Understanding Disaster Management in Practice with reference to Nepal

PRACTICAL ACTION
Technology challenging poverty

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Preface

Nepal, along with three quarters of human population occupying a quarter of the global landmass is facing unprecedented disaster risks. People are being exposed to more frequent and severe hazards becoming vulnerable to the impact of natural physical phenomena and less able to cope. While hazards may be increasing in frequency and severity, their impacts are exacerbated by a series of dynamic processes including population growth, increasing levels of poverty and marginalisation, environmental degradation, poor planning and preparedness and the impacts of climate change.

Disasters damage natural and physical resources on which people's livelihoods depend. While different hazards have specific effects, the ultimate impact of each hazard on resource and poor people is mostly to disrupt or destroy their livelihoods. Small farmers, artisans and fishermen are affected both through the loss of assets and the loss of employment opportunities. Prevailing poverty, characterised by low level of awareness, limited resources, including access to skills and knowledge, limit livelihood options. These constraints limit opportunities to build resilience. The vulnerability of the poor is predicted to increase in the future under pressure from increasing human population, environmental degradation, unsustainable socio economic practices and the adverse impacts of climate change. Currently two thirds of disasters are estimated to be meteorologically induced. Climate change is likely to increase the frequency and severity of such disasters.

Disaster management in the past has focused on the aftermath of sudden onset large scale events such as earthquakes, volcanic eruptions, floods or tsunamis. Yet more deaths, accumulated losses and greater suffering is caused by slow onset and creeping hazards such as drought, disease, invasive species and the degradation of natural resources. The cumulative effect of a succession of several small adverse events can devastate the lives and livelihoods of poor people; frequently driving them from subsistence to a state of total destitution.

Disasters affect poor countries and poor people the most. According to UNDP, 24 out of 49 least developed countries face high levels of disaster risks. Nepal is no exception. Not only are the people of poor countries worst affected by disasters, they also lack the capacity to deal with the consequences of a disastrous event. Lack of capacity to deal with the aftermath of a major disaster developing countries are in the mercy of external humanitarian aid. This exacerbates the situation which is often characterised by food shortages, civil unrest and furthermore creates dependency. Despite irrefutable evidence that mitigation activities can reduce the negative impacts of disasters, developing countries are reluctant to spend money to limit the impacts of an event that might only occur some time in the future time or not.

Linking DRR approaches to development can overcome this dichotomy. DRR and development must be coherent. Disasters put development at risk if development continues without considering future disaster risks. Hazards turn into disasters where there is a low level of physical and social development. For example floods may happen because of the absence of necessary flood management or counter disaster infrastructure such as embankments and drainage channels. In some cases poorly planned infrastructure development can itself be the cause of disasters such as outburst of dams and collapse of mines.

Although external efforts are necessarily driven by the disasters they seek to prevent, local communities should be the major drivers of DRR strategies. They are at the forefront and the first to suffer and respond. Each community should be aware of the hazards they are exposed to, recognise the potential risks and plan interventions to reduce the risk of hazard impacts turning into disasters. DRR should be an integral part of development processes to reduce potential losses and ensure that development gains are sustainable at all levels – local, national and regional.

This book is written by Dinanath Bhandari, DRR Project Manager and Yuwan Malakar, DRR Project Officer, Practical Action and Ben Murphy, Practical Action UK. The authors benefited from the guidance and support of Pieter Van Den Ende, International Project Manager and Gehendra Gurung, Nepal Team Leader, Reducing Vulnerability Programme.

The achievements described in this publication are a tribute to the hard work and dedication of Practical Action staff, the members of MADE and SAHAMATI, numerous local government officials and other collaborators and the hard working communities. It is hoped that the improvements in the communities' lives will inspire other like minded organisations to adopt a livelihood centered approach to disaster management.

Lastly, thanks to Upendra Shrestha, Fundraising and Communications Manager for his assistance and Shradha Giri, Communications Officer from Practical Action for rigorously working on language and structure of the book and bringing physically to this shape.

Achyut Luitel
Country Director

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Foreword

Disaster Risk Reduction (DRR) strategies must be included in all development processes as the recognition of negative impact of hazards disbars attainment of Millennium Development Goals (MDGs). While the Hyogo[1] Framework for Action (HFA) places DRR firmly in the centre of development activities, a focus on national level and technical solutions with little recognition of existing local capacities has resulted in minimal progress on the implementation of DRR actions at the local level. (Global Assessment Report 2009, Views from the Front-line Report).

Work done in the past by Practical Action and other NGOs with poor communities demonstrate that communities are not passive victims waiting for disasters to strike, but rather have the capacity to build their resilience to disasters. By adopting a holistic approach, focusing on people's livelihoods, their assets and the environment on which they depend, communities can adopt appropriate strategies that dramatically reduce the impact of disasters. Building on local knowledge, resources and with appropriate support even the poorest deprived communities are able to engage in activities that increase their resilience to prevailing future hazards.

In January 2007 Practical Action Nepal Office joined Bangladesh, Sri Lanka, Peru and Zimbabwe in the implementation of the DFID CHF funded project entitled "Livelihood Centred Approaches to Disaster Management." The project focuses on the roles and linkages between poor communities and district and national institutions in relation to both disaster management and development.

The project has two main components:

- Community level activities which reduce the impact of particular hazards by increasing livelihood opportunities, increasing resilience, reducing vulnerability, while fostering preparedness to deal with the hazard and its aftermath.
- Advocacy and capacity building to link community based experiences with district and national level institutions. Community based experiences and best practices are documented and used to demonstrate the validity of the livelihoods approach to disaster management to government institutions.

[1] www.unisdr.org. Summary of the Hyogo Framework for Action 2005-2015: "Building the Resilience of Nations and Communities to Disasters".

Ultimately, the project aims to influence development and disaster preparedness and mitigation processes to adopt a livelihood centered approach to disaster management.

This book documents lessons learned during the implementation of the project in Nepal. It describes the prevailing physical, institutional and socio economic context and details of activities and interventions. It describes how participatory hazard and vulnerability analysis leads to the development of community development plans while accounting prevalent future risks. Improved and diversified livelihood strategies, including the adoption of new income generating opportunities have increased incomes, food security, better health and resilience of targeted communities while reducing their exposure to prevailing future hazards. The aftermath of project implementation reveals that a livelihood centered approach reduces both poverty and vulnerability.

Evidence in increased resilience of communities that have adopted livelihood centered approach has a positive impact on local development processes. Collaborating with existing community and local government structures has resulted in the mainstreaming of DRR into poverty reduction in two districts –Chitwan and Nawalparasi. Both Practical Action and the concerned district authorities have approached the national level policy makers to replicate the process in other vulnerable districts of Nepal.

Pieter Van Den Ende

Acronyms

CBDM	Community Based Disaster Management
CBO	Community Based Organisation
CBS	Central Bureau of Statistics
CRA	Community Risk Analysis
DADO	District Agriculture Development Office
DDC	District Development Committee
DDRC	District Disaster Rescue Committee
DFID	Department for International Development
DHM	Department of Hydrology and Meteorology
DMC	Disaster Management Committee
DRR	Disaster Risk Reduction
GHG	Greenhouse Gas
GLOF	Glacier Lake Outburst Flood
HFA	Hyogo Framework for Action
ICIMOD	International Centre for Integrated Mountain Development
IFRC	International Federation of Red Cross and Red Crescent Societies
I/NGO	International/Non Governmental Organisation
IPCC	Intergovernmental Panel on Climate Change
LDC	Least Developed Country
MDG	Millennium Development Goal
MLD	Ministry for Local Development
MOHA	Ministry of Home Affairs
NSDRM	National Strategy for Disaster Risk Management
PVA	Participatory Vulnerability Analysis
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN/ISDR	United Nations/ International Strategy for Disaster Reduction
V2R	Vulnerability to Resilience
VDC	Village Development Committee

Chapter

1 Introduction

1. Concern about disaster

A disaster is an adverse situation that overwhelms the capacity of those in the vicinity to protect their lives and livelihoods, and in most instances requires external help in dealing with the losses. Disasters arise from hazards, and, crucially, it is the impact on human life that distinguishes the former from the latter. With its uniquely varied geology, topography and climate, Nepal is very familiar with a range and frequency of hazards and, unfortunately, its population has experienced the drastic consequences when these hazards manifest into disasters. In many regions of Nepal, the threat of disaster is a persistent concern.

Globally, nearly all hazards carry a higher risk of culminating in a disaster, a fact that reveals the inseparable human influences in disaster creation. Between 1970 and 2007, the United Nations recorded that the highest death tolls and economic losses occurred in more concentrated geographic areas, evidence that the worst impacts are felt where exposure and vulnerability to hazards are intensified within smaller but more populated areas (ISDR, 2009). At the same time, vast areas experienced more frequent low intensity losses (typically from weather events) which, whilst claiming fewer fatalities, persistently effect more people, livelihoods, local infrastructure and property (ibid). The increase in the impacts from low-intensity events is associated with better reporting of losses and new problems linked to climate change, but primarily it indicates 'locally specific increases in exposure, vulnerability and hazard in the context of broader processes of urbanisation, economic and territorial development, and ecosystem decline' (ibid).

Alongside its prevalence of various hazards, Nepal has many of the characteristics that increase disaster impacts - high local level vulnerability associated with poverty levels, depleted natural resources, fragile land and infrastructure; and increasing intensive risk as urbanisation rises in some areas. Nepal experiences high floods once to twice a decade with increasing trend in the recent decades and counts perhaps highest losses. However, losses from drought, fire and disease outbreak are more frequent and cause greater economic loss although less information is documented.

Between 1971 and 2007 about 133,000 people were affected annually and 9350 houses destroyed. During the last 24 years epidemics claimed over 10,000 lives followed by flash flood that took 6584 lives. At least 4013 people were killed by landslide and floods between 1993 and 2007. According to the Ministry of Information, there has been annual average loss worth of NPR 1, 208,000,000 for every last decade. Many casualties do not come into the national reporting due to remoteness and other unforeseen reasons. Since 1993, landslides and floods have become almost annual disastrous events in the country.

Fortunately, disasters are not inevitable, even where there is a high rate of hazards. With better support, a disaster can be completely averted or its impacts reduced to limit loss and disruption.

2. The role of disaster management

Ultimately, disaster management aims to reduce the impact of disasters. The ways of achieving this have varied and evolved over time. The earliest and still predominate approach is for agencies to provide relief to those affected once a disaster has happened. Rescue assistance, medical support, food and water supply are vital for saving lives which prevent further harm. However, responding to a disaster can only do so much, and a level of loss is almost inevitable before a rescue operation can even arrive. As well as wasting precious time, relying on external support is not desirable for communities at risk of a disaster, particularly as they often have a capacity to deal with a disaster already.

More recent approaches, such as that followed by Practical Action, take a more holistic view and seek to reduce the risk of a disaster. Rather than waiting to respond, disaster management programmes plan for the whole disaster process including a range of activities at different stages of disaster management. The strategies include risk reduction such as hazard, exposure and sensitivity reduction, impact reduction, and capacity building for resilience addressing not only the impacts but the factors that turn a hazard into a disaster. Poverty is well understood to significantly increase the disaster impact, a fact that is observable in nearly all events around the world as it is the poorest that are the most affected each time. This leads to the view that disasters are a symptom of incomplete, inappropriate or inequitable development. As a development organisation that specialises in working with communities to develop technologies to alleviate poverty, Practical Action aims to break the cycle that makes people in poverty particularly susceptible to disasters and disasters particularly detrimental to poverty.

3. Terms used in disaster management

Disaster management has developed a discourse that helps to conceptualise the whole process of a disaster, covering the contributors, categorising the implications, and explaining solutions. A brief explanation of some terms useful for understanding and applying this book is given below.

Hazard

A hazard is an event, or its potential, that threatens to cause damage and disruption for a particular area at a certain time threatening lives, livelihoods, property, infrastructure and the natural environment, as well as normal socio economic operations. An important distinction to note is that, whilst hazards act as catalysts for disasters, it is not inevitable that one should lead to the other. Disasters only occur if the coping mechanism of the people in that vicinity is overwhelmed.

Hazards manifest in different forms determined by their origins broadly classified into two groups: natural hazards and man made or technological hazards. The dynamics involved measures the two as either slow or rapid onset. However, the distinction in both categories is not clear cut. Hazards can originate from a single source or a combination, and can gradually emerge in a sequential pattern of slow and fast phases such as land degradation, glacier lake formation which are slow to a point and then generate disastrous results such as landslide due to land degradation in the hills, glacier lakes are also slow in the formation but at certain point they exceed the

dam capacity and outburst. On the other hand, one hazard can invite another hazard or disaster risk for example famine could invite conflicts, robbery; landslide damming river temporarily and generating flood afterwards and drought enhancing forest fire. Following example helps to understand role of natural or human factors associated to a particular hazard.

Example 1.1. Natural hazards are biophysical phenomena and generally fall into the following categories.

Hazards	Natural	Human Induced
Flood	Flood is a natural phenomenon but it is also exacerbated by human activities such as deforestation, construction of dam	
Earthquake	Earthquake is a natural phenomenon. However, the losses of assets depend on their susceptibility to the earthquake	
Landslide	Landslide is generally considered natural. Human activities enhance them to a scale either in short or longer term such as mining, shifting cultivation and deforestation	
Drought	Drought is a natural phenomenon. Its impacts may mix to other factors. Recent human induced climate change is likely to escalate drought severity.	
Wildlife Intrusion	Wildlife intrusion can be attributed to both natural and human induced. Many factors may be involved. It is largely associated with encroachment of wildlife habitat by humans.	
Road Accidents	Vehicle accident on the road is human induced. Difficult terrain/slide are natural factors	
Industrial Accidents	Industrial accidents are human induced hazards	
Outbreak of Epidemic	Biological hazard; mostly natural but also due to enhanced environment to outbreak and transfer by mankind	

- **Geophysical** - earthquakes, landslides, tsunamis and volcanic activity
- **Hydrological** - avalanches and floods
- **Climatological** - extreme temperatures, drought and wildfires
- **Meteorological** - cyclones and storms/wave surges
- **Biological** - disease epidemics, insect/pest outbreak, animal plague and wildlife intrusion.

Man made hazards are typical threats posed by conflict, industrial accidents, pollution and dangerous use of machinery and transport. Many hazards once considered as naturally occurring

are now identified as a result of human induced environmental changes. For example, an increase in the threat from flooding is linked to the escalating rate of deforestation in watershed areas, and the risk famine is often considered to be a human induced hazard. That there is no clear boundary between natural and man made origins (except for events such as earthquakes and volcanoes) is due to human reliance on the natural environment. Whilst the hazards are undesirable, their source may be essential to human life: a river provides water for agricultural irrigation and livestock production, but extreme and unmanageable floods pose a threat to these practices as well as lives and property.

Understanding the dynamics of a hazard is essential for assessing the potential threat to a community and determining which risk reduction measures to follow. Slow onset or creeping hazards are protracted events such as drought, desertification, and some forms of pollution which gradually increase to their full potential. Rapid onset hazards, such as, road accidents, industrial accidents, flash floods, earthquakes, landslides, storms, and volcanoes occur faster, reach their disaster potential sooner, and move quickly in spreading in terms of physical movement damaging and affecting areas.

Exposure

Exposure is a gauge of the potential threat and defined by physical proximity to, as well as, the extent of interaction with a hazard. If individuals and their properties are close to a river bank, their exposure to flooding is higher than those further away or on higher ground. In the context of slow onset hazards, the duration of exposure also determines the scale of risk. For example, the longer a community suffers from drought it increases the potential for stress and losses. In some hazards such as diseases it is both physical distance and interaction such as in the case of exposure to HIV. In the case of hazards where exposure is uncertain or its probability is the same across the area and assets, exposure is measured in terms of frequency and intensity as well. Extreme weather events are relevant example.

Sensitivity

Sensitivity measures the likelihood of being affected by a hazard and is an indicator to how well protected or capacitated to defend those exposed to a hazard are? An elephant is less sensitive to a tiger than a deer as the former has stronger defending capacity in general. A community at the bank of river is exposed to flooding but their sensitivity will be low if the embankment is reinforced. A house with a lightening rod is less sensitive to being struck by lightning during a thunderstorm. The risk associated with exposure can be reduced by decreasing sensitivity, yet the exposure itself still remains: a mouth mask may reduce a person's sensitivity to flu but their exposure remains when in close contact with someone carrying the virus. A house away from the river bank may still be sensitive to flooding but its low exposure (or say zero exposure) makes it less vulnerable to flood. However, in some cases exposure and sensitivity come together confusing to segregate. Sensitivity and defending capacity are opposite properties to each other whereas exposure and sensitivity contribute in the similar way to vulnerability.

Vulnerability

Vulnerability is a core concept in both DRR and poverty reduction work. Broadly, it is used to understand a group's overall susceptibility to any negative consequences that will throw them deeper in poverty or even tip them into destitution. DRR considers the wide aspect of vulnerability but also contains a specific assessment in relation to disaster risk. Being vulnerable to a disaster is considered to be the 'diminished capacity of an individual or a group to anticipate, cope with, resist and recover from the impact of a natural or man made hazard' (IFRC, nd).

The physical aspects of a hazard, and a group's relationship to them, determines a proportion of

vulnerability - individuals or their properties are not classed as susceptible to a disaster if they are not exposed to a hazard, and vulnerability can be reduced by decreasing sensitivity. Even for individuals or families exposed equally to the same hazard, variances in sensitivity can alter the level of vulnerability.

As such vulnerability can be expressed as the relationship between hazard, exposure and capacity:

In this relationship vulnerability can be reduced either by limiting the hazard potential, decreasing exposure and/or capacity.

$$\text{VULNERABILITY} = \frac{\text{HAZARD} \times \text{EXPOSURE}}{\text{CAPACITY}}$$

Assessing the 'capacity' to deal with a disaster broadens the concept of vulnerability from the focus on the physical hazard. The ability to deal with a hazard is influenced or as is for the case of those with high vulnerability - limited by many social, political and economic conditions. Amongst other attributes, strong livelihoods, access to credit, and influence in disaster plans form part of the capacity to deal with a disaster; however, these are often absent in those considered to be vulnerable disasters. As explained in the course of this book, poverty is a key contributor to vulnerability; it limits the capacity to deal with a hazard and increases exposure for those forced to live in the most high risk places through a lack of financial capital or civic rights.

Given the changeability of these factors, the concept of vulnerability is relative term to understand the situation of a family, community or assets with respect to potentiality of being adversely affected or lost and is dynamic with respect to development, trends, governance, environmental changes etc

Disaster risk[2]

Disaster risk refers to the probability that harmful consequences or expected losses will result from a hazard event. It can also be described as the probability of a disaster. Risk is measured by assessing a hazard's characteristics such as the likelihood and magnitude of its occurrence and the corresponding vulnerability level of those expected to be affected:

Disaster risk = Hazard × Vulnerability

In this equation, risk only exists if there is vulnerability to the hazard event. For instance, if a family lives downstream from a strong dam or far away from the river all together, their decreased sensitivity and exposure would make them physically less vulnerable to flooding, and, therefore, there is no risk. Likewise, if the family lives in a flood prone area but is well prepared for flooding then vulnerability will decrease and the probability of a hazard culminating in a disaster is lowered.

The formula does not provide precise valuations of risk. This provides likelihood of disaster event. There is high disaster risk if the vulnerability is high or hazard is severe or both. Determining risk is particularly difficult; being partly based on human perceptions is reliant to a degree on personal knowledge and information. But both the concept of disaster risk and its equation helps to show that disasters are not inevitable; the probability that a hazard becomes a disaster for communities can be reduced by taking appropriate action to address vulnerability.

[2] Information on this term is adopted from "Vulnerability to Resilience (V2R)", publication of Practical Action.

Example 1.2. Successful DRR

In some countries, disaster risk is successfully lowered. Japan experiences frequent earthquakes which proved disastrous in the past, but now, as a result of appropriate technologies, widespread awareness raising, preparedness and institutional response mechanisms, they are less likely to result in serious losses or disruptions. Even when affected, the majority of people are able to cope and recover as a result of having insurance cover and secure jobs. Similarly, Australia has suffered six years of severe drought and, though farmers experienced reduced harvests, the drought has not resulted in widespread death or drastic food shortages. Farmers have been able to adapt to changing circumstances, many have diversified to different livelihoods, and government support is available to help people cope.

Effect

When a disaster occurs, its effects are the immediate consequences, most often estimated immediately or calculated to the extent of possible through some sort of enumerations by the direct near term losses and the coverage of a disaster. Figures and information on deaths, injuries, and property losses calculate the effects. In reference to disasters, the terms 'effect' and 'impact' are often used interchangeably; however, effect explicitly refers to the initial consequences directly resulting from the force of the hazard event. The example in example 1.3 clarifies the distinction where first paragraph describes effects and the second impacts

Impact

The impact is the sum of all effects imposed by a disaster, a total of the short and long term results including the indirect consequences. Impact indicators cover a broad range of areas, from those directly concerned with humans (death toll, livelihood losses and psychological impacts) to the socio economic, cultural, physical (infrastructure and landscape) and environmental consequences.

