

# Landslide Hazard Management and Control in India



**V.C. Thakur**

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Cover Photograph: Two perspectives of the area near Nathpa village, NW Himalayas — rockfall cum debris slide blocking the Sutlej River (background) and translational debris slide on the same site, the imminent hazard to construction activities (inset)

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The inherently unstable geology, well recognised. The steep slopes, unstable geology, and intense monsoon rains combine to make the Hindu Kush-Himalayas one of the most hazard-prone areas in the world. Although natural hazards of varying intensity have occurred frequently in the past in Hindu Kush-Himalayan countries, more recently there has been an increase in human settlement of hazard-prone areas as a result of population pressure, as well as improvements in accessibility by road and the onset of other infrastructural developments. Consequently, natural and man-made disasters are on the increase and each event affects an even greater number of people than before. Floods and landslides during the monsoon season are the most common natural disasters affecting this region, often resulting in substantial economic and environmental losses and causing great suffering to many people.

Despite all this the present levels of understanding and systematic analysis of these disastrous events are very poor and data bases are non-existent. No monitoring activities are carried out even in cases where such monitoring can be of direct benefit to project-related management activities. Investments in developing practical guidelines for managing such events as well as in forecasting them have been inadequate.

Since its inception, ICIMOD has been promoting the development of a better understanding of natural hazards. Various activities have been undertaken so far. These include several training programmes dealing with mountain risk engineering, focussing on improving road construction along unstable mountain slopