



Chapter 4
The Larger Picture



Ratu Khola at Bahunmara

Conclusions

The main hazards repeatedly occurring and causing heavy losses in terms of lives and property in Nepal are floods, landslides, avalanches, hailstorms, windstorms, lightning strikes, earthquakes, fire, and epidemics. On an average, natural disasters take 951 lives and damage property worth NRs 1,242 million every year. Of these hazards, the overall impact caused by floods, landslides, and avalanches is most severe. Between 1983 and 2005, on average, 309 people (32%) were killed annually by water-induced disasters such as floods, landslides, and avalanches; this is second only to the deaths caused by epidemics, i.e., 524 lives per year. About 70% of the total families affected from all types of natural disaster in the country are affected by water-induced disasters. Loss of property from floods, landslides, and avalanches combined is about 61%.

On average the estimated losses from floods and landslides are almost 0.6% of the GDP at current prices (2006), 3% of the total budget, 4.7% of total development expenditure, and 14.9% of foreign loans. Unaccounted losses from disruption in transportation, power, water supplies, and normal business from such events were also discouraging. The government spends large amounts of money every year in relief and reconstruction activities. On average, 12.9% of the development expenditure of Nepal and 5.39% of its real GDP are spent on response and recovery activities.

Devastating floods in Nepal are triggered by several different mechanisms: i) continuous rainfall and cloudbursts, ii) glacial lake outburst floods (GLOFs), iii) landslide dam outburst floods (LDOFs), iv) floods triggered by the failure of infrastructure, and v) sheet flooding or inundation in lowland areas due to excessive rain, bank overflows, or obstructions imposed on the flow.

Among the three ecological regions: the Mountains, Hills, and the Terai, the Terai is the most affected by flood hazards. Although loss of life is comparatively low in the Terai districts where floods are the main natural disasters, the extent of the floods' impact in terms of the number of families affected and estimated losses is very high. Nearly 77% of the total losses due to floods, landslides, and avalanches in combination from 1992-2001 were incurred in the Terai. During this period, the loss of houses, livestock, and farmland in the Terai was about 85, 71, and 69% respectively. Families affected by floods in the Terai accounted for 70% of the total.

In the Terai, districts located in the central Terai, such as Rautahat, Sarlahi, Mahottari, and Dhanusa, are seriously affected by flood disasters. A comparison of the losses and damage between 1970-1992 and 1993-2002 shows that these districts have experienced increasing losses from water-induced disasters in the years since 1993.

An extremely rugged, diverse, and dynamic landscape, landlockedness, inaccessibility, dispersed human settlements, and a high rate of human migration have been the causes for a high rate of physical and locational vulnerability. Nepal lies in a high-energy environment with a dynamic landscape with high relief, steep

mountain slopes, active tectonics, and highly concentrated precipitation, creating conditions vulnerable to different types of geo-hydrological hazard such as landslides and floods. Nepal does not have easy access to other countries via land and water. This constrains the timely flow of goods and services during emergencies and means of transportation is expensive. Similarly, development of infrastructural services such as transportation, communication, health, marketing, and extension services such as education, skills development, and so on, which play an important role in all stages of flood-hazard mitigation and management; pre-disaster preparedness; during-disaster evacuation and relief activities; and post-disaster rehabilitation and recovery activities, remain poor. Human settlements are dispersed and territorial shifting is great as a result of human migration. Evidence of this is the extent of the population increase in the Terai from 35.2% of the total population in 1952/54 to 48.4% in 2001. Such a rapid rate of migration and shifting of human settlements in the Terai have led to increased vulnerability to flood hazards.

Nepal is not only highly vulnerable to water-induced hazards from the perspective of physical and locational conditions, but also from socioeconomic conditions because of the low human development profile, poor economic growth, mass poverty, disparity in productive assets and income, heavy dependence on agriculture and its low production potential, inadequate service provision, and lack of political commitment and accountability. Its human development index is very low. About 40% of the population live below the national poverty line. Economic growth has been less than 4%. The parcels of agricultural land are small. Small farmers operating less than 0.5 ha of land comprise about 45% and they own only 13% of the agricultural land. Similarly, the 20% of households at the lowest economic end receive only 5.3% of the national income. Access to safe drinking water, health facilities, and sanitation is poorer than South Asian standards. Government activities in disaster mitigation and management are mainly directed towards post-disaster activities, viz., rescue, relief, and rehabilitation only. There is no coordination among institutions involved in disaster mitigation and management, and there is a lack of integration among such activities.