The impact of one disaster varies for different sections of a population, and even certain groups within communities. It is often the poorest and most vulnerable people that experience the greatest impact from a disaster because, aside from facing a higher exposure to disaster risk, the impacts are more detrimental to those already struggling. Financial losses, damages to property and disruptions to work patterns are much more harmful to groups that rely on subsistence livelihoods. Damages to the natural environment are often insufficiently covered in impact assessments, yet these add to the scale and duration of the effects on smallholder farmers who depend on natural resources.

Due to their limited access to the services, impacts for the poor appear less on the national database systems. The society is always more or less dynamic and impacts are both qualitative and quantitative in nature. So, there are problems measuring the actual total impacts.

Mitigation

Mitigation in disaster management is the reduction of disaster effects and impacts. The UNISDR (2009) defines the term as 'structural and non structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards'. Mitigation is an important component in aspects of the disaster management cycle (see Chapter 5). All activities carried out before a disaster are considered as mitigating the potential for severe impacts; those during mitigate the loss and further losses; and the post disaster work is an important opportunity for reducing the potential from future disasters.

Example 1.3. Effects and impacts of a disaster: Gig Tso GLOF

In 1985 a glacier lake, Dig Tsho in Mt. Everest region burst and a glacier lake outburst flood (GLOF) flooded Bhote Koshi River. The GLOF destroyed the Namche hydropower project that was built at the cost of US$ 1.5 million approximately. Many agriculture fields along the banks of Bhote Koshi and down the confluence, along Dhud Koshi River were destroyed. In some villages such as Ghat in Chaurikharka, 5 houses and a monastery were destroyed. 14 suspended bridges across the Dhudh Koshi and Bhote Koshi Rivers were destroyed. Long distances of foot trail along the river banks were crumbled down in many places that cut off communication and transport for a long time. Some livestock were reported killed though actual data is not available. No human death or injury was reported as it happened during the daytime and people escaped the risky zones. The effect spread down to 90 kms in the downstream destroying foot trails, foot bridges, agriculture lands, forests and other properties.

This warranted relocation of the Namche hydropower project site in Thame village and it took some more years to get electricity supply in the Khumbu region. The damage was irreparable as the destroyed bridges were replaced by temporary crossing which only worked during winter and dry seasons. In monsoon seasons the temporary crossings were often washed away by the increased water level in the river and required reconstruction year after another. Construction of longer span and higher free board suspended bridges were initiated some years later but took years to complete. During the reconstruction, longer span and high free board bridges required as stream banks were washed away and river bed rose due to debris deposition that required greater costs. Restoration of vegetation damaged by the GLOF took many years in the downstream and it is still in the recovering phase in the upper reaches (even after 20 years) as ecologically it takes longer, particularly in its sub alpine and alpine region. Some villagers hailing from Ghat area had to relocate their houses higher up in the terraces. In many stretches, foot trails had to be modified to change their alignments from the original one. Tourism is main source of income in the region but the number of tourists visiting the area remained below average from the usual statistics as infrastructures were damaged.

Resilience

Resilience is the ability to cope or endure a stress, the opposite of vulnerability. A resilient community is equipped with certain capacities which can be employed in anticipation during and before a disaster strikes:

- Absorb stresses or destructive forces through resistance or adaptation
- Manage or maintain certain basic functions (such as clean water supply or market systems) and structures during disastrous events
- Recover or 'bounce back' after an event

Strategies for increasing resilience capacities start with being able to foresee a potentially threatening event and progress to the ability to take action to prevent, protect, or respond appropriately when they do occur. Resilient communities are able to implement the majority of these actions themselves, or can draw upon local support to deal with a disaster as independent from external assistance as possible. However, the most comprehensive state of resilience is determined by wider factors, such as the degree to which the whole social system is capable of learning from past disasters, its ability to improve risk reduction measures, and its willingness to address the vulnerability of the poorest.

Resilience to disasters requires constant vigilance, particularly in hazard prone areas like Nepal. It is not an end state as such, but the approach described in this book aims for communities to reach a level of resilience whereby they have the ability, using their own means, to take action and, ultimately, reduce both the disaster risk and the underlying causes of their vulnerability.

4. Organisation of this book

This book charts the approach to DRR and poverty alleviation followed by Practical Action. It aims to be informative of the relationship between disasters and poverty and makes suggestion on the basis of the project work with Nepali communities. Those with a particular interest in Nepal will find that its focus - starting with the Nepal profile in chapter two illuminates the physical and human features of the country, yet the approach described is applicable anywhere if tailored to the context. Given Nepal's situation, it is highly relevant for multiple hazard contexts. Chapter three outlines the logical progression from disaster and poverty focus to a vulnerability approach, and explains why working with communities is important to the imperative.

The practical planning processes outlined in chapter four are the initial steps for reducing vulnerability. The explanation of the community selection process, vulnerability assessments and plan formation make it a valuable resource for local, regional and national planners and policy makers, disaster practitioners and organisations hoping to work with community knowledge at the local level. Putting these plans into practice, chapter five explains the whole disaster cycle and identifies and precautionary steps that should be implemented at each stage.

Chapter six describes ways to link local level plans with higher level process and disaster practitioners as well as government organisations will find it useful for understanding how communities can benefit from inclusion in national and international policies.

Chapter seven explains the impact of climate change for those that are already susceptible to disasters and draws upon Practical Action's experience in dealing with this new threat to outline ways in which this extra burden for those in poverty can be averted. Finally, the book acknowledges that neither disasters nor vulnerability are static processes but evolving challenges that require constant learning and improvement to approaches. The book hopes to give the reader a key lesson i.e. by working together with communities it is possible to simultaneously reduce the losses, distress and disruptions caused by disaster and alleviate poverty.

Baulaha khola bridge abutment damaged by flood

Chapter

2

Factors of Disasters- Nepal Profile

Nepal has experienced many disasters in the past, a product of its unique natural features combining with local, regional and global conditions. These factors give Nepal a prevalence of natural hazards which present a constant threat to large population and occasionally lead to various catastrophic events. The most common disasters are flooding which can occur relatively frequently, perhaps only on a minor scale and may be confined to certain regions or communities. Drought i.e. shortage of water for irrigation occurs almost annually which often induces fire hazard. Fire causes greater loss in the forest and biodiversity but the impact of drought and fire losses are poorly represented in the national information system as the government fails to prevent such hazards. Nepal also experiences extraordinary natural events such as earthquakes (Nepal stands 11th as the most at risk country in the world) and flooding from glacial lake outbursts, which, although less common, happen on a greater magnitude and affect a larger number of people. According to the disaster loss record maintained by Ministry of Home Affairs, at least 1000 people are killed each year due to different disasters in Nepal, not to mention the non fatal victims and the high costs associated with recovery.

Yet most of Nepal's naturally occurring hazards cannot be isolated and treated separately from the other processes they relate to. Except for earthquakes, the source of a hazard can be an essential resource for communities, and can only become disastrous when they occur on a scale that adversely affects those in the vicinity. The river Rapti, for example, is an important source of water, surface irrigation, and many ecological services in Chitwan, but its flooding destroys acres of agricultural land and a particularly bad flood in 2001 washed away 120 houses in Ghailaghari in Jagatpur VDC and over 500 people were affected. Wind spreads the seeds and spores of many important species such as *Bombax ceiba* and *Alstonia scholaris* to rejuvenate the local biodiversity, but storm winds can damage property, natural resources and even claim lives in less protected communities.

Disasters, therefore, are inextricably linked to the human context. Nepal has a population of over 27 million (2009 projection). About 30 per cent of that figure lives below the poverty level and the majority of the population are considered to be particularly at risk of a hazard because of location and/or socioeconomic factors. Human activities are also a major contributor to the likelihood and extent of a disaster; people have to engage with the natural environment on a daily basis and can aggravate the natural conditions in ways that lead to extreme events. The problem is more acute in Nepal, where the topography is highly pronounced, socio economic activities are linked closely to the natural environment, and disturbances in one region can easily lead to consequent effects in other areas - destructive practices like slash and burn agriculture in the upstream areas increases risk of flood downstream. Understanding the process involved in a disaster event requires analysing hazards at the locality, linking them to wider driving factors, and assessing the human interaction. This chapter profiles the features of Nepal as the origins of natural hazards, providing an account of the geology and topography, climate and ecological conditions that interact with human activities and have proved disastrous in the past.

1. Geology and topography

The topography of an area is formed by the relief and terrain of the earth's surface, producing various structures from mountains ranges to plains planes, valleys to cliffs. These features are a major factor contributing to disasters, determining the characteristics of a hazard - its origin, extent and severity. Strong geology - where the earth's surface is made up of stable rocks and can withstand shocks and stresses - can provide a defence to hazards but weak geology, on the other hand, enhances hazard severity. The physical landscape plays a part in shaping the weather for an area and also the context for the type of ecosystems that can flourish and the options for socio economic activities. Whilst playing such a primary role in disasters, it is impossible to change the physical landscapes of an area. However, DRR measures are possible by understanding the nature of these regions and how they contribute to both vulnerability and resilience.

2. Weather and climate

Weather is the day-to-day conditions of temperature and precipitation for a particular region and expressed in indicators such as sunshine, cloud, wind, rainfall, cold and warmth. Weather conditions are generated by the interaction between the earth's surface and the density of temperature and moisture elements in the atmosphere. As the most dynamic aspect of the atmosphere, weather is temporary and can change variously within a day, however sustained weather patterns for a region are associated with particular seasons – such as the winter or monsoon period which are longer term (months) expression of typical conditions.

The weather is a vital input for many livelihood practices, particularly those involved in crop based agriculture, yet adverse conditions can be hazardous. Storms, cold and heat waves, heavy rain, hail and snow fall are weather events that create stresses and can lead to disasters. Accurate weather forecasting is a key tool for disaster management as it provides a signal for the implementation of activities to reduce the impacts. Knowing that high rainfall is expected in three days, a community can make decision to secure property and livelihoods.

Average atmospheric conditions over significantly longer periods (20-30 years) are referred to as the climate. Different climatic regions are associated with different areas of the world classified into tropical, dry, moderate, continental and polar – yet Nepal is unique as it is one of the few countries to experience the greatest range of climate zones within a comparatively small geographic area (see chapter 7). For a particular region, the climate is considered as being more or less permanent, although recently this has been challenged by the onset of climatic change. Changes in climatic conditions can heighten or increase the likelihood of extreme weather events or contribute to other hazards by speeding biodiversity loss, desertification, and disease and insect outbreaks. Further explanation of the link between climate change and disaster is provided in the chapter 7.

3. Ecosystems

An ecosystem is an intricate network of living organisms such as plants, animals and bacteria, interacting with and within a physical environment. They may be any scale of living community from a small puddle to a whole planet but, for the purposes of disaster management and development, focus is given to the processes that are involved in sustaining human life. Principally, ecosystems provide humans with food, water and energy, but they are also utilised for livelihoods, particularly those based on agricultural, and fulfilling needs beyond subsistence living.

Not all aspects of an ecosystem are beneficial for humans and if a careful balance in the interactions between living organisms is not maintained there is the potential for a disaster. Whilst animals and wildlife help rejuvenate the ecosystem, excessive population rises in one species can lead to decline in another. Human encroachment into the habitat of wild animal often leads to conflicts and danger for both sides. Many insects are useful for cross pollination of plants, but Nepal has several crops eating species, like locust, white flies, brown plant hopper, that destroy yields and an outbreak of these varieties may result in food scarcity and famine. Human diseases, such as flu viruses, can also be spread by vectors, passing on bacteria with the potential to affect large populations within a few weeks.

Nepal is home to 118 ecosystems, 75 vegetation types and at least 35 forest types, and, because of its diverse topography and climate there are marked differences in ecosystems within short distances. For example, the Rara National Park (106 sq km) in the mid western hills harbours 16 endemic species. It also harbours a lake covering 10.8 sq km at an altitude of 2990 m above sea level (HMGN/MFSC, 2002). At similar altitude (900 to 1500 meter) south of Annapurna range in central Nepal (Kaski District) harbours *Schima-Castanopsis* forests whereas in other areas *Pinus roxburghii* is common. South of the range is green and productive as it receives more rainfall. On the other hand, north of it (Mustang and Manang Districts) are dry at the similar altitude and harbours dry sub alpine and alpine vegetation. In single hill too, south facing slopes are covered by *Pinus roxburghii* and north facing slopes are covered by *Schima-Castanopsis* vegetations at the same altitude because south facing slopes are more exposed to solar radiation and thus drier. In general, eastern Nepal receives more rainfall and Ilam-Dhankuta area is appropriate for tea and cardamom whereas western Nepal is less potential for these crops. Instead, Jumla and Dolpa areas in the west are potential for apple production.

Appropriate management of ecosystems helps reduce disaster risks. Appropriate utilisation of ecosystem services provides inputs to DRR of vulnerable livelihood assets. Collection of fallen leaves and dry matter from forests and establishing firebreak lines provides input to agriculture in the form of manure and fuel wood for household energy later and reduces fire risk in the forest. Conservation of watersheds improves water availability and reduces soil erosion. Small actions on the ground generate bigger results in the ecosystems. Such information about ecosystem function should be considered in the development and DRR initiatives for which awareness of community and stakeholders is important.

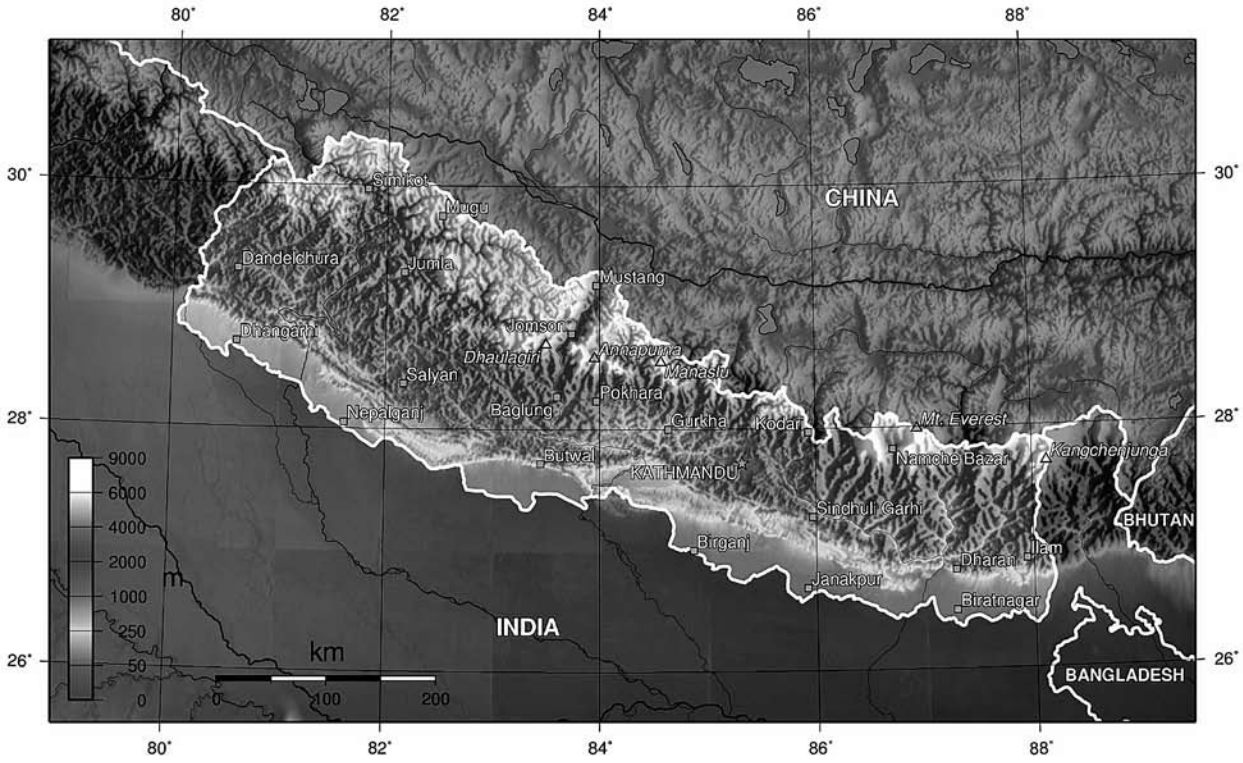
Features of Nepal

Though not a spatially expansive country, Nepal has a vast geographic range, rising from the southern plains to the world's highest mountains in the north. It spans to five physiographic regions: *tarai*, Siwalik, mid hills, high mountains and Trans-Himalayas, and these shape Nepal's diverse weather, climate, ecosystems characteristics as well as the livelihoods pursued by the population. The combination of these factors also determines the type of hazards and disasters that occur within the country:

The tarai region

The *tarai*, lies at the south of Nepal and stretches as a belt across the full length of the country, nearly 800 km from east to west and 17 per cent of the total land area of Nepal. It forms a border with India and is the northern most limit of the Indo Gangetic plain. From north to south it only covers 30-40 km with an elevation between 100 to 200 m above sea level. It is generally flat land with fertile alluvial soil beneficial for agriculture. Livestock rearing and trade are the other main occupations in this region.

There are over 6000 streams and rivers in Nepal and these drain through the *tarai* region channelled by three major river systems – Koshi, Gandaki and Karnali - and many second and third order rivers. As the most down stream and flattest area in the country the area is normally prone to flooding, yet increased sedimentation from upstream regions has raised the river beds and now even average floods overwhelm embankments and dams. A study carried out in the Chitwan and Nawalparasi Districts identified the threat of over 15 hazards in many VDCs in each district - flooding was acknowledged as the most significant rapid onset hazard and drought, particularly during the winter, as the slow onset in each district (DDC Chitwan, 2009 and DDC Nawalparasi, 2009). Fire is also



Source: Google earth

equally important hazard in the *tarai* and damages forests and houses in particular.

The population is increasing in the *tarai* at a faster rate in the last 3-4 decades. In 1961, the population in Chitwan District stood at 67,882, it had reached 183,644 by 1971 and in 2001 it stood at 470,713 (CBS, 2003). The population was projected to increase over 625,000 in 2009 (CBS, 2007). This trend is fuelled by migration from the hills and mountains as living conditions worsen in hills and mountains and people want to live in emerging new cities in the plains. The *tarai* has become a more attractive option for relocation after successful malaria eradication programme by the government and settlement initiatives in the *tarai* region.

The Siwalik region

Commonly known as the Churiya, the Siwalik are the foot hills that rise abruptly from the *tarai*. Here the elevation ranges from 700 to 1,500 m above sea level. Extending west to east, it lies north of the *tarai* except at Chitwan and Dang where it touches the southern border, creating the inner *tarai* or *dun valleys*. The Siwalik is discontinued near Koilabas and Butwal as the Mahabharat range adjoins the *tarai*.

The Siwalik Hills are composed of poorly consolidated coarse sediments which allow rainwater infiltration to recharge the *tarai*. Many seasonal streams, active during monsoons, also originate in Siwalik and flow south to the *tarai*. For the past decades, these have widened at a faster rate. Any disturbance to this range during the monsoon season (between June and September) heightens flood hazards in both the Siwalik and *tarai* zones, whilst in the winter and pre monsoon seasons water shortage is a major problem. Drought has increased in frequency over the recent years due to various issues such as dwindling underground aquifers and increased resource exploitation.

The Siwalik has weak topography making it sensitive to soil erosion and unsuitable for agriculture. However, the hills are experiencing a rise in inhabitants due to population pressure in the *tarai* and migration from the upper hills. Agriculture and livestock keeping are the main occupation of the inhabitant. These unsustainable socio economic activities have led to a faster degradation of ecosystems. The region is already highly prone to landslides; mass wasting and debris flow add significant amounts of sediment load into the major rivers that cause problems downstream. Climate change is also likely to exacerbate the problems in the Siwalik, with subsequent problems in the *tarai* where vulnerability to sediment deposition, land scouring and inundation has already increased in recent decades.

The hill region

After the Siwalik, the middle mountain range, or Mahabharat, extends the length of Nepal, intersected only by antecedent rivers such as the Koshi, Gandaki, Karnali and Mahakali. It makes up 68 per cent of Nepal's total land area. Its altitude ranges from 1500 to 3000 m above sea level and in some places reaches 4000 m making it the first great barrier to the monsoon winds. The slopes of the Mahabharat are steep and sparsely cultivated, with settlements in the hill slope. There are few valleys in the middle hill but these are the site of some increasingly urbanised cities.

Due to the steep topography, the region is vulnerable to landslides and flooding, particularly during the monsoon season, and these are exacerbated by poor land use practices. Agriculture is the mainstay for majority of population and cropping takes place in the hill terraces and flood plains of rivers in the valleys. Degradation has decreased productivity and the resultant pressure on natural resources has led to desertification in some districts. The situation is likely to increase famine events, spread diarrhoeal

diseases and create further environmental stresses. In addition, erratic patterns of rainfall, storms, hail, forest fire and drought are increasing hazards and likely to get worse with the further advance of climate change.

Outward migration from the mid hills is increasing, generally to the *tarai* and the urban area within the hill region. The population is increasing in cities, such as Kathmandu and Pokhara.

The high mountain range

This range, consisting of some of the highest peaks in the world, runs at Nepal's northern frontier to the China. In west Nepal it extends to part of Tibetan plateau and covers 15 per cent of the total land area. The mountains serve as the ultimate barrier to the monsoon rains which drop the highest precipitation on its southern slopes. Lumle on the southern slopes of Annapurna Range receives over 5400 mm while Mustang to the north of it only receives around 250 mm per year.

Much of the region is covered with snow providing the source of perennial rivers that serve millions of people in Nepal, India and Bangladesh. There are over 2323 glaciers in Nepal alone (Mool et al, 2001). The population in the high mountain range itself is small, with people engaged in livestock raising, agriculture, wool preparation, seasonal trading and seasonal migration for livelihood generation. The area is also famous for mountaineering, nature based and adventure tourism. However, as the Himalayas are the youngest and most fragile mountains, they are sensitive to human disturbances, climatic variability and changing weather.

The glaciers in the Himalayas are believed to be melting at a faster rate. This means higher flow and the threat of glacier lake outburst floods (GLOF in the short run and less water availability in the long run), a potential source of disasters for millions of people in the South Asia region. At least 20 glacier lakes are identified as being at risk of breaking out of their moraine dams according to a study by the ICIMOD (Mool et al, 2001). Water shortages during dry periods in particular will affect irrigation, hydropower, ground water recharge and ecosystems in downstream areas of Nepal. The Himalayan range is also vulnerable to avalanches and rock fall.

The Trans-Himalayan region

The land north of the high Himalayas is part of the Tibetan plateau and described as the Trans-Himalayan region. This region mainly covers the areas west of the Kaligandaki basin and the districts of Manang, Mustang, Dolpo and Humla.

As the monsoon rain is blocked by the high mountains, the Trans-Himalayan region is known as a rain shadow area with an annual precipitation of less than 250 ml. Due to its higher altitude the region is very cold, yet changes in its climate have seen the temperature rise in recent years based on 30 year weather data between 1976 and 2005 (Practical Action, 2009). Adverse effects on the ecosystem and livestock and agriculture livelihoods are likely to arise due to climate induced desertification in the region.

Strong wind and drought are major stresses in the region and small scale earthquakes are almost annual events.

Many hazards have extended across the physiographic regions. A destructive earthquake in 1933 damaged Kathmandu and other areas of Nepal followed by large scale earthquakes in 1966, 1980 and 1988. Flood and landslides in the hills have downstream effects along their catchments.

4. Human factors

As the descriptions above testify, Nepal's natural conditions can be challenging and in many regions there is always a certain degree of risk that cannot fully overcome. Human interactions in these settings can make the situation worse, provoking a natural hazard and leading to a disaster.

Damaging socio economic activities and livelihood practices can weaken the capacity of the natural defence against hazards. Over 85 per cent of Nepal's population is involved in some form of agriculture as a livelihood source and subsequently deforestation and changes in land use are two of the most significant contributing factors to many disasters in the country. Overuse of these practises contributes to the loss of biodiversity and desertification as experienced in the middle hill region - leaving ground surface bare of the tree and plant coverage that holds soil together, protects it from the impact of rain and slows rainwater run-off. Without this natural protection, the landslides and floods of the Siwalik region occur more frequently and with a higher magnitude. The development of infrastructure and settlements, as is happening in the *tarai* and mid hill regions, creates an even greater demand on the natural environment. Increased urbanisation has resulted in a greater exploitation of water, forests and land resources.

Depleted natural resources limit the coping and recovery options of a community in the event of a disaster, and heavily increase the scale and duration of the impacts. A lack of alternative food supply can slow attempts at relocation, rescue or recovery making the community more dependent on external help. Returning to a normal existence will also take longer if local resources are too weak to withstand a hazard and there are few other options for pursuing a livelihood. Furthermore, the causal relationship between damaging livelihood practices and disasters can be cyclical – deforestation or over farming in one area may lead to or increase the chances of disaster, forcing the community to move and clear land elsewhere adding pressure on resources in the new location.

Man made constructions, as such is a major alteration to the natural surroundings, have the potential to undermine the geological strength of an area; if not carried out properly or in an unsuitable location, mining and settlement construction adds pressure on the lands. Gravel quarrying, agriculture, and deforestation in the Siwalik Hills, where the geology is weakest, have accelerated erosion in an area that is already susceptible to disturbances. Man made constructions can increase the threat from the physical surroundings during a disaster; however, with thoughtful planning and suitable materials, infrastructure can reduce the risk of disasters and stresses by providing coping measures during a disaster and preventing a disaster from reaching its full potential.

The ways that humans interact with their natural environment is not just determined by the environment itself, but are a result of wider social, economic and political factors that influence

livelihood options, migration patterns, natural resource governance, and construction. The national economic imperatives may, for example, warrant the construction of dams or highways, or social and political problems may lead to conflict, all of which create either direct or indirect threats for communities.

At the local level, the preparation and consumption of local brew is a common activity for some Nepalese communities, linked to cultural practices and ceremonies. For certain members; selling the produce at a local market is also a major source of income. However, collecting firewood needed to produce alcohol contributes to deforestation in nearby forests. Despite experiencing disasters linked to deforestation and degraded natural ecosystems in the past, it is difficult for many communities to abandon the damaging practices for various reasons relating to the social, economic and political characteristics of Nepal. They are a part of local traditions; an important source of income needed to fulfil immediate needs; allowed to continue because natural resources are poorly governed and often carried out with a lack of awareness for the implications.

The factors that spur damaging practices that heighten the likelihood of a hazard are linked to the local, national and global configurations and power relations within a country. All of these factors increase the vulnerability of poor people to disasters – a topic that is explored in the chapter.

Settlement along the banks of Lothar river near Lothar bridge in Chitwan District

Flood in Deusad khola in Nawalparasi District

Chapter

3

Practical Approaches to Disaster Management

Practical Action works with communities to reduce the impacts of disasters and to alleviate poverty, with a particular geographical focus on the districts within Narayani and the Karnali watersheds of central and western Nepal. It takes an approach that recognises the cross implications of these challenges and addresses them jointly by reducing vulnerability. Community based Disaster Management (CBDM) concentrates on risk reduction measures to where the greatest risk lies and the worse impacts are likely to be felt. This strategy aims to ensure that disaster plans are based on the attributes and weaknesses of the community, and is premised on the belief that the existing knowledge of those at risk is vital for both development and disaster management. The existing capacities of the community, such as the livelihoods and assets, are the basis to enhance their ability to improve economic status and increase resilience. Practical Action along with the communities have initiated integrated approaches of building resilience by improving capacities of community and stakeholders to reduce hazard stresses, sensitivity and better preparedness such as early warning to reduce disaster risks. By incorporating good practices of each approach into community led actions Practical Action attempts at mainstreaming DRR into development at local, district and national level.

1. Disaster management approaches

Disaster management has come along different approaches each adamant in different aspects of disaster management. They vary from traditional relief approach to recent ambitious total disaster risk management approach. Disaster management is linked to a number of disciplines, contexts, cultures and practices. So, this chapter briefly describes the approaches context for practical application.

Traditional relief approach evolved with the kindness and humanity; one has to help others in peril. This is based on the fundamental principles of humanity and strategy for coexistence with the hope one will get help if s/he helped others. This must have been inherited and developed through generations to modern civilisation from natural mammalian characters of caring and rearing off springs, family and group security and defending predators and competitors. Relief approaches generally perceive disasters made by supernatural powers. These approaches continue today and practices are embedded in cultures and religion. Examples such as collection of grains and vegetables by relatives and neighbours during funeral, helping disabled and building resting platforms and public shelter houses.

For decades development programmes considered DRR to 'prevent development from being destroyed' for sustainability of development achievements.

Sustainable development approach considers understanding relationship between disaster, environmental degradation and sustainable development. DRR is an integral part of development programme with the efforts to enhance the capacities of communities and coping systems at various levels and sectors towards self reliance and self sufficiency in managing disaster effectively. This approach facilitates the adoption of disaster mitigation programmes at the local level including structural and non structural measures. This is a holistic approach of sustainable development promoting the culture of prevention and incorporation of disaster management in development planning.

Vulnerability reduction approach is a recent concept that complements existing approaches to disaster management and views vulnerability as an interaction between a community, its environment and hazards. This approach addresses both the vulnerability and resilience by dealing with the causes of stresses and disasters, and strengthening communities at risk. It includes a number of coordinated activities on vulnerability assessment, prevention and mitigation, and preparedness for response. The strategies are development oriented and espoused to sustainable development. This insists on the building resilience capacity of the communities through strengthening their livelihood capacities and governance.

Total disaster risk management approach is conglomeration of all disaster management approaches in holistic manner. This is an ideal concept and a purposive viewpoint trying to address disaster management issues holistically and comprehensively. It focuses on the underlying causes of disasters, the existing conditions of risks and vulnerability of people and their assets to different hazards. It also emphasizes multilevel, multidimensional and multidisciplinary cooperation and collaboration in disaster management. It is a shift from response and relief to preparedness. Nepal tried to adopt this approach from 2002 in its 10th plan. Twenty three districts were identified vulnerable to different disasters and accordingly disaster management planning was initiated as piloting. However, implementation process could not take momentum for various reasons.

Vulnerability to resilience approach (V2R) is to capacitate vulnerable communities to absorb hazard stresses and shocks and bring their livelihoods back to original position. It focuses on building adaptive capacity of livelihood elements to enhance their resilience capacities. It is a two way approach of reducing hazard, exposure and sensitivity at one side and enhancing coping and restoration capacity of those vulnerable on the other. There are some broad measures such as building linkages between upstream and downstream communities where those who get benefited (down stream community in particular) pay for environmental services and upstream communities contribute to maintain ecosystem healthy. This focuses on community based disaster management. Integrated watershed management is an appropriate strategy to DRR for various hazards where vulnerable elements can be transformed into resilient ones incorporating all aspects of disaster management. V2R envisages mainstreaming DRR into development. In Nepali context where high mountains in the north and the *Tarai* are linked through hydrological systems watershed management is the best place to envisage V2R.

2. Disaster management and development

Disasters are the greatest challenge for development. When one occurs it can claim lives, cause injuries, wipe out livelihoods, property and infrastructure, and cause disruptions on a national scale. Frequent small scale hazards and stresses can cause even greater losses, particularly for the poorest groups. Amongst such devastation and upheaval progress made in poverty alleviation can be eradicated and development plans could be set back.

Furthermore, the experience of disasters worldwide, even in developing countries have shown that the poorest are affected worst by a disaster as they often live in the highest risk areas, are less able to protect themselves in anticipation of a disaster and even less able to recover afterwards. In addition to this, people in poverty face a greater risk from the spread of disease, the erosion of natural resources, conflict and global economic

trends which are likely to present more regular threats than a flood or earthquake.

Most people within Nepal experience some degree of risk, but, because of their low economic status, significant numbers are forced to live in close proximity to a hazard, either on river embankments, flood plains, or steep slopes. In Nawalparasi District of the *tarai* region, for example, many people are highly exposed to the flooding of Narayani. These communities rely on subsistence agriculture and livestock rearing, and with little surplus assets and few resources they have insufficient means to prevent a disaster, protect what assets they have or to recover after.

Those in poverty are not only marginalised geographically into high risk areas, but also lack support mechanisms that can help them deal with a disaster. Poverty is characterised by a lack of rights and/or an inability to access resources and services. This marginalisation is linked to location and can be compound by disasters - there are a number of examples from Nepal where families who have lost property and assets in disasters have had to resettle in less favourable areas that lacks basic services and opportunities.

In all, poverty is a major contributor to vulnerability, and both are similarly affected by processes of social, economic and political systems.

3. Reducing vulnerability

A key strategy for Practical Action's approach to development and disaster management is to reduce the vulnerability of those groups that are at highest risk and/or marginalised. Vulnerability includes being subject to 'the conditions determined by social, economic, physical, environmental and governance factors or processes which increase susceptibility to hazards and the impact of hazards' (Pasteur, 2010). Within this definition, the physical causes of vulnerability, such as the natural surroundings and hazard origins, present the most immediate risk, and the social and economic processes limit the capacity, particularly of those in poverty, to deal with the physical factors.

The physical contributors to a community's vulnerability can often be addressed by a combination of physical measures and establishing connections. In a community that is susceptible to floods, the physical threat can be decreased by reinforcing embankments, and, if the flooding is caused by the agricultural practices of upstream communities, then linking the downstream villages to the higher villages can create awareness of the issue and encourage the upstream communities towards better watersheds conservation and providing flood information. In this example, supportive relationships can be built by sharing the benefit of the river between communities. Many downstream communities earn revenue through stone and sand extraction, in addition to environmental services such as water for domestic use and irrigation and, if these are shared with the upstream communities, it helps to create trust in the upstream communities helping conserve watershed, information sharing on the hazard potential and early information on flood to benefit the downstream communities.

Reducing vulnerability requires assessing (see Chapter 4), and addressing all factors broadening the focus of disaster reduction from the physical hazard itself to the wider processes that hinder a community's ability to deal with a disaster. However, it is true that the political, social and

Box 3.1. Indigenous knowledge and practices

People in Kaligandaki basin in western Nepal have always witnessed the Siberian crane flying south in March. The crane's migration denotes the Kaligandaki communities the time for seasonal migration to up hills to sow seeds. Similarly when the cranes fly north in September/October it indicates the beginning of winter and the time for harvesting crops and returning back to the lower hills. The timely migration of these cranes provided important information to the communities when there was no calendar. Those who don't migrate, this signal is they should start sowing the seed for summer vegetables that grow through the season (climbers such as gourds and cucumbers) and carry out maintenance to house roofs - if made of thatch - is carried out so that the buildings are safe from rainfall during the summer.

After the monsoon, houses and foot trails are repaired and doors and windows are repainted by the end of September, which is aligned with the Dashain festival. As the preparation and reconstruction work is linked to different cultural practices and embedded in the annual calendar, this ensures that houses, common property or infrastructure gets regular maintenance. Along with the social, economic and environmental benefits, these traditions help ensure the community can reduce the risk of hazard associated with the seasons.

economic factors, being abstract and ingrained in a country's configuration as they are, are more difficult to alter in favour of the poor. More immediate reductions in vulnerability can be made by addressing the physical hazards, but if a community has the ability to deal with a disaster, then it is imperative to gain recognition of their situation at higher levels.

Less attention by planners is generally given to the smaller hazards that threaten people's property, assets and livelihood. A holistic approach to development and DRR planning enables reducing vulnerability to these issues, saving on the cost of rescue, relief and recovery measures. Measures taken to address vulnerability should be initiated during the prevention and preparedness stages of disaster planning to limit the effect of a hazard and ensure communities are ready in anticipation of a threat. However, there is much that must be done in the response and recovery stages to ensure that vulnerability is not increased as a result of either the disaster or even the response strategy. For example, resettlement should be made in safer places; victims should be made aware enough on the causes, vulnerability and potential future consequences, and actions required to reduce further disaster risk in the new destination. Safety factors must be considered during the time of reconstruction such as raising free board and increasing span of the bridge if floods were the reason of disaster. Planned response and recovery measures are rare in Nepal hence it is difficult to state an example in place. The end result should be an increase in resilience, whereby communities have greater ability to withstand and change in response to a hazard.

The context of vulnerability keeps on changing due to long term trends, markets, governance and other socio economic dynamics. As described in Ch. seven, climate change has added additional uncertainty to the vulnerability context and preparedness for usual hazards, particularly those related to weather events, may not be sufficient in the future. Better access to information and efficient forecasting systems and new appropriate technologies and approaches are becoming essential to the poor communities to deal with the vulnerabilities generated by multiple hazards.

4. Community Based Disaster Management (CBDM)

Those vulnerable to disasters are not passive victims, but the key actors for dealing with a threat and increasing resilience. This is the central perspective of CBDM which works with groups at the local level where vulnerability is highest. It is based on the understanding that those at risk from a hazard have the skills, knowledge and experience that can be built on in order to plan and prepare for a disaster. Although a community may live in a fragile area, their indigenous knowledge holds in-depth understanding of the situation and is based on familiarity with the locality developed through the day to day engagement with the surrounding geography, natural environment and local affairs. In order to survive in risky situations, perhaps for many decades, communities often already have the survival techniques passed down through generation.

Communities are also the ultimate users and implementers of disaster management plans, and, therefore, projects must be context specific and tailored to the local settings and needs. Community members should be engaged in all aspects of disaster management, including 'the identification, analysis, planning, implementation, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities' (UNISDR, 2006). The direct involvement of a community in disaster planning is essential to determine the appropriate solutions and to ensure that information is generated in a manner and language that is accessible for all members. Furthermore, by working closely at the local level, disaster management can be more inclusive for those vulnerable groups within a community, such as women and disabled.

Ensuring community ownership of disaster management is considered vital for sustainable, long term achievements. To this purpose as well, CBDMs seek to create links with other actors from outside the community that may become stakeholders in disaster management plans. Recognising that, whilst a community has local expertise, there are limitations in its ability to act in response to a hazard, this has the advantage of increasing the resource base of the community. A community can then draw upon these stakeholders - who may be local, regional, national or even global – as support. Typical external stakeholders may include meteorological stations (providing flood warning information); universities (expert advice and latest research); local suppliers for communication tools; and the emergency services (for response during a disaster). It is important to include local government officials from the early planning stages in order to bestow authority to the plans and feed into the national government's disaster and development plans. To ensure sustained disaster preparedness and to permanently reduce vulnerability, linkage between the actions of the community level and national level action must be a key objective of a CBDM approach (see chapter 6 for integrating community level plans into the national level).

Local communities can have indigenous ideas and practices to avoid and manage small scale stresses despite some superstitious perceptions. Successful practices can be incorporated into community plan for DRR and management. In many villages in the *tarai*, communities are mixed up from different origins particularly in the hills from where they had migrated. In such a context there are some additional benefits to accumulate indigenous knowledge and practices from different communities. However, it is worth considering whether the idea and practice would work for the locality.

Natural resource management to reduce underlying risks

Natural ecosystems often provide physical barriers, absorb stresses such that the strength of hazard is reduced, and moderate the impacts of disasters. Healthy ecosystems provide resources and capacities for community resilience such that their livelihoods are restored quickly after a disaster shock. For example if there is well stocked forest, communities can utilize timber for reconstruction of homes, wooden bridges, tools for agriculture and rejuvenate their livelihoods quickly.

On the other hand, degradation of ecosystems leads to hazards as it is a hazard in itself. Deforestation leads to soil erosion, landslides and flood. Degraded lands are more sensitive to excessive rainfall, drought and extreme weather events. Natural resources are also affected by hazards. Fire damages forests; landslide damages water resources and so forth. Therefore, there is close relationship between natural resource management and disaster management; wise natural resource management reduces hazards and disaster risks. Over exploitation, on the other hand, decreases the capacity of nature to sustain hazards and stresses and enhances environment for hazards.

Natural resource management involves management of natural systems and social processes which affect natural resources. It involves management of different sectors such as agriculture, forests, water resources, livestock, land use, biodiversity and socio economic development activities such as health, sanitation, education and communication which have implication to natural resources [Box 3.2].

A best practical approach of natural resource management in relation to disaster management is integrated management of watershed focusing on prevailing hazards and vulnerabilities. In the context of climate change future trend of hazards particularly those weather induced should bear in mind while planning disaster management activities including managing local resources.

5. Livelihood strategies and disaster management

By working closely with a community, disaster management programmes gain a more accurate picture of the opportunities and constraints faced in relation to a hazard. Understanding the livelihoods of a community - the means involved in generating a living and attaining a good quality of life – provides a key indicator of a community's vulnerability or resilience in relation to a hazard.

Livelihoods are not just a job or an income source, but include the 'assets, skills, technologies and activities required to make a living and have a good quality of life' (Pasteur, 2010). Acknowledging all the elements – or 'capitals' – involved in generating a living makes it possible to see that some livelihoods, particularly those of the poor, can lack the constituents that make them secure.

Livelihood strategies depend on the available and potential access to capitals. The capitals can be clustered into different groups [Box 3.2]. Strength in a capital can influence and improve other capital. For example human capital utilises other capitals; financial capital can exchange services and utilities from different capitals such as access to physical capital which is a sum of all basic infrastructures that produce goods and services.

The capitals are important in the DRR perspective in two ways - firstly they provide defence and resilience capacities to hazards and stresses, and secondly they are vulnerable to different disasters. Failing to manage capitals properly can create distress.

Communities that have weak livelihoods are typically more vulnerable to a hazard as they are often inadequately protected or lack the finance to move when faced with a threat and have little resources to draw upon during a disaster. If a family is only able to carry out subsistence farming then they are likely to have little extra money in order to protect their produce from an outbreak of locust, or may not be able to cure themselves if they are affected by a disease.

All livelihoods are at risk from a hazard if the capitals that underpin them are disrupted and those based on agriculture are particularly susceptible. Farmers possessing small area of land to grow only one type of crop will struggle to maintain an adequate supply of food if a flood or landslide blankets their fields. Such was the situation for communities in Daldale, Nawalparasi, when flood in Baulaha Khola destroyed their rice crop and land in 2007. To recover from the crop loss and food shortage, families worked as daily labourers for minimum wage.

Furthermore, if conventional forms of livelihood are unavailable or destroyed because of a hazard, this can force people to take riskier steps for income generation, such as farming in more dangerous areas or entering into prostitution, thus further increasing vulnerability (Pasteur, 2010). Families affected by flood and landslide often start collecting sand and gravels in the stream beds or wood in the forest to sell in the nearby market. This raises risk of landslides and limited availability of forest resources to other families.

The aim of a livelihood centred approach is to strengthen and diversify assets so that they remain a reliable resource and coping strategy in the event of a disaster. Livelihoods can be strengthened by either physical protection - such as building irrigation schemes to defend against drought and defensive walls along a river embankment to stop the erosion of land or by creating linkages that can provide support, such as agriculture service centres that supply seeds and information and provide training and skills for agriculture, fisheries and bee keeping.

Diversifying livelihoods means increasing the options for making a living. Having an alternative crop that can be grown during a dry period can ensure that food supply continues during a disaster or having a non agricultural option may bring in an income when a flood occurs. If a livelihood can be maintained during a hazard event communities can focus on the recovery stage and are less likely to become more vulnerable as a result.

Box 3.2. Agricultural livelihood capitals

Capitals contribute to the functioning of daily life, self protection and development, and the level of access to these capital determines the extent to which a particular community group, household or individual is vulnerable to external trends, shocks and seasonality and is able to absorb the effect and impact of a disaster.

Human – Health and strength carries out physical labour and tool usage such as knowledge on crops, varieties, fertilisers, disease, pest management and knowledge in inter cultural operations (planting, weeding and irrigation).
Physical – Irrigation, roads, bridges, footpaths, market place, equipments, storage facilities.
Social – Labour exchange practices; rules and institutions to distribute resources, kinships, culture, governance, formal and informal networks and institutions such as cooperatives, market linkages and service providers.
Natural – Forests, river, underground water, land, biodiversity, weather and climate.
Financial – Cash or savings for investment, credit facilities, livestock, crops, subsidies when required, seeds and fertilisers

Weak livelihoods	Strong livelihoods
• Reliant on a single form of livelihood/ reliant on one source of input/output	• Diverse option spread that include options for generating a income even if disaster strikes
• Low income/subsistence level	• More profitable
• Contribute to degradation of the natural environment/add stress to the geology of the area	• Manage natural resources sustainably to protect and reinforce ecosystems
• Rely on outside support	• Are in the control of local community
• May involve personal risk	• Have strong linkages and access to the resources, services and markets
• Isolated from social and technical services, networks, markets	• Are resistant to a disaster
• Sensitive to even small scale stresses and shocks	• Are flexible enough to defend and tolerate stresses and socks.
• Likely to be wiped out in a disaster	• Possess potentiality of restoration

6. Conclusion: communities prepared for disasters

However, the combination of these approaches should result in communities that have the capacity to prepare for, withstand, and make a quick recovery from a hazard stress. Local ownership of disaster management should mean that community members are in charge of the process and can instigate disaster plans on their own accord, drawing on the networks set up by the CBDM approach when external support is required. Their livelihoods options do not cease during a disaster and, in non disaster times, increased productivity should improve the economic situation of communities and strengthen their capacity to deal with future threats. This is a position of resilience.

Box 3.3. Natural resource management to strengthen livelihoods

Simalgiri is a village of 47 households on the bank of Rapti River next to the Chitwan National Park in Chitwan. Agriculture, livestock rearing, daily wage work on agriculture and fishing are parts of livelihoods and income. They own small pieces of land with de facto use right.

Some of the major hazards faced by the Simalgiri community were flash floods, particularly during the summer months from June to October, wildlife intrusion year round and lack of water for irrigation between November and May. Limited skills provided opportunities to plant maize only. The grains produced was only sufficient to cover food supply for 3 to 6 months. To fulfil gap shared cropping in others' land and daily wage work.

In 2007 a natural wetland was improved by constructing a dam and linking it through a channel to the farming fields. Two shallow tube wells were constructed to increase water supply. These provided irrigation for crops during the winter and dry period, thereby reducing sensitivity of crops to droughts.

They received trainings and inputs on cereals and vegetables for two years along with best practices. Crop production increased in quantity and variety. Today, communities are growing crops in different seasons compared to the growth of only one type of crop - maize in the past. People are selling vegetables after household consumption in the local markets. Food security has improved drastically with greater production from their land.

The upstream and downstream communities are linked with telephones to help them receive flood information at an earlier stage which helps them prepare better, save their livestock and other important portable necessities. A disaster management committee has also been formed at the local government level which has responsibility of preparedness and response to disasters.

With support from national park and other stakeholders the community erected low voltage electric fencing around the village to prevent wildlife intrusion. Community have constructed flood dykes with support from different stakeholders which can protect the village from medium scale flood. The outcomes have secured and increased livelihood assets, both in quantity and quality. Although vulnerability to more severe flooding still exists and the communities still have further development requirements, they now have food security for almost the whole year and the self-confidence to bounce back from shocks and stresses.

Farmers in Simalgiri village planting rice in March after gaining access to improved irrigation facility

Chapter

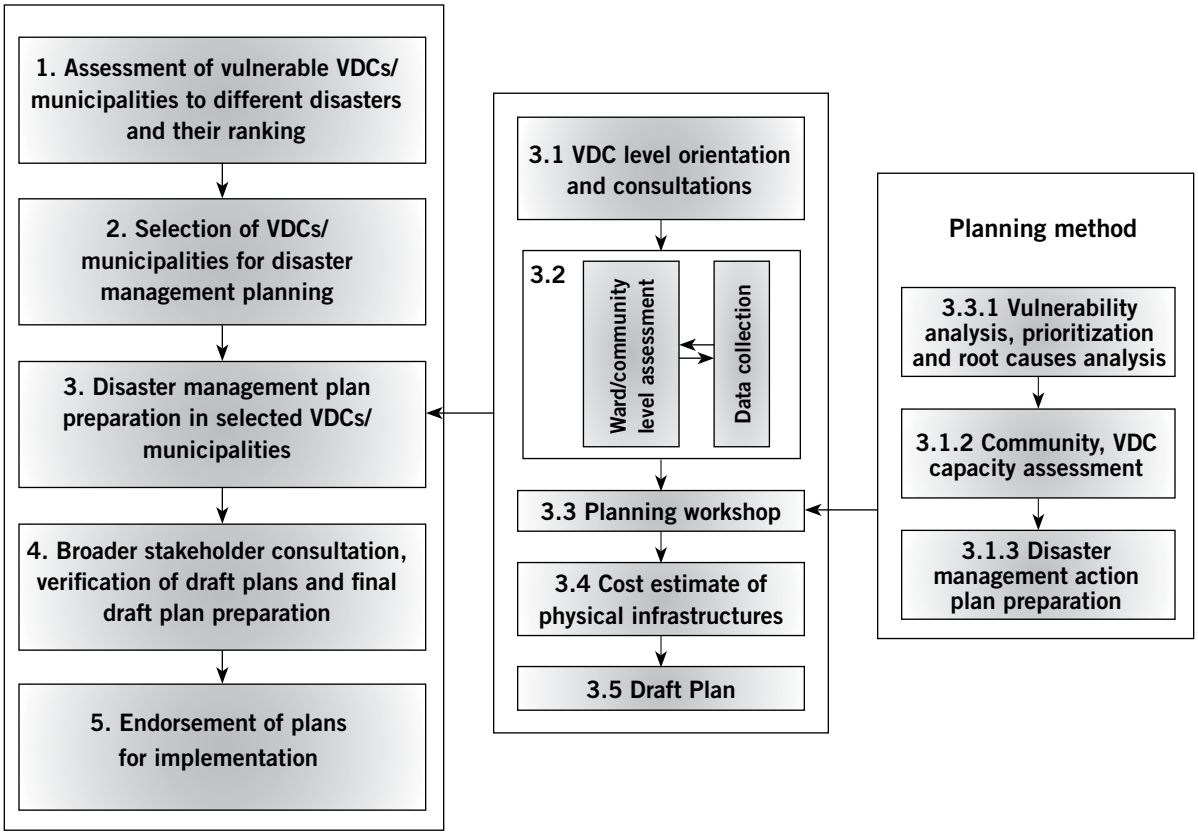
4

Practical Methods for CBDM Planning

Advance planning is imperative for disaster management; it can minimise risk, substantially reduce loss and significantly ease the drudgery and cost of rescue, relief, resettlement and reconstruction. It provides the opportunity to implement appropriate mitigation strategies, which distinguish disaster preparedness from pure relief work, and also incorporate DRR into development plans. With the active participation of vulnerable communities, the Community Based Disaster Management approach to planning helps identify local hazards, devise locally appropriate strategies and formulate development activities. Because the community participates in the development and implementation of these plans their ownership and sustained use of the plans is ensured. Whilst the plans are tailored to the context of the community, a key objective is to enable local bodies such as Village Development Committees and Municipalities (urban communities) to integrate these strategies into their development plans.

This chapter describes a practical approach to disaster management based on field experiences gained while preparing disaster management plans for 59 village development committees (VDCs are the lowest administrative and development units) in Nepal's Chitwan and Nawalparasi Districts. It is a modified version of a paper that appeared in http://practicalaction.org/docs/region_nepal/practical-approaches-cbdm.pdf [Practical Action 2009]. The needs of the local communities in these areas provided the impetus for the development of locally owned, community based, multi stakeholder disaster management plans, and as explained in detail in chapter six much effort was given to link the plans of the VDCs into the national and international disaster policies

Figure 4.1. CBDM planning process at local level



that have provisions to do so. The objective of the prepared plans is to enable communities and local governments to prevent, reduce and effectively respond to stresses, shocks and potentially disastrous events and implementing them has been an essential component of poverty reduction and sustainable development. The communities that have implemented activities from their plans have developed resilience to different stresses, shocks and potential disasters.

Disaster management planning process

As communities fall under the constituency of local and district government, developing the plans should be led by the appropriate agencies at these levels such as VDCs and DDCs , and supported by local and national stakeholders. The active participation of vulnerable communities and other appropriate stakeholders is essential. The planning process consists of five major steps described below and illustrated in the flow chart [figure 4.1]. The process can be modified based on local contexts.

Different tools can be used to analyse vulnerabilities and risks and devise strategies to deal with different hazardous situations. Community level assessments of vulnerability and capacity are best conducted using participatory tools (Actionaid, nd; Blaikie et al, 1994; Cannon et al, 2003)

1. Vulnerability assessment of VDCs, municipalities and their priority ranking

a) Vulnerable or potentially vulnerable communities can be identified by the existing hazards they face and the stresses and disastrous events and losses suffered in the past. Secondary information, from documents and records in DDC, VDC and municipality offices is collected, analysed and collated. The VDCs and municipalities are grouped together on the type of vulnerability faced by the communities within their constituency those vulnerable to flood, landslides, and susceptible to drought. Factors such as existing hazards, levels of risk, exposure of population and threats to livelihoods and assets, coping strategies, degrees of resilience and issues of governance are all considered in categorising the level of vulnerability represented by each VDC (highly vulnerable, vulnerable, moderately vulnerable).

b) The ranking of the VDCs according to their communities' vulnerability status is then discussed by representatives of the various stakeholder groups – members of District Disaster Management/Rescue Committee (DDMC), political party representatives, relevant I/NGOs, district level experts and VDC and municipality representatives. These deliberations provide an opportunity for the ranking of individual VDCs and municipalities to be changed. Detailed and objective information helps to minimise conflicts of interest and reduces the time taken to reach a consensus. In the event of disputes, the district disaster management/rescue committee will make the final decision. The ranking identifies the most vulnerable communities and selects the VDCs that will be prioritised for the development of disaster management plans plus the implementation of risk reduction initiatives.

2. Selection of VDC/municipality for CBDM planning

a) All the VDCs and municipalities representing vulnerable communities, no matter what their ranking, can be selected for disaster management planning provided that adequate resources and time are available. When resources are limited, it may be necessary to prioritise the most vulnerable and disaster prone VDCs identified in the ranking exercise above. Political influences and other stakeholder interests may need to be taken into account in making these choices. The commitment to implement plans once formulated and other factors may also influence the choice of which VDC or municipality is prioritised. It is suggested that an independent arbitrator (possibly an NGO, a group of independent non aligned experts or a consortium) should facilitate the inevitable consultation to choose which VDC or municipality should be selected as the DDC planning officers will need assistance.

b) The overall leadership for coordinating the planning process should be led by the local government officials. A task force can be formed by the DDMC to steer the process which is facilitated by an independent advisor. The task force may be comprised of officers from the District Development Office, District Technical Offices, District Administration Office, District Agriculture and Livestock Offices, other relevant Government Offices and NGOs. The taskforce should be coordinated by the Planning Officer or Disaster Focal Person of the DDC. This provides the necessary link to the VDCs, municipalities and other stakeholders and ensures the integration of DRR into District Development Planning.

c) The taskforce should develop Terms of Reference (ToR) and a work plan for the CBDM process. It is important to define and agree a methodology (what is to be done, when, where, how and by whom) and a budget. The ToR and work plan should be approved by the DDMC or the DDC who than organises the human resources, budget and other necessities from either the government or other sources. With the constraints of the ToR and the resources available, the taskforce may decide to employ consultants/service providers/supporting institutions to deliver specific components of the planning process.

3. Disaster management planning of selected VDCs/municipalities

In order to ensure that all VDC and municipality stakeholders have a similar understanding regarding vulnerability and disasters, orientation workshops need to be held. The workshop will help update those at the VDC and municipality levels who were not involved in the district level consultation processes. Discussions on theoretical and practical aspects of DRR will increase the awareness of participants on the importance of disaster management. With this information, VDC personnel will be able to identify hazards and vulnerabilities in their respective communities. Enlightened stakeholders can inform other members of their VDCs and communities thereby increasing the amount of people sensitive to disaster and vulnerability issues. This will facilitate the identification of vulnerable communities within their respective VDCs.

The members of the local government taskforce need to coordinate; facilitate and monitor the planning processes and methods in the field.

Timely feedback to the consultants/service providers/supporting institutions helps to address the needs and priorities of the stakeholders active in different VDCs. Monitoring the process by Chief District Officer, Local Development Officer and other members of the DDMC makes the overall planning more effective.

VDC/municipality disaster management planning should follow the following steps:

3.1 Ward and community level assessments

Wards are sub divisions of VDCs or municipalities and consist of different villages, settlements and communities. Wards and communities identified in the orientation workshops should be visited to collect information on the hazards and stresses to which they are exposed. Using participatory vulnerability assessment methods and tools, information on local experiences, losses, coping strategies, capacities and resilience to the impact of hazards can be collected. This enables communities to identify their vulnerabilities, capacities and gaps. This information, while essential for the preparation of CBDM plans, also provides a pool of information for the development of VDC disaster management plans. It may not be possible for the consultants or taskforce members to visit every community (nor every family in each community). During the VDC orientation workshops, it should be possible to identify a representative sample of communities to be visited. Vulnerable communities within wards can be clustered on the basis of similar vulnerabilities. Facilitators may need to visit as many areas and sites as possible to collect and verify information. All information needs to be recorded and collated for later interpretation and use.

3.2 Data collection

Relevant information can be collected from VDC/ municipality records and from communities using questionnaires or checklists. Data should include information on the numbers and groups (age, gender) of people, assets and livelihoods, natural resources and infrastructure affected by locally occurring hazards. On the other side different information should be collected on capacities of local communities and stakeholders such as community and VDC/municipality to manage disasters in the context of identified vulnerability and locally available resources and their resilience potential. This information will be analysed in the planning workshop. Information on capacities should include the ability of the community to cope and manage the impacts of hazards and shocks, and the availability of services and facilities (health posts, shelters, ambulance, fire service and trained personnel). Past events and their impacts are of particular relevance. The information from community discussions and checklists can be checked against information recorded in relevant VDC offices. The information gathered from ward level assessments and that collected from primary and secondary sources must be used in unison to cross check the validity.

3.3 Planning workshops

Once the necessary information is gathered, a planning workshop should be organised for as many stakeholders from each VDC/municipality as possible. Workshops can be organised for individual VDCs or for up to three similarly vulnerable VDCs. There are both benefits and constraints in organising workshops together for more than one VDC. Having more than one VDC present provides the opportunity for adjoining VDCs to manage disasters in coordinated way. Furthermore, detailed plan development can be carried out in separate groups. However, care must be taken to ensure that representatives of the most vulnerable communities participate in the workshop and have the chance to express their opinions as they are most frequently disenfranchised at such opportunities. The

participation of local government officials, such as DDC Planning Officer or members of the DDMC is essential for the legitimacy of the planning process. Other participants should include:

- VDC president, vice president, secretary and relevant staff
- Ward members or representatives of political parties whose constituency includes the VDC/ municipality
- Representation for the local Nepal Red Cross Society in the VDC (or the area if their branch is not in the office)
- Community forest user groups and other resource user groups
- Representatives from among disaster affected/ vulnerable community
- Individuals with expert knowledge on disasters and coping strategies
- Representatives of women and marginalised/ groups
- Representatives from civil society/I/NGOs working in the field of disaster management in the VDC
- Representatives of respective government line agencies in the VDC or from areas such as agriculture, forestry, livestock development, health, security

An initial orientation of the participants is needed to ensure a common understanding of disaster management. The duration of the planning process is dependent on the understanding and engagement of the participants, but past experience suggests that a four day residential workshop is usually sufficient; the first day being devoted to the introductory session while the following three days are devoted to the development of the disaster management plan.

3.3.1 Planning methodology

The participants from each VDC will initially examine and verify the information collected from different sources relating to their specific VDC. Where members from more than one VDC are participating in a workshop, common issues such as methods for analysing and prioritising data can be discussed in plenary and issues specifically relating to a particular VDC will be discussed in a separate group. Facilitators will help to maintain focus in the groups, clarify misunderstandings and defuse disagreements.

The stakeholders representing each VDC or municipality will be guided through a three stage process; (a) situation (vulnerability and risk) analysis, (b) root causes analysis, (c) capacity analysis and (d) the drafting of a disaster management plan.

a) Situation analysis

Information collected from different parts of the VDC (see 3.1 and 3.2 above) relating to hazards is examined. Initially all the prevailing hazards are listed.

Building on the data collected in communities and supplemented by the participants' own recollections of past events, the severity, frequency and impact of hazards and stresses are discussed and tabulated.

Some of the hazards listed may not appear in the historical timeline as they might be "normally" occurring annual small scale stresses, or very infrequent events. Discussions among the participants will determine whether they need to be included in the draft plan or not.

Discussion and analysis of frequency, severity and losses from each event and the reasons for the impacts of hazard event will help participants to understand why planned interventions are needed to reduce their impact and aid recovery. Participants will begin to recognise how their communities can improve their resilience.

The hazards and stresses can be categorised into high, moderate and low impact events on the basis of the losses to life, property, land, livestock, infrastructure and natural resources. The frequency in which such events occur is relevant. For example, an earthquake may cause massive losses, but occur very infrequently. A combination of severity and frequency will determine the importance of a particular hazard with respect to its impact on the affected community.

Suggested indicators:

High frequency hazard: One that has occurred at least twice in 5 years or 3 times in 10 years. The occurrence of the hazard appears to have increased in recent decades.

Medium frequency hazard: One that has occurred 1 to 2 times in the last 5 years or at least twice in the past decade.

Low frequency hazard: Hazards that have occurred only once in the last 10 years or more.

Highly severe hazard: One that has caused severe damage in past events.

Medium severe hazard: One that has caused moderate damage in past events.

Low severe hazard: One that has not created a situation where external support has been sought. The affected family or community has been able to cope and manage using their own capacities and resources.

Community vulnerability to hazards

Each hazard or stress experienced in the past or more recently, may not necessarily have affected every community within the VDC to the same extent. Some communities may have been severely affected while others remained almost untouched. In order to account for this, community or ward ranking of identified hazards and stresses is necessary. Four categories are used to classify the frequency, severity and impacts of past hazards at ward or community level; high, medium, low and negligible. Participants need to understand and agree on this classification. Using information collected at ward and community levels, a matrix can be constructed for each VDC or municipality.

Suggested indicators:

High: The hazard occurs frequently and is extremely damaging. Communities suffer large losses and recovery takes a long time. External support is needed.

Medium: The damage caused by the hazard are less, but still significant. Recovery requires external support.

Low: The hazard causes relatively little damage and the community is able to cope without external support.

Zero: The hazard either did not occur, or if it did, it caused negligible damage.

As plans are made to deal with future events, the participants need to be made aware if and how the circumstances that determine their relationship to a hazard have changed. Factors which may influence future events include development activities such as road or bridge construction, embankment works, population growth, changes in cropping patterns and the impacts of climate change. Future vulnerabilities in the face of such changes need to be taken into consideration. The exposure, sensitivity and resilience of different livelihood strategies and assets to particular hazards and stresses are of particular relevance with respect to future hazardous events. Detailed consideration of the location and number of exposed households, the location of fields and their exposure to flooding and erosion is important.

