

Annex 9



Chitwan District Disaster Management Action Plan

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Acknowledgements

Nepal is highly prone to several disasters in general and water-induced disasters in particular. Each year approximately one thousand people are killed, about one hundred people get lost and thousands of families are exposed to several disasters. In addition, property worth of million is destroyed, and public property is damaged. The extent of pain, suffering, tragedy and psychological trauma has been heart breaking.

Despite the fact that Chitwan is one of the hard hit districts in terms of disasters, it is surprising that until very late no serious attention was made to lessen the impact of disaster and carry out activities for mitigation and preparedness. I believe that the present *Chitwan District Disaster Management Action Plan* has definitely broken this silence.

As noted in the Action Plan, although there are more deaths related to flood in Sarlahi, the loss of property, land and infrastructure has been highest in Chitwan. The debris flow contributed by landslides in upstream of Chitwan core area has been the cause of unprecedented devastation in this district. In this context, the present Action Plan not only draws our attention towards effective management of disasters in Chitwan District, but also inspires us for a concerted effort of several stakeholders in different fronts. The District Development Committee of Chitwan, being the representative local political body in the district, is

willing to contribute towards bringing synergy towards effective disaster management now so that the pain and risks of communities exposed to disaster could be lessen.

While DDC Chitwan has been at the centre of preparing the present Action Plan and publishing it for wider consultation and reference, as a matter of fact it has been a joint effort of several institutions and individuals. We are thankful to the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) and United Nations Development Programme (UNDP) for their generous support for the Action Plan preparation process, and the Participatory Disaster Management Programme (PDMP) for supporting its publication. Without their support and encouragement, this Action Plan, first of its kind in Nepal, would not have been possible. Finally, on our part, we express our firm commitment to incorporate its strategies and recommendations into our mainstream development process.

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1 July 2004

Abbreviations and Acronyms

| | |
|--------|--|
| CDO | Chief District Officer |
| DDC | District Development Council |
| DHWG | Disaster Health Working Group |
| DNDRC | District Natural Disaster Relief Committee |
| ERIP | East Rapti Irrigation Project |
| FGD | Focused Group Discussion |
| GLOF | Glacial Lake Outburst Flood |
| HMG/N | His Majesty's Government of Nepal |
| JWIDF | Japan Women In Development Fund |
| LDO | Local Development Officer |
| NGO | Non-Government Organisation |
| NLSS | Nepal Living Standard Survey |
| NRs. | Nepali Rupees |
| PDMP | Participatory Disaster Management Programme |
| PRA | Participatory Rural Appraisal |
| SGCO | Self-Governing Community Organisation |
| TDRM | Total Disaster Risk Management |
| TOR | Terms of Reference |
| UN | United Nations |
| UN-DMS | United Nations Disaster Management Secretariat |
| UNDP | United Nations Development Program |
| VDC | Village Development Committee |

Executive Summary

Nepal is prone to various kinds of disasters. Its geographical setting and physical environment make it vulnerable to floods, landslides, earthquake, windstorm, fire and so on. In Nepal, some of the disasters are localized and seasonal such as floods and landslides, whereas others are occasional and widespread e.g. earthquake and drought. Nepal has the highest percentage of disaster-caused deaths in the whole of South Asia among the affected or injured ones

Within Nepal also, there are some districts and parts of it which are more vulnerable. Among these districts, Chitwan is one of them. This district has both hill and the flat inner tarai part. In the former, there is the widespread problem of landslides whereas in the latter part, there is an ever increasing threat of floods. Fire and windstorm threats are also no less prevalent. During the 1993 flood which significantly affected five tarai and hill districts, Chitwan was one of the worst affected districts. Although there were more deaths related to flood in Sarlahi, the loss of property, land and infrastructure was the highest in Chitwan. Chitwan's vulnerability to flood disaster is contributed by the landslides in parts of the hills of Chitwan and Makwanpur, the debris from which are brought to the district by the tributaries of Narayani river in the western border and Rapti river in the east. In the last two rainy seasons, the number of deaths in Chitwan by landslides and flood alone reached nearly 1,000. This is primarily because of the accumulated rise in the level of bed which increases the vulnerability from even smaller floods. The dam constructed under ADB East Rapti project some one decade ago to prevent the flood entry into agricultural fields has now almost equaled the river bed height in

many places. The east-west highway bridge surface at Lothar is now only about one and a half meter above the river bed. The bridge is in imminent danger because even the small logs brought by the flood can clog the water entry beneath the bridge and demolish it. Therefore, it is never too early to plan and implement the disaster management initiatives to save important lives and properties of the Chitwan dwellers including one of the most fertile lands that are capable of ensuring the food security of the country.

The TDRM Concept

The concept of TDRM is new to Nepal as is true in the case of many other developing countries. It is a concept that propagates more on the preventive measures on the notion that preventive actions are at least six times cheaper than prohibitively costly rescue, relief and rehabilitation measures to be taken after the disaster has actually occurred. Early Warning System (EWS) is an important component of TDRM which involves forecasting of probable disaster and information to potential victims well ahead of actual disaster incidence so that they will take appropriate measures to protect their respective lives and properties. However, some disasters like earthquakes, lightning are extremely difficult or impossible or at best costly to forecast and warn. In fact, no amount of precaution and investment will fully free the risk of any disaster. Hence, TDRM has also the components of efficient rescue, relief and rehabilitation. One of the components is to expedite the rescue, relief and rehabilitation process through the improvements in communication by way of appropriate institutional mechanism. If the rescue and relief

team is able to reach the disaster site faster due to improved communication, many more lives and properties can be saved.

The other equally important feature of TDRM is to admit the relationship between disaster and development. The development can both enhance and minimize the probability of various disasters, and in the same vein, disasters can both destroy and augment the development. TDRM, therefore, propagates that each development component must internalize the disaster probability and take appropriate safety measures.

The title of the Act itself reveals the partial nature of response mechanism as it overlooks the wider set of man-induced disasters. Before the promulgation of this Act, coping with disasters was done on a case-by-case basis using *ad hoc* committees. The Act was amended twice after 1982 but with no headway towards TDRM. After the heavy flood of 1993, the need for disaster management has been realized more seriously. However, only one of three components of disaster management cycle, namely preparedness, relief/rescue, rehabilitation/reconstruction has received due attention.

A project close to TDRM concept was introduced by UNDP which helped to implement the "Upgrading Disaster Management Capacity in Nepal" project on a pilot basis to tackle with the problem of water induced natural disasters. This project was implemented in 1996 for a period of 1.5 years in Kavre and Chitwan districts. The follow-on Participatory Disaster Management Programme (PDMP) began from January 2001 for a period of one year. The program covered two VDCs each in four highly disaster-prone districts namely Tanahu, Syangja, Chitwan and Bardiya with the assistance of UNDP/Japan Women in Development Fund (JWIDF). During 2003 the second phase of PDMP has been expanded to two more districts namely Sindhuli and Makawanpur.

Objectives of the study

The objective of the study is to prepare an action plan for total disaster risk management for Chitwan district. The specific objectives and activities (scope) of the preparation of the action plan are as follows:

1. To enhance disaster management capacities of local institutions and communities.
2. To mitigate disaster losses through strengthening quick response and sustainable rehabilitation mechanisms.
3. To ensure sustainability of development infra-structures through rendering them disaster resistance.

Methodology

The present study proceeded after the preparation of hazard and vulnerability assessment of the Chitwan district and the review of the documents and references related to the study objectives. This was followed by the visit to the project district Chitwan. In the district, the Study Team met with the DDC officials (DDC Chairman, Local Development Officer), District Administration officials (Chief District Officer) and the officials from the disaster management related institutions (such as local Red Cross). The meeting with the above officials, besides collecting secondary data on the subject, was to solicit their respective opinions and suggestions about the project. This was followed by the visits to the communities in the identified vulnerable sites. The fieldwork was carried-out during the months of November-December, 2003.

Among the tools used for information gathering were the PRA exercises with the vulnerable communities (particularly the historical timeline and the seasonal calendar). Other methods included focus group discussions (FGDs), informal group discussions, individual inquiries and other consultations.

Limitations of the Study

The most significant limitation in the study was the time factor. TDRM being a new concept for Nepal, the time required to complete

the whole process of exploration and consultation was in no way matched with the total time allotted for the entire exercise. Other limitations were caused by the on-going conflict situation and lack of baseline information on vulnerability to different hazard risks.

Ranking of Hazards in Chitwan District

During hazard and vulnerability assessment, sixteen hazards were ranked based on their severity and magnitude. The human casualties and property losses were taken as the severity indicators, whereas frequency of occurrence and number of VDCs affected were taken as the indicators of magnitude. Similarly, 80 percent of the total weight was given to severity indicators whereas 20 percent weight was given to the magnitude indicators. Among the sixteen hazards, flood has been the most severe trigger event followed by wild animals, thunder bolts, river bank cuttings and landslides.

Vulnerability Assessment

VDCs prone to various hazards have been identified in previous studies based on the population exposed to the hazards, vulnerable properties and infrastructures susceptible to disasters. Vulnerable VDCs by various parameters are given in the table 3. The data reveal that *Lothar* VDC ranks the highest in terms of the percentage of the total population exposed to disasters whereas *Bachheuli* and *Jutpani* were the most vulnerable VDCs in terms of agriculture land and infrastructures.

Risk Assessment

Between 1954 and 2003, a total of 231 persons were killed by nine disasters in Chitwan district alone. In an estimate, a property worth more than Rs 10.62 billion was lost annually as a result of the disasters in the district. Flood, landslides and fire have been the three most frequent hazards happening 31, 25 and 19 times during the last 49 years. Potential impacts of the five main hazards based

on the past events and their corresponding vulnerable VDCs are given below.

Recurrence Period

Historical records give first indication of disaster return periods and extent. This is applicable to all types of disasters such as landslides, fire, earthquake, windstorms, etc. However, the predication of occurrence of earthquake is quite a difficult task. Based on the historical trend, an earthquake with considerable damages occurred in the interval of every 70 year. The last major earthquake occurred in January of 1933 and, based on this recurrence cycle, it is forecasted that a major earthquake of unprecedented magnitude is due soon in the country, particularly in the western region.

This information should be taken cautiously because they represent the simple averages of events that occurred in 49 years. What is required is the moving average that shows the trend through time. It is believed that some of the more damaging disasters like landslides and floods are recurring more frequently now. Due to lack of time series information, this could not be estimated.

District Capability Analysis

Service Delivery and Financial Institutions

There are altogether 1415 government and non-governmental organizations working in the field of health, agriculture, education, poverty alleviation, saving and credit schemes, security, rescue and relief works and disaster management in Chitwan district. However, these service delivery and financial institutions are not properly distributed. Around 40% of such institutions are located in two Municipalities, whereas these municipalities bear only 7.5 percent of the total exposed population to different hazards.

Communication and Media

Chitwan is relatively a resourceful district in terms of communication and transportation facilities. It has relatively wide networks of road linking almost all VDCs to main market

centers and the district headquarters. Besides, Chitwan is meeting point of many national highways like Prithivi Highway, Mahendra Highway etc. There is also Airline Service from Kathmandu to Bharatpur Airport in Chitwan district. Telecommunication facilities have reached to 30 VDCs, Marts line in 12 VDCs and VHF line in 18 VDCs. Postal service has reached to 30 VDCs / Municipalities except in 6 VDCs. Nine express delivery service organizations and pager and cellular phone facilities have been present in the district. In addition, two FM radios namely *Kalika* and *Synergy*, have been in operational and become effective in disseminating local, national and international news and events in no time. Six daily, 3 weekly and 1 fort nightly news papers are published in the district. FM radios provided significant help in disseminating news and appeals for the public support for rescue and relief operations in the devastating disasters last year.

Preparedness Apparatus and Human Resource

An inventory of various apparatus and human resource of the district was done. The study reveals that Chitwan district is self sufficient in terms of various equipment/preparedness apparatus and human resource. Health service, engineers, transportation means, dodgers and ambulance are adequate whereas fire brigade, skilled divers and trained rescue operators are in deficit.

Evaluation of Resources

Evaluation of the existing resources present in the district has been done taking its capability, availability and durability indicators into account. The study reveals that several services and resources essential to cope with the various disasters are available in the district, however majority of them are available at the district level.

Action Plan and Implementation Strategy

The Action Plan

The "Action Plan" of Chitwan district has been presented in a tabular form specifying disaster type, stage, actions proposed, location of action, and responsible agency/person/s.

Implementation Strategy

Some basic strategies to implement the proposed action plan in connection with the TDRM in Chitwan have been discussed below:

Initiation

The initiation will be with the meeting of DNDRC with the following agenda:

- Establishment of a permanent secretariat at District Administration Office (to be shifted to DDC later) with computer and communication equipment;
- Resource mobilization for social mobilization initiatives in the vulnerable VDCs;
- Instructions to VDCs for organizing permanent settlement level committees for disaster management;
- Designing participatory planning framework for disaster management plans and activities at the local levels (in VDP planning framework); and
- Identification of major disaster preventive projects for central level support.

Communication Mechanism

The communication strategy will include the extension of communication facilities in the vulnerable VDCs, development of early warning system incorporating the local knowledge, FM radio station mobilization for adverse weather reporting, posting disaster

safety information at public places and establishment of communication towers.

Coordination

The coordination function of DNDRC has already been specified by the 1982 Act. Further coordination is needed between the neighboring districts (Makwanpur, Dhading, Nawalparasi) for sharing information and equipment.

Monitoring and Evaluation

Formats have been developed for monitoring the activities proposed in the action plan. DNDRC members should be given specific responsibilities to monitor and evaluate these activities and based on these, improvements in plan must be made.

Resource Mobilization

The proposed action plan and identified activities can be presented to different donors by the DNDRC as a shopping list to these donors. The supported accepted by these donors should be monitored for avoiding duplications.

The proposed changes in policies allowing the extraction of sand and boulders from the problem rivers and the logs brought by floods, should be strictly lobbied which will be a significant source of revenue to finance preventive as well as rehabilitation activities against disaster.

Apart from the above sources of revenue, the DDC and VDC can set aside at least 5 percent of the total revenue every year for disaster mitigation purpose.

Recommendations

Besides the recommended "Action Plan", other recommendations are as follows:

Incremental Institutional Mechanism

These include additional institutional measures such as the enhanced role of DNDRC, establishment of settlement level disaster management committee and permanent and fully equipped disaster

management secretariat at the district level to conform to the needs and standards of TDRM.

Policy Change

It is recommended to annul the existing policy provision to enable the local governments to extract at least the annually added debris to be extracted for disaster safety and revenue purposes and also to annul the provision of banning the extraction of logs brought by the floods.

Social Mobilization in the Vulnerable VDCs

Two packages of social mobilization general and disaster related, is recommended to be developed and applied in the vulnerable VDCs. The general package will constitute awareness about the importance of education, health, sanitation, desirable and undesirable social customs, etc and coping capacity for different disasters. In fact, where NGOs have worked in the communities or Village Development Programme (VDP) is implemented, the general package is already applied. So, this package needs to be applied only in those VDCs where people are not already mobilized. The second, disaster package, however, has not been developed and implemented in any VDC. This package will constitute awareness about preventive measures to be taken before disasters and safety measures to be taken during the disaster.

For social mobilization, an experienced external social mobilizer will work in the 5 VDCs to mobilize as well as to train two local or internal social mobilizers (animators) per VDC, one male and one female, who will be permanently located within the respective VDC. The external mobilizer will work in the area for an initial period of 6 months.

