Flood Hazard in Nepal and New Approach of Risk Reduction

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1 Introduction

Nepal is exposed to multiple hazards that have tectonic, climatic and geological causes or their combined effect. High topographical variation, highly weathered and deformed rocks in the mountains, intense erosion and bank scouring by the high gradient rivers, and extreme precipitation patterns in the Siwaliks are the reasons for high hazard of flood and debris flows in Nepal. In addition to this, global warming has resulted high rate of glacial melting and formation of glacial lakes. Many of these lakes are in danger of breaching that has intensified the Glacial Lake Outburst Flood (GLOF) hazard as well.

Of all the disasters reported in Nepal, floods are the most devastating in terms of the number of deaths that occur and the damages they cause. A study by UNDP ranked Nepal as 30th country with respect to relative vulnerability to flood (UNDP/BCPR, 2004). Of the total death by any type of natural disaster in 2010, 29.02% were by flood and 24.55% were by landslides; and 71.35% of the total affected families by any type of disasters in 2010 are by flood (DWIDP, 2011). In terms of the numbers of people affected by all types of natural disasters, flood is the main disaster affecting 68.3% of the total affected people between 1971 to 2007 (NSET, 2007). Terai and some hill districts show the highest number of disaster-deaths and injuries although this impact is also spread almost to all VDCs/municipalities of the country. In the last decade between 2001 and 2008, floods and landslides killed 1,673 people, affected 221,372 families, killed 33,365 livestock, destroyed 52,007 houses and washed away or destroyed over 22,000 ha of land. The monetary value of damages due to floods for 2001-2008 was about US$ 130 million (about 0.1% of GDP), according to government data (MoHA, 2010).

2 Floods in the Terai

The flood has most devastating effect in the Terai of Nepal. Nepal’s entire Siwalik zone is highly degraded because of the weak rocks, unpredictable extreme precipitation and the high rate of deforestation as well as encroachment. As most of the river basins in Terai originate from the Siwaliks, they carry lots of sediments from degraded Siwaliks and deposit them to the Terai plain. Many communities in the Terai are well below the river bed due to sedimentation and they got inundated in rainy season every year. Since a majority of Nepal’s agriculture and forestry resources are dependent on Siwaliks and Terai, climate induced floods are causing significant human and economic devastation and such devastation will further accelerates in the future as the effect of climate change is projected significantly higher in these areas. At the individual and organizational level, there are capacity deficits on the anticipated distribution and effects of potential flood in the context of climate change. On analyzing the monthly rainfall data for the period of 30 years from 1976-2005 (166 meteorological stations) throughout Nepal, it is found that most part of the country, including the eastern Terai and Siwaliks, experienced increasing annual trend of premonsoon, monsoon, post monsoon and winter precipitation (Practical Action, 2009). Frequency analysis of the extreme rainfall event trends for the same duration reveals that the foothill of the Siwaliks, which is the main source of many rivers in the Terai, received the highest intensive rainfalls for 10, 20, 50 and 100 years of return periods.

3 Traditional approach of risk reduction

Limited activities are presently undergoing to prevent the flood in Nepal and are highly inefficient. Additionally, the interventions are mostly of very small scale and operated by the local government authorities according to their annual budget distribution or by I/NGOs according to their priority actions. There is lack of coordination between the authorities which are carrying out risk reduction measures whether such interventions come from the government bodies, I/NGOs or combinations. Interactions with district level government authorities and communities revealed that they have faced difficulty on monitoring and keeping
records of the interventions in the absence of coordinated communication between the stakeholders. They put their voice strongly to operate the interventions with the consent and communication with Chief District Officer (CDO) in order to prevent the duplication of the interventions and keep their records.

The traditional approach of risk reduction do not analyze the cause and effect scenario and mostly apply the structural measures at the site where there is frequent flooding which include construction of earth and gabion embankment, spurs, making shelter houses and river training. However, it is found that gabion embankment and spurs will be buried under the sediment within short period of time as the sediment deposition is very high in Terai because of intense erosion in the weak and fragile Siwaliks. As an example, the sedimentation in Kong Khola and Hadia Khola of Udayapur district is so high that currently the settlements are well below the river beds. Such examples can be found in other river basins of Terai as well. In this situation, traditional approach of risk reduction becomes ineffective and inefficient.

4 New approach of risk reduction

The upstream and downstream of the river basins are closely related for flood to occur and its intensity to amplify. The interventions that are meant to prevent floods and mitigate its effect, shall therefore link the upstream and downstream through cause and effect analysis approach. Past interventions on flood risk reduction lack the link between the upstream and downstream through cause and effect analysis and proper communications between upstream and downstream communities. The issues of flood mitigation and community based early warning systems are closely linked to an existing requirement of making the Disaster Management systems and policies in Nepal. Current disaster management policies, risk reduction and preparedness plans in Nepal address recurrent natural hazards in the country through static and reactive approach, but are not yet geared to deal with the emerging climate change induced flood threats. In this context, a new approach of flood risk reduction is recently prepared after wide consultations with governmental and non-governmental stakeholders as well as affected communities. This approach integrate all the activities including upstream downstream linkage, watershed management considering extreme precipitation in Siwaliks, information centers and alternate economic activities in replacement of the traditional approach of treating flood risk separately for the upstream and downstream. Proper communications between upstream and downstream communities as a means of early warning systems can help to minimize the loss from the flood to great extent. Without these components in place, the impact of floods could be very serious in Nepal especially in southern Terai. This approach has identified different activities for the flood risk reduction in the Terai of Nepal. For the upstream, Siwalik conservation through watershed management, bio-engineering and alternative economic activities to the surrounding communities to stop deforestation and encroachment has been identified. This will stop the land degradation and sediment production during extreme precipitations. In the middle stream, river training and check dams for erosion control has been identified as suitable method of risk reduction. Embankment construction, safe escape route, shelter houses, water level monitoring systems and formation of information centers have been identified for risk reduction in downstream. Low cost and easy to operate early warning system has been identified to be applied in upstream, middle stream and downstream. Flood risk reduction through this approach is under the implementation phase in Terai of eastern Nepal.

5 Concluding remarks

Floods are the most devastating disaster in Nepal in terms of the number of deaths that occur and the damages they cause; and mostly Terai of Nepal faces most devastation because of degraded Siwaliks in upstream. Traditional approach of flood risk reduction does not consider cause and effect analysis and intervene only in affected area. This approach has been identified as ineffective and inefficient, and therefore new approach of risk reduction that integrates interventions for reducing land degradation, erosion control in upstream, inundation control in the downstream and early warning systems through the communication between upstream and downstream communities through upstream downstream linkage has been proposed.

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References