Table 4.1. Summary of hazard analysis

	Flood		Fire		Cold wave		Hazard N	
	High	Medium	High	Medium	High	Medium	High	Medium
Severity and frequency	1	1	1	1	-	-	-	
Ward level assessment	5	4	-	2	-	1		
Vulnerability assessment	5	-	-	3	-	1		
Total	11	5	1	6	1	2		

The production of a hazard map for each community or ward is a useful resource that brings together this information in an understandable form. The relationship between hazard, exposure, sensitivity and resilience is simply displayed.

Both qualitative and quantitative information is valuable in assessing current and future vulnerabilities. Most of the information will be collected at the community level prior to the planning workshop. Information such as 6,000 people are extremely exposed to flooding in Ward 5, or winter crops in 10 hectares worth XX,000 rupees are vulnerable to drought. Cold waves in Ward 3 contribute to a more detailed picture of the vulnerability of individual communities or wards. The basis for formulating risk reduction plans is the relationship between the hazard, its nature, frequency and impact, and the exposure and sensitivity or resilience of the component or assets of the affected communities. A hazard that impacts negatively on many sectors - such as agriculture, water and health - or assets of a community or particular livelihood strategies indicates a high degree of vulnerability. Qualitative and quantitative information from community and ward assessments is summarised in table 1.

Four categories of hazards, based on destructiveness, frequency of past occurrence and degree of vulnerability are identified. Based on the past occurrence some important hazards such as earthquakes and other low level hazards might have rated zero but may in the future become more frequent or increase in intensity. Low level hazards cannot be ignored. Expert information (for instance climate change predictions) may ultimately need to be taken into consideration, but for the current purposes of developing the VDC disaster management plans, it can be omitted as there are existing hazards more important to deal with.

The remaining hazards need to be prioritised based on their severity and frequency and the vulnerability of the specific ward or community.

Priority ranking should draw information from tables on frequency, severity and current and future exposure (vulnerability) of different assets such as land, crops, livestock, infrastructure and human life analysed separately and categorised into high, medium and low categories. Hazard 1 (flood) has the highest score (11) in the high category and also scored (5) in the medium category. Similarly, hazard 2 (fire) scored second highest score (1 in

high and 6 in medium categories). Although both fire and cold wave have 1 point on high category, fire has greater potential to create disastrous situations as it spreads in more community (wards) and more livelihood elements are affected. This sort of analysis provides an objective view of the disaster risks faced by the people in a vulnerable community and forms the basis for the preparation of the disaster management plan.

Past experience has shown that a plan can be prepared by taking account of the three top-ranked hazards, as these have proven to have the greatest impact on the affected community. However, management of these three hazards should enhance the capacities of the affected communities to manage less significant hazards, and the VDC or DDC can select other hazards that should be in the plan.

Many hazards are seasonal in nature and are most severe at particular times of the year. This particularly applies to weather related hazards such as floods, droughts and cold waves. It is, therefore, useful to prepare a seasonal calendar which identifies when particular hazards most commonly occur.

The calendar indicates that preparedness activities to cope with floods should be completed before the middle of June each year, while awareness activities on fire prevention should start in February. Some disaster events such as earthquakes, outbreak of certain diseases and industrial accidents are unpredictable and, therefore, can not be anticipated.

b) Root causes analysis

Each hazard has different causes behind, both natural and man made. Causes and contributing factors for each prioritised hazard for CBDM plan need to be analysed in detail. It helps to devise strategies and actions to mitigate the factors particularly human factors that contribute to hazard that are being included in the action plan. There are different PRA tools to analyse root causes one of which can be used. The root cause analysis exercise helps understand cause and effect relationships between different factors that ultimately lead to vulnerability of a particular disaster. The supportive information to identify root causes would be available during community level assessments and vulnerability analysis as well.

c) Community and VDC/municipality capacity analysis

Having prioritised the hazards and their root causes analysed, the stakeholders need to asses the capacities of the community and VDC to cope with and manage disasters needs. Again, this is done using the information gathered from the ward assessments, VDC records and the judgment of participants. Some resources essential include early warning systems, boats, life jackets, trained rescue groups, access to different services such as communications and emergency shelter (this is not an exhaustive list). Alternative livelihood options or access to means of maintaining minimum standards of living for the duration of a disaster as well as the means to rebuild livelihoods are essential components of any disaster management plan.

Some of the necessary capacities are institutional, such as trained personnel, access to humanitarian support, health workers, and issues of governance. Others are material inputs such as boats, rescue equipment and emergency food supplies. Community awareness, preparedness and the existence of an evacuation plan (contingency plan) helps to limit losses and save lives. The physical infrastructure such as roads, bridges and embankments play an important part in protecting communities. Participants of the workshop should carry out a detailed analysis, based on the information available from data collection at step

Box 4.1. Negligence to smaller issues may cost high

Generally, smaller issues may be ignored by planners but these play an important role in disaster events, for example, neglecting to extinguish fires after cooking in picnic locations. Raising awareness on the smaller issues might be overlooked by the planners who think they are not important. Some malpractices, such as slash and burn and shifting agriculture practices, might be so firmly embedded in local culture that they are not perceived as hazardous and are consequently overlooked or not disclosed in the planning process. In one example, communities hesitated to disclose their practice of making and selling liquor, which was one of the main contributors to deforestation. Awareness of all the causes, contributing factors and impacts of livelihood strategies in increasing vulnerability is crucial in CBDM planning. People will not give up their traditional practices unless better alternative options for livelihoods are made available. Appropriate policy needs to be coupled with access to technologies that encourage this transformation.

3.2 and additional information they would have, of what assets exist and what capabilities can be enhanced needs to be carried out in order to identify elements for inclusion in the VDC plan.

d) Preparation of disaster management plan of action

After the stakeholders have evaluated in detail the vulnerabilities and capacities of communities, a plan of action is prepared. With particular focus on the prioritised hazards identified in the foregoing phases of the workshop, this takes account of the different measures needed to be taken at each stage of the disaster management cycle. The work plan contains the tasks to be carried out before, during, and after a disaster.

A simple format of a work plan is given below and an example is provided as an annex to this document. Contained in this are columns stating the activities to be carried out in particular locations, agency to take lead role to implement the activity such as community, VDC, and DDC to support if the lead agency would require support, when to implement the activity. An estimated cost is in a corresponding cell to the activity.

3.3.2 Estimate costs of physical infrastructure

The final aspect of disaster management planning is the costing of the physical infrastructures, such as embankments, check dams, access to roads and shelters identified as being necessary to reduce the exposure of some communities. Similarly, EWS, rescue equipment and other more expensive hardware may be identified in the plan. Estimating the cost of these resources should be undertaken by technical personnel from the VDC and DDC in consultation with the relevant communities. This will involve site visits and feasibility studies before costs can be inserted into the plans. As costs are steadily increasing and can change according to context and market prices, the estimation for large scale structures is best undertaken shortly before implementation.

4. Stakeholder consultation and plan verification

The draft plan prepared using the procedures above should include:

- A list of actions to prevent communities from a hazard, including structural and non structural measures
- A procedural plan for communities to follow in the event of a disaster
- A cost estimation for the physical infrastructure needed above
- Certain predictable activities for recovery stages (the losses caused by disaster largely determine the activities and the costs of recovery stage)

The draft plan should be distributed to the participants of the planning workshops in their villages such that each has opportunity to review among community and provide further comments, feedbacks, and additions from the community. VDC can distribute and again collect the document with feedbacks and provide to facilitator for incorporation of feedbacks in the final draft. The plan may be amended to incorporate all the feedback collected.

The draft plan should then be shared with the relevant government and civil society organisations at district level for comment and feedback. A consultation workshop can be held for this purpose. National ministries and relevant departments, such as the Ministries of Home Affairs and Disaster Management and Local Development should be consulted for their inputs. The final plan should incorporate all the relevant comments and feedback accumulated.

5. Approval of plan and implementation

The final plan should be endorsed by the respective VDC or Municipality Council and approved for inclusion in their local development plan. Similarly, the plans of the different VDCs and municipalities within one district should together be endorsed by the DDC Council and approved for inclusion in the District Development Plan. The DRR plans should form part of the Periodic Development Plans of both the relevant VDC/municipality and DDC. As DRR is an essential part of sustainable development, there are different possible roles for outside communities, agencies and stakeholders in the plan. These stakeholders might not have initially been involved in the planning processes, but the plan should be communicated to all concerned stakeholders who might be able to contribute to the implementation of the plan. Coordination among various stakeholders and agencies is crucial for the ultimate implementation of the plan.

Discussion in community and participants preparing CBDM plan

District level stakeholder consultation meeting for VDC level Disaster Management Plan in Nawalparasi District

Chapter

5

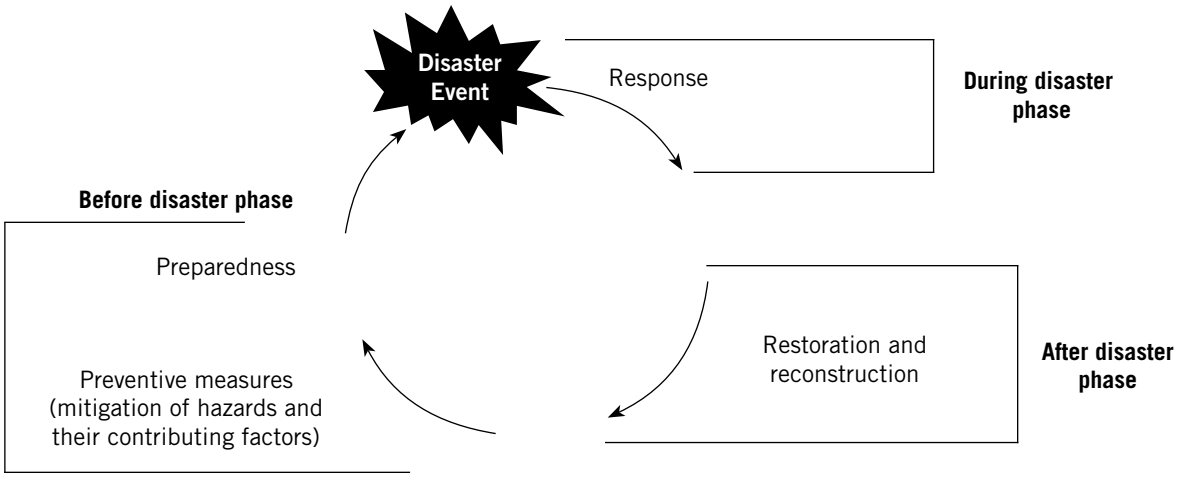
Implementation of CBDM Plans

After the planning stages, the implementation of disaster plans is the initial step to reducing vulnerability to a hazard. Based on the priorities identified in the vulnerability assessment, communities, with support of disaster agencies, work to address the threat and ultimately limit the effect that a potential future disaster would have. Effective disaster management does not wait for a disaster to strike before acting, but starts as early as possible when a particular threat to human life and livelihoods is identified. There are certain actions that are only applicable when or after a hazard event occurs, but, by thoroughly preparing in the pre disaster phase, a community will be ready to implement these measures when required.

The standard model for understanding when and how to act in relation to a hazard is the disaster management cycle, which treats disasters on a timeline divided into the 'pre', 'during' and 'post' disaster stages. The model provides guideline for communities, practitioners, planners and policy makers when and how to devise strategies and activities for particular hazards. The management plan provides DMCs a guideline to decide and implement when and how to take preventive measures and prepare for response and relief measures in the vulnerable communities. As a simple concept, the model can be applied to different types of hazards, but the four stages will appear differently in practice for fast and slow onset hazards. For example, for the latter, the 'during' disaster period will be protracted over a longer period and will not generate the same intensity or urgency as experienced during the first few hours of a flood. Treating disasters as a cycle recognises the continual nature of mitigating disaster risk and draws attention to how each stage is connected to the next. By addressing the whole disaster cycle, communities develop the capacities needed to prepare, act, rebuild and learn, thereby increasing their power over a hazard and boosting their resilience to disasters.

The model also helps to understand disaster management and its close linkage with the development activities by the local planners, community leaders and general community members as DRR and development activities are related - one affecting the other. Integration of development and DRR helps to reduce disaster risk while isolation increases the problem or lessens the outputs of inputs and investments. Local governments or disaster management bodies would be better to take leadership on formulation and implementation of disaster management plans. Local governments or DMC can plan activities in different stages based on the hazard calendar identified during CBDM planning. For example, the hazard reduction and preparedness activities before the probable month of hazards, response during hazard event and recovery and reviving activities after hazard event is over. It becomes almost year round intervention where there are more than one hazard arising at different period in a year. The usual development practices runs together with DRR activities throughout the year. Therefore, disaster management plans should be integrated to development plans, in other words, DRR and development should be integrated to each other.

Figure 5.1. Disaster management cycle



1. Pre disaster phase

Preparation before a hazard is the most crucial opportunity for drastically reducing the effect and impact of a hazard. By preparing for a disaster, communities are proactive in addressing the threat and disaster agencies are not limited to reacting to an event. Both are working together to protect the lives, livelihoods and property, and, when a hazard occurs, the efforts in the pre disaster stage will help the next two stages to be carried out more efficiently. The actions required prior to a disaster can be split into two strategies, mitigation and preparedness.

Hazard mitigation

Activities undertaken to reduce the impact of hazards are an integral part of community plans. These range from the building of barriers which protect communities from the physical aspect of a hazard, such as the construction of flood proof housing, to training in alternative, more resilient livelihood strategies and linkages made with support networks. Where possible, efforts are made to address the root causes of vulnerability. Mitigation involves both short term and long term activities in different sectors for long durations. For example, raising awareness and understanding the hazards and their root causes are continuous activities lasting for longer period of time. Establishment of institutions, policy and governance mechanism have long reaching impacts on disaster mitigation. While construction of flood barrier can be considered as short term mitigation measure, conservation of watersheds is a long term mitigation measure for rainfall induced flash flood. Overall objective of mitigation in disaster management is to reduce the magnitude of hazard, exposure and sensitivity to hazard and increase coping capacity of the community and their assets. The objective is seldom achieved in full as hazards are part of dynamic natural and socio economic processes. So, certain degree of vulnerability is anticipated even after successful implementation of mitigation measures. Preparedness activities are necessary for risk management and to reduce losses if the hazards occur.

Preparedness

Preparedness is getting ready for a hazard and being able to act when one occurs. Preparation begins at the planning stage where, as explained in the last chapter, village level disaster management committees are helped to develop plans based on a community's context. The type of measures required depends upon the nature of the hazard and the existing capacities of the community. The components such as establishing early warning

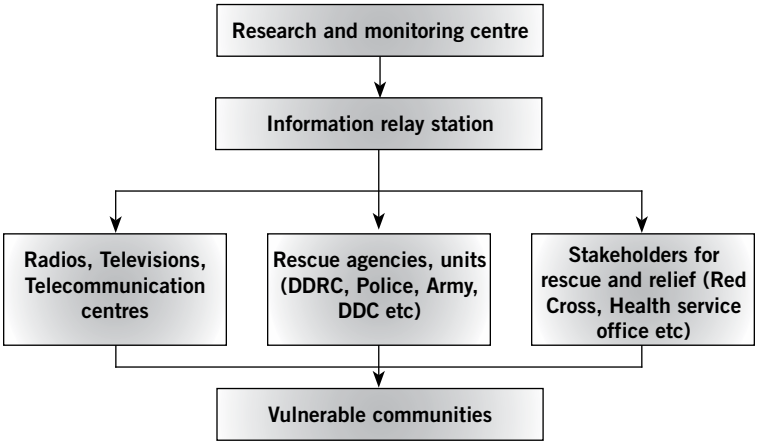
systems, plotting and rehearsing evacuation procedures, participating in training to deal with the aftermath of disasters (search, rescue and first aid courses) and stockpiling emergency supplies could be included. Even relatively simple measures, such as storing belongings and important documents (land registration certificate, citizenship, ration card, passport) in safer places, are useful practices that can help prepare for disasters.

Installing effective and well connected communication channels plays a vital role in early warning systems (EWS). As widely available tools; telephones - mobile or landline, radios, sirens, television broadcasts, and hand mikes can be used to disseminate information about a hazard. Multiple communication channels help disseminate warning signs to a wider community and lower the risk of disrupted service. Ensuring the authenticity and reliability of information is important for the effectiveness of the EWS. If people find that a hazard scenario differs from the information received, it may be too late to take any action and the message could not be relied upon in the future which undermines the usefulness of the EWS. Hence, setting up a system which guarantees regular and accurate updates is essential.

Figure 5.2 an ideal early warning system and figure 5.3 at end of this chapter reveals the EWS mechanism set up in the downstream of Narayani River in Nawalparasi District based on telephone and radio communication. Within vulnerable community, mix of telephones, hand mikes, sirens and other indigenous means of quick communication can be utilised.

Providing training for rescue, storage of emergency goods, medicine, construction or maintenance of emergency shelters are some examples of preparedness for particular hazards. The overall objective of activities at the preparedness level is to be prepared to defend or respond better to the anticipated hazard.

Figure 5.2. Early Warning System for disaster risk management



2. During disaster phase

In the event of a fast onset disaster, the situation is likely to be chaotic where people are shocked and confused. The task at this stage is primarily to safeguard human life. Rescue and relief measures involve searching for lost people, treating those injured, arranging temporary shelter and food and clothes. The response measures laid out in the planning stage are now implemented and should establish some order and coherence. In a well planned response, specific people will take up pre determined roles, such as communication team of DMC may inform vulnerable communities, rescue teams, volunteers, supporting agencies and so forth. Within the community, alarm raisers will blow sirens and announce the situation through hand mikes or best appropriate means available. Life boat operators will organise rescue operations, shelter managers will manage temporary shelters and first aid personnel will start treating the injured. Overall management of the rescue and relief activities should be led and coordinated by the DMC through different sub committees and task forces as necessary. These sub committees/ taskforces should be well prepared in advance during preparedness phase with sufficient understanding of their roles and adequate skills to execute their roles.

The procedures organised for rescue and escape should coordinate the effort and utilising communication channels will ensure that the response is based on relevant information and the community is able to draw on external support.

As identified in the initial vulnerability assessment, some groups within a community are at a greater threat from a hazard due to age, physique and health conditions and these issues must be considered while carrying out rescue operations. The rescue mission may be led by the prioritisation of particular groups and specific equipment may need to be mobilised. The special requirements for particular groups such as pregnant, handicapped, children and old age should be taken into account while carrying out rescue and relief operations. There may be people who have lost their family members in the disaster and may need special counselling services. Social, cultural and psychological issues should be considered to respect the local context. Awareness and skills of rescue and relief crew for all these operations should be raised during preparedness stage.

The security of the area is an important concern during a disaster and the disruption, particularly to the physical surroundings, can cause and provoke the emergence of other hazards, such as the spread of fire, diseases, or structural collapse. Some disasters may have a second wave of hazards such as earthquake may generate fire due to short circuits, floods may be followed by diarrhoea, or social conflicts and looting due to unfavourable situation. Good preparation may allow actions to be taken to minimise the extent of a hazard and further losses - hazard suppression, such as extinguishing fire, can be carried out if possible.

Precautionary actions on health, security, communication, and maintaining law and order are essential. Coordinated actions on these issues prevent tailored hazards due to main hazard; help prevent additional losses. Generally, responsibility of maintaining security, law and order are taken over by police. Local communities, volunteers and DMC should help and cooperate with the police to fulfil their responsibilities. A taskforce should be active in the disaster affected site for primary treatment; based on the severity of injuries patients should be referred to hospitals for further treatment. Availability of ambulances, fire extinguishers, water purification tool kit and proper sanitation facilities

should be ensured as precautionary actions to prevent secondary hazards and losses.

Ideally a community should be adequately equipped to respond to a disaster, yet some certain types and magnitudes of hazard will inevitably be out of the capacity of a community to face using only their immediate resources – a strong earthquake, for instance, will require heavy machinery for rescue particularly at reconstruction stage. To overcome this, communities will call upon the relevant external support, such as the emergency services, and through the connections made in the pre disaster stage. The Sphere Project has developed different norms and standards for this stage known as the 'humanitarian charter and minimum standards on disaster response' (2004). Ideally governments and other rescue and relief agencies are responsible to maintain these standards but it depends on the government's capacity to do so. If the disaster is beyond the capacity and preparedness of the agencies or capacity of the agencies, these standards cannot be met. In such situation, efforts to achieve optimum standards, stakeholders should understand the situation and accordingly cooperate with the agencies.

DMC should meet time to time, preferably day to day, to review the situation, rescue and relief process and activities, and devise appropriate strategies and actions on the ground. Other stakeholders may be invited as necessary who can advice DMC and help on rescue and relief. DMC and other stakeholders frequently review the day's work and plan for the time ahead.

Another important task is to make detail inventory of loss, affected population and potential impacts, document them and submit to authorities. Detail database of the situation, losses and the rescue and relief operations and their outcomes should be documented on a day to day basis and communicated to the authorities. On the ground, VDC/DMC should take lead in collaboration with security agencies. VDC/DMC should report to district disaster rescue committee (DDRC) and DDRC further reports to central agencies. This helps agencies and stakeholders to monitor the losses, situation and plan for immediate reinforcement to enhance rescue and relief actions. This is equally important for recovery stage. The inventory of losses and impacts is also helpful for mitigation and preparedness activities in the future.