Gender Issues in Disaster

Although the incidence of disaster and being its victim is equally painful for everybody, the women are found to bear larger amount of pain and sufferings during and after any disaster.

Therefore the needs of women must be seriously considered in designing any disaster mitigation project. Since they know what they need, it is necessary to fully participate them in such a design.

Indigenous Knowledge

The use and upgrading of local people's knowledge on disaster forecasting, coping and mitigation through disaster research should also be an integral part of the TDRM.

Formulation and Implementation of Disaster Preventive Projects

There are several medium to large scale projects required to avoid or mitigate the effect of disaster in Chitwan district. Some of these are listed as follows:

- Construction of a reasonably flood-proof road connecting district HQ with Thori via Patihani and Jagatpur. Such a road will save 3-4 VDCs in the west Chitwan which are severely affected by flood and river bank cuttings.
- Slope stabilization measures in the catchments of Rapti River.
- River training works on the location of sharp Narayani bend at Mangalpur.
- Control of slash-and-burn farming and forest encroachment in the hilly areas of Chitwan (Chepang Development Project).

Besides these; the following additional recommendations should be considered:

- Extend telephone lines in the vulnerable VDCs for quick communication purpose.

- Provide cycle-based ambulances (developed by ITDG) at the rate of one ambulance per 100 population in the vulnerable VDCs where cycles can ply.
- Provide one communication tower (developed by ITDG) at the rate of one tower per vulnerable VDC.
- Provide AM/FM radio sets (one set per community hall) in the vulnerable VDCs.
- Post telephone numbers of DMC, Fire station, Police and pamphlets and posters depicting safety information against different disasters in as many public locations as possible.
- Mandate the use of building codes (developed by MPPW) for the new construction of public buildings such as schools, hospitals, etc. and retrofit the existing public buildings to make them reasonably disaster resistant.
- Equip major public buildings with systems of fire alarm and control

Exogenous Activities/Projects Affecting Chitwan

Chitwan's vulnerability to disasters, particularly water induced ones, are aggravated by projects and activities that are exogenous or beyond control of the local authorities. Some of these are caused by the Gandak barrage and dams constructed by the Government of India across the border. For this, local authorities will have to lobby with the national government.

1.1 Background

Hazard is an event caused by natural or man-made actions and when such hazard touches upon the lives and properties of the people, it becomes a disaster. In practice it is assessed in terms of risk probabilities.

Disaster is a sudden event that has very unfortunate consequences for those affected by it. Disaster is as old as the human history itself. Disasters involve large-scale loss of life and property. Some of the worst forms of disasters in the world have killed millions of people and destroyed properties and habitats worth billions of rupees (see: Box 1, Figures 1 and 2).

1.2 Nepal's Vulnerability to Disaster

Nepal is a disaster-prone country mainly due to, among others, its young geology and sloppy terrain. Disasters in Nepal are further exacerbated by widespread poverty. The assessment made by the Ministry of Home Affairs shows that, between 1983 and 1998, more than 18,000 people have lost their lives, falling prey to several forms of disaster. Nepal has the highest percentage of deaths (0.34%) among the affected or injured persons in South Asia (Table 1). While an average of one among 9175 exposed persons died in South Asia, one among 295 exposed persons died in Nepal - six times more than the South Asian average. The losses of productive properties such as animals, agricultural land and crops, etc. are overwhelming. Major types of disasters in Nepal include flood, earthquake, drought, landslide, disease epidemic, Glacial Lake Outburst Flood (GLOF), fire and ecological hazard. Other minor ones are avalanche, storm, hailstorm, stampede, transit and industrial accidents (see Box 1). Among the major disasters, flood, landslide and disease epidemic are the most recurrent ones claiming several lives annually. As seis-

mic faults pass through the country, it renders Nepal vulnerable to earthquake disaster also. In fact, it is reported

that the country's preparedness must be highest for a major earthquake due in the region.

Table 1: Average Number of People Killed or Affected Annually by the Disasters in South Asia (1993-2002)

| Country | People killed (No.) | People affected (No.) | Killed/Affected (%) |
|------------|---------------------|-----------------------|---------------------|
| Bangladesh | 9132 | 73368083 | 0.24 |
| Bhutan | 222 | 1600 | 13.9 |
| India | 77125 | 802063399 | 0.01 |
| Nepal | 3894 | 1147785 | 0.34 |
| Pakistan | 6037 | 8989631 | 0.07 |
| Sri Lanka | 590 | 4675163 | 0.01 |
| South Asia | 97000 | 890245661 | 0.01 |

Source: World Disasters Report, 2003.

1.3 Disaster Vulnerability of Chitwan

Within Nepal also, there are some districts and parts of it which are more vulnerable. Among these districts, Chitwan is one of them. This district has both Hill and the flat Terai parts. In the former, there is the widespread problem of landslides whereas in the latter, there is an ever-increasing threat of floods. Fire and windstorm threats are also equally dominant. During the 1993 flood which significantly affected five Terai and Hill districts, Chitwan was one of the worst affected districts. Although there were more deaths related to flood in Sarlahi, the loss of property, land and infrastructure was the highest in Chitwan. The losses that occurred at that time have not yet been fully replenished. Chitwan's vulnerability to flood disaster is contributed by the landslides in parts of the Hills of Chitwan and Makwanpur, the debris from which are brought to the district by the tributaries of Narayani river in the western border and Rapti river in the east. In the last two rainy seasons, the number of deaths in Chitwan because of landslides and flood alone reached nearly 1,000. Local people believed that the year of heavy flood is followed by a year of

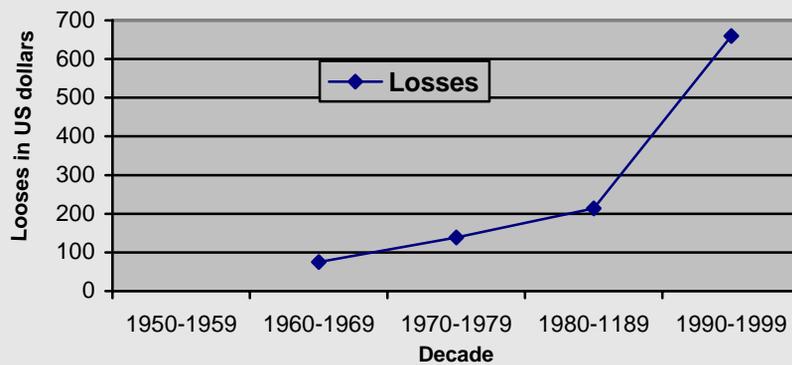
drought. But this was proved wrong in the last two years. This is primarily because of the accumulated rise in the level of river-bed which increases the vulnerability from even smaller floods. The dam constructed under Asian Development Bank East Rapti Project (ERP) some one decade ago to prevent the flood entry into agricultural fields has now almost equaled the river bed height in many places. The east-west highway bridge surface at Lothar is now only

about one and a half meter above the river-bed. The bridge is in imminent danger because even the small logs brought by the flood can clog the water entry beneath the bridge and demolish it. Therefore, it is never too early to plan and implement the disaster management initiatives to save important lives and properties of the Chitwan dwellers including one of the most fertile lands that are capable of ensuring the food security of the country.

Box 1: The cost of disasters in the world

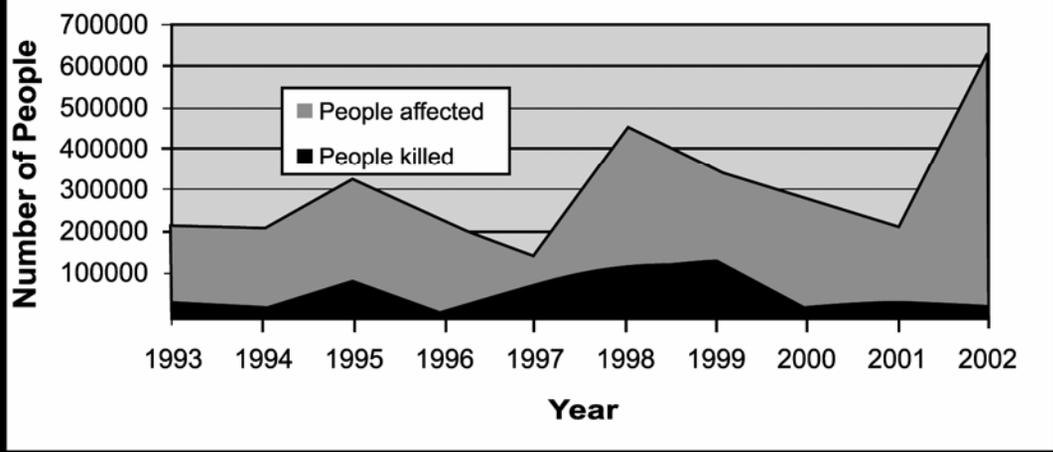
The recorded economic cost of disasters has been increasing over decades (Figure 1). Munich Re (2002, as quoted in UNDP 2004) estimates that global economic losses for the most recent ten years (1992-2002) were 7.3 times greater than the 1960s. The world disasters report 2002 assesses the annual average estimated damage due to natural losses were reported from high human development countries. According to Munich Re, real annual economic losses in 2002 averaged US \$ 75.5 billion in the 1960s, US\$ 138.4 billion in the 1970s, US \$ 213.9 billion in the 1980s and US \$ 659.9 billion in the 1990s. Disasters not only have made a huge number of casualties but also have yielded thousands times more people affected (Figure 2).

Figure 1. Economic losses due to natural disasters



Data source: Munich re, 2002 as quoted in UNDP, 2004.

Figure 2. The number of people killed and affected by natural disaster



Data Source: World Disasters Report, 2003,

1.4 The concept of Total Disaster Risk Management (TDRM)

The concept of TDRM is new to Nepal as is true in the case of many other developing countries. It is a concept that propagates more on the preventive measures on the notion that preventive actions are at least six times cheaper than prohibitively costly rescue, relief and rehabilitation measures to be taken after the disaster has actually occurred. The TDRM concept is a purposive viewpoint that addresses holistically and comprehensively the various concerns and gaps in the disaster management cycle. In this regard, it necessarily focuses on the underlying causes of disasters, the conditions of disaster risks and the vulnerability of the community. It emphasizes multilevel, multidimensional and multidisciplinary cooperation and collaboration (Guzman 2003). Early Warning System (EWS) is an important component of TDRM which involves forecasting of probable disaster and information to potential victims well ahead of actual disaster incidence so that they will take appropriate measures to protect their respective lives and properties. However, some disasters like earthquakes, lightning are extremely difficult or impossible or at best costly to forecast and warn. In fact, no amount of precaution and investment will fully free the risk of any disaster. Hence, TDRM has also the components of efficient rescue, relief and rehabilitation. One of the components is to expedite the rescue, relief and rehabilitation process through the improvements in communication by way of appropriate institutional mechanism. If the rescue and relief team is able to reach the disaster site faster due to improved communication, many more lives and properties can be saved.

The other equally important feature of TDRM is to admit the relationship between disaster and development. The development can both enhance and minimize the probability of various disasters, and in the same vein, disasters can both destroy and augment the development. TDRM, therefore, propagates that each devel-

opment component must internalize the disaster probability and take necessary measures.

1.5 Existing Disaster Response Mechanism

The government of Nepal had established Department of Narcotics Control and Disaster Management within the Ministry of Home Affairs in order to provide immediate relief to the disaster victims but this Department has been annulled very recently to revert back to the existing old institutional arrangement. *The Natural Calamity Relief Act* was enacted for the first time in 1982. The title of the Act itself reveals the partial nature of response mechanism as it overlooks the wider set of human-induced disasters. Before the promulgation of this Act, coping with disasters was done on a case-by-case basis using *ad hoc* committees. The Act was amended twice after 1982 but with no headway towards TDRM. After the heavy flood of 1993, the need for disaster management has been realized more seriously. However, only one of three components of disaster management cycle, namely preparedness, relief/rescue, rehabilitation/re-construction has received due attention.

In the case of major disasters, the government declares the affected areas as disaster victim and funds and relief efforts are mobilized both internally and from the international donors. After the 1993 flood, United Nations Development Programme (UNDP) established a full time UN Disaster Management Secretariat (UN-DMS) to support the government's disaster response efforts. At the initiative of this secretariat, three sectoral working groups were formed in the areas of food and agriculture, health and the logistics. These working groups met regularly and discussed the respective sectoral policies regarding disaster response and proposed to prepare a practical Disaster Relief Implementation Manual and Disaster Response Plan in each of the three sectors. The Manuals and the Plans in case of food and agriculture, and logistics are in the process of being finalized whereas the Health Sectoral Working Group (now known as DHWG) has already finalized the Plan.

A project close to TDRM concept was introduced by UNDP which helped to implement the

Upgrading Management Capacity in Nepal project on a pilot basis to tackle with the problem of water induced natural disaster. This project was implemented in 1996 for a period of one and a half years in Kavre and Chitwan districts. The follow-on Participatory Disaster Management Programme (PDMP) is the second phase which began from January 2001 for a period of one year. The programme covered two VDCs each of four highly disaster-prone districts namely Tanahu, Syangja, Chitwan and Bardiya with the assistance of UNDP/Japan Women in Development Fund (JWIDF). According to the programme's strategy, the DDC of the respective districts have categorized/selected the worst affected VDCs as the "severely disaster prone" and upon the selection of target VDC by the District Programme Management Committee, the entire target VDCs/Municipalities selected one/two wards/sites for programme implementation. After the selection of sites, the respective community members formed the Self-Governing Community Organizations (SGCOs) as a representative to implement disaster mitigation activities with the support of the programme and local communities. Activities under the local capacity-building component are supervised through the District Programme Management Committee which is headed by the DDC chairman with Chief District Officer, Local Development Officer and Community Disaster Management officer (UNDP staff as member secretary) as members of the committee. At the central level, the programme has been executed through the Ministry of Home Affairs as a liaison Ministry. The programme is coordinated and facilitated by the executing agency through the National Programme Director.

1.6 Poverty and Disaster Nexus

Poverty is pervasive in Nepal. Nepal Living Standard Survey (NLSS) of 1995/96 some 42 per cent of Nepalese people lived below poverty line in 1995/96. Of these, some 25 percent are counted as 'poor' and the remaining 17 percent as 'ultra poor'. Although Chitwan district is considered to be relatively higher ranked in terms of overall aggregate development indicators, there are locations and households which are situated in extreme pockets of spatial poverty and these areas and households are the

most vulnerable. Chepangs and their habitat are the example cases.

Poverty is both a cause and consequence of any disaster. Causatively, the nexus between poverty and environment (particularly forests) has been a cause of concern. The over extraction of natural resources beyond the regenerative capacity of these resources in order to support the livelihood of the poor households has been a cause of many landslides. In terms of consequence, many well-to-do families have also turned poor in a flash because the resources that rendered them rich are quickly and mercilessly destroyed by disasters such as flood, landslide, earthquake, etc. The observation suggests that the poorer settlements are more vulnerable to the disasters. Hence, the realistic mitigation over disaster has to focus on the basic problems of poverty.

1.7 Objectives of the Study

The study objective is guided by the Terms of Reference (TOR) provided to the Study Team. The TOR is presented in Annex-1. According to the TOR, the major objective of the study will be to prepare an action plan for total disaster risk management for Chitwan district. The specific objectives and activities (scope) of the study will be as follows:

1. To enhance disaster management capacities of local institutions and communities;
2. To mitigate disaster losses through strengthening quick response and sustainable rehabilitation mechanisms; and
3. To ensure sustainability of development infrastructures through rendering them disaster resistant.

