365.519851	566.7953	682.4565	9.165483	85.32359	161.435	872.0706	3810.641

Source: DesInventar, 2011

**Table 5.11: Total disaster losses and ex-ante and ex-post investments in disasters during (1998-2008) in Million USD**

Hazard /Disaster	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Grand Total
I. Water Induced Disaster	9966	10109	11337	14749	11117	11283	15234	22539	19108	23491	26881	175814
L. Water Induced	132699.5	79320.91	388838	431567.6	318237.1	558017.2	632421.6	4006.148	71692.8	139117	856129	
I. Earthquake	122	128	802	225	163	553	287	1157	390	1387	3072	8286
L. Earthquake	0	0	0	20.65975	0	0	0	0	0	9.8112	1.334784	
I. Epidemics	20100	27212	30518	32788	35322	32895	49690	53038	64093	76098	144446	566200
L. Epidemic	11.09808	54.9408	1910.373	4087.506	78.41856	303.7611	812.0969	16.24248	161.9557	407.872	253.9717	
I. Fire	112	125	122	130	134	132	135		171	190	175	1426
L. Fire	3441.03	6783.253	4225.262	7866.113	45804.24	3852.713	42537.33	4766.448	9953.958	10303.4	14898.53	
I. General - All	41644	15981	12566	11553	25569	32728	24721	29996	36407	41541	60011	332717
L. General	875.3872	742.9121	684.0779	4745.989	1400.079	4621.664	6685.526	143.7036	3514.88	10050.58	787.8016	
Total	71944	53555	55345	59445	72305	77591	90067	106730	120169	142707	234585	1084443

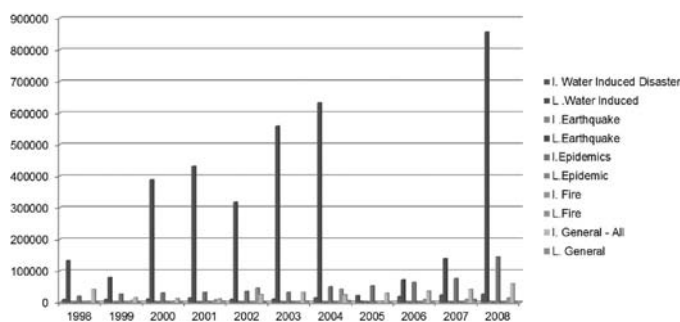
Source: DesInventar, 2011

(See Figure 3). These drastic shifts are more formally captured in the average deviation of ex post expenditures: 8.78 million dollars, which is equivalent to 2.23 more times the average deviation from mean ex ante expenditures.

The trend of investments on disasters has been compared with the occurrence of different natural disasters and the impacts during the same period. Table 11 and Figure 5 provide summary of the disasters occurred during the period 1998-2008. The obvious observation is that the investments in different phases of disaster risk management are very low as compared to the losses caused by various disasters during the period.

## Past studies

There have been a number of studies carried out in the past to understand the economic impacts of disasters in Nepal. Following paragraphs capture some of the key findings of such studies.



**Figure 5.5: Total Disaster Losses and Ex ante and ExPost Investments in disasters during (1998-2008) in millionUSD**

(I- Investment, L- Losses)

Source: DesInventar, 2011

- Some particular events, which are intensive in nature have caused very large amount of damage and losses. One example for such type of large extent of disaster can be seen in flood of 1993. The data on number of infrastructure damages due to the July 1993 disaster is shown in Table 5.13.

Table 5.12: Infrastructure damage in July 1993 in Nepal

Roads (km)	Bridges (No.)	Dams (No.)	FMIS (No.)	Public Buildings (No.)
367	213	64	620	452