Many hazards are slow onset such as drought compared to flood, fire and earthquake. In the case of slow onset hazards both pre and during disaster stage activities may go side by side. Activities include mitigating hazard where possible, reducing sensitivity to hazard such as supply of water, reducing risk of fire, disease epidemics and famine. Similarly, rescuing worst affected families and their assets come together as rescue and relief operations. Generally slow onset hazards last for longer. So, long term preparations and coping mechanisms are necessary.

3. Post disaster

Once the community's immediate needs are addressed, the focus in the post disaster stage is on returning to normal. Reconstructing infrastructure, replacing lost assets, rebuilding homes and resuming livelihoods are actions for recovery. However, while returning to life after disaster conditions must be improved to avoid same kind of vulnerability during or after a disaster. Care must be taken not to replicate the existing causes of vulnerability or even worsen them. However, the post disaster stage is an opportunity to increase resilience to hazards.

As disaster management is conceived as a cycle, the recovery stage is not the end point and actions taken in this stage should contribute to the mitigation of future hazards.

Reconstruction

Most recovery programmes invest in large scale infrastructure such as road networks and essential services. Frequently, external contractors are employed to carry out the work as swiftly as possible often under the direction of external funding agencies. These top down interventions pay scant regard to local needs and cultural sensitivities and often result in the construction of unsuitable housing and infrastructure which do little to reduce the future vulnerability of affected communities.

The **building back better** principle for reconstruction aims to improve the situation communities experienced prior to a disaster. As with all stages of a CBDM approach, it is led by the active participation of communities in both the planning and implementation of reconstruction. Communities receive training to rebuild houses and these skills can consequently be used as another livelihood option. Where implemented, this approach has been found to be more efficient, quicker and sustainable than the usual centralised 'top-down' delivery mechanisms adopted by many agencies.

Learning for future

To develop better methods of dealing with disasters and to further reduce vulnerability to hazards, it is important that both communities and disaster agencies learn from each event. In many areas hazards are recurring phenomena so collating the experiences and looking for areas that need improvement feeds into the preparation for the next event.

The process of 'learning from past events' not to repeat the same mistakes again is facilitated at different level. At the community level, communities could discuss on how things were prevented or how and why there were greater losses. They could discuss on how the situation could be mitigated or better managed in future if it occurred. Similarly, community can assess their capacity to cope with particular disaster and review their disaster management plan based on the experiences and learning. At the local government level similar questions should be an agenda for review. Additional issue would be the evaluation of 'skills and capacity' of DMC or VDC to lead and coordinate mitigation, preparedness, rescue and relief activities. Future strategies can be devised based on the lessons where low capacity and skill areas should be in focus in future while maintaining good practices and achievements. The review should take place at district, province and national level. Such reviews provide guidance for future course of disaster management.

There are many lessons that a community and stakeholders can learn from their response to a disaster:

- How well were procedures followed and coordination between different task groups maintained? What are the gaps to be fulfilled in future?
- Did the communications systems work, why and how can they be made effective in future?
- Which infrastructure not strong enough, why?
- How promptly was information acted on?
- Was the information supplied accurate?
- How fast did the emergency services respond?

The whole management cycle should be reviewed in addition to 'during disaster' stage. It helps to understand dynamisms of hazards, vulnerabilities and capacities:

- Was the community sufficiently prepared?
- Was there any aspect that could have been foreseen and over looked?
- Were there any groups that were more affected; reason for that?

- Would any physical protection have helped prevent a disaster?
- Could the community have benefited from networks' support?
- How well did livelihoods withstand the hazard, what worked and what did not?
- How long did it take to recover?
- Has vulnerability increased due to the hazard? If yes, how?
- What changes or improvements are necessary in the existing mechanisms and practices?

The learning should be shared during community meetings where DMC/VDC and other stakeholders can review their own effectiveness to cope with such situations. Feed backs to each other can be shared through joint meetings, workshops and networks. Learning by the community and VDC/DMC can be fed into the CBDM plan and later implemented. District and national level stakeholders can be fed into future strategies and policies. Other agencies and NGOs involved should also review the process and outputs of the operations at different stage. The limitations can be fed into on going works as well. Implementation of lesson learned and not to repeat the same mistakes strategy should be fed back in to the next preparation stage by all concerned at different level.

Specific hazards based measures landslides and floods

Floods and landslides can be mitigated to some extent through conservation measures in the watersheds. However, it is a long term objective

Box 5.1. Disaster management activities at different phases

Pre disaster
- Set up institutions, governance and functioning mechanisms.
- Update past disaster events and analyse reasons and root causes for the disaster
- Assess hazards, exposure, sensitivity, coping capacity and vulnerability to different disasters
- Review human resources, equipments, fund and other resource situation available and required
- Plan mitigation activities for short and longer terms to reduce underlying risks for individual hazards such as check dams, spurs, bridges, water supply, fire prevention measures
- Plan preparedness, rescue and relief activities, and the resources and technologies needed
- Raise awareness and train volunteers, communities and planners in the required skills and capacities
- Prepare relief materials, emergency shelters, rescue tools and equipments and operating mechanism
- Establish early warning systems and communication mechanisms that reach vulnerable communities
- Organise preparedness meetings, orientations, and rehearsal exercises for rescue and relief
- Start contingency planning

During disaster
- Inform vulnerable communities; mobilise volunteers and activate communication channel to inform as much as relevant stakeholders
- Search and rescue, bring affected to shelter, organise treatments
- Mobilise health workers, maintain security, distribute relief materials, provide counselling
- Manage dead bodies (handing over to the relatives, cremation), document losses
- Survey and assess situation of needs, supplies and manage resources to fulfil gaps
- Manage temporary shelter (includes ensuring clean and accessible water and sanitation)
- Review situation and effectiveness of rescue and relief operation
- Keep record of lives lost during each operation and their effectiveness for future review

Post disaster
- Survey in detail the losses, causes and future impacts, review pre and during disaster activities
- Health and livelihood support to disaster victims
- Resettlement and restoration of livelihoods of affected families
- Reconstruct physical infrastructures like schools, bridges, culverts, irrigation channels and roads
- Provision of subsidies and allowances for victims such as ration, low interest credit, tax discount
- Review of disaster management plans, strategies and policies where necessary
- Mitigation and preparedness activities for likely future disasters

and is affected by various issues and trends. Constructional measures such as strengthening embankments and dams that can reduce the sensitivity to the floods to some scale. During flood disaster, search and rescue of people and their belongings buried or washed away is the focus of immediate action. Well trained human resources and equipment, coordinated efforts and timely actions are necessary. There can be mechanised equipments where available; otherwise simple tools such as spade, shovel, ropes can be used at the community level. Search and rescue during flood requires boats, ropes, life jackets, trained human resources for swimming as specific requirement.

Other search and rescue activities can be similar to other disaster events. Vulnerable communities, respective government agencies and stakeholders should have preparedness plans ready in advance which can be applied during a disaster.

During the rescue stage, priority is given to saving lives and assets second to the possible extent. As some people within a community have specific vulnerability to a hazard, the specific issues and needs of affected people of different age, physique and health conditions should be considered while carrying out rescue operations.

Floods and landslides can bring to other hazards such as communicable diseases (diarrhoea, cholera), famine and disruptions. Preventive and preparedness measures such as maintaining hygiene, security and sufficient supply of food and logistic materials are important to prevent further losses.

Earthquakes

Earthquakes are the most sudden disaster with the strongest potential to cause severe damage, particularly to infrastructure. The aftermath can create widespread disruption and lead to other hazards such as fire, landslides, and floods.

There is nothing that can be done to prevent an earthquake from occurring or to reduce its magnitude, but following building codes in all construction area is a key measure for preventing the associated loss and damage. Communities can prepare for the response and recovery stage. The immediate response to an earthquake prioritises the search and rescue of people, and suppressing fires to avoid the potential of further disaster. Planning for the rescue response needs to take into consideration the likely collapse of buildings and the threats caused by the surroundings. The reconstruction stage is the opportunity to make property and infrastructure earthquake resilient, but prior to this the cleaning of debris will be the main focus. Other rescue and relief operations are similar provided that the infrastructures for shelter are not damaged. Temporary arrangement of tented camps may require. Earthquakes when occurred in the form of a disaster affect larger geographic areas making rescue difficult. National and international collaborations are required in such consequences.

Drought

Drought is a creeping hazard and takes longer to reach its full severity. If a region receives less than its average precipitation, generally 250 mm rainfall equivalent in a year than it is generally classified as drought conditions. This level of rainfall or below creates stress on water resources with negative implications for human lives and ecosystems in that affected area. The water stress situation is created by the increased demand of water with the increased population and lack of proper management of water resources that cannot be regarded to drought.

Because the lower parts of Nepal are in the drainage basin to the Himalayas, they can experience both floods and droughts in different seasons. However, despite some examples of drying of springs for drinking water the effect

of drought is solely due to the lack of water for irrigation purposes.

Prevention of drought is almost impossible. Preparedness strategies can be possible for low scale and short duration droughts. In many parts of the world drought is a seasonal phenomena for which communities have developed approaches and practices to cope with the situations such as enhanced storage facility, recycling of waste water and seasonal migration. Improving access to water resources, efficient irrigation technologies - such as drip irrigation, drought tolerant or less water demanding variety crops or livestock are some options. However, it takes a long time for a community to gain the capacity to change all these practices.

Disease pandemics

Disease may have multiple causes in both hazard and vulnerable sides. It varies in scale from the personal to global. Viral and bacterial diseases have the potential to spread fast and affect large areas of population. All the preventive, preparedness and remedial measures should and can go side by side or together in practice in the case of disease pandemics.

Vaccinations have been widely applied immunising people from the effects and preventing a pandemic. Awareness on various measures required preventing spread of the disease, storage and supply of sufficient medicine, effective surveillance, arrangement of easy and timely access to medical treatment are some important issues to be considered in practice as preparedness. Exposure to the disease source and susceptibility (or immunity) of the victim to a particular disease factor decide on the risk of disease. There are different guidelines for particular disease. However, maintaining hygiene, keeping away from the source such as minimising travels and meetings, reducing interaction, using masks and globes are preventive or preparedness measures. There are specific characteristics of diseases and pandemic situations that can be acquired from medical or public health sector services.

At the community level there are a number of factors that provide breeding ground for disease factors and vectors. Hygiene (drainage, sewerage system, nutrition, waste disposal systems) at personal, household and community level can have implications on the disease outbreaks.

Wind storms

There are EWS available at the regional level. Establishing access to the information available at the weather stations for vulnerable communities is crucial in preparedness and prevention of losses. The strength of the storm, possible affected areas, duration and measures to be taken should be informed to the vulnerable population. Preparedness for rescue and relief operations are similar to flood and earthquake. Dry winds can fan fire. Therefore, precaution to prevent associated disasters is necessary such as switching off electricity, suppression of fire and escaping to safer places.

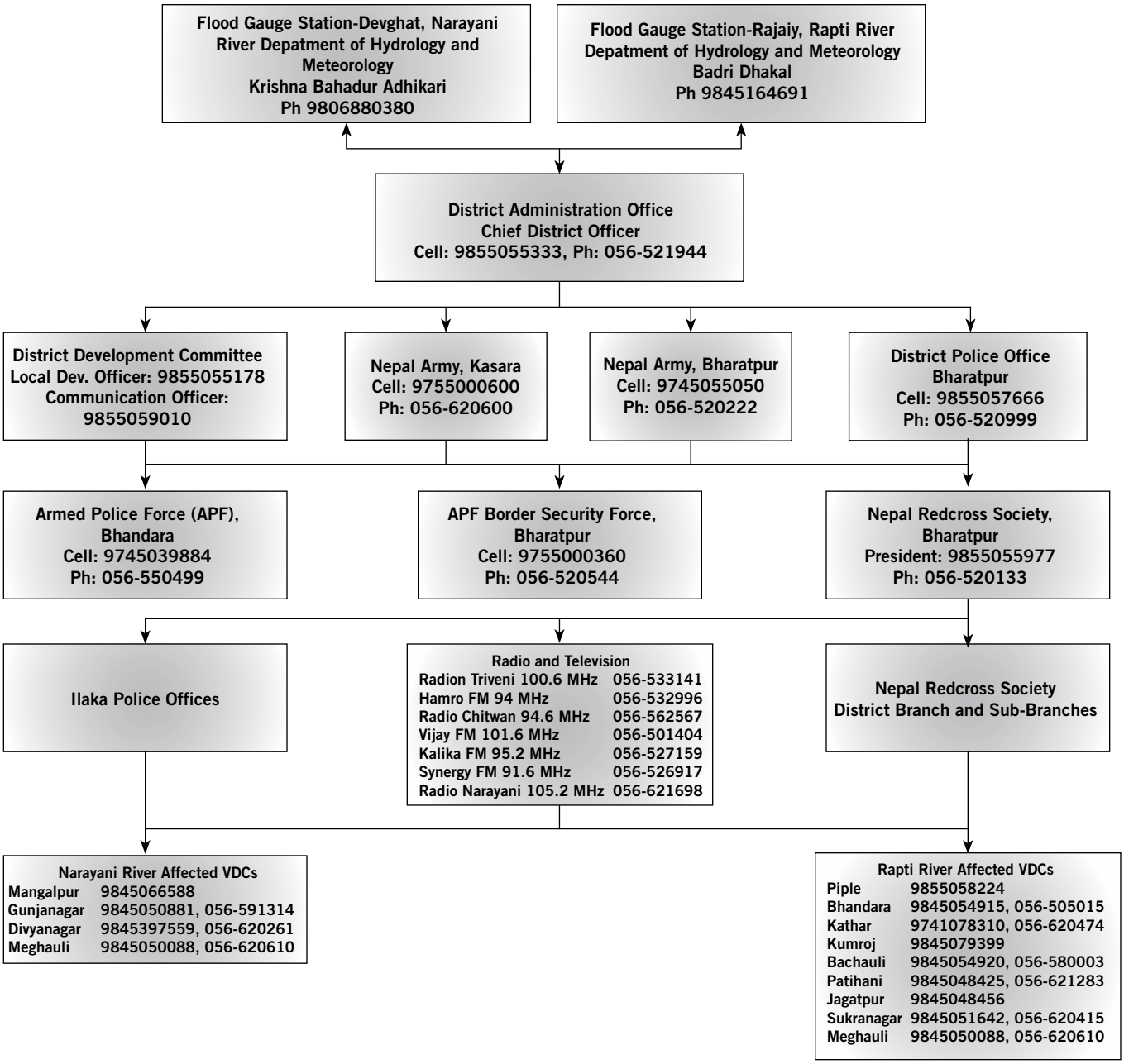
Storms are seasonal phenomena. They have been more unpredictable in recent years due to the impact of global warming and are likely to be more severe and unpredictable in the future. Populations in the coastal areas, islands, deltas, plains and windward sides are more vulnerable to different storms. Storms are given different names in different places and are categorised based on their damaging strengths.

Shelter belts (row of stronger trees around the agriculture field) can provide defence to certain storm stress. Appropriate orientation of building can withstand wind storms such as corner part of the building faced to windward side.

Table 5.2. Scope of management measures of different hazards

Hazards	Description	Preparation	Mitigation	During disaster	Post disaster
Landslides and floods	Movement of landmass, water in excess mostly with debris	early warning, Structural and non structural measures to reduce sensitivity	Both structural and non structural measures	Rescue and relief, prevention to secondary hazards.	Rehabilitation, reconstruction, recovery of livelihoods
Drought	Lack of water for plants and animals	water storage where possible	Alternate sources of water where possible	Protecting lives and crops	Recovering livelihoods
Earthquake	Shaking of earth surface due to seismic forces	Building earthquake resilient infrastructures	There is nothing that can be done to prevent an earthquake from occurring or to reduce its magnitude	Search and rescue Putting out fires	Rehabilitating displaced people Reconstruction of better building and infrastructure to withstand higher magnitude earthquakes in the future
Disease pandemics	Outbreak of disease affecting larger population at a time	• The preventive, preparedness and remedial measures can and should go side by side or together in practice • Awareness of general hygiene • Vaccination programmes • Surveillances and treatments • Prevention to spreading out of diseases			
Wind storms	Strong blow of wind damaging assets	EWS available at the regional level		Preventive measures to fire	Rehabilitation and reconstruction

Figure 5.3. Flood early warning and rescue communication system Narayani and Rapti River, Chitwan District



Chapter

6

Integrating DRR and Development into Policy and Practice

Given the scale and prevalence of hazards in Nepal and the poverty associated, there is only so much that disaster and development organisations can do to address widespread vulnerability by working on specific hazards at the community level. I/NGOs may be constrained by location, financial factors or capacity limitations. At the same time I/NGOs are not the only agencies responsible for disaster preparedness. Disaster management needs to be prioritised on a national and international level and, therefore, governments must produce and, more importantly, implement disaster planning that treat the problem holistically. If used effectively and with careful consideration of the most vulnerable, the policies, institutions and codes of practice used in national planning should be able to reduce on a national scale the losses associated with disasters.

The challenge for disaster and development organisations is to ensure that the institutions and policies at the higher level work in favour of the community - often the most forgotten in disaster and development plans (this being a contributor to their vulnerability) - by responding to the local situation, vulnerabilities and capacities. There are many international, regional and national policies which set out guidelines for disaster management and development such as the Sphere Project, the Hyogo Framework for Action (HFA), and the Millennium Development Goals. Of these, certain policies at least acknowledge the importance of community within disaster management, whilst their implementation may differ, for various reasons from the principles. This chapter charts the importance of national level planning for disaster risk and the processes that can be followed to obtain high level actions to reflect the local level needs within Nepal.

1. The need for national level planning

Reaching all areas

If disaster resilience is to reach the scale at which it is needed, particularly within a country as hazard prone and diverse as Nepal, co-ordination and finance must come from the national level. Disaster policies and institutions can provide oversight to ensure that all regions are included in development planning, and, by understanding the country's wide hazards scenario, it becomes possible to prioritise and target the most vulnerable areas, communities and groups. A geographic map of the hazards can assess the implications of different regions and areas. Knowing that different regions have consequences for others, such as upstream farming practises contributes to downstream flooding, government may tackle this problem by implementing training or creating laws to stop the damaging practises.

Currently Nepal's disaster preparedness provision does not cover all geographic areas. The National Action Plan for Disaster Management 1996 has only produced plans for five of Nepal's seventy five districts, and only Chitwan District has been formally launched by the Nepal Government (ICIMOD, 2007). Whilst some districts, such as Chitwan and Nawalparasi, have formulated and implemented disaster management plans for vulnerable VDCs with assistance from different I/NGOs some of highest risk areas of Nepal lack detail assessment of vulnerability, hindering the ability to adequately prepare for a threat.

Holistic view of disaster issues

National planning has the potential to provide an oversight of the whole disaster problem. Supported with detail identification and analysis of causes and effects of particular hazards, thorough planning helps us understand the range of issues related to disasters, how they interlink,

and the best ways to deal with. The national level is the ideal place to link together and address the socio economic contributors to disasters, the natural factors, and even the global aspects that may influence a disaster. National level plans may consider the smaller but more frequent threats to communities and also has an important role to play in taking into consideration emergent threats, particularly those posed by climate change.

Integrating development and disaster plans

A most crucial connection to be realised at the national level is the relationship between poverty and disasters, and this should inform national level planning for both DRR and development aspirations. The link should hopefully convince governments to create policies and institutions that address the needs of the poorest and, by doing so, lower the impact of a disaster. National strategies that are aware of the environmental aspects of hazard creation and livelihood practise should be more sensitive to implications that future development, such as infrastructure construction, population settlement and natural resource use will have on the likelihood of disasters. Achieving this acknowledgement would be a major step to altering the underlying causes that contribute to vulnerability.

There should be an obligatory mechanism to integrate DRR initiatives in development plans at all levels. When the government leads in implementing and facilitating integration of development and DRR plans, there is less chance of duplication and gap of activities. More importantly, national policy can create an environment of synergy where different stakeholders put their efforts jointly on development and protect development outcomes from natural and man made hazards.

Better support

An overview of the whole problem helps to create efficiency in disaster support. By recognising the scale of the problems and its effect for areas such as the economy, governments might be convinced to increase the support for disaster management. Support can become systematic and more methodically applied by prioritising the highest risk areas and making better use of the relevant ministries and government resources. A government's access to populations, for example, and its use of communication channels could be effectively used for raising awareness. Local governments can channel government and external funding into the areas of greatest vulnerability. At present, resources are invested sporadically within Nepal, but, if these can be systematised at the national level, greater outputs can be achieved with more efficient use of available resources, and synergy created between the actions of the government, civil society organisations and communities.

Providing stability during disasters

When a disaster occurs, national policies and procedures provide a framework for operations which can add clarity to an otherwise situation of chaos. Whilst widespread physical damage may have occurred and confusion may be rife, having guidelines to follow can provide a degree of stability that stops the situation becoming worse and speeds a recovery.