Disaster Reduction and Millennium Development Goals

The millennium development goals (MDGs) 1, 3, 4, 6, 7 and 8 are directly related to disaster risk reduction. Integrating disaster risk reduction and development planning help to meet the MDGs. The disaster related MDGs are:

- | | |
|--------|--|
| MDG 1. | Eradicating extreme poverty and hunger |
| MDG 3. | Promote gender equality and empower women |
| MDG 4. | Reducing child mortality |
| MDG 6. | Combating HIV/AIDS, malaria and other diseases. |
| MDG 7. | Ensuring environmental sustainability |
| MDG 8. | Developing a global partnership for development. |

Source: UNDP, 2004, pp 82-85.

1.8 Methodology

The study proceeded with the review of the documents and references related to the study objectives. This was followed by the visit to the project district Chitwan. In the district, the Study Team met with the DDC officials (DDC Chairman, Local Development Officer), District Administration officials (Chief District Officer) and the officials from the disaster management related institutions (such as local Red Cross). The meeting with the above officials, besides collecting secondary data on the subject, was to solicit their respective opinions and suggestions about the project. This was followed by the visits to the communities in the identified vulnerable sites. The fieldwork was carried-out during the months of November-December, 2003.

Among the tools used for information gathering were the PRA exercises with the vulnerable communities (particularly the historical timeline and the seasonal calendar). Other methods included focus group discussions (FGDs), informal group discussions, individual inquiries and other consultations.

1.9 Limitations of the Study

The most significant limitation in the study was the time factor. TDRM being a new concept for Nepal, the time required to complete the whole

process of exploration and consultation was in no way matched with the total time allotted for the entire exercise.

Secondly, the on-going conflict situation in the country barred the study team from reaching the important local destinations for soliciting the opinions of a much larger set of stakeholders.

The third limiting factor was the baseline information on vulnerability to different hazard risks. The preceding recent UNDP study on the vulnerability assessment covered only two disasters - flood and landslides - and provided more complete information only on these two forms of disasters which is obviously incomplete for TDRM plan development purpose. This study also appeared to be facing severe time limitation.

Even in the midst of these limitations, the study team has tried its level best to come up with a pragmatic TDRM for Chitwan district.

Review of Related Materials

2

2.1 General

TDRM has been taken as the state-of-the-art management philosophy for disaster management. The disaster preventive measures taken in several South Asian countries have been found to have saved at least six times resources compared to the costly post-disaster relief and rehabilitation. However, no country in the region has fully adopted this approach. Because of the frequent disaster, Bangladesh has made some headway in this direction and it has mobilized international projects for shelter and preventive measures. Some South Indian states have also been marching in this direction.

As stated earlier, only Participatory Disaster Management Programme (PDMP) supported by UNDP and implemented in two Village Development Committees (VDCs) each of four districts has come closer to the TDRM concept. PDMP demonstrated:

- That disaster affected communities can be mobilized effectively to carry out disaster mitigation and other social/economic development works;
- That the communities, however poor and distressed they are, are willing and able to contribute in cash and/or kind for their own protection and development;
- That necessary infrastructure can be built at a very low cost with the participation of the communities, particularly those infrastructure which the community ranks as high priority one; and
- That the lost confidence of the people on matters of disaster mitigation can be restored.

2.2 Indigenous Knowledge

Indigenous or local knowledge in disaster prediction and mitigation comes from the hidden research and observation about the correlation between events, which is passed through generations, although not all of these knowledge and beliefs have scientific base.

The people in Bahakot, Syangja believe that if a big snake runs downhill, there will soon be torrential rain.

- Local people can sense the big flood about 2-3 hours earlier from two observations: the heavy rain in the watershed and a strange smell coming from the upstream.
- Local people use bamboo nets, crop-residue, maize cobs, wood and log in critical stream banks to minimize the effect of flood.

The virtue of the local knowledge is that it is inexpensive and readily available. It is an irony that the government has not made any serious effort to build on such local knowledge and beliefs.

2.3 Coping against the Disaster

Even without any external support, the communities have their own coping strategies and mechanisms to overcome the menace of the disaster. Some of these are enlisted below:

Before the nationalization of the forests in 1957, the communities were preserving the forests for, among others, controlling the natural disasters such as flood and landslides. The nationalization gave way to the forest denudation process thus increasing the vulnerability of the community to such natural disasters. Now, when forests are given back to the communities

for management, they are not only conserving the forests but also planting diverse species of trees.

Another coping mechanism reported by the victims of disaster is learning to live with the effects of disaster. For example, the victims of landslide in Bahakot, Syangja do not sleep in a rainy night to be alert for any further disaster.

Migration to safer destination is another coping strategy adopted by the affected households. People from the Hills are migrating to Terai not only to save themselves from the risks of landslides but also to supplement income.

In some areas like Bhandara, Kathar and Bahakot, the communities have constructed sheds at safe and elevated places to gather at the time of disaster.

In the Terai sites, Self-Governing Community Organization (SGCO) members said that they put the food-grains and other valuable items in the upper floor of the house so that it is not lost during the flood. In the Hills, people build their houses at higher elevation.

The practice of fencing with trees in-and-around their homesteads is also a common coping phenomenon. The temporary method of river training by deepening the river and placing the crop-residue, bamboo, maize cobs, wood and log are also common indigenous practices to avert the danger from flood.

Even with these coping practices, communities' coping strategies are also often constrained by the huge and horrible nature of floods and landslides. But, however, Nepalese society has longstanding traditions of group activity based on ties of kinship, ethnicity, or place of residence. For many generations, shared labor has been used to clear farm ground, construction of check dams, river training, building of irrigation canals and to carry out several community activities.

2.4 Disaster management in the Acts, Laws and Codes

In order to protect the life and property, an act called the "Natural calamity Relief Act" was promulgated in 1982. The Act has bestowed the authority to the government to declare "Natural Calamity Area" for the areas affected or likely to be affected by natural calamity. One of the major provisions in the Act is the constitution of the "Natural Calamity Relief Committee" at the central, regional and local levels. Presently,

the Central Disaster Relief Committee (CDRC) and the District Natural Disaster Relief Committees (DNDRCs) are functioning while the other two, regional and local level committees, can be constituted in times of disaster (Ministry of Home, 1994). The act has also provisioned two sub-committees i.e. Relief and Treatment sub-committee and Supplies, Shelter and Rehabilitation Sub-Committee at central level. The functions and duties of the committees at all levels have been specified. The major functions and duties of the DNDRCs include the formulation of district level plans on natural calamity relief works, monitoring of the natural calamity relief works being conducted by the local level committees and supply of information to the regional level committees. The act also allows to set up "natural calamity aid funds" at all levels.

The Ministry of Home Affairs has formulated a "National Action Plan for the Disaster Management" for the disaster mitigation in the country in close cooperation with various governmental as well as non-governmental agencies (DNCDM, 2001). The action plan is divided into four broad categories viz. disaster preparedness, disaster reconstruction and rehabilitation, disaster response and disaster mitigation. The overall disaster management strategies of the country have been set up as follows (Ministry of Home, 1996):

1. Carry out rescue and relief works in disaster affected areas,
2. Protect and reduce the loss of life and property,
3. Mitigate the sufferings of the people,
4. Implement effective land use zoning,
5. Prepare hazard maps of the disaster prone areas,
6. Rehabilitate the disaster victims,
7. Control and mitigate natural disasters,
8. Raise funds, resources and relief materials and distribute them to disaster affected areas and households,
9. Raise disaster awareness among the people,
10. Coordinate among different agencies involved in disaster management,

11. Mobilize the non-governmental sectors in rescue and relief works,
12. Mobilize internal and external resources for rehabilitation and reconstruction,
13. Provide training at the grassroots level for the management of disaster,
14. Build capacity on disaster management,
15. Form teams and send them in disaster area to assist in relief works,
16. Assess the damages, collect and analyze data and disseminate information.

3

Risk and Vulnerability Assessment

Due to its complex topography with distinct altitude variation, complex terrain and distinct physiography, Chitwan district is fragile and extremely vulnerable to hazards. These are triggered by extreme weather events associated with heavy rainfall, deforestation and disruption of natural ecosystems which cause landslides, floods, debris flows and widespread damage every year. A total of 16 different types of hazards which caused loss of lives and properties between 1954 and 2003 have been reported in Chitwan district. An assessment of risk and vulnerability has been done based on the report prepared by a team of consultants for UNDP (UNDP, 2003). The report, however, has focused only on the two major water-induced disasters - flood and the landslides.

3.1 Ranking of hazards in Chitwan district

All sixteen hazards were ranked based on their severity and magnitude. The human casualties and property losses were taken as the severity indicators, whereas frequency of occurrence and number of VDCs affected were taken as the indicators of magnitude. Similarly, 80 percent of the total weightage was given to severity indicators whereas 20 percent weight was given to the magnitude indicators. Among the sixteen hazards, flood has been the most severe trigger event followed by wild animals, thunder bolts, river bank cuttings and landslides (Table 2). Similarly, hazard probability was calculated based on the hazard mapping of two major hazards – landslides and floods (Table 3).

Table 2. Ranking of Hazards

| SN | Hazards | Severity | | Magnitude | | Total score |
|--------|--------------------|--|--|--|--------------------------------------|-------------|
| | | Casualties (% of the total fatalities) | Property loss per year (Out of total loss) | Frequency of occurrence (in the last 49 years) | No. of VDCs affected by the disaster | |
| Weight | | 50% | 30% | 10% | 10% | |
| 1 | Landslides | 0.026 | 0.0016 | 0.039 | 0.029 | 0.0956 |
| 2 | Debris flow | 0 | 0.0001 | 0.006 | 0.0053 | 0.0114 |
| 3 | Floods | 0.33 | 0.2751 | 0.063 | 0.084 | 0.7521 |
| 4 | River bed rise | 0 | 0 | 0.022 | 0.0034 | 0.0254 |
| 5 | River bank cutting | 0 | 0.0138 | 0.029 | 0.058 | 0.1008 |
| 6 | River shifting | 0 | 0.0059 | 0.012 | 0.029 | 0.0469 |
| 7 | Water logging | 0.002 | 0.0001 | 0.002 | 0.0053 | 0.0094 |
| 8 | Windstorm | 0.0045 | 0.0001 | 0.027 | 0.021 | 0.0526 |
| 9 | hailstorm | 0.0065 | 0.0001 | 0.035 | 0.039 | 0.0806 |
| 10 | Thunderbolt | 0.037 | 0.00003 | 0.035 | 0.042 | 0.11403 |
| 11 | Drought | 0 | 0.0009 | 0.027 | 0.021 | 0.0489 |
| 12 | Cold wave | 0 | 0 | 0.004 | 0.0027 | 0.0067 |
| 13 | Earthquake | 0 | 0.0001 | 0.004 | 0.0053 | 0.0094 |
| 14 | Fire | 0.002 | 0.0011 | 0.051 | 0.037 | 0.0911 |
| 15 | Pest and diseases | 0.0325 | 0.0002 | 0.016 | 0.012 | 0.0607 |
| 16 | Wild animals | 0.06 | 0.00024 | 0.037 | 0.047 | 0.14424 |

Table 3. Hazard Probability

| Name of VDCs | Status of Hazard probability (from land-sides) | | | | | Status of Hazard probability (from floods) | | | | |
|-------------------|--|----|----|----|-----|--|----|----|----|-----|
| | VHH | HH | MD | LH | VLH | VHH | HH | MH | LH | VLH |
| Panchakanya | | | | • | | | | | • | |
| Lothar | • | | | | | | | | | • |
| Korak | • | | | | | | | | | • |
| Bhandara | | | | • | | | | | • | |
| Gitanagar | | | | | • | | | | | • |
| Patihani | | | | | • | | | | • | |
| Shivanagar | | | | | • | | | | | • |
| Mangalpur | | | | | • | | | • | | |
| Phulbari | | | | | • | | | | | • |
| Parbatipur | | | | | • | | | | | • |
| Dibyanagar | | | | | • | • | | | | • |
| Gunjanagar | | | | | • | • | | | | |
| Saradanagar | | | | | • | | | • | | |
| Meghauri | | | | | • | • | | | | |
| Kabilas | | | | | • | | | | • | |
| Dahakhani | • | | | | | • | | | | |
| Chandibhanjyang | • | | | | | • | | | | |
| Darechowk | • | | | | | • | | | • | |
| Jagatpur | | | | | • | | | • | | |
| Gardi | | | • | | | | | • | | |
| Ayodhyapuri | | | | • | | | | | • | |
| Sukranagar | | | | | • | | | | • | |
| Bagauda | | | • | | | | | • | | |
| Madi Kalyanpur | | • | | | | | | • | | |
| Bharatpur | | | | • | | | | | • | |
| Khairahani | | | | | • | | | | • | |
| Bachhauri | | | | | • | | • | | | |
| Kathar | | | | | • | | | • | | |
| Birendranagar | | | • | | | | | | • | |
| Kumroj | | | | | • | | • | | | |
| Chainpur | | • | | | | | | • | | |
| Pithuwa | • | | | | | | | • | | |
| Ratnanagar | | | | | • | | | • | | |
| Shaktikhor | • | | | | | | | | • | |
| Siddi | • | | | | | | | | | • |
| Jutpani | | | • | | | | | | | • |
| Kaule | | | | | • | | | | | • |
| Padampur | | | | | • | | • | | | |
| Total | | | | | | | | | | |

VHH=Very high hazards; HH= High hazards; MH= Medium hazards; LH= Low hazards; VLH= Very low hazards

3.2 Vulnerability Assessment

VDCs prone to various hazards have been identified based on the population exposed to the hazards, vulnerable properties and infrastructures susceptible to disasters. Vulnerable VDCs by various parameters are given in the

Table 4. The data reveal that *Lothar* VDC ranks the highest in terms of the percentage of the total population exposed to disasters whereas *Bachheuli* and *Jutpani* were the most vulnerable VDCs in terms of agriculture land and infrastructures.

