

Overall Assessment and Needed Action

The Workshop

Objectives

The main objective of the workshop was to identify concrete measures for better flood and landslide disaster preparedness and mitigation in Nepal.

More specifically, it was (a) to synthesise the relevant and available information on different aspects of the recent floods and landslide disasters in Nepal, (b) to promote inter-agency dialogue and review of the events in order to develop a better understanding of the factors and processes involved, and (c) to identify concrete short- and long-term measures needed on different levels, by various agencies, for better disaster preparedness and mitigation.

Preparatory Activities for the Workshop

(i) ***Reviews and Assessments***

- Evaluation of land-use changes and their possible impact.
- Assessment of hydrological factors and conditions and their impacts on the concerned areas.
- Landslides, debris flows, and geological conditions and their interrelationships with land use and hydrology.
- Identification of upstream and downstream linkages.
- Assessment of infrastructural damages and their possible causes (to be prepared by different sectoral line agencies).
- Critical assessment of institutional responses in post-disaster management.

(ii) ***Preparation of maps showing different events and their effects.***

(iii) ***Preparation of photo-documentation on various aspects of the natural disaster.***

Workshop Schedule

The workshop was organised by ICIMOD from November 22nd to 23rd, 1993. All the concerned agencies of His Majesty's Government, a number of donor agencies, and ICIMOD participated in this workshop. Presentations were made of the different field reports, and these were extensively discussed. Different working groups were organised to identify priority areas for future attention. The following section discusses the issues identified during the discussions and by the working groups. The workshop programme and the participants have been provided in Appendices 4.1 and 4.2. Appendix 4.3 contains a selection of maps related to infrastructural installations, human and animal losses, and land affected by the disaster.

Overall Assessment

The inherently unstable nature of mountain areas has been well recognised. Past occurrences of natural hazards, as reported by the local people, also suggest that hazard events of varying intensity have occurred quite frequently. These events will also continue to occur in the future because of the nature of these environments. The present levels of systematic understanding and analysis of these natural events are very poor. No data base exists. No monitoring activities are carried out on a regular basis, even in cases where such monitoring can be of direct benefit to project-related management activities.

Not all hazards necessarily become natural disasters. A natural hazard turns into a natural disaster when these naturally occurring hazards result in heavy losses of human lives, property, and other economic assets of society. This happens when human decisions (because of limitations of knowledge, resources, capacities, and alternatives in natural hazard zones) result in interventions. Different types of natural hazards have different types of spatial manifestations, and, once these are occupied by human activities, they naturally become influenced by these events. The fact that a naturally hazardous space has been occupied increases the probability of a natural hazard becoming a natural disaster in such locations/areas, depending upon the extent to which precautionary measures are actually taken. These measures are concerned with appropriate land use practices, construction of suitable structures, increasing awareness of potential natural hazards in hazard-prone areas, more comprehensive assessment of watershed conditions and their implications for development activities, and incorporation of these considerations into development projects and different economic activities.

In the present case of the natural events of July 19 and 20 in the southern parts of the Central Development Region, the fact that different types of natural hazards occurred was not surprising, nor unexpected. Recent histories of such events are still quite vivid in people's memories. The fact that some of these had become natural disasters of catastrophic proportion has a lot to do with human decisions and activities in and along the natural hazard zones in the area.

Some of the important human activities identified in this context were:

- a) expanding cultivation on to steeper slopes;
- b) increasing settlements on floodplains with no protection measures;
- c) continuing deforestation of upper slopes;
- d) limited reforestation of exposed slopes;
- e) unregulated mining activities along upper slopes and in upstream areas;
- f) establishing vital structures in hazard-prone zones without adequate review of existing information, watershed conditions, and past experience, resulting in unsuitable locational decisions, inadequate standards, and poor maintenance;
- g) limited sharing of available information regarding natural events and poor infrastructure for disseminating critical information about potential hazards; and
- h) lack of continuing and systematic attention to the growing problems of different types of natural hazards and their mitigation.