The importance of flood-hazard, risk, and vulnerability mapping and assessment in developing appropriate disaster-mitigation and management strategies and programmes to reduce the impacts of flood hazards has been realised and such activities have been incorporated into National Development Plans. Many government institutions such as the Disaster Prevention Technical Centre (DPTC), Department of Hydrology and Meteorology (DHM), and the District Irrigation Office (DIO), as well as NGOs and INGOs such as JICA, UNDP, and ICIMOD have been involved in such activities. However, so far, no substantial work has been carried out in this field, hence the reason for this study.

Recommendations

Flooding is a natural process and its complete control is beyond the capability of human efforts. However, the magnitude of flooding and its impact can be reduced to a certain extent through development and effective implementation of land-use zoning guidelines and building codes and standards. The problems of increasing

risk and vulnerability are not associated with physical features only, but also with socioeconomic conditions. Programmes well integrated with physical processes and socioeconomic developments are therefore needed. Watersheds are well-defined geophysical units in which the problems of flood hazards can be assessed and monitored properly. Attention should be given to integrated watershed development programmes in national development plans. Political commitment and accountability in devising and implementing such programmes are essential.

The risk of flood hazards in the Ratu Watershed has been increasing. Since Ratu Khola originates in the Siwaliks, there is no risk of GLOFs. (It should be noted that there is a risk of GLOFs in the Terai region, but this is confined to major rivers originating from the high mountain region). However, the risk of flooding and its associated processes such as river-bed rise, bank cutting, and channel shifting is very high. Another common feature in this watershed as in other areas of the Terai is sheet flooding. The frequency and magnitude of sheet flooding and its associated risks have been increasing in recent years. The establishment of infrastructure, such as roads, perpendicular to the drainage paths have contributed in large measure to this rise. All the major rivers in the Terai flow to India. So the development of infrastructure such as roads, barrages, dams, afflux bunds, and dykes downstream near the Nepal-India border increases flood risk and vulnerability in Nepal. This problem has been exacerbated by the construction of a road near the Nepal-India border in this basin. This problem has been realised by the government and a special inundation committee with members from Nepal and India has been established. Yet the committee has not so far been effective in solving the inundation problem in border areas. This problem should be addressed by making the committee effective and exercising regional cooperation by exchanging information and developing an early warning system.

The work in the Ratu Watershed clearly shows that flood-hazard, risk, and vulnerability mapping and zoning using GIS and remote sensing are economic in terms of both time and money, and a useful tool for developing land-use guidelines in order to reduce the impact from flooding. Such work should also be carried out in other watersheds.

Flood-mitigation and management efforts in the past were confined to rescue and relief work and structural measures such as construction and maintenance of retaining/gabion walls, check dams, and spurs. Local people have realised the importance of a preparedness plan incorporating components of watershed conservation and drainage management through proper land-use guidelines, income-generating activities, an early warning system, and creation of awareness. However, a local institutional network to devise and implement such programmes and dissemination of information should be established.

An attempt was made to establish an early warning system and identify safe evacuation routes and areas safe for shelter during the 2nd phase of this work. For this, people were trained to read and record precipitation in the upstream area and discussions took place on the use of maps for delineating safe evacuation routes and shelter areas. These efforts have yet to culminate in the establishment of a local institutional network for early warning and creation of awareness in the community, as recommended.

The capability of local people to respond to hazards and their resilience against them is poor in terms of physical assets, economic conditions, human development, and the technical capability of infrastructure. However, local people are willing to participate in and contribute to flood-hazard mitigation and management. Efforts should be made to tap this sentiment through developing and strengthening local community-based institutions.