Table 4. Vulnerability Assessment (mainly from water-induced hazards)

| VDCs / Municipalities | Population exposed (%) | Vulnerable agriculture land area | Vulnerable crop yield (Metric tonne) | Vulnerable forest area | Homestead trees | Vulnerable private houses | Status ¹ |
|-----------------------|------------------------|----------------------------------|--------------------------------------|------------------------|-----------------|---------------------------|---------------------|
| Panchkanya (Piple) | 3025 | 734 | 2202 | 803 | 0 | 605 | VHDP |
| Lothar | 2394 | 70 | 213 | 1005 | 215 | 440 | VHDP |
| Korak | 2400 | 509 | 791 | 30 | 0 | 400 | VHDP |
| Bhandara | 3813 | 97 | 357 | 2 | 2490 | 690 | VHDP |
| Gitanagar | 0 | 68 | 285 | 0 | 0 | 0 | VLDP |
| Patihani | 1796 | 34 | 150 | 0 | 2500 | 150 | VHDP |
| Shivanagar | 0 | 38 | 117 | 0 | 0 | 0 | VLDP |
| Mangalpur | 4268 | 68 | 207 | 7 | 0 | 12 | VHDP |
| Phulbari | 699 | 96 | 268 | 0 | 0 | 0 | HDP |
| Parbatipur | 0 | 0 | 0 | 0 | 0 | 0 | VLDP |
| Dibyanagar | 1037 | 87 | 278 | 0 | 0 | 236 | VHDP |
| Gunjanagar | 3206 | 109 | 337 | 271 | 0 | 686 | VHDP |
| Saradanagar | 0 | 48 | 148 | 0 | 0 | 0 | VLDP |
| Meghauri | 7367 | 271 | 867 | 10 | 0 | 283 | VHDP |
| Kabilas | 251 | 10 | 39 | 2 | 0 | 20 | LDP |
| Dahakhani | 964 | 88 | 263 | 20 | 0 | 0 | MDP |
| Chandibhanjyang | 1161 | 205 | 129 | 100 | 0 | 198 | HDP |
| Darechowk | 1214 | 60 | 46 | 12 | 0 | 121 | HDP |
| Jagatpur | 1041 | 0 | 0 | 330 | 0 | 199 | HDP |
| Gardi | 810 | 30 | 315 | 0 | 0 | 113 | MDP |
| Ayodhyapuri | 2957 | 83 | 291 | 1755 | 0 | 99 | HDP |
| Sukranagar | 21 | 0 | 0 | 0 | 0 | 4 | LDP |
| Bagauda | 1121 | 78 | 500 | 0 | 0 | 191 | HDP |
| Kalyanpur | 2038 | 50 | 53 | 1100 | 0 | 47 | HDP |
| Bharatpur | 2529 | 140 | 200 | 300 | 0 | 200 | HDP |
| Khairahani | 6120 | 400 | 1250 | 0 | 0 | 350 | VHDP |
| Bachheuli | 3377 | 1569 | 3850 | 313 | 0 | 767 | VHDP |
| Kathar | 3162 | 510 | 1300 | 0 | 0 | 600 | VHDP |
| Birendranagar | 4602 | 800 | 1750 | 1250 | 0 | 800 | VHDP |
| Kumroj | 3216 | 420 | 1100 | 250 | 0 | 215 | VHDP |
| Chainpur | 2100 | 175 | 75 | 0 | 0 | 1350 | HDP |
| Pithuwa | 2053 | 405 | 225 | 0 | 0 | 630 | HDP |
| Ratnanagar | 3773 | 700 | 1800 | 135 | 0 | 900 | VHDP |
| Shaktikhor | 4394 | 333 | 590 | 0 | 0 | 724 | VHDP |
| Siddi | 2019 | 351 | 365 | 167 | 0 | 321 | HDP |
| Jutpani | 2578 | 149 | 288 | 0 | 0 | 458 | HDP |
| Kaule | 0 | 0 | 0 | 0 | 0 | 205 | VLDP |
| Padampur | 2538 | 150 | 310 | 0 | 0 | 190 | HDP |
| Total | 84044 | 9037 | 20958 | 7861 | 5205 | 12204 | - |

¹(The score is primarily based on the exposed population. The scores have been given as: <50 populations as VLDP, >50-200 as LDP, 200-1000 as MDP, 1000-3000 HDP, >3000 VHDP).

3.3 Risk Assessment

Between 1954 and 2003, a total of 231 persons were killed by nine disasters in Chitwan district alone. In an estimate, a property worth more than Rs 10.62 billion was lost annually as a result of the disasters in the district. Flood, land-

slides and fire have been the three most frequent hazards happening 31, 25 and 19 times during the last 49 years. Potential impacts of the five main hazards based on the past events and their corresponding vulnerable VDCs are given below (Table 5).

Table 5. Risk Assessment

| Type of hazard | Interval of occurrence in a large scale (Year) | Potential impact | Vulnerable area (VDCs) |
|-------------------------|--|--|--|
| | | | |
| Flood | 2 | Physical damage: infrastructures- public buildings, bridges and canals. Casualties and public health: Loss of human life, animals, possible outbreak of malaria, diarrhea and viral infections. Water supplies: Contamination of wells and ground water. Crops and food supplies: harvests and food stock may be lost due to inundation. Animals, farm tools and seeds might be lost. Based on the information of the last 49 years, floods in Chitwan district have occurred 31 times and killed 153 people and damaged the public properties equivalent to Rs 4773318000 The average per event loss of life from this disaster is 5 people and worth equivalent to Rs 153978000 as properties. | 32 out of 38 VDCs/Municipalities have been affected by flooding. However, very high and high vulnerable category VDCs include Meghauri, Dibyanagar, Gitanagar, Gunjanagar, Bachheuli, Chainpur, Gardi, Khairahani, Pithuwa, and Birendranagar. |
| Landslide / Debris flow | 3 | Physical damage: Road, bridges, lines of communication, indirectly may reduce crop/forest productivity, trigger flooding, reduce property values. Casualties and public health: Loss of human life, animals, Crops and food supplies: harvests and food stock may be lost due to mudflows. Based on the information of the last 49 years, landslides in Chitwan district have occurred 19 times and killed 12 persons altogether, and damaged the public properties equivalent to Rs 1.45 million per event. | VDCs of very high and high hazard class include: Chandibhanjyang, Darechowk, Kabilas, Korak, Lothar, Piple, Shaktikhor, Siddi, Kaule, Pithuwa, Chainpur and Madi Kalyanpur. |
| Earthquake | 25 | Physical damage: infrastructures- public buildings, bridges and canals. Fires, landslides, flooding may occur. Casualties and public health: Loss of human life, animals, fracture injuries will be the widespread problem. Water supplies: Damage of water system, Contamination of wells and ground water. Loss of human life and public properties. It occurs at a long interval but in a devastating manner. The earthquake of 1995 damaged the properties equivalent to Rs 190000, and of 2001 was Rs. 1 million. | Darechowk, Birendranagar, Dahakhani, Kaule, Kabilas, Lothar, Siddi, Shaktikhor and Korak |
| Fire | 2 | Physical damage: infrastructures- public buildings, industries, houses, forest. Casualties and public health: Loss of human life, animals Crops and food supplies: clothes and food stock may be lost due to burning. Per event loss from fire is Rs. 725000. | Chandibhanjyang, Siddi, Padampur, Kabilas, Darechowk. |
| Windstorm | 4 | Physical damage: infrastructures- public buildings and houses. Casualties and public health: Loss of human life, injuries Crops and food supplies: can damage crops in the field. Casualties during the last 49 years are 13, and per event loss of properties is equivalent to Rs. 157000. | Chandibhanjyang, Dahakhani, Darechowk, Kabilas, Kaule, Padampur, Shaktikhor, Siddi. |

3.4 Average Recurrence Period

Historical records give first indication of disaster return periods and extent (UNDP/ UNDR0, 1991). This is applicable to all types of disasters such as landslides, fire, earthquake, windstorms, etc. However, the predication of occurrence of earthquake is quite a difficult task. Based on the historical trend, an earth-quake with considerable damages occurred in the in-

terval of every 70 year. The last major earthquake occurred in January of 1933 and, based on this recurrence cycle, is forecasted that a major earthquake of unprecedented magnitude is due soon in the country, particularly in the western region.

Based on the current UNDP study (49 years of recall), the average time of recurrence of various disasters are as follows:

Table 6: Average Recurrence Time of Various Disasters

| Disaster Type | No. of events in last 49 years | Average Recurrence time (years) |
|----------------------|---------------------------------------|--|
| Flood | 31 | 2 |
| Landslide | 19 | 3 |
| Earthquake | 2 | 25 |
| Fire | 25 | 2 |
| Windstorm | 13 | 4 |
| Debris flow | 3 | 16 |
| Riverbed rise | 11 | 4 |
| River bank cutting | 14 | 4 |
| Water logging | 1 | 49 |
| Hailstorm | 17 | 3 |
| Drought | 13 | 4 |
| Cold wave | 2 | 25 |
| Pest and diseases | 8 | 6 |
| Wild animals | 18 | 3 |
| River shifting | 6 | 8 |
| Thunderbolt | 17 | 3 |

The information presented in the above table should be taken cautiously because they represent the simple averages of events that occurred in 49 years. What is required is the moving average that shows the trend through time. It is

believed that some of the more damaging disasters like landslides and floods are recurring more frequently now. Due to lack of time series information, this could not be estimated

District Capability Analysis

4

4.1 Service Delivery and Financial Institutions

There are altogether 1,415 government and non-governmental organizations working in the field of health, agriculture, education, poverty alleviation, saving and credit schemes, security, rescue and relief works and disaster manage-

ment in Chitwan district. However, these service delivery and financial institutions are not properly distributed. Around 40% of such institutions are located in two Municipalities, whereas these municipalities bear only 7.5 per cent of the total exposed population to different hazards (Table 7).

Table 7. Service Delivering and Financial Institutions Working in the District

| VDCs/Municipalities | Population exposed to hazards | No. of service delivery institutions | | | | | No. of financial institutions | Other institutions | | Total institutions |
|---------------------|-------------------------------|--------------------------------------|--------------------------------|--------------|------------|-----------------|-------------------------------|---|---------------------------|--------------------|
| | | Police | Health centre/Hospitals/Clinic | Agri. Centre | Veterinary | School/colleges | | NGOs/CBOs (FUGs, COs, Cooperatives, Ama groups etc) | INGOs and donor-supported | |
| Piple | 3025 | 0 | 3 | 1 | 1 | 13 | 0 | 2 | 0 | 20 |
| Lothar | 2394 | 0 | 2 | 0 | 0 | 10 | 0 | 21 | 0 | 23 |
| Korak | 2400 | 0 | 1 | 0 | 0 | 9 | 0 | 4 | 2 | 16 |
| Bhandara | 3813 | 1 | 2 | 1 | 1 | 10 | 1 | 3 | 2 | 21 |
| Gitanagar | 0 | 1 | 1 | 0 | 0 | 5 | 2 | 5 | 0 | 14 |
| Patihani | 1796 | 0 | 2 | 1 | 2 | 9 | 2 | 1 | 0 | 17 |
| Shivanagar | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 4 | 0 | 9 |
| Mangalpur | 4268 | 0 | 1 | 0 | 1 | 8 | 9 | 2 | 0 | 21 |
| Phulbari | 699 | 0 | 1 | 1 | 0 | 3 | 1 | 6 | 2 | 14 |
| Parbatipur | 0 | 0 | 1 | 1 | 0 | 9 | 32 | 9 | 1 | 53 |
| Dibyanagar | 1037 | 0 | 2 | 0 | 0 | 10 | 6 | 11 | 0 | 29 |
| Gunjanagar | 3206 | 0 | 1 | 0 | 2 | 7 | 0 | 29 | 1 | 40 |
| Saradanagar | 0 | 0 | 1 | 0 | 0 | 6 | 2 | 8 | 0 | 17 |
| Meghauli | 7367 | 1 | 1 | 0 | 1 | 11 | 2 | 3 | 0 | 19 |
| Kabilas | 251 | 0 | 1 | 1 | 0 | 11 | 14 | 26 | 1 | 54 |
| Dahakhani | 964 | 0 | 1 | 0 | 0 | 7 | 0 | 10 | 0 | 18 |
| Chandibhanjyang | 1161 | 0 | 2 | 0 | 2 | 2 | 1 | 3 | 0 | 10 |
| Darechowk | 1214 | 1 | 1 | 1 | 1 | 13 | 1 | 0 | 1 | 19 |
| Jagatpur | 1041 | 0 | 1 | 0 | 0 | 9 | 0 | 2 | 2 | 14 |
| Gardi | 810 | 0 | 1 | 0 | 0 | 11 | 2 | 5 | 1 | 20 |
| Ayodhyapuri | 2957 | 0 | 1 | 0 | 0 | 10 | 0 | 0 | 0 | 11 |
| Sukranagar | 21 | 0 | 1 | 0 | 0 | 7 | 8 | 0 | 1 | 17 |
| Bagauda | 1121 | 0 | 1 | 1 | 0 | 10 | 3 | 2 | 0 | 17 |
| Kalyanpur | 2038 | 0 | 1 | 0 | 0 | 8 | 2 | 3 | 0 | 14 |
| Bharatpur | 2529 | 4 | 53 | 4 | 7 | 155 | 47 | 140 | 0 | 410 |
| Khairahani | 6120 | 1 | 1 | 1 | 0 | 16 | 3 | 2 | 1 | 25 |
| Bachhauli | 3377 | 1 | 6 | 1 | 1 | 8 | 4 | 6 | 2 | 29 |
| Kathar | 3162 | 0 | 1 | 0 | 0 | 7 | 3 | 16 | 0 | 27 |
| Birendranagar | 4602 | 0 | 1 | 0 | 0 | 13 | 51 | 6 | 0 | 71 |

| | | | | | | | | | | |
|-------------------|--------------|-----------|------------|-----------|-----------|------------|------------|------------|-----------|------------|
| Kumroj | 3216 | 0 | 4 | 0 | 0 | 7 | 1 | 9 | 0 | 21 |
| Chainpur | 2100 | 0 | 4 | 1 | 0 | 11 | 6 | 13 | 0 | 34 |
| Pithuwa | 2053 | 0 | 4 | 0 | 0 | 11 | 2 | 10 | 0 | 27 |
| Ratnanagar | 3773 | 1 | 21 | 2 | 15 | 48 | 10 | 58 | 0 | 155 |
| Shaktikhor | 4394 | 0 | 1 | 1 | 1 | 11 | 1 | 13 | 1 | 29 |
| Siddi | 2019 | 0 | 1 | 0 | 0 | 11 | 0 | 4 | 0 | 16 |
| Jutpani | 2578 | 0 | 1 | 1 | 1 | 9 | 4 | 9 | 0 | 25 |
| Kaule | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 4 |
| Padampur | 2538 | 0 | 1 | 0 | 0 | 8 | 2 | 16 | 0 | 25 |
| Total | 84044 | 11 | 131 | 19 | 36 | 518 | 223 | 459 | 18 | 141 |
| | | 8 | 52 | 15 | 13 | 53 | 39 | 84 | 13 | |

4.2 Communication and Media

Chitwan is relatively a resourceful district in terms of communication and transportation facilities. Telecommunication facilities have reached to 30 VDCs, Marts line in 12 VDCs and VHF line in 18 VDCs. Postal service has reached to 30 VDCs / Municipalities except in 6 VDCs. Nine express delivery service organizations and pager and cellular phone facilities have been present in the district. In addition, two FM radios namely *Kalika* and *Synergy*, have been in operational and become effective in disseminating local, national and international news and events in no time. Six daily, 3 weekly and 1 fort nightly news papers are published in the district. FM radios provided sig-

nificant help in disseminating news and appeals for the public support for rescue and relief operations in the devastating disasters last year.

4.3 Preparedness Apparatus and Human Resource

An inventory of various apparatus and human resource of the district was done. The study reveals that Chitwan district is self sufficient in terms of various equipment/preparedness apparatus and human resource. Health service, engineers, transportation means, dodgers and ambulance are adequate whereas fire brigade, skilled divers and trained rescue operators are in deficit (Table 8).

Table 8. Status of Preparedness Apparatus and Human Resources

| S.No. | Particulars | Status | | Source/suppliers | Remarks |
|-------|---|----------|---------|---|--|
| | | Adequate | Deficit | | |
| 1. | Fire brigade-2 | | • | Bharatpur and Ratnanagar municipalities | Needs one more in Ratnanagar Municipality and <i>Madi</i> area. |
| 2. | Dodger-6 | • | | Municipalities, Road Division | |
| 3. | Excavator-12 | • | | Bharatpur municipality and Private contractors | |
| 4. | Ambulance-18 | • | | | |
| 5. | Doctors/Nurses/Health Assistants | • | | Government/private hospitals/Social Organizations | |
| 6. | Engineers/Overseers | • | | Line agencies/Private firms/Individuals | |
| 7. | Volunteers | • | | Schools, Red cross, NGOs, CBOs, Individuals | |
| 8. | Boats | | • | Police, Army, Royal Chitwan National Park, Municipalities / DDC | Needs to deploy some more boats |
| 9. | Skilled divers | | • | - | |
| 10. | Security of belongings left at the disaster sites | • | | Police/Volunteers | |
| 11. | Transportation means (Truck, bus, jeep, Rickshaw) | • | | Line agencies, Private sector | Problems in some VDCs including <i>Madi</i> area. |
| 12. | Food, cloth, utensils | • | | Red cross, DDC / Municipalities, DAO, NGOs / Private individuals / Donors | |
| 13. | Trained rescue and relief operators | | • | Police, NGOs, volunteers | People have self-trained through trial and error method, No systematic training received except in conceptual package. |
| 14. | Water tankers | | • | Drinking water corporation | Needs to add some more |

4.4 Evaluation of Resources

Evaluation of the existing resources present in the district has been done taking its capability, availability and durability indicators into account. The study reveals that several services and resources essential to cope with the various disasters are available in the district, however majority of them are available at district level (Table 9).