Widen the focus from post disaster work

However, there is a greater need for national planning that fully considers the risk of disaster as part of an ongoing situation and, therefore, focuses on preparedness and mitigation for a disaster. If national planning follows all the aspects mentioned in its policies institutions will be able to address the whole disaster

cycle, rather than merely focus on responding to individual disaster events and post disaster work, which is a current limitation on reducing disaster risk and impact within Nepal at present. The lack of sufficient disaster management plans for the majority of districts means many District Disaster Relief Committees typically focus only on the post disaster work, and is a problem characteristic of a general lack of recognition to the importance of preventive measures, community based approaches and integrating development with DRR (ICIMOD 2007). The need for these approaches is realised by individuals at the district and national policy level for planned initiatives for DRR, yet this needs to be translated into the institutional level.

However, whilst forming better national planning it is important that the plans are implemented, put into operation, and adhered to if the plans are to be effective. Integrated disaster and development plans need to be relevant to the community level in order to ensure those with the greatest needs are helped and that the policies are not instigated top down measures that increase vulnerability.

2. National and international policies looking to the local

There are policies already in place that acknowledge the importance of the community level contribution in disaster management. Certain international policies and strategies such as HFA recognise the role of local level actions in reducing disaster risks and suggest the institutional arrangements that could help enable this action (UNISDR, 2005). In many countries particularly those of South Asia like Nepal, Bangladesh and India appropriate national policies and strategies recognise community level actions on DRR and include provisions for the integration of local disaster management plans into development planning. Appropriate institutions and resources are in existence and ready to be utilised right down to local levels (GOB, 1999; GOI, 2005; GON, 1990; GON, nd).

HFA

The HFA (2005-2015) was set up by the UN for 'the substantial reduction of disaster losses, in lives and in social, economic and environmental assets of communities and countries'. It prioritises DRR at local and national level and the establishment of strong and functional institutions to manage disasters UNISDR, 2005). The action plan explicitly identifies the assessment of disaster risks, early warning systems, enhancement of community resilience capacity, reduction of hazards and risks, and preparedness strategies and activities at all levels.

The HFA sets out three strategic goals for DRR action:

- The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction;
- The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards;
- The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.

Within these goals, 5 prioritised actions are identified for achieving the objectives.

- Ensure that DRR is a national and a 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 risks factors
- Strengthen disaster preparedness for effective response at all levels

Each priority action should incorporate four key issues such as multi hazard approach, gender perspective and cultural diversity, community and vulnerable constituencies and technology transfer. Priority actions provide outlines to formulate national strategies.

Within Nepal, the national strategy for disaster risk management was endorsed by the government in 2009 and aims to synchronise national actions with the HFA. Government as signatory to the HFA has to comply with and has to report to UN on the implementation progress of HFA in the country. However, the priority actions of the strategy are yet to be fully adopted into practice at the district and VDC level with an adequate functioning mechanism.

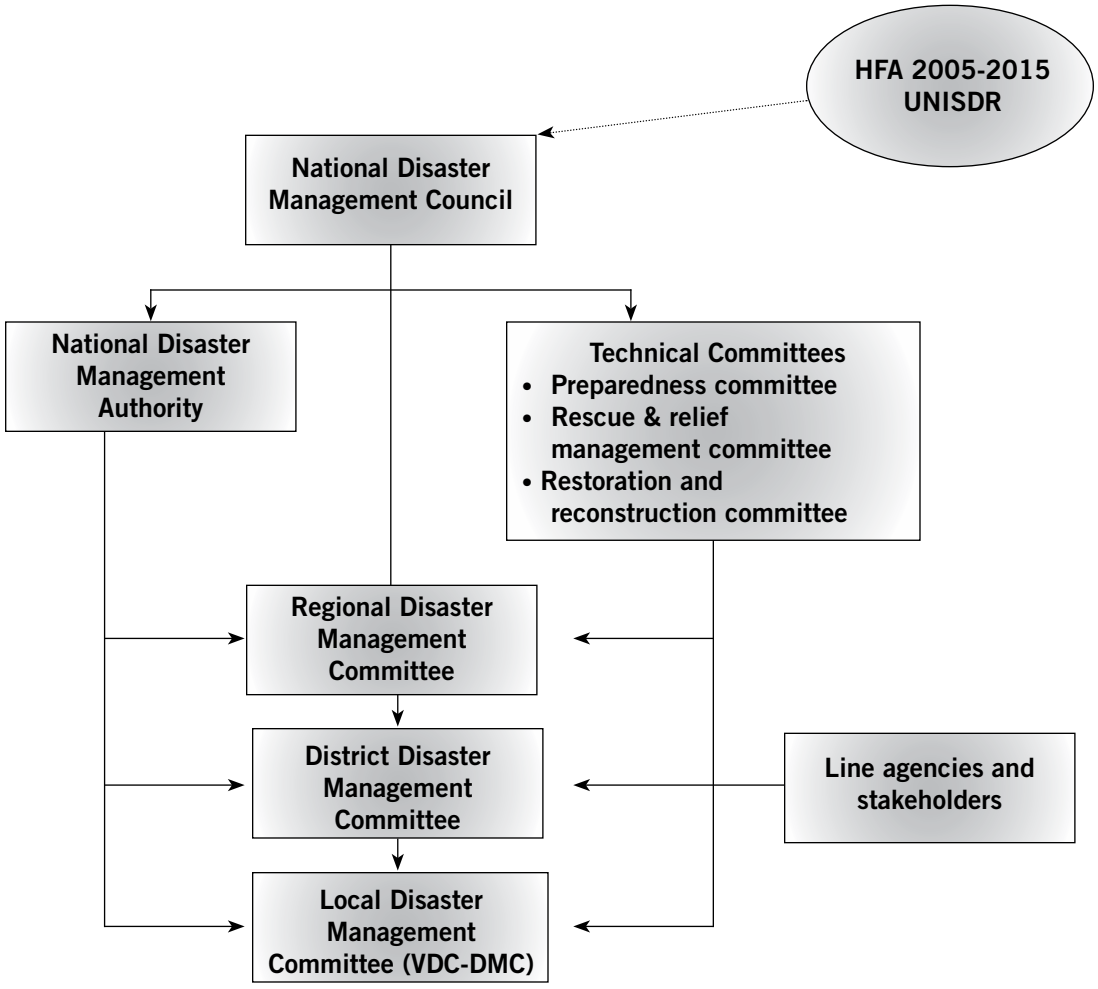
Nepal's national planning

Since the Disaster (Relief) Act of 1983, Nepal has had policies and institutions to respond to disasters. DRR was first discussed in 10th national plan in 2002. Then sectoral strategies such as water resources strategy (2002), national water plan (2005) and water induced disaster management policy (2006) were formulated. Building codes to earthquake hazards were enforced in 2003. A National Disaster Rescue Committee was set up under the Chairmanship of the Prime Minister which includes most Ministries and Departments. Ministry of Home Affairs acts as secretariat to the committee while other ministry and departments are members. The committee draws upon their support in different sector according to their scope of work. Similarly, District Disaster Rescue Committees, under the Chairmanship of the Chief District Officer were set up including almost all government agencies in the district as well as representation from civil society organisations. DDC acts as secretariat to the committee and others are members. Local Development Officer in the DDC is a member secretary of the committee. These institutions coordinate rescue and relief activities throughout the country. However, as their role is not proactive, but limited to response, they are widely regarded as ineffective, and the act has undergone a series of amendment.

The Disaster (Rescue) Act of Nepal (1983), including its subsequent revisions, has highlighted the planned implementation of disaster management at district and national levels. In addition, the Local Governance Act of 1998 recognises the indispensable roles of local bodies, such as VDCs, municipalities and DDCs in disaster management. The new draft "Disaster Management Act" (drafted in 2008), which will supersede the 1983 Act, recognises the importance of preparedness and includes provision for the integration of disaster management plans into development planning with adequate institutions and resources right down to local levels.

In some districts where disaster events are experienced more frequently, community level actions have been initiated with support from donors and I/NGOs. In traditional manner DDRCs organise preparedness meetings for flood in the district only after getting support from donors and I/NGOs. Some DDCs frequently experiencing flood hazards in the district have started to allocate budgetary resources to the DRR activities.

Figure 6.1. Disaster and development institutions at the local level within Nepal



Source: NSRDM, 2009

Initiatives have reached up to VDC level as well. For example, Chitwan and Nawalparasi Districts have set up DMCs for the specific purpose of DRR activities in more vulnerable VDCs to different hazards and disasters following the endorsement of their disaster management plans, and allocated resources for the fulfilment of the plans. These efforts, though slower in pace, can be regarded as the start of putting policy and strategy into practice. It is expected that the promulgation of the new act and regulations will speed up the implementation of strategies and plans nationwide in the field as it will be legally mandatory for officers to prepare and implement such plans.

The provisions of these policies and their acknowledgement of the local level provide opportunities to integrate the concerns of the community in to the national level disaster planning, and by doing so achieve disaster reduction and poverty alleviation assistance that is appropriate to their situation.

3. Building up from the community level - using the local development plans

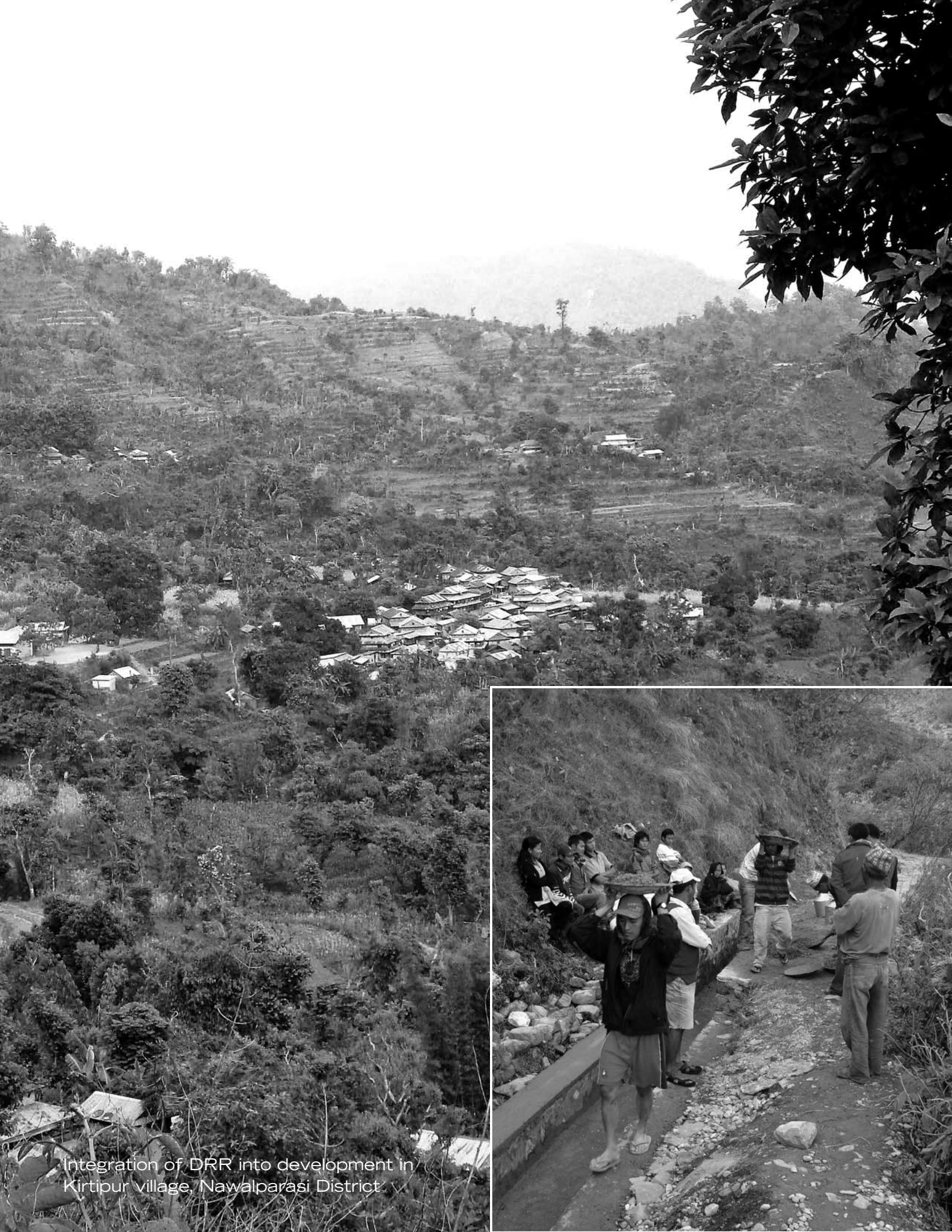
The development of disaster management plans at the community level is an ideal tool to use when linking the local level interests with the national. The participatory nature of vulnerability and capacity assessments means that the community's interests and situations are captured in the plan and can be represented at a higher level. With these in existence it becomes easier to resist the top down measures that could be inappropriate for the community. The integration of these plans into the periodic development plans of VDCs and municipalities is the first step of formality for the plans and a chance to recognise community issues.

The next step is to incorporate the local plans in district and national level development plans to provide bottom up linkages with planning and implementation. Though planned locally, there are certain activities such as building embankments in rivers like Narayani, setting up of EWS nationwide and linking them with vulnerable communities, conservation of lager watersheds which extends to more than one VDC, construction of link/access roads which cannot be achieved without district/ national level or financial support. Creating the links is also beneficial for national planning. The priority areas at the local level requiring support have already been identified and prioritised making it easier for higher level agencies to provide support.

Within Nepal, there is already a bottom up approach for development planning that runs from the VDCs up to the national level, with 14 formal stages between the two in which projects are scrutinised annually. This process should be used to incorporate activities to integrate the DRR plans, as has been initiated to practice in Chitwan and Nawalparasi. The VDCs and DDCs are the key actors at the local level and have a remit for DRR work to be included in their development plans. The VDCs and, below them, the DMCs should be able to include prioritised activities of disaster management plan into annual plans of VDC, and the DDCs should do the same to ensure that they are included in the national planning processes. In short, development and DRR should be integrated from the early planning phase.

The Ministries for Home Affairs, Local Development, and the Department of Water induced disaster are key actors that contribute in the DRR by enabling local and national stakeholders to implement national and local level disaster management strategies and plans. The other ministries and their district level offices such as health, agriculture and forestry can contribute in the respected sector. VDCs and DDCs should have commitment and capacity to facilitate integration of plans through different agencies.

The incorporation of local DRR planning process and plans into the national planning process will result into the reduction of vulnerability and increased resilience of the community. This process also requires enhanced capacity of the stakeholders. This can be hoped to be in practice widely once the enable environment is ensured through policy instruments, political stability and presence of elected bodies in the local government. Furthermore, understanding on disaster management should be raised up in the planners specially government officers. Efforts from community and national and international stakeholders are essential to bring a concept of 'safe place to live' into reality.



Integration of DRR into development in Kirtipur village, Nawalparasi District

Chapter

7

Climate Change and DRR

This book has described a practical approach to disaster management followed with communities in the hazard prone context of Nepal. Different types of disaster have been considered - flooding, landslide, drought, earthquake and pest outbreak, and the relationship with poverty explored. These issues are challenging enough, however, those that are particularly vulnerable to them face a new threat, and one that has the potential to undermine success in both disaster prevention and development. Climate change is recognised to be seriously altering natural conditions and scientists are observing its effects in many regions around the world. It is already accepted that the poorest people in developing countries are, and will continue to be worst affected. Nepal is expected to be highly susceptible to the negative implications of climate change because of the prevalence of hazards.

For communities that are already susceptible to disasters and living in poverty, climate change is a burden difficult to comprehend or overcome. For disaster and development organisations it requires altering approaches to deal with an issue that from now on must be tackled proactively just to stop the risk and increasing poverty. Measures are being applied within Nepal and other vulnerable locations around the world to limit the effects of climate change. This chapter describes the implications of a changing climate in the context of disaster risk and poverty and explains some of the methods for preventing the new threat realising its full disastrous potential.

1. What is climate change

Climate change is an associated phenomenon of global warming – the average increase in near surface air and ocean temperatures around the world. As the lower atmosphere heats up, its temperature and moisture levels vary and, as a result, the climate system becomes altered. This process creates differences in a region's typical weather and seasonal conditions noticeable over a 20-30 year period. Global warming may be partially the consequence of natural causes, but the most recent science from the Intergovernmental Panel on Climate Change (IPCC) state that it is 'very likely' (90 per cent) that human actions are responsible for the exponential increase in global temperatures experienced since the mid 1700s. The emission of greenhouse gases (GHG), most notably carbon dioxide mainly from developed countries, is considered to be the most significant contributor to global warming and climate change.

2. Climate change in Nepal

Nepal has a wide range of climate zones, a consequence of its diverse geology and topography. Within a short geological area the climate varies from subtropical in the *Tarai*, to alpine in the high Himalayas. As a result, changes in the climate affect each region differently but, because of the inter linkages between them, the impacts are not contained and results in knock on effects in other areas.

Temperature

The annual mean temperature in Nepal has increased in the last thirty years, particularly in Dhankuta (in the eastern development region) and Lamjung (in the western development region) and at a faster rate (0.06 degree per year) than the global average (Practical Action, 2009). However, the change in temperature is not

Box 7.1. Nepal's climate scenario

Globally, Nepal falls within a subtropical climate zone. However, due to its unique physiology and topography it possesses enormous climatic and ecological diversity within a North South span of about 140 km. The climate zones range from subtropical in the *tarai* to arctic in the North.

Precipitation
The climate of Nepal is largely dominated by the south easterly monsoon which brings most of the precipitation during the rainy summer months (June to September). Monsoonal precipitation is the most important climatic element for agriculture as well as for the water resources of the country. The average annual precipitation is 1,768 mm (Shrestha et al. 2000) and, depending on the location, between 70 to 85 per cent of annual precipitation occurs during the monsoon period (Singh 1985).

As mentioned above, the rate of rainfall increases with altitude on the windward side and sharply decreases on the northern side of the mountains. In the higher altitude areas, summer monsoon precipitation occurs in solid form which nourishes large numbers of glaciers, especially those situated in eastern and central Nepal.

Outside the monsoon period, the winter season caused by the westerly winds dominates rest of the year. The associated systems are commonly known as western disturbances and originate from over the Mediterranean Sea, forming lows which are steered eastwards. These disturbances bring snow and rain during winter and spring, most significantly in the north western part of the country, where it plays a major role replenishing glaciers and snow fields and contributes to the supply of melt water use in agriculture during the dry season between February and April. (Seko and Takahashi 1991)

Temperature
Nepal's temperature is directly related with season and altitude of the location. The rains of the monsoon starting in early June check the increase in daily temperature, and so the maximum temperature of the year occurs in May or early June. From October the temperature starts significantly decreasing and reaches the annual minimum in December or January.

Altitude is the major factor in the variation of temperature, with temperature patterns following the topographical variation. The hottest part of the country is in the *tarai* belt, where the extreme maximum temperature reaches more than 45ºC, and this gradually decreases moving towards the North. Over the Siwalik range the maximum temperature varies between 26° to 30°C. The maximum temperature ranges between 22°C to 26°C in the middle mountain regions and below 22°C in the high mountains and Himalayas...

(Adopted from Practical Action. 2009. Temporal and spatial variability of climate change over Nepal (1976-2005). Kathmandu, Nepal: Practical Action

uniform in Nepal, even within the same ecological region, and there are various micro climates with different temperatures. The general trend shows that the rise in the mean temperature greater (0.09 degree per year) in the higher altitudes as compared to lower altitudes (0.042 degree per year), meaning that the mountains and hills are warming at faster rate than the *tarai*. Temperature rise in these areas increase the rate of snow and glacier melt, releasing a higher volume of water to flow into lower regions.

Precipitation

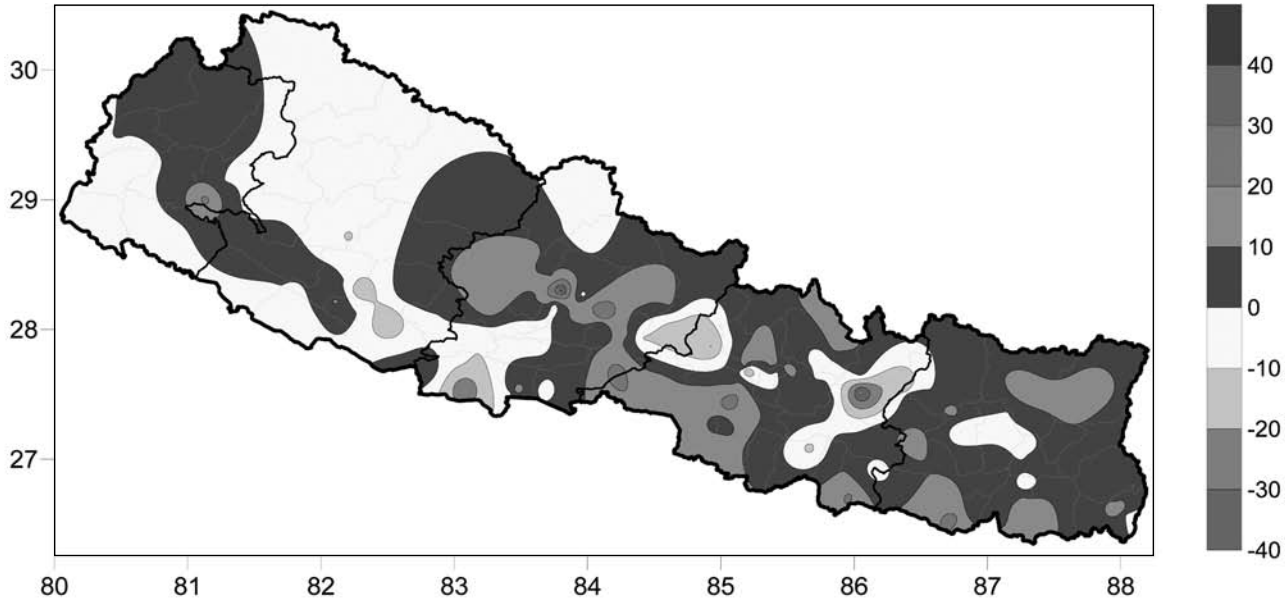
Distribution of precipitation is also highly varied, with the eastern region receiving more precipitation than the west. From the trend observed between 1976 and 2005 it is expected that the regions with already high precipitation will receive more rainfall and those with low precipitation will see further decreases (Figure 7.1). Over the past decades rainfall has become more intense, with less frequent rainstorms dropping more water in a shorter period of time, and longer gaps of no rain in between.