Recommendations

Organising a High-level Technical Review

The Government needs to organise a high-level technical review of the damaged bridges and dams to ascertain clearly the reasons for their vulnerability. If major technical problems were involved, these have to be corrected so that they are not repeated in future. If poor design standards were used, these need to be upgraded so that future infrastructure can be better protected. If maintenance was poor, the Government should be committed to providing more resources in future. Not doing anything about this problem will cost much more in the future to society. Incorporating geological, climatic, hydrological, and land-use information in the design of infrastructural installations would improve their resistance to natural hazards. More dialogue is also needed among engineers, scientists, and local people to improve their understanding of natural events and to formulate appropriate design standards for different types of structures. If one objective is to reduce the potential dangers to these infrastructures, the other problem is to reduce the potential dangers arising out of structures such as barrages and dams. If these are not properly managed, they could trigger major disasters. This review should look into these issues and provide appropriate guidelines and decisions for safeguarding these vital installations and providing protection from adverse effects of such structures.

Development of Settlement Location Guidelines

With increasing human mobility, the settlement patterns in the country are undergoing major changes, and yet there is little understanding regarding the development and hazard risks of these settlements. Many of the settlements destroyed by the natural events were those established recently along floodplains and in landslide hazard areas. The people living in these areas have a right to know the type of risks they face. Knowledge of these risks might result in preventive measures being organised on a local basis. The generation of this knowledge is also dependent on the development of suitable hazard maps for use by local and project authorities.

Development of Hazard Maps

As a long-term measure, it is recommended that a preliminary hazard map on a 1:50,000 scale be prepared for the critical watersheds of the country. The map should show the level of hazard (i.e., low, medium, and high) as well as the type of hazard (i.e., landslide, gully erosion, debris flow, flooding). The data should be based on the field observations as well as on the available maps and aerial photographs. For more critical areas, the maps should be on a 1:10,000, or larger, scale, especially in areas with settlements, roads, barrages, and other infrastructures. In these areas, an inventory map of the existing and past mass movements, and the risk associated with the hazard, should also be depicted. The need for a climatic atlas of Nepal was also pointed out, and this would also be a critical input into the hazard mapping process.

Preparation of Land-use Guidelines and Mobilising Local Support for Their Implementation

Land-use problems are one of the most common and serious environmental issues throughout the hill areas of Nepal. Landslides, debris flows, slope failures, and increasing sediment loads in rivers are all directly traceable to the widespread mismanagement of land

resources resulting from deforestation, increasing cultivation of steep slopes, overgrazing and inadequacy of soil and water conservation measures, and haphazard growth of settlements in highly vulnerable areas. The needed measures are complex and effects will be seen and felt only in the future. However, if no efforts are made to improve land-use conditions and identify hazard zones, the situation will worsen, increasing the probability of every natural hazard turning into a major natural disaster. Uncontrolled mining activities are already beginning to trigger major landslides in many parts of the hills. Land-use guidelines have to be developed so that fragile areas are protected and degraded lands are rehabilitated. No land-use guidelines can be implemented without the participation and cooperation of the local people. Hazard mapping must also be approached from the perspective of developing suitable land-use guidelines.

Early Warning Systems

Some efforts must be made to establish early warning systems in order to prevent large-scale damage from floods. The advantage of lead times available, if used to warn people downstream, can save many lives. The most appropriate systems and mechanisms available should be evaluated and specific water-management related projects should be made responsible for operating these systems. Local people in downstream areas should be made aware about the early warning signals.

Environmental Rehabilitation Work

Environmental rehabilitation activities can help to reduce the impact of future hazards, and some of the important activities which can be supported under local and rural development activities are the following:

- a) promotion of sloping agricultural land technologies on sloping terraces;
- b) promotion of agroforestry techniques using multiple tree species;
- c) promotion of bioengineering techniques for soil and water conservation;
- d) building of protective and diversion structures along floodplains based upon the historical perspective of flood events; and
- e) providing support to different types of river control activities.

All of these activities can become important sources of employment for local people and contribute towards improving the environment in the long run.