Resource and service facilities available in the district have been shown in the maps

(see maps). They include accessibility of primary schools, types and location of health services, garden, bus park, airports and lakes, types and density of communication services, accessibility of health services, banking services, land use and land cover types, sources of water supply, distance to water supply, natural drainage condition of landscape, river network, road network, and accessibility of major road.

Table 9. Evaluation of Various Resources Available in the District

| Services and resources | Capability | | | Availability | | | Durability | | |
|-----------------------------------|------------|-------------|----------------|------------------|---------------------|---------------|----------------|-----------------|---------------|
| | VDC level | Ilaka level | District Level | easily available | Reportely available | Not available | Short duration | Medium duration | Long duration |
| Fire brigade | | • | • | | • | | • | | |
| Health services | • | • | • | • | | | | | • |
| Civil supply and food | • | • | • | | • | | | • | |
| Engineering services | | | • | | • | | | • | |
| Private hospitals | | | • | • | | | | | • |
| CBOs | • | • | • | • | | | | | • |
| NGOs | • | • | • | • | | | | | • |
| College/school student volunteers | • | • | • | • | | | • | | |
| Road network | • | • | • | • | | | | | • |
| Water ways | | • | • | | • | | • | | |
| Ambulance | • | • | • | | • | | | | • |
| Police | | • | • | | • | | | • | |
| Telecommunication | • | • | • | • | | | | | • |
| Water supply | • | • | • | • | | | | • | |
| Power supply | • | • | • | • | | | | | • |

5

Action Plan and Implementation Strategy

The "Action Plan" of Chitwan district has been presented in a tabular form specifying disaster type, stage (pre-disaster, during disaster and post-disaster), actions proposed, location of action, responsible agency/person/s, expected

output and verifiable indicators. This log-frame design of the "Action Plan" is believed to help in the monitoring and evaluation of the planned activities for disaster management.

| Disasters / Stages/ Broad activities | Action points | Where? Whom? | Responsible/ executing agencies | Cooperating agencies | Time of completion (Yrs) | Tentative estimated budget | Expected outputs | Verifiable indicators |
|---|--|--------------------------------|---------------------------------|--|--------------------------|----------------------------|---|--|
| TDRM in general (Applicable to all types of disasters) | | | | | | | | |
| Policy / Legislation | Prepare district disaster management guidelines/programmes | | DDC/DAO | Line agencies | 5 | | District guidelines/ Programmes on disaster management prepared and implemented by DDC/DNDRRC. | District Disaster guidelines and programmes are prepared, endorsed and disseminated to all district level stakeholders. |
| | Prepare guidelines / manual for resettlement / rehabilitation and reconstruction (low cost disaster resistant housing, low cost sanitation measures etc) | Whole district | DAO/DDC | NGOs | 2 | | A manual/ guidelines on disaster-resistant resettlement and reconstruction prepared. | All rehabilitation and reconstruction works are done following the guidelines and programmes. |
| | Prepare/execute guidelines on the mobilization of NGOs, private sectors and communities for the disaster reduction. | Whole district | DDC/DAO | NGOCC/NGO federation (district branch) | 2 | | NGO mobilization guidelines in the disaster management field prepared, endorsed and implemented. | |
| | Promote / encourage international donors/INGOs/NGOs to mobilize their resources in the prioritized disaster management areas of the district through formulation of appropriate resource mobilization policies.. | Whole district | DDC / Municipalities / DAO | PDMP / LGP/PDDP | 2 | | External resources increasingly tapped in the disaster management sector in the district. | At least 20% additional funding mobilized in the district every year from external sources. |
| Organizational development | Strengthen/equip disaster management unit. | DAO | DAO / DDC | NGOs, self-help organizations | 2 | | DMU at the district equipped/strengthened with a computer, a photocopier, a fax machine, a LCD, and trained staff on GIS and disaster management. | DMU is able to conduct hazard mapping, risk/vulnerability assessment and facilitate to prepare annual disaster management plans. |
| | Allocate the disaster wise responsibilities among DNDRRC members | DNDRRC | DAO | Line agencies / NGOs | 2 | | Disaster wise responsibilities delegated to DNDRRC members and members assumed their new roles and responsibilities | Disaster wise meetings on the chairmanship of DNDRRC member are held and prepare disaster mitigation strategies and review the progress in each quarter. |
| | Collect/compile/disseminate hazard maps | High risk VDCs/ municipalities | DNDRRC/DDC | Municipalities, VDCs, NGOs, Line | 2 | | Hazards maps collected, compiled and disseminated | Hazard maps are used in planning and sensitization / training purposes. |

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| | | palties; Media | | agencies | | | nated to all concerned at a periodic interval. | |
| | Upgrade/revise hazard maps at a regular interval. | Whole district | DNDRC, DDC, DTO | NGOs | 2 | | Hazard maps upgraded/ revised at every two year interval. | |
| | Establish a district level DMIS for disaster information collection and dissemination. | DAO | DAO/DDC | NGOs | 5 | | DMIS established in the district. | DMU receives disaster related information regularly from VDCs, COs, NGOs, Local authorities and media/individuals, analyze and disseminate them to all concerned. |
| | Conduct risk/vulnerability assessment of selected buildings (hospitals, school etc) and infrastructure (power station, bridges etc). | High risk areas | DNDRC, DTO | NGOs | 2 | | Risk/vulnerability assessment of selected buildings and infrastructures conducted. | Risk/vulnerability reports are prepared and disseminated to all concerned. |
| | Prepare communication network at VDCs / municipality / district level. | Dist- trict/Municipal or VIC level | DAO/Telecommunication Office/NJA | Local authorities | 2 | | Communication networks for disaster related works/information established. | The proposed communication/information flow system runs smoothly*. |
| Plan formulation / implementation | Introduce TDRM concept into development planning | Whole district | DDC/DNDRC | Line agencies, NGOs | 2 | | Disaster management activities incorporated into annual district development plan | Prepare annual disaster management action plan and incorporate it into district development plan |
| | Incorporate the results of risk/vulnerability assessment into the development activities. | Whole district | Local authorities | NGOs | 5 | | The results of risk and vulnerability assessments incorporated into the planning processes. | |
| | Allocate disaster management budget in the annual plan of all disaster management actors in the districts/VDCs. | Whole district | Local authorities/Line agencies | NPC/MLD, NGOs | 2 | | Development budget for disaster management increased in the district. | At least 10% budget is allocated for disaster management by local authorities in their annual plans. |
| | Review/update disaster management plan annually | District level | DDC/DNDRC | Municipalities, VDCs, NGOs, Line agencies | 2 | | Disaster management plan reviewed and updated annually. | Revised Disaster Management Plan is published and circulated to all concerned stakeholders in the district. |
| | Allocate open spaces in urban/rural planning for post disaster temporary settlement sites. | Nearby sites of high risk areas | DAO / Local authorities / TDF | NGOs, Red cross, Private sector | 5 | | Open spaces for temporary settlement sites for disaster victims allocated. | All rescue workers and concerned authorities including people of vulnerable places know about the rescue sites. |
| | Adopt/publicize/execute plan. | High risk areas | Local authorities / DNDRC | NJA district branch, Line agencies | 2 | | Disaster management plan endorsed by district council, publicized and implemented. | District development plan incorporating disaster plan is published and disseminated to all stakeholders |
| Human resource development | Provide training to VDCs/district level stakeholders/actors on the risk/vulnerability assessment and response measures. | District, Municipal, VDCs | DNDRC, Local authorities | Red cross, NGOs | 2 | | Training programmes to various actors organized. | At least 1 personnel in each VDC, municipality, DDC and line agencies received training on risk/vulnerability, and response/mitigation/rehabilitation measures. |
| | Provide training to personnel/volunteers on warehouse management and supply of relief materials. | District headquarters / municipalities | DNDRC/DDC / Municipalities/ Red cross society | NGOs, CCI | 2 | | Trainings on warehouse management and supply of relief materials provided to personnel and volunteers. | Volunteers from each VDC, NGOs, community and schools receive training on the disaster management. |

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|---|--|--|--|--|---|--|--|---|
| | Provide training to community leaders at VDCs and Ilaka level on disaster management. | Community leaders (CO/FUG /Users committee representatives) of high risk areas | DAO/DDC / Municipalities | Red cross society/NGOs | 2 | | Training on disaster management provided to community leaders at VDC and Ilaka level. | |
| | Conduct awareness raising campaigns on the likely damages and precautionary measures of disasters. | Community leaders (CO/FUG /Users committee representatives) of high risk areas | DAO/DDC / Municipalities/ Red cross society/NGOs | NJA district branch | 2 | | Several awareness campaigns organized about the likely damages and precautionary measures of disasters. | Various activities including organize essay competition, display hoarding boards, and observe the disaster management day are done. |
| | Provide training to personnel on need assessment. | District or municipal or VDC level | DNDRC, DDC, Municipalities | Red cross, NGOs, Private sector | 2 | | Orientations on need assessment to personnel provided. | DDCD/DAO/Red Cross, NGOs, volunteers are received trainings on need assessment, rescue and damage assessment. |
| | Provide training to rescue personnel | District head-quarters | DAO/DPO / DDC/ Municipalities | NGOs | 2 | | Training on rescue operation provided to selected volunteers and rescue personnel. | |
| | Orient the damage assessment team members | District level | DNDRC/DDC | NGOs, Line agencies | 2 | | Damage assessment team members oriented on the formats. | |
| | Sensitize local people/community leaders/others concerned through disseminating the risk assessment results. | High risk VDCs/ Municipalities | Local authorities / DNDRC | NGOs | 2 | | Local residents and community leaders sensitized on the extent and severity of the damages based on the risk/vulnerability maps. | COs, FUGs and other CBOs are sensitized on the results of the risk/vulnerability assessment. |
| | Prepare/distribute awareness raising materials (such as pamphlets, TV documentary films, radio programmes etc). | High risk areas | DAO/Municipalities/Red cross/NGOs | NJA district branch | 2 | | Awareness raising materials prepared and distributed to the residents of high risk areas. | |
| | Organize disaster management conferences / seminars in the district to share experiences among district and national level actors. | District head-quarters | DNDRC, Local authorities | NGOs | 2 | | Conferences/seminars on disaster management organized at district level | At least one conference/seminar/workshop is organized each year. |
| | Conduct rehearsal and drill exercises on a periodic basis about relief works. | District and some high risk VDCs | DAO/DPO | Volunteers, NGOs | 2 | | Rehearsal and drill exercises on relief works done. | Rehearsal and drill exercises are done periodically and specially before the rainy season. |
| Preparedness, relief and rescue operations | Establish/manage emergency supply warehouses at accessible location | Municipalities and Madi area | DDC/DAO / Municipalities | VDCs, Municipalities | 2 | | Emergency warehouses established and managed. | Warehouses are managed efficiently to keep the available stocks without any damage and with proper inventory. |
| | Provide regular supply of relief materials in warehouses. | Municipality and Madi areas | DAO/DDC/ municipalities / Red cross society | NGOs, , volunteers | 2 | | Warehouses received relief materials regularly. | DNDRC/DDC/Red cross make coordination with other institutions to receive relief materials regularly. |
| | Form a permanent search and rescue team at district level. | District | DAO/DDC / Municipalities | NGOs, Red cross, civic society, Human right groups | 2 | | A permanent search and rescue operation team formed at district level. | |

| | | | | | | | | |
|--------------------------------|---|----------------------------------|--|--|---|--|---|---|
| | Identify emergency evacuation sites at local level. | High risk VDCs/municipalities | DAO/DDC/VDC/Municipality | Line agencies / NGOs | 5 | | Emergency evacuation sites for various disasters identified to evacuate the people in need. | All rescue workers and concerned authorities including people of vulnerable places know about the rescue sites. |
| | Form a permanent need assessment team at district level. | District level | DNDRC, DDC, Municipalities | Line agencies / NGOs | 2 | | A permanent team for need assessment formed under the coordination of a DNDRC member. | |
| | Develop a standard need assessment format and distribute it to all VDCs and Municipalities. | All VDCs / Municipalities | DAO/DDC / Municipalities / Red cross/DTO | Line agencies / NGOs | 2 | | A standard need assessment format developed. | Communities of high risk areas know about to fill out the formats. |
| | Manage/procure equipment / transportation vehicles for rescue and relief operation. | District or municipalities level | DAO/DDC / Municipalities | Red cross, NGOs, Private sector | 5 | | Transportation vehicles for rescue and relief operations procured. | A fire brigade is procured by the Ratna Nagar municipality |
| | Form a medical assistance team | District level | DAO/DDC/DHO | NGOs | 2 | | A medical assistance team headed by a senior doctor formed | |
| | Strengthen the emergency ward in each government hospital. | District level | DAO/DDC/DHO | NGOs | 5 | | Capacity of emergency ward increased. | |
| | Prepare a standard damage assessment format by disasters | | DNDRC/DDC | Line agencies / NGOs | 2 | | A standard damage assessment format developed and distributed to all local authorities. | Community people and respective VDC officials know about the fill-out of the damage assessment formats. |
| | Form a permanent team for damage assessment in the district. | District level | DNDRC/DDC | Municipalities, NGOs, Line agencies | 2 | | A permanent team for damage assessment formed under the coordination of a DNDRC member. | |
| | Form a permanent committee for rehabilitation and reconstruction planning in the district consisting of experts of all disasters. | District level | DAO/DDC / municipalities | Line agencies / NGOs | 2 | | A permanent committee for rehabilitation and reconstruction planning/works formed incorporating experts of all disasters. | |
| Studies / documentation | Conduct feasibility study of local income generating activities. | High risk areas | DDC | Line agencies / NGOs | 2 | | Feasibility studies on local income generation activities for the disaster victims conducted. | Feasibility study reports are published and disseminated to all concerned. |
| | Document indigenous technology, knowledge, practices and values of local communities relating to disaster management. | Whole district | DNDRC/ Line agencies / Local authorities | NGOs / Red cross | 2 | | Indigenous technology, knowledge practices and values of local communities on disaster management documented. | Study reports are published and disseminated to all concerned. |
| | Conduct regular capability assessment of GOs/NGOs and private sector, and prepare inventory of public/private resources. | Whole district | DDC/DAO | NGOCC/NGO federation (district branch) | 2 | | Capability assessment of organizations working in the field of disaster management in the district and inventory of resources done. | Capability analysis reports are published in each alternate year and disseminated to all concerned. |
| | Conduct periodic assessment of risk and vulnerability of disasters. | Whole district | DDC/DAO/DTO/ Municipalities | NGOs/Experts | 2 | | Assessment of risk and vulnerability done at regular interval. | Risk/vulnerability reports are prepared and disseminated to all concerned. |
| | Incorporate EIA for disaster reduction into annual district development planning and private initiatives. | Whole district | Local authorities | Private sectors | 2 | | EIA incorporated into development planning in disaster management. | |