From the analysis of monthly precipitation over last 30 year, it is noted that rainfall at the beginning of the monsoon (June) has decreased and increased at its end in September (Practical Action, 2009).

Local observations

Scientific studies are important for providing accurate and independent assessments of change in the climate, but communities also have relevant observations from their intimate involvement with the natural environment. Differences in seasonal length; rainfall patterns; crop quality; change in leaf growth and shedding; flowering time of plants; and animal behaviour (bird nesting and migration) are examples of indicators noted by farmers in particular that the climate is changing. A fuller picture of the effects of climate change in different areas of Nepal will be gained by incorporating scientific analysis and local level knowledge. By linking the two it will be possible to verify community observations and provide more reliable context specific predictions for the future.

Figure 7.1. Annual precipitation trend across Nepal (1976-2005)



3. Climate change and disasters

The change in Nepal's climate conditions are not isolated phenomena but have significant consequences for human livelihoods and other living systems, most catastrophically by increasing disaster risk. Over two thirds of disasters globally are related to weather and climate. Climate change affects the physical aspect of hazard in two ways; it adds to existing stresses and hazards and secondly creates adverse and extreme weather events that are hazardous in themselves, such as storm surges, cold and heat waves.

Worsening current problems

Climate change is said to have a magnifying effect on disasters, in that it is likely to exacerbate existing problems. Many of Nepal's hazards (described in Chapter 2) are expected to get worse as a result. A higher rate of glacial melting has increased the volume of water that passes from the high hills down to the *tarai* through rivers and over land. As this happens, it increases the instances of flooding and speeds land erosion in lower regions. At least 20 glacier lakes out of

2323 so far identified are now at risk of bursting because of the higher temperatures, posing a serious threat of flash floods (ICIMOD, 2001).

Drought, rain fed floods and storms are worsening due to climate change mixed with socio economic practices. More water is necessary for the increasing population but recharge of aquifers has dwindled down due to erratic pattern of precipitation. Springs and dig wells are reported drying off and this worsens the drought situation. Longer drought conditions have aggravated fire hazards burning forests and settlements. On the other hand, intensive rainfall causes soil erosion, landslides and floods which are increasing in the recent years while crops are badly affected due to lack of water due to longer gaps between two successive rainfalls. Storms are other hazards threatening livelihood elements such as houses, crops and trees.

Disaster risk is further heightened because climate change amplifies the effects of damaging human practises. Where the natural environment is already depleted through the use of unsustainable practises, ecosystems will be less able to withstand the variances in water levels or temperature rises. In turn, damaged ecosystems provide weaker protection against physical threats and, therefore, the likelihood of an associated disaster event increases. This is the case in the Churiya range, where settlements and agricultural practices have degraded the landscape and weakened the natural defence system. Natural defence system becomes weak when vegetations which provide cover to surface are cleared off for agriculture and settlement; loose soil is exposed open, natural recharge and discharge balance of water is disturbed through soil erosion, quarrying sand, gravel, haphazard infrastructures construction such as roads without considering disaster risk and carrying capacity of land. As a result, excessive rainfall now accelerates soil erosion and generates landslides and floods in the region. These events also damage agricultural lands and other assets downstream in the *Tarai*.

New threats

Change in the climate can intensify normal weather patterns into extreme weather events. Whilst the average annual rainfall for a region may stay the same, alterations in precipitation timings can bring extended periods of drought and intense moments of high rainfall. The *tarai* and mid-hill regions of Nepal are currently experiencing an increased rate of erratic rainfall which damages crops, property and land and can lead to flooding. In lower areas of the high mountains such as lower Mustang and parts of Jumla where there used to be snowfall are experiencing precipitation in the form of rain which accelerates soil erosion and flooding.

Higher temperatures are also linked to changing environment to favourable to disease vectors spread higher altitudes. Malaria, encephalitis, and other vector born diseases are now reported to exist in higher altitudes where they were not found in the past but the temperature has become more favourable for their existence. Farmers elsewhere are noticing new diseases and pests affecting their crops. Outbreak of viruses and tuber moth in potatoes, Aphids in rape mustard, diseases in apple are some examples that are directly linked to temperature change although further investigations are necessary to confirm the claim. The distribution of mosquitoes is also expanding into higher altitudes, although temperature rise may not be the only reason for this.

Any changes in weather or seasonal patterns can instigate new disasters for those that rely on the natural conditions for their livelihoods. Altered seasonal dates – either too early or delayed – or a variance in seasonal precipitation makes it difficult to plan for farming and can result in some practices becoming unfeasible. If a community

does not have alternative options to generate a livelihood or maintain food supplies then the risk of famine becomes greater.

Reducing resilience

Whilst the threats are new and heightened, climate change also undermines the capacity to deal with hazards. By putting pressure on natural resources such as water, forests and land, the productiveness, profitability and even viability of certain (particularly subsistence) livelihoods is challenged. With less financial capital, people have little spare funds to prepare for a disaster, protect their property and other assets, and recover afterwards. As the poverty of those with diminished livelihoods increases, so does their vulnerability to a hazard. When a disaster strikes, being less able to withstand it, livelihoods and assets are affected, poverty is further increased and the cycle of vulnerability is worsened.

In all, climate change increases the vulnerability of those that are already susceptible to disasters and poverty by:

- Increasing the disaster risk in places where the poorest people live
- Adding strain on the natural protection against hazards
- Undermining the livelihoods that provide resilience against a disaster

4. Dealing with climate change: DRR and development approaches

The onset of climate change has major ramifications for efforts both to reduce disaster risk and poverty. Development agencies have begun to initiate programmes that enable people to take action in response to changes in their climate and surroundings. Being able to avoid and withstand a disaster is a key part of adaptation strategies and understanding how climate change will alter hazards which is an important concern for disaster management. As such, the two share common approaches and, given the link between disasters - climate change and poverty, an appropriate solution to these issues is to address the underlying causes of vulnerability.

Reducing vulnerability

As explained earlier, people are vulnerable to disasters largely because of the conditions associated with poverty. The same is applicable to climate change, which is also another factor increasing their vulnerability to disasters. Addressing the underlying causes of vulnerability, therefore, is even more urgent. To an extent, the strategies for increasing disasters resilience – working closely with the community; increasing and strengthening livelihood options; linking communities into networks and external stakeholders; enhancing local techniques; making use of local knowledge; and identifying the most vulnerable groups are vital for overcoming the increased threat caused by climate change.

However, the extra burden of climate change requires vulnerability strategies to extend their focus beyond the hazard context and socio economic factors. Greater consideration should be given to the long term changes in the natural conditions, particularly weather and seasonal patterns, and from this determine how hazards and community capacity will change in the future. If enough is known about the likely outcomes, specific actions may be taken with the community to prepare – a higher rate of glacial melt may warrant downstream protection

measures; depleted water reserves may demand improvements in the way water is used and stored; and property and assets may have to be protected against extreme weather events.

Need for better climate science

However, one of the main complications in dealing with climate change is the uncertainty in understanding its exact implications. The effects occur over a 20 - 30 year period, making it difficult to describe detailed outcomes for a specific location. As such, climate science is not currently able to make accurate predictions that can reliably inform long term planning at the local level. The current imprecision requires care to avoid impeding a community with measures that could prove unsuitable to future conditions or that lock people into a particular development path. This is a difficult issue to tackle, particularly as impacts in many areas are already witnessed and are expected, but not assured, to get worse.

Effective disaster management makes use of shorter projections of atmospheric conditions - weather forecasting provides critical information for EWS and seasonal data informs agricultural planning, increasing the resilience of livelihoods. However, whilst in most cases there is a better supply of this information, it is often inaccessible to communities because scientists are unaware of their need or are unused to dealing with the local level. Disaster management projects can reduce vulnerability by filling the gaps in the communication of this information, but, in order to enhance long term resilience, projects should look to future improvements in climate science and seek to make connections between this and communities. As more reliable and relevant climate information becomes available, more hazard specific technological improvements can be developed with greater confidence to protect against new and heightened risks.

Protecting natural systems

Given that the natural environment plays such a vital role in hazard prevention and the generation of livelihoods, as well as being at threat from climate change, protecting it is an important and necessary resilience measure against the increased threat. A healthy ecosystem will be better able to withstand changed conditions than one that is depleted and already damaged; therefore, promoting natural resource management, halting unsustainable practises, and replenishing plant and tree cover are key strategies for boosting the natural protection.

Targeted measures can also address specific problems; certain crops or trees that can survive with altered water levels, on land that has been deemed unusable, or outside the typical growing season, can be planted helping the community to find out about these options increases their resilience. Low input sustainable agricultural practices such as system of rice intensification (SRI) optimises the efficient use of water and nutrients and crops withstanding adverse environment; thus demanding less water, fertiliser input and pesticides. Organic agriculture uses natural and locally available environment friendly resources and inputs which have long term environmental benefits on both adaptation and mitigation. Within Nepal, better water resource management will be a particularly important action for dealing with the faster rate of glacial melt in some areas, and lowering water table in others. Based on experiences from community based adaptation programmes, the management of whole watershed is seen as a viable option for adaptation to climate change. Watershed management involves soil conservation, water resources conservation and utilisation, forests conservation, proper land use, livestock management and appropriate livelihood strategies suitable to local ecosystems. Watersheds differ

Box 7.2. Integrated watershed management: a no regret option to CCA and DRR

Landslide and flood is one of the major disaster risks in Jugedi Khola watershed in Chitwan District, Nepal. Both socioeconomic practices (such as deforestation, cultivating unsuitable hill slopes, uncontrolled grazing and lack of skills for alternate livelihood options) and erratic pattern of rainfall enhanced floods during summer and drought and forest fire risks during winter.

Between 2004 and 2007 a range of activities in improving livelihood capacities and improving watershed condition were implemented. Communities learned to grow vegetables during winter as additional income source, improved livestock rearing, conserved soil and forests and utilised water resources to irrigate crops by improving existing irrigation channels. Some farmers chose to cultivate bananas instead of rice which would bring more income in limited water availability situation. Soil erosion was managed by controlling gulley in the micro catchments and applying appropriate slopping agriculture land technology and by conserving forests through community forestry.

Although rainfall is becoming more erratic and potentiality of hazards still exists, natural ecosystem is improved providing better defence and minimises the disaster risks. Alternative options on growing crops and improved irrigation facilities have enhanced production and income.

Stabilisation of steep land through terracing and tree planting, improving water management, construction of flood barriers help prevent small scale disasters; introduction of intensive vegetable gardening and improved livestock breeds strengthen livelihoods, as increased agricultural biodiversity is a key livelihood strategy for coping with changing and more challenging environmental conditions. Sustainability of livelihood initiatives are ensured by establishing an institutional set up of community based organisations and linking them to service providers and markets to carry over the activities in the future.

in sizes from less than a sq km to thousand sq kms covering many countries. Communities can be involved in managing micro watersheds which are eventually part of larger watersheds. Governments have to take initiatives at national and international level for larger watersheds.

Furthermore, protecting natural ecosystems is perceived to be a 'no regrets' option as its appropriate use benefits livelihood practices and addresses the threat of climate change despite the uncertainty of climate science (see box 7.2).

Climate and disaster policies

The issues brought about by climate change require global action and coordination in redressing them. To prevent further global warming, reducing the level of GHGs emitted into the atmosphere is imperative of industrialised and rapidly emerging economies. For Nepal, and other developing countries, adaptation actions are most urgent for protecting the most vulnerable populations whilst the wider implications must be addressed over the long term. The impetus and responsibility for these changes must come from the international and national level whilst being responsive to the needs and experiences of those most at risk.

National

Most critically, counteracting climate change must be an important consideration for disaster and development planning and natural resource management. With particular attention to the community level and the most vulnerable groups, specific considerations must be given to how people, both in rural and urban areas, will adapt to rising temperatures, shifting rainfall patterns, changed ecosystems, increases in river flow and, generally the higher likelihood of associated disasters. In order to ensure adaptation measures are appropriate and effective for the context, vulnerable communities should be at the centre of planning and action for adaptation initiatives and feed into the national level planning. Responding to the needs of the most vulnerable will include a way of ensuring that adaptation support from the international level can be channelled down to where the need is most urgent.

As a general measure, all levels of government should be open to and accommodating of climate science in order to understand the exact implications. Climate change needs to be considered in all sectors of national operations - from agricultural planning to energy supply as hydro dams are affected by changed river flow and reflected at all levels of policies, strategies, plans and actions. Movement into the *tarai* and urban areas is already increasing because of depleted natural reserves and therefore, migration planning, resource allocation and urban and rural developments will need to respond to these new patterns. As damaged ecosystems are the precursor to many problems related to climate change, national policies for conserving forests, biodiversity and land would be able to build on the local level initiatives and provide 'no regrets' measures that are particularly beneficial to Nepal's farming population and advantageous to all sectors of society.

International

Support for these national level actions should come from the international community, and particularly from the largest historic emitters. In 2009, the United Nations Framework Convention on Climate Change (UNFCCC) was expected to bring about an agreement between nations on dealing with climate change, including means to help developing countries prepare. This should have included pledges for adaptation to climate change funding; the creation of a funding mechanism; setting up of a system for the transfer of technology and learning on best adaptation practice; and an insurance mechanism to help countries respond to climate related disasters. Unfortunately, the conference in Copenhagen failed to reach an agreement leaving the people vulnerable to climate change. Negotiations towards an international treaty are still on going and hopefully a decision that incorporates all points mentioned above will be agreed upon.

HFA

The HFA is focused to DRR and recent reviews and elaborations linked to HFA have put concerns in the context of climate change to the traditional disaster events. There is ample information available and experience on dealing with disasters that can be utilised to reduce vulnerability to climate change. There is a need to integrate both streams (DRR and CCA) on the ground and the communities have to face single or combined effects of disaster with or without climate change. Efforts have been made in practice at the ground level such as climate change is recognised as one of the causes to accelerate disasters. HFA strongly recommends policy and institutions both at local and national level to recognise the need for regional cooperation to DRR. Integration of DRR and CCA and mainstreaming them into development planning is crucial to address the disaster vulnerability in the context of climate change.

Water collection intake, Deusad khola irrigation scheme in Kirtipur village, Nawalparasi District

Chapter

8

Conclusions

Concern on DRR is growing. Exposure to different hazards is increasing caused by both natural and manmade factors. In recent decades and future, particularly in the context of climate change, exposure to multiple hazard environments will affect lager populations and systems. As impacts of climate change are wide ranging and deep reaching to constituents of natural and socio economic systems, exposure and stresses are likely to be more frequent, powerful and uncertain. Rapid but unplanned urbanisation and speedy migration to urban areas are putting larger population exposed to hazard stresses and disaster risks particularly in Nepal and in the region.

Disasters are not new to human kind. Civilisation has faced great disasters in the past sustaining huge losses. Disaster management discourse has come a long way from concept of 'act of divine power' to a capacity of forecasting of occurrence of some hazards in advance. Although disaster risks could not be eliminated, they are not inevitable. Based on the nature of hazard it can be prevented or minimised and their impacts can be mitigated with better support and appropriate measures. There are various options through which we could reduce damaging strength of hazard, decrease exposure and sensitivity of vulnerable entity to particular hazards. On the other hand disaster impacts can be moderated through various preventive, response and recovery measures. Most important aspect realised recently is resilient capacity of vulnerable family or community.

Nepal is particularly vulnerable to various hazard stresses and disasters due to natural factors such as topography, geographic location and climate. Moreover, human behaviour in terms of socio economic practices such as lack of proper management of natural resources, poor governance and carelessness to preparedness and mitigating small scale hazards have increased the risk potential. Human factors are major contributors to aggravate hazards increasing vulnerability to disasters. These factors are linked to the local, national and global configurations and power relations within a country. People and their assets in different regions are differently and uniformly exposed to different hazards. There are downstream effects of hazards, particularly weather and water induced hazards such as flood and drought. Socio economic and long term impacts are due to affect broader communities through intricate socio economic ties, linkages and dependencies between people in different regions.

Disaster management has been in isolation although international and national policies acknowledge the integrated and community based approaches. Still there is more focus on the rescue responding to disaster events. There is a need to establish models at different districts and regions to replicate them nationwide. Stakeholders' awareness on the approaches and national commitment is necessary to build on disaster resilient societies. This demands mutually connected strategies and actions between different ministries and sectors for short and long term. Past experiences showed that local governments should take lead in field level implementation of long term strategies and plans supported by national governments.

Disaster management planning needs practical approaches such that community and stakeholders better understand their vulnerability, underlying causes and appropriate methodologies to build up resilience capacities. Stakeholder participation in all stages of planning and implementation creates better ownership of plans by the stakeholders. Local governments such as VDCs and DDCs should take lead in the process. This provides conducive environment to integrate DRR and development. Small scale hazards can be mitigated through development interventions such as sensitivity and impacts of drought which can be mitigated to a

large extent by improving access to water resources through irrigation channels, tube wells and water efficient irrigation technologies. Better natural resource management provides services to cope with adverse situations and helps build on resilient capacities of the community. There are numerous examples of indigenous practices, project implementation; national replication of successful intervention that has influenced the process.

Influencing policy through practice is yet to be established. Culture of working together by government agencies and civil society needs to be promoted. It helps to create synergy to better results at all level and environment for mutual learning. Contemporary advocacy practices do not fully harbour practical learning. So, the gap lies between formulation of policy and strategy and their implementation. Local level planners such as in the VDCs and district level have limited access to knowledge and information on disaster management. External inputs are necessary to raise knowledge, skills and confidence to enable them in integrating disaster management into development. National level policies and strategies should have mandatory provisions to integrate disaster management into development at local, district and national level. Development risk assessment should be mandatory to each development activities and priority should be given to such development projects which enable communities to better cope with the adversities they have been facing.

Climate change will aggravate the hazards in future and make coping capacities weaker. Hazard dynamics is likely to change. Small scale hazards may become stronger and more frequent. Whole ecosystem is exposed to climate change and is unavoidable. Disaster management will have to go through a state of uncertainty in the context of climate change. However, development of technology such as in forecasting and early warning will help preparedness to certain degree. Work should not be delayed to act on the root causes of vulnerabilities and building our capacities to adjust livelihood practices in the consequences.

Efforts are necessary from individuals to nations. The world is facing various problems brought about by unbalanced development, rapid population growth and over exploitation of natural resources. Time is running out and it could be too late to understand the risks associated with natural phenomena, environmental pollution, ecosystem degradation and impacts of climate change which demand mutually coordinated efforts from all to mitigate the adverse impacts of climate change.

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Practical Action: Overview

ECONOMIST Dr. E.F. Schumacher, author of "Small is Beautiful", founded Practical Action in 1966. It was established with the objective of reducing poverty through the wider use of appropriate technologies in the developing world. With a Head Office in the UK Practical Action works through country and regional offices in Bangladesh, Kenya, Nepal, Peru, Sri Lanka, Sudan and Zimbabwe.

In 1979, Practical Action started its work in Nepal, initially concentrating on the development and transfers of micro hydro technologies, building the capacities of local manufacturers and rural entrepreneurs, and advocating for appropriate policies and institutions in the sector. After establishment of the Country Office in the 1998, Practical Action diversified its activities into other forms of renewable energy and expanding into agro processing, rural transport and disaster management. Since 2003, Practical Action's programme in Nepal has been directed by the four International Programme Aims (IPAs): Reducing vulnerability; Markets and livelihoods; Improving access t o useful services. Systems and structures; and Responding to new technologies.

Practical Action believes that the right intervention - however small – can create jobs, improve health and livelihoods, give access to services and help people lead better lives. In its every effort, Practical Action aims to bring about positive and lasting changes in people's lives. Practical Action's programmes are driven by the needs of both the rural and urban poor, and are launched through partnership with government, non government (I/NGOs) and private sector stakeholders. In Nepal, Practical Action is operating through a General Agreement and separate Project Agreements with the Social Welfare Council of the Government of Nepal.

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