Public Awareness of the History of Natural Events

Local people should be encouraged to be more familiar about the history of natural disasters in their areas. Local discussions should be organised to identify different protection measures that can be undertaken by the local people. The district government should undertake this as part of its regular development agenda. The various issues related to environmental management should be highlighted through different awareness-raising programmes. Special materials that are easily understood should be widely distributed to schools and other public places.

Problem-oriented Research

Specific problem - oriented research is needed to improve mapping methodologies for slope, alluvial fan, and flood areas; to develop performance guidelines for building and other activities; to prepare standards and techniques for retrofitting existing structures; to improve modelling capabilities to assess the nature of risks and the impacts of development; to assist communities in preparing disaster-mitigation plans; and to develop and test mitigation strategies other than planning and regulation (e.g., warning systems, dewatering of potential mudflow areas, debris basins, and land treatment after forest fires). Field studies should be regularly conducted after hazard events to determine the precise nature and types of losses and the adequacy of mitigation approaches.

Pilot studies that are rehabilitation focussed should be conducted by different agencies, in cooperation with local agencies, to assess the practicality and feasibility of particular approaches. Such pilot or demonstration projects could also help meet immediate 'on the ground' needs if conducted in communities with severe problems.

The other aspect of research deals with the monitoring and analysis of regularly occurring events, e.g., the monsoon and its effects. Little is understood about the phenomenon of cloudbursts in specific areas.

Information Networks and Coordination

If inadequate information was one aspect of the problem, the other even more serious handicap has been the lack of knowledge and the failure to share available information. As no one agency can possibly provide all the relevant information, there is an urgent need to establish a network among related agencies to share information that is already available with respect to different natural events. Resources are being wasted through duplicated efforts and failure to use available information. An information network is, therefore, considered essential in order to facilitate information exchange and sharing among the different agencies concerned. The National Planning Commission should play a lead role in developing such a network of concerned agencies.

Training in Natural Hazard Mitigation and Management

Technical skills needed in different subjects and at various levels for natural hazard mitigation, monitoring, and management are still very limited in the country. A major effort is needed to improve these technical skills in many different areas such as slope stabilisation, watershed management, hydrological and geological assessments, and problems related to risk engineering in mountain areas. Concerned departments of the Tribhuvan University and the Government should organise regular short courses in these areas.

Improvement in Hydrological and Meteorological Stations

Although the number of hydrological and meteorological stations have increased in recent times, there is a pressing need for more stations with substantial improvements in facilities. These stations are the only source of basic hydrological and climatic information to

become an essential planning input for all major development activities. More support is needed in order to improve the quantity and quality of these stations.

Environmental Guidelines for Specific Projects

All development activities in hazard prone areas should be subject to environmental screening (based upon guidelines) on a mandatory basis. This will involve some costs, but these will be more than compensated for through the increased life of the project. Not enough attention has been given in past discussions to different types of natural hazards arising out of extreme weather events and mass movements or out of the geomorphological characteristics of these mountain areas. Some of these considerations should be integrated into the project screening of environmental guidelines.

Establishment of a Multidisciplinary, Hazard Mitigation Body

A multidisciplinary, hazard mitigation body is necessary in order to ensure that disaster preparedness does not decline over time. In most cases, as the immediate shock of disaster wears out, there is decreasing commitment in terms of resources, attention, and institutional activities. Such a body should follow up on all the recommended measures if the level of preparedness is to improve over time. There is no doubt that natural hazards of varying intensities will occur from time to time in future at different places. While these events can hardly be controlled, their adverse effects can be contained through better awareness, planning, monitoring, and coordination of different activities. Such a body should function to facilitate the development of this capacity at different levels.

More Effective Development Policies

It is well recognised that the slow pace of development and the failure to control rapid population growth, reduce poverty, and diversify the economy are the main compulsions behind increasing cultivation on steep slopes, colonisation of floodplains, deforestation of hillsides, and many other related activities that enhance the probability of recurring natural hazards turning into major disasters. Unless the economy can provide sustainable economic alternatives and reduce population pressures, hazard mitigation efforts alone will be tantamount to treating the symptoms rather than the basic processes underlying increasing human colonisation of hazard-prone areas.