| Flood | | | | | | | |
|---------------------------|---|--|---|---------------------------------|-----------------|--|--|
| Pre-flood measures | Establish/strengthen flood forecasting and warning system. | 15 high flood risk VDCs. | DAO/DDC / Concerned VDCs/Dept of hydrology. | Meteorological centre / NGOs | 2 | | Flood forecasting and warning systems established. Flood monitoring towers/Rain gauge are established mobilizing resources from district and external sources, and are protected by local communities. |
| | Train selected villagers of affected villages in manning boats, constructing rafts, methods of making unclear water potable, first aid and prevention of epidemics, diving and saving lives, and flood relief works. | 15 high flood risk VDCs. | DNDRC / Local authorities | NGOs, Red cross, civic society | 2 | | Selected villagers trained on various subjects including manning boats, constructing rafts, making unclear water potable, diving and saving lives and other relief works. At least 20 persons are trained in disaster related trainings in each VDC. |
| | Publicize/distribute the phone numbers of relief team/DMU. | All VDCs / Municipalities | DNDRC | Local authorities | 2 | | Phone numbers of relief team and institutions publicized in the high disaster risk VDCs/municipalities. |
| | Inspect, strengthen and repair all approach roads and culverts to villages to ensure that the roads will remain open during floods. | 15 affected VDCs. | DDC/VDCs/Municipalities | | 5 | | All approach roads inspected and repaired in time. A status/completion report is submitted to DNDRC. |
| | Provide wireless sets to villagers likely to be cut off during monsoon (if possible!). | VDCs of highly sensitive areas | DNDRC | Local authorities | 5 | | Wireless sets to VDCs/villagers of very high risk areas provided. |
| | Inspect transmission lines, electric poles etc to ensure safety of people in the flood affected areas. | Flood risk VDCs. | DEA | Local authorities | 2 | | All basic infrastructures such as transmission lines and electric poles inspected before rainy season. A completion report is submitted to DNDRC. |
| | Carry out annual cleaning, desilting, deepening of natural water reservoirs and drainage channels. | River damaged areas of high flood risk VDCs. | DIO, DDC/VDCs | Local authorities | 2 | | Desilting and cleaning of natural water reservoirs and drainage channels carried out annually. The bed level is maintained at the same height as before. |
| | Inspect/strengthen, where necessary, all flood protection embankments. | 15 VDCs | DNDRC/DIO | Local authorities | 5 | | All flood protection embankments inspected/strengthened. A status report is prepared and submitted to DNDRC. |
| During flood measures | | | | | | | |
| | On receiving the flood warning, evacuate people in roadside (if flood have not yet hit the area). Once the floods have hit, boats/rafts at village, evacuation centers should be pressed into action. Also, ensure that in each team there are some divers who can save life. | Flood affected areas | DAO, Army, DPO /Local authorities | NGOs, Red cross, civic society | During disaster | | During disaster, people evacuated in safer sites. All vulnerable and injured people are evacuated in the safer locations as planned earlier. |
| | Ensure that arrangements are made for security of belongings left behind by people in evacuated areas. Involve local residents in patrolling such areas at night. | Flood affected areas | DAO/DPO | volunteers/Red cross | During disaster | | security of belongings left by people in evacuated areas maintained. Security men and volunteers are mobilized to maintain proper security situation and to look after the belongings left by affected people at the sites. |
| | Ensure that members of a family are evacuated together to the same safe site. | Flood affected areas | DNDRC/Local authorities | Red cross, NGOs, Private sector | During disaster | | Members of a family evacuated in the same place. |

| | | | | | | | | |
|----------------------------|---|------------------------------------|---------------------------------|---|-------------------------------------|--|--|---|
| | Report/identify all deaths promptly and handover or dispose as per custom. | Flood affected areas | DNDRC / Local authorities / DPO | Red cross, civic society, local volunteers | During disaster | | All deaths identified and reported promptly and handed over/disposed as per custom. | Damage assessment forms are filled out promptly. |
| | Ensure availability of cooked and dry food and safe drinking water to all evacuees at the evacuation centre. | Flood affected areas | DNDRC / Local authorities | Red cross, NGOs, Private sector | During disaster | | Cooked/dry food and drinking water made available to all evacuees. | |
| | Do adequate publicity of methods of making drinking water for human consumption using bleaching powder etc. | Flood affected areas | DHO, drinking water office, | NJA district branch | 2 | | Methods of making drinking water potable publicized. | Treated drinking water is available in the evacuation sites. |
| | Mobilize NGOs, local teachers, students and other volunteers for distribution of rescue services including drinking water, food, clothes and utensils. | Flood affected areas | disaster hit areas | DAO, Local authorities, District Education Office, DHO, Red cross | During disaster | | NGOs, volunteers, local teachers and students mobilized for rescue and relief operation. | There is no shortage of rescue operators in the sites. |
| | Ensure availability of additional beds at district and ilaka/VDC level hospitals to meet any eventuality. | District or ilaka hospitals | DHO/DNDRC | Local authorities | During disaster | | Additional beds arranged in hospitals during disaster in the district. | There is an increase in the number of beds in the hospitals. |
| | Ensure adequate availability of medicines at various levels. | Hospitals | DHO/DNDRC | Local authorities, NGOs | During disaster | | Adequate availability of medicines arranged during/before the disaster. | DDC/DNDRC/Red cross are ensured about the adequacy of medicines in the district. |
| | Keep few teams of doctors and paramedical staff ready at district and affected areas. | District head-quarters / Madi area | DAO/DHO | NGOs, Red cross | During disaster | | Few teams of doctors and paramedical staff kept ready during disaster. | |
| | Prevent outbreak of epidemics by making availability of safe drinking water, removing dead bodies of human and animals. | Affected areas | DNDRC, Local authorities | Red cross, NGOs, volunteers | During disaster | | Outbreak of epidemics prevented by making safe drinking water and removing dead bodies. | Safe drinking water is available in the sites and dead bodies are removed at the soonest. |
| | Drain the flooded areas with priority of strategic installations like power houses, substations, hospitals, water disposal systems and residential areas. | Affected areas | DNDRC/Local authorities, DTO | NGOs, local residents | During disaster | | Flooded areas drained with priority of strategic locations. | Strategic locations are closely monitored. |
| | Manage a team of veterinary doctors to prevent cattle epidemics. | Affected areas | DDRC/DLO | Local authorities, NGOs | During and right after the disaster | | A team of veterinary doctors made ready to prevent cattle epidemics. | |
| | Prepare a basic report of the damages to the given buildings and infrastructures. | Affected areas | DNDRC/Local authorities, DTO | NGOs, Civil society | During and right after the disaster | | A damage report is prepared and submitted to DNDRC/DDC. | DNDRC and DDC discuss damage report and make strategies to repair/rehabilitate the sites. |
| Post-flood measures | | | | | | | | |
| | Inspect the flood affected localities by medical teams to prevent outbreak of post-flood epidemics even after the flood waters have subsided and people have returned their villages. | Flood affected areas | DHO/DNDRC | Local authorities, NGOs | During and right after the disaster | | The flood affected areas inspected by the medical teams to prevent outbreak of post-flood epidemics. | An inspection report is prepared and submitted to DNDRC/DDC |

| | | | | | | | | |
|------------------|---|---------------------------------|---|---------------------------------------|--------------------------|--|---|--|
| | Conduct a comprehensive survey to provide fair distribution of relief/compensation packages to be offered by government/other institutions. | Flood affected areas | DAO, Local authorities, Red cross | Civil society / Human right activists | Right after the disaster | | A comprehensive survey to provide compensation packages conducted. | The survey report is discussed at DNDRC/DDC and a compensation plan is prepared. |
| | Ensure that the new houses constructed in the villages use construction practices that make them more resistant to standing flood waters. | Flood affected and nearby areas | Local authorities | NGOs, Civil society | 2 | | Flood-resistant houses in the villages increasingly constructed. | At least 20% of the new houses built are flood-resistant. |
| | Start repair of road, canals, electrical transmission lines as soon as possible. | Flood affected and nearby areas | DEA, Transport and road division, District irrigation office. | Local authorities, NGOs | 2 | | Road, canal, electrical transmission lines repaired. | A work completion report is prepared and submitted to DNDRC/DDC. |
| | Provide adequate, timely and speedy credit to farmers to purchase agriculture inputs and cattle. | Flood affected and nearby areas | Commercial banks, LDFB | Local authorities, NGOs | 2 | | Adequate credit capital mobilized in the flood affected villages. | Credit demand and disbursement status is prepared and submitted to DDC/DNDRC. |
| | Supply/maintain food, fodder, and safe drinking water in the pockets where affected people may require. Carry out rehabilitation of degraded riversides through agroforestry activities (See: Kaffle 2000 for appropriate Agro-forestry models). | Flood affected and nearby areas | DMRC/Local authorities | Red cross, private sector, NGOs | 2 | | Food, fodder and safe drinking water provided to the affected villages. | A status report is prepared and submitted to DDC/DNDRC. |
| | Conduct income generating activities in the affected areas | Flood affected areas | DADO/District Veterinary Office | DDC/VDCs | 2 | | Income generating activities conducted. | |
| | Provide seeds of agricultural crops/vegetables for affected farmers | Affected areas | DADO | DDC/NGOs | 2 | | Seeds of various agriculture crops provided to affected farmers. | |
| Follow up | Document the experiences in handling floods. | Disaster prone areas | DMRC | NGOs | 2 | | Flood handling experiences well documented. | The document is published and disseminated to all vulnerable VDCs / Municipalities and the concerned actors. |
| | Identify the points from where the water had entered, and document them so that future actions can be taken before the onset of monsoons. | Disaster prone areas | DNDRC/ Local authorities | NGOs | 2 | | Water-entered points identified and documented for future reference. | Document is made available to all district level actors. |
| | In consulting with the elderly people of the affected areas, identify the natural drainage points of such villages/localities and ensure that such natural drainage lines are strengthened and maintained and earmarked. | Disaster prone areas | DNDRC/ Local authorities | NGOs | 2 | | Natural drainage points of the locality identified and documented. | Document is made available to all district level actors. |

| Landslides | | | | | | | | |
|--------------------------|---|---|--|--|---|--|--|---|
| Pre-landslide activities | Prevent shallow erosion slides constructing check dams, asphalt mulch, natural fiber grids/jutes or synthetic grids. | Landslide spots of 16 VDCs | DTO, | District irrigation office | 2 | | Check dams, asphalt mulch, natural fiber and grids constructed to prevent the soil erosion. | |
| | Identify landslide prone areas (Hazard mapping) | whole district | DWIDP, DSCWM | DTO | 2 | | Landslide prone areas identified. | Hazard mapping is done and results are disseminated to all concerned. |
| | Prepare rainfall intensity map of the whole district. | District | Meteorological centre/DNDRC | Expert / consultant | 2 | | Rainfall intensity maps of all VDCs/Municipalities prepared analyzed. | Make the results of the analysis of the rainfall intensity map available to all district/central level actors and sensitize local people based on this. |
| | Make proper drainage system (catchwater drains, roadside drains, trench) | Catchments area of landslide-risk VDCs. | DTO, District soil conservation office | District transportation office | 2 | | Proper drainage system made. | Status reports published and disseminated to all concerned. |
| | Construct retaining walls (Masonry walls, concrete retaining wall, gabion walls) | High risk areas | DTO, District soil conservation office | District irrigation office | 5 | | Retaining walls in all necessary spots constructed. | Progress reports are published and submitted to DDC/DNDRC. |
| | Relocate/change the location of the facility to avoid landslide prone areas. | High risk areas | DAO/Local authorities | Line agencies | 5 | | Location of the facilities relocated to avoid landslide prone areas. | New service location maps prepared and distributed to all concerned. |
| | Regrade and bench the slope. | High risk areas | District soil conservation office, DTO | NGOs, Local authorities, Line agencies | 5 | | Slope of the possible landslide areas regraded and benched. | |
| | Construct revetments, spurs, dykes to protect slopes against river and stream erosion. | High risk areas | District soil conservation office, DTO | NGOs, Local authorities, Line agencies | 5 | | Revetments, spurs, dykes, groins constructed to protect slopes against river and stream erosion. | Status reports prepared and disseminated to all concerned. |
| | Plant barren and sloppy areas in Hills with suitable plant species. | 16 high risk VDCs. | DFO, FUGs | NGOs/ Local authorities | 5 | | Afforestation done in the barren and sloppy areas. | All barren lands in the vulnerable areas are covered with tree plantation in 10 years. |
| | Conduct awareness raising campaigns on safe locations, community buildings and so. | high and very high vulnerable areas. | DDC, DFO, RCNP | NGOs/CBOs/ Civic society | 2 | | Awareness campaigns conducted in the vulnerable VDCs. | World disaster day and soil conservation days are observed every year. |
| | Relocate public and private facilities | Vulnerable areas | DNDRC/Local authorities | Line agencies | 5 | | Public and private facilities relocated to safer sites. | |
| | Mobilise communities for awareness raising and during and post landslide disaster management. | Vulnerable areas | DDC/DAO | NGOs/CBOs/ Line agencies | 2 | | Awareness campaigns conducted in the vulnerable VDCs. | |
| | Discourage paddy farming in the Hill slopes. | Vulnerable areas | VDCs, DDCs | DADO, CBOs, NGOs | 5 | | Awareness campaigns conducted in the vulnerable VDCs. | |
| | Coordinate among concerned agencies in the districts and outside districts for pre, during and post landslide management. | Inter/intra district | DDC | NGO/CBOs | 5 | | A coordination mechanism established in the district. | |
| | Conduct preparedness training/drill exercises for coping landslide | In the district | DPO, DAO, VDCs | NGOs | 5 | | Drill exercises conducted regularly before the | Atleast one preparedness training organised each year before monsoon. |

| | | | | | | | | |
|--|--|-----------------------------------|---|--|-------------------------------------|--|--|--|
| | disaster. | | | | | | monsoon. | |
| | Display boards in the public areas prone to landslides to avoid accidents. | High risk VDCs. | DFO, District soil conservation office, FUGs | NGOs/ Local authorities | 2 | | Hoarding boards displayed for the awareness raising and avoid accidents. | |
| During and right after the landslides | Ensure that members of a family are evacuated together to the same safe site. | Landslide affected areas | DNDRC/Local authorities | Red cross, NGOs, Private sector | During disaster | | Members of a family evacuated in the same place. | |
| | Mobilize NGOs, local teachers, students and other volunteers for distribution of rescue services including drinking water, food, clothes and utensils. | Landslide affected areas | disaster hit areas | DAO, Local authorities, Red cross | During disaster | | NGOs, volunteers, local teachers and students mobilized for rescue and relief operation. | There is no shortage of rescue operators in the district. |
| | Report/Identify all deaths promptly and handover or dispose as per custom. | Landslide affected areas | DNDRC / Local authorities / DPO | Red cross, civic society, local volunteers | During disaster | | All deaths identified and reported promptly and handed over/disposed as per custom. | Damage assessment forms are filled out promptly. |
| | Ensure availability of cooked and dry food and safe drinking water to all evacuees at the evacuation centre. | Landslide affected areas | DNDRC / Local authorities | Red cross, NGOs, Private sector | During disaster | | Cooked/dry food and drinking water made available to all evacuees. | |
| | Ensure adequate availability of medicines at various levels. | Hospitals | DHO/DNDRC | Local authorities, NGOs | During disaster | | Adequate availability of medicines arranged during/before the disaster. | DDC/DNDRC/Red cross are ensured about the adequacy of medicines in the district. |
| | Keep few teams of doctors and paramedical staff ready at district and affected areas. | District headquarters / Madi area | DAO/DHO | NGOs, Red cross | During disaster | | Few teams of doctors and paramedical staff kept ready during disaster. | |
| | Prevent outbreak of epidemics by making availability of safe drinking water, removing dead bodies of human and animals. | Affected areas | DNDRC, Local authorities | Red cross, NGOs, volunteers | During disaster | | Outbreak of epidemics prevented by making safe drinking water and removing dead bodies. | Outbreak of epidemics is completely under control. |
| | Manage a team of veterinary doctors to prevent cattle epidemics. | Affected areas | DDRC/DLO | Local authorities, NGOs | During and right after the disaster | | A team of veterinary doctors made ready to present cattle epidemics. | |
| | Prepare a basic report of the damages to the given buildings and infrastructures. | Affected areas | DNDRC/Local authorities, DTO | NGOs, Civil society | During and right after the disaster | | | |
| Post Landslide | | | | | | | | |
| Post landslides | Inspect the landslides affected localities by medical teams to prevent outbreak of post-landslide epidemics. | Landslide affected areas | DHO/DNDRC | Local authorities, NGOs | During and right after the disaster | | The flood affected areas inspected by the medical teams to prevent outbreak of post-flood epidemics. | An inspection report is prepared and submitted to DNDRC/DDC. |
| | Conduct a comprehensive survey to provide fair distribution of relief/compensation packages to be offered by government/other institutions. | Landslide affected areas | DAO, Local authorities, Red cross | Civil society / Human right activists | Right after the disaster | | A comprehensive survey to provide compensation packages conducted. | Based on the survey report, a compensation plan is prepared. |
| | Start repair of road, canals, electrical transmission lines as soon as possible. | Flood affected and nearby areas | DEA, Transport and road division, District irrigation office. | Local authorities, NGOs | 2 | | Road, canal, electrical transmission lines repaired. | Damaged roads, canals, electrical transmission lines are smoothly running. |