FMIS: Farmer-managed Irrigation System

Source: Khanal, 1996

- Sedimentation - 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 cubic meters to 7.6 million cubic meters as a result of sedimentation and siltation during landslide and flood disasters of 1993 alone (Galay et. al. 1995).  
In the absence of a systematic and detailed data on infrastructure damage in consolidated form, it is difficult to get their rehabilitation/ reconstruction.
- Roads - 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 million (i.e., equivalent to US\$ 50 million). An estimated 10-25 per cent of the hill roads passing through river valleys are completely washed out every four to five years by a combination of landslides and floods. 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. The implication of the cost of roads requires investment of 5 to 30 million rupees per kilometer that is about 0.01 to 0.04 per cent of the annual budget of the nation for every kilometer of road.
- Based on the data compiled by the Ministry of Home Affairs, in the twenty three years between 1983 and 2005, over 28 billion rupees were lost due to disasters; this is an average of nearly 1,208 million rupees per year. In 2000 alone, the economic losses were estimated at 1.2 billion rupees; this is a normal year, when no exceptional disastrous events were reported (Chhetri, 2002). 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.
- JICA (1993) has estimated the total disaster loss from floods and landslides in the year 1993 is nearly 5 billion Nepalese rupees. In the same way, Khanal (1996) has estimated the average annual infrastructure damage due to landslides and floods in terms of financial loss is approximately US\$ 20 million.
- A study on hydro-climatic disaster and its risk reduction in Nepal (Paudel, 2006) indicated that out of total financial assistance of 8.8 million USD provided by different agencies during the period of 2000-2005, 9% (0.8 million USD) was spent of emergency management, 3.3% (0.29 million USD) on recovery, 68% (6

million USD) on prevention, 17% (1.5 million USD) on mitigation and 2.4% (0.21 million USD) on preparedness.

## Summary and Conclusions

Disasters have tremendous impact on the life of the people in many aspects. It has caused widespread devastation, costing thousands of lives and billions of rupees.

- The data reveals that Nepal suffers human casualties and damages of infrastructures every year due to various disasters, though there are some variations in data. The economic loss due to major disasters, such 1988 earthquakes and the floods of 1993 in Nepal is phenomenal. The total direct losses due to property and infrastructure damages and destruction alone reach billions of rupees on an annual basis. Average annual losses to disaster are quite high by any standard in a poor country like Nepal. This is a substantial amount of loss on annual basis to warrant serious attention.
- The data of impacts caused by the disasters also reveal that the estimated annual economic loss is increasing with the increasing frequency of disasters. The number of natural disasters as well as the number of corresponding casualties, injured and affected people, and economic loss is steadily on the rise.

If this trend holds, the country is likely to face higher overall economic loss with the passage of each year.

- The direct losses have potential further indirect and secondary impacts. Not all the impacts are measurable. The secondary impact which is measurable is also quite significant as evident in the loss of GDP. A significant proportion of GDP is lost every year due to natural disasters. An enormous amount is spent for rehabilitation and reconstruction of damaged and destroyed infrastructures. However, the indirect effects of disasters 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, 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, human sufferings, psychological impacts/ trauma etc. that the people have to undergo after the disaster are not available as they are difficult to determine empirically. This suggests that the socio-economic impacts of disasters are far reaching, and hence a more rigorous study on these aspects is required.



Koshi Flood affected girl taking care of little sister while her parents queue up  
Photo Courtesy: everestuncensored.org

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## In this report:

- Nepal is exposed to several types of natural as well as human-induced hazards. A wide variety of physiographical, geological, ecological and hydro-meteorological factors contribute to the high levels of hazards faced; while demographic factors also make the country extremely prone to disasters.
- Epidemics are in fact the number one killer in Nepal, with an average of 410 deaths per year. During 1983-2010, 22,306 people lost their lives (MoHA,2004;DWIDP, 2010). Fifty-two per cent of those deaths were caused by epidemics. The pattern is not much changed during later time as well.
- According to DesInventar database of Nepal, epidemics (130 deaths), and landslide (67 deaths), Fire (61 deaths), flood (27 deaths) were the most lethal hazards in the year 2010. There were a total of 1,551 disaster events in the year (almost three events per day) and more than two disaster-related deaths per day. Total monetary losses due to disaster in 2010 amounted almost to 11 billion Nepali Rupees or about 1 % of GDP.
- The past three decades have witnessed tremendous amounts of policy level interventions, inclusion of DRR in national level plans, programs and several cases and examples of disaster risks reduction and preparedness efforts...The environment has become more conducive for taking the concepts of disaster risk reduction to a new height with more focused and widened scope of works.

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