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| | Provide adequate, timely and speedy credit to farmers to purchase agriculture inputs and cattle. | Landslide affected and nearby areas | Commercial banks, LDFB | Local authorities, NGOs | 2 | | Adequate credit capital mobilized in the landslide affected villages. | The demand and disbursement forms are filled out and submitted to DNDRC/DDC. |
| | Supply/maintain food, fodder, and safe drinking water in the pockets where affected people may require. | Landslide affected and nearby areas | DMRC/Local authorities | Red cross, private sector, NGOs | 2 | | Food, fodder and safe drinking water provided to the affected villages. | There is no shortage of food, fodder and safe drinking water in the affected areas. |
| Earthquake | | | | | | | | |
| Pre-disaster activities | | | | | | | | |
| | Conduct awareness programmes on safety precautions during earthquake. | Municipalities and highly populated areas and public buildings/important infra-structures | DNDRC/Local authorities | NGOs | 2 | | Awareness programmes on safety precautions conducted. | TV, radio programmes and pamphlets/brochures on the safety precautions are produced and disseminated. |
| | Carry out seismic risk assessment zoning | Whole district | DNDRC | NGOs | 2 | | Seismic risk assessment zoning carried out. | Risk assessment results are published and distributed to the communities of high risk areas. |
| | Implement seismic codes of design and construction of various structures effectively. | | DNDRC/DDC / Municipality / DTO | | 5 | | Seismic codes of design and construction of various structures implemented effectively. | At least 80% houses / buildings are constructed following the seismic codes. |
| | Provide trainings on earthquake engineering principles and use of codes to engineers working in the district. | high risk areas | DNDRC/DTO | NGOs | 2 | | Trainings on earthquake engineering principles and use of codes to engineers provided. | All engineers at the district technical office are trained on the earthquake engineering principles. |
| | Develop methods for seismic strengthening of existing structures, particularly in the structures considered critical for the community. | Whole district | DNDRC/DTO | NGOs | 5 | | Methods for seismic strengthening of existing structures developed. | The methods of strengthening existing structures are published and disseminated to all concerned. |
| | Develop simple methods (retrofitting) for upgrading the seismic resistance of traditional non-engineered construction and their dissemination to the common builders and owners by mass communication media, demonstrations and extension works. | Whole district | DNDRC/DTO | NJA, NGOs | 5 | | Simple methods for upgrading the seismic resistance of traditional non-engineered construction developed and disseminated to builders and owners. | The methods are published and disseminated to all concerned. |
| | Do insurance for the buildings and structures to reduce the economic impacts on individuals. | Whole district | Line agencies | Insurance companies | 2 | | Insurance of the buildings and structures to reduce the economic impacts on individuals done. | Important public buildings and structures are insured. |
| | Install seismological observatory for monitoring seismic activities with a density of instruments capable of recording and locating all earthquakes bigger than 5.5 Richter scale magnitude. | Earthquake risk areas | Meteorological centre/DNDRC | Local authorities | 5 | | Seismological observatory for monitoring seismic activities installed in Bharatpur. | Seismological observatory is in use. |

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| | Provide trainings to government staff on response measures to an EQ, house owners on making their houses EQ-resistant and masons on EQ-resistant construction techniques. | Selected VDCs and municipalities | DNDRC | NGOs, Red cross | 2 | | Training programmes organized for government staff, house owners, and masons. | At least 3 persons received earthquake related trainings in each VDC. | |
| | Provide training to volunteers and personnel on basic first aid measures. | All VDCs/municipalities | DNDRC/Local authorities | NGOs/Red cross | 2 | | Training on basic first aid measures organized for volunteers and personnel. | | |
| | Arrange/list out the involvement of voluntary organizations for relief works in the district. | District | DDC / Municipality | NGOCC/NGO Federation (district branch) | 2 | | A list of voluntary organizations working in relief works prepared. | The profile is published and distributed to all concerned. | |
| | Educate people/actors in basic response measures-what to do when an earthquake occurs. | Whole district | DNDRC/Local authorities | NGOs / Red cross | 2 | | Local people and actors oriented on basic response measures. | | |
| | Promote awareness of EQ-risks. | Whole district | Local authorities / DNDRC | NGOs/Line agencies | 2 | | Awareness campaigns on the earthquake risks/vulnerability organized. | Awareness materials are published and displayed in public places. | |
| During earthquake | | | | | | | | | |
| | Make people aware on the do's and don'ts during earthquake time | Whole district | DNDRC/NGOs | Local authorities | 2 | | People made aware on the do's and don'ts during earthquake. | | |
| | Make arrangements for evacuation of people. | Disaster hit areas | DNDRC/DPO / Local authorities | NGOs/Private sector | During disaster | | Affected people evacuated in the safer sites. | | |
| | Make recovery of dead bodies and animal carcasses and their disposal arrangements. | Disaster hit areas | DAO/DPO/Local authorities | DHO/ Veterinary office | During disaster | | Dead bodies and animal carcasses removed at the soonest. | | |
| | Arrange medical team to check up the injured on the site. | Disaster hit areas | DHO/DNDRC | NGOs | During disaster | | A medical team made ready for checking up of the injured ones. | | |
| | Make arrangement to supply food and water. | Disaster hit areas | DNDRC/Local authorities/Red cross | NGOs/Private sector | During disaster | | Food and water supply made available to the affected people. | There is no shortage of food and water in the rescue sites. | |
| | Manage temporary shelters such as tents, metal sheets etc. | Disaster hit areas | DDRC/Redcross / Local authorities | NGOs/ Private sectors | During disaster | | Temporary shelters such as tents, metal sheets etc arranged. | | |
| Post earthquake | Restore telecommunication lines and information flow. | Disaster hit areas | Telecommunication office | Local authorities | During and right after disaster | | Telecommunication lines and information restored. | Telecommunication lines and communication system are smoothly running. | |
| | Restore transport communication. | Disaster hit areas / access roads | DTO/Local authorities | Local residents | During and right after disaster | | Transport communication system restored. | | |
| | Conduct quick assessment of damage and demarcate the damaged areas according to the grading. | Disaster hit areas | DNDRC/Local authorities | Red cross/NGOs | During and right after disaster | | Damage assessment and demarcation of the damaged areas done. | Damage assessment report prepared and demarcation done. | |
| | Do condoning off severely damaged structures liable to collapse during earthquake. | High risk areas | DNDRC/Local authorities | DPO | During and right after disaster | | Severely damaged structures liable to collapse during earthquake condoned off. | | |
| | Shore certain precariously standing buildings to avoid collapse and damage to other adjoining buildings. | High risk areas | DNDRC/Local authorities | Line agencies | During and right after disaster | | Certain precariously standing buildings saved from collapse. | | |

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| | Commence the search and rescue operations, activation of public shelters etc. | Disaster hit areas | DNDRC/DPO / Local authorities | NGOs/Red cross/Private sector | During disaster | | Rescue operation is smoothly running. | |
| | Gather information about the extent of damage caused by earthquake. | Disaster affected areas | DNDRC/Local authorities | Red cross/NGOs/ Private sector | During and right after disaster | | Damage assessment done promptly. | |
| | Arrange periodic press release. | District | DNDRC/Local authorities | NJA | During disaster | | Periodic press release arranged. | |
| | Maintain enough security situations in cooperation with police/army to minimize possibility of looting, ground control. | Disaster hit areas | DAO/DPO | Local authorities / Local residents / Volunteers | During disaster | | Enough security situation maintained in cooperation with police and army. | Police/army and volunteers properly mobilized to maintain security situation in the affected areas. |
| | Open the temporary relief centers and supply food and other basic requirements. | Disaster hit areas | DNDRC/Local authorities | Red cross / LAs/ private sectors | During disaster | | Temporary relief centers opened and food and other basic requirements supplied. | There is no shortage of food and water in the rescue sites. |
| | Restrict people to enter into affected areas without pass issued by the authority. | Disaster hit areas | DAO/DPO | Volunteers | During disaster | | Pass system to enter into the affected areas arranged. | |
| | Restore communication network (establish phone ...). | Disaster hit areas | Telecommunication office | DAO/Local authorities | During and right after disaster | | Communication system maintained as soon as possible. | There is smooth running of communication system in the affected areas. |
| | Start quick relief operations (up to one week to one month). | Affected areas | DNDRC/Local authorities | Red cross/NGOs/ Private sector | Right after the disaster | | Quick relief operations started. | Activities are commenced as per the damage assessment and rehabilitation plan. |
| | Establish the hygienic and sanitary conditions in the relief centers. | Relief camps | DHO/DW Office/Local authorities | NGOs/Private sector | Right after the disaster | | Safe drinking water and toilets arranged in the relief centers. | There is no shortage of drinking water in the shelter areas. |
| | Distribute the basic/minimal compensation (through proforma) using local peoples' representatives. | Disaster affected areas | DAO / Local authorities | NGOs / Private sector | Right after the disaster | | Basic compensation packages distributed. | |
| | Establish a district level relief and rehabilitation cell with government and NGO representatives. | District head-quarters | DAO/Local authorities | CCI/Private sector, NGOs | Right after the disaster | | A district level relief and rehabilitation cell established. | |
| | Announce the relief/rehabilitation policy package. | For the victims | DAO/Local authorities | Red cross/NGOs/ Private sector | Right after the disaster | | Relief and rehabilitation policy package announced. | Relief and rehabilitation package is made known to all concerned people and agencies. |
| | Make people aware of the simple and economical earthquake resistance constructions. | All VDCs / Municipalities | Local authorities / DNDRC | NGOs/ Red cross/ Line agencies | 2 | | People made aware on the simple and economical earthquake resistance constructions. | Cost effective earthquake resistance constructions are disseminated to all concerned. |
| | Carry out safety analysis of dams and other appurtenant structures. | Whole district | DNDRC/Local authorities | NGOs/Line agencies | 2 | | Safety analysis of dams and other important structures carried out. | Study reports are published and disseminated to all concerned. |
| | Carry out safety studies of existing bridges and incorporate appropriate retrofitting features to achieve desired earthquake resistance. | High risk areas | DNDRC/Local authorities | NGOs/Line agencies | 2 | | Appropriate retrofitting features incorporated into the existing bridges/infrastructures.. | Some of the important buildings are repaired/made earthquake resistant. |
| | Conduct seismic rating analysis of existing critical buildings such as hospitals, schools and other community and public buildings. | High risk areas | DNDRC/Local authorities | NGOs / Line agencies | 5 | | Seismic rating analysis of existing critical buildings done. | Seismic rating analysis reports are disseminated to all concerned. |

| Fire | | | | | | | | |
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| Pre-fire plans | | | | | | | | |
| | Make people aware on the proper use of electricity and not to throw inflammable materials carelessly such as cigarette butts. | Municipalities, Densely populated areas and settlements near to forest areas. | DNDRC/Local authorities | DEO, NGOs/CBOs, civil society | 3 | | People made aware on the fire hazards. | Awareness materials have been prepared and disseminated to fire prone areas. |
| | Apply fire prevention codes in industries/factories and building construction. | High risk areas | Local authorities/DAO | NGOs/CBOs/Civic society | 2 | | Fire prevention codes in industries/factories and building construction applied. | Fire prevention codes are strictly followed while constructing buildings and factories. |
| | Inspect water supply and sensitive substances in the high risk areas. | High risk areas | DNDRC | DWS office / Municipalities / VDCs | 2 | | Water supply and sensitive substances in the high risk areas inspected. | Inspection report is submitted to DNDRC/DDC. |
| | Prepare fire safety plan by large industries and multi-storied buildings. | Whole district particularly municipalities and industrial estate | Industries and house owners, DNDRC | Consultants / Experts | 2 | | Fire safety plan of large buildings and industries prepared and implemented. | Fire safety plan is prepared and followed in all new/important buildings |
| | Upgrade level of consciousness through trainings and extension materials among workers, personnel, rural people and school children. | High risk areas | DNDRC/Local authorities | NGOs, Line agencies | 2 | | Orientations to workers, personnel, rural people and school children given to make them aware on the fire management. | Community people, students and personnel are trained on fire management. |
| | Establish/strengthen fire station with proper adequate appliance equipment and human resource | Municipalities and Madi area | Municipalities / VDCs | DNDRC/NGOs | 5 | | Fire station established/strengthened. | Fire station regularly monitors the sensitive sites. |
| | Coordinate with other essential services such as water supply, electricity, army, police etc. | Affected areas / Relief camps | DAO/Local authorities | Line agencies | 2 | | Coordination with other essential service providers such as water supply, electricity, police developed. | All service providers are ready to provide emergency services. |
| | Establish proper communication network. | municipality, madi area | DAO/DPO / Telecommunication authorities | Local authorities | 2 | | Proper communication network established. | Communication network is made operational. |
| | Maintain the equipment (fire brigade) in readiness. | | Municipalities | DAO | 2 | | Fire brigade kept in readiness. | |
| | Keep the hazards of fire off. | Fire prone areas | DNDRC | FUGs, COs, Local people | 2 | | Hazards of fire kept off during the fire season. | |
| | During forest fire season, keep fire fighting team ready to extinguish forest fire. | Fire prone forest areas | DFO | FUGs | 2 | | Fire fighting team kept ready during the fire season. | |
| | Train FUGs on the methods/techniques to extinguish forest fire. | All FUGs | DFO | KMTNC/NGOs | 2 | | FUGs trained on the methods/techniques to extinguish fire. | At least FUG committee members of all FUGs receive basic training on fire management. |
| | Maintain fire lines as per the forest management plan. | Fire prone forest areas | DFO | FUGs | 2 | | Fire lines prepared as per the forest management plan. | Fire lines are kept clean and ready as per forest management. |
| | Prepare a separate forest fire plan for the National Park. | Royal Chitwan National Park | RCNP office | KMTNC/DFO | 2 | | A separate forest fire plan for NP prepared. | Forest fire plan for NP prepared, published and implemented. |

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| | Educate/train employees/volunteers in loss prevention and proper action in emergencies. | High vulnerable areas | DNDRC/Local authorities | NGOs/Donors /Red cross | 2 | | Employees and volunteers trained on loss prevention and proper action in emergencies. | Training on rescue operation provided to volunteers/students/teachers and personnel. |
| | Publish/implement fire order. | All VDCs and Municipalities | DDC/DNDRC | NGOs/LAs | 2 | | Fire order published and implemented. | |
| | Prepare fire response contingency plan for each vulnerable area and issue standing instructions of "Do's" and "Don'ts". | Vulnerable areas | DNDRC/DDC | VDCs / Municipalities / NGOs / Volunteers | 5 | | Fire response contingency plan prepared. | All rescue workers and community people know about the plan. |
| | Arrange mass awareness programme with print and electronic media, training in schools and colleges, poster campaigns, exhibition, demonstration and exercises. | All VDCs and Municipalities | DNDRC/DFO/NJ A district branch | NGOs | 5 | | Mass awareness programme arranged. | |
| | Arrange special burn wards in hospitals with facilities. | District hospital | DHO | Local authorities | 5 | | Special burn wards in district hospitals arranged. | Additional beds are added during emergency. |
| | Identify refuge room/camp for evacuated people and their relief arrangement. | Near but safe sites | DAO/Local authorities | DFO/District revenue Office | 2 | | Refuge rooms/camps identified for evacuated people. | Potential refuse camps are identified before the disaster occurs. |
| | Mobilize NGO resources to provide trainings to community leaders, teachers, personnel on preventive measures of fires. | High risk areas | DNDRC/Local authorities | NGOCC/NGO Federation (district branch) | 2 | | NGOs/private sector resources mobilized to provide trainings and other disaster management activities. | |
| | Inspect the sensitive villages/places to ensure that the village premises are clean to avoid fire spreading. | High hazardous areas | DDMC/Local authorities | NGOs / Red cross | 2 | | Regular inspection done. | Inspection reports are submitted to DNDRC/DDC during fire season. |
| During fire | Once fire occurs, assemble people and try to put off the fire at the earliest possible. | Fire affected areas | DNDRC/ Municipality / Local residents | Volunteers / CBOs | During disaster | | | Fire extinguishing works are running smoothly. |
| | If there are forest areas nearby try to clean the fire lines so that fire would not spread from village to the forest areas and vice versa. | Fire prone areas | FUGs | DFO | 2 | | Fire lines cleansed before fire season. | |
| | Unloose the cattle if any, if they are tied near the fire occurred areas. | Fire affected areas | Local residents | Volunteers | During disaster | | Cattle are untied during disaster. | |
| | Prevent fire spreading by dismantling structures in adjacent areas and also simultaneously pouring water or sand or even beating the fire with fresh twigs. | Fire affected areas | Municipalities / VDCs/ Local volunteers | FUGs, CBOs, | During disaster | | Fire spreading prevented by various means. | No fire is spread from the location of its emergence. |
| | Evacuate immediately if anyone is trapped in fire. | Affected areas | DNDRC/DPO | Volunteers / NGOs | During disaster | | Anyone trapped evacuated promptly. | |
| | Take special steps to remove children and the old. | Affected areas | DNDRC/Local authorities | Volunteers | During disaster | | Children and old removed from the affected areas. | |

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| | Give first aid to all the injured and rush them to the nearest hospital. | Affected areas | Medical team | VDCs / Municipalities / NGOs / Volunteers | During disaster | | First aid to all injured given and rushed them to the nearest hospitals. | |
| Post fire | Investigate the cause of fire, if there is any criminal involvement/malevolence, it has to be investigated as per the law. | Affected areas | DAO/DPO | Local authorities | Right after the disaster | | Investigation about the cause of fire done. | Investigation report discussed at the DNDRC/DDC and make necessary precautionary measures public. |
| | Prepare a detailed report about the occurrence and the damage impact and make available who need it. | All disaster affected areas | DNDRC | Red cross / Local authorities | Right after the disaster | | Damage impact report prepared and made available as per requirements. | |
| | Rehabilitate fire victims. | Affected areas | DNDRC/local authorities | NGOs / Red cross | 2 | | Fire victims rehabilitated. | Fire victims are provided with all support they needed for rehabilitation. |
| | Provide compensation and relief to those eligible and affected according to the loss and vulnerability. | All affected areas | DAO/DDC | Municipalities / VDCs | Right after the disaster | | Compensation and relief packages provided. | |
| | Encourage people for insurance against fire. | Fire prone VDCs | Concerned VDCs / Municipalities | Insurance companies | 2 | | Insurance against crops, animals and houses done. | |

5.2 Implementation Strategy

Some basic strategies to implement the proposed action plan in connection with the TDRM in Chitwan have been discussed below:

5.2.1 Initiation

The initiation will be with the meeting of DNDRC with the following agenda:

- Establishment of a permanent secretariat at District Administration Office (to be shifted to DDC later) with computer and communication equipment;
- Resource mobilisation for social mobilisation initiatives in the vulnerable VDCs;
- Instructions to VDCs for organizing permanent settlement level committees for disaster management;
- Designing participatory planning framework for disaster management plans and activities at the local levels (in VDP planning framework); and
- Identification of major disaster preventive projects for central level support.

5.2.2 Communication Mechanism

The communication strategy will include the extension of communication facilities in the vulnerable VDCs, development of early warning system incorporating the local knowledge, FM radio station mobilization for adverse weather reporting, posting disaster safety in-

formation at public places and establishment of communication towers.

5.2.3 Coordination

The coordination function of DNDRC has already been specified by the 1982 Act. Further coordination is needed between the neighbouring districts (Makwanpur, Dhading, Nawalparasi) for sharing information and equipment.

5.2.4 Monitoring and Evaluation

Formats have been developed for monitoring the activities proposed in the action plan. DNDRC members should be given specific responsibilities to monitor and evaluate these activities and based on these formats; improvements in plan must be made.

5.2.5 Resource Mobilization

The proposed action plan and identified activities can be presented to different donors by the DNDRC as a shopping list to these donors. The supported accepted by these donors should be monitored for avoiding duplications.

The proposed changes in policies allowing the extraction of sand and boulders from the problem rivers and the logs brought by floods, should be strictly lobbied which will be a significant source of revenue to finance preventive as well as rehabilitation activities against disaster. Apart from the above sources of revenue, the DDC and VDC can set aside at least 5 percent of the total revenue every year for disaster mitigation purpose.

Linkages among Disasters and their Management

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Disasters can also be classified on the basis of independence and association. For example, thunder strikes are likely to occur only during the rain. Landslides are associated with floods as the former compounds the effect of the latter and both are likely to occur mostly during the monsoon season (June to August). Windstorms can spread the fire hazards faster. Earth quakes are more or less independent events and can occur at any time. In the case of associated hazards, preparations must be made for both likely events.

In the case of Chitwan, the floods are caused by the landslides and rains in the river catchment areas falling outside the district (e.g. Dhading and Makwanpur). It is therefore necessary to coordinate with these districts in the unified mitigation of some hazards like floods.

Some of the equipment and facilities for disaster response are common to all disasters. For example, vehicles for mobility are used in all types of disasters. Similarly, tents are used for shelter in all types of disasters. Such common equipment and facilities must be used and operated under a unified command.

The whole plans of actions presented in this report are the recommendations emanating out of the consultation process followed in the study. Nevertheless, there are some important prerequisites and actions that need to be spelled out and attended to, to ensure effective implementation of TDRM package of Chitwan district. These are enlisted as follows:

7.1 Incremental Institutional Mechanism

As is evident from the foregoing discussions, the country never had a perspective of total disaster risk management. Therefore, it is both a challenge and an opportunity for the country to develop a comprehensive disaster management plan and associated institutional mechanism. The current institutional mechanism is partial and geared towards rescue, relief and rehabilitation only during and after a disaster. Therefore, the current mechanism does not conform to the needs and standards of TDRM. Since disaster possibilities must be internalized in the development activities, it must be led by the Ministry of Local Development (MoLD) at the national level and by DDC at the district level. An immediate shift to this new arrangement may be difficult but the need to do so in the near future must be emphasized. For the present purpose, two new institutional mechanisms are proposed for Chitwan district.

DNDRC's Incremental Role: Besides the current role and responsibilities of the DNDRC as per the Act, following additional roles and responsibilities will have to be performed in order to be compatible with the TDRM concept:

- Regular quarterly meetings (even in the absence of disaster) to discuss and prepare, among others, for various preventive measures to be followed to avoid or mitigate disasters.
- Special meetings before the identified season of monsoon (June to August) for pre-

paratory and alertness purposes against floods and landslides and dry season (March-May) for preparations and alertness against windstorms and fire.

- Coordination with centre and neighbouring districts for - a) collaborative program formulation and implementation, b) sharing of equipment.
- Mobilization of resources for disaster preventive projects.
- Coordination of social mobilization initiatives in the vulnerable VDCs.

Settlement level disaster management committee: The settlements falling in the disaster vulnerable VDCs will form a committee whose function will be to:

- Coordinate pre-disaster social mobilization activities in the settlement;
- Form and mobilize local youth groups for communication, rescue and relief
- Take charge of disaster management related equipment available in the settlement
- Inform VDC and DMS as soon as possible in the case of disaster
- Coordinate rescue, relief and rehabilitation activities
- Estimate the level of support needed from outside the settlement in the case of a disaster
- Identify safe location/s near-by for additional shelter needs during disaster

Disaster Management Secretariat (DMS) at the district level: A permanent disaster management secretariat must be established within the District Administration Office (to be shifted to DDC later) which will be fully equipped (including computer with e-mail facility and communication mobile) to receive and disseminate information related to disasters. This secretariat must be manned 24 hours particularly during the monsoon season when flood and

landslide possibilities are higher and during March-April season when fire and windstorm possibilities are higher.

7.2 Policy Change

The disaster problem in Chitwan is compounded by a single policy provision of not allowing the extraction of the incremental debris deposits that contribute to raise the river-bed level. This policy has its roots embedded in the Acts for Conservation areas (such as the Chitwan National Park) which for no scientific and logical reason, has forbidden the extraction of accumulated debris, in the form of sand and aggregates. These are the potential avenues of revenues for the local bodies at the DDC and VDC levels to finance the disaster management component parts. Thus we are tempted to make this important recommendation of annulling this policy provision enabling the local governments to extract at least the annually added debris to be extracted for disaster safety and revenue purposes. If one looks at the precedence, the district of Rupandehi is earning almost Rs.60 million by selling the sand and aggregates from a relatively smaller river Tinau compared to almost that level of annual local body program passed by the DDC and VDC councils in Chitwan.

The sand and aggregates could also be used to manufacture construction material such as hollow or solid concrete blocks to be used for house or fence construction. These blocks have much stronger resistance to disaster compared to the existing materials used such as bricks. The construction of house with concrete blocks will also be cheaper and faster as it does not require additional cement. The patch extraction of soil in manufacturing of bricks practiced currently is helping to augment the disaster possibility by encouraging the shift of river course.

The study team, therefore, strongly argues in favor of lifting this unfounded existing policy provision of not allowing the extraction of the sand and aggregates from the problematic rivers. The sooner it is reversed, the better it will be for Chitwan to move forward with the TDRM package.

Another financing avenue, in the short run at the least, is to allow the district to harness the opportunity of extracting the logs from the up-

stream rivers that are brought by the flooding rivers. This is again barred by the National Park legal provisions. This legal provision is resulting into these valued products being landed into neighboring India. The study team strongly feels that these logs must be legally allowed to be extracted at the local level. This provision alone can finance, in the case of Chitwan, the major rehabilitation initiatives.

7.3 Social Mobilization

Social mobilization is the process of sensitizing, creating awareness and conscientizing the people on various aspects of development. Two packages of social mobilization - general and disaster related, is recommended to be developed and applied in the vulnerable VDCs. The general package will constitute awareness about the importance of education, health, sanitation, desirable and undesirable social customs, etc. In fact, where NGOs have worked in the communities or Village Development Programme (VDP) is implemented, the general package is already applied. So, this package needs to be applied only in those VDCs where people are not already mobilized. The second, disaster package, however, has not been developed and implemented in any VDC. This package will constitute awareness about preventive measures to be taken before disasters and safety measures to be taken during the disaster.

For social mobilization, an experienced external social mobilizer will work in the 5 VDCs to mobilize as well as to train two local or internal social mobilizers (animators) per VDC, one male and one female, who will be permanently located within the respective VDC. The external mobilizer will work in the area for an initial period of 6 months.

7.4 Gender Issues in Disaster

Although the incidence of disaster and being its victim is equally painful for everybody, the women are found to bear larger amount of pain and sufferings during and after any disaster. These facts indicate that the needs of women must be seriously considered in designing any disaster mitigation project. Some of the important recommendations to this respect are as follows:

- Women must be equally participated in the design and implementation of the disaster management activities;
- Safety shelters must be designed to take care of the extra privacy needs of the women; and
- Both women and men have to be sensitised on the gender roles.

7.5 Indigenous Knowledge

The use and upgrading of local people's knowledge on disaster forecasting, coping and mitigation through disaster research should also be an integral part of the TDRM. Therefore, there must be a continuous mechanism to document, upgrade and disseminate such local knowledge for use towards cost effective disaster management.

7.6 Formulation and Implementation of Disaster Preventive Projects

There are several medium to large scale projects required to avoid or mitigate the effect of disaster in Chitwan district. Some of these are listed as follows:

- Construction of a reasonably flood-proof road connecting district HQ with Thori via Patihani and Jagatpur. Such a road will save 3-4 VDCs in the west Chitwan which are severely affected by flood and river bank cuttings.
- Slope stabilization measures in the catchment of Rapti river.
- River stabilization project on the location of sharp Narayani bend at Mangalpur.
- Control of slash-and-burn farming and forest encroachment in the hilly areas of Chitwan (Chepang Development Project).

7.7 Other Recommendations

Besides these policy recommendations; the following additional recommendations should be considered:

- Extend telephone lines in the vulnerable VDCs for quick communication purpose.
- Provide cycle-based ambulances (developed by ITDG) at the rate of one ambulance per 100 populations in the vulnerable VDCs where cycles can ply.
- Provide one communication tower (developed by ITDG) at the rate of one tower per vulnerable VDC.
- Provide AM/FM radio sets (one set per community hall) in the vulnerable VDCs.
- Post telephone numbers of DMC, Fire station, Police and pamphlets and posters depicting safety information against different disasters in as many public locations as possible.
- Mandate the use of building codes (developed by MPPW) for the new construction of public buildings such as schools, hospitals, etc. and retrofit the existing public buildings to make them reasonably disaster resistant.
- Equip major public buildings with systems of fire alarm and control

7.8 Exogenous Activities Affecting Chitwan

Chitwan's vulnerability to disasters, particularly water induced ones, are aggravated by projects and activities that are exogenous or beyond control of the local authorities. Some of these are caused by the Gandak barrage and dams constructed by the Government of India across the border. For this, local authorities will have to lobby with the national government to take up these issues at the bilateral and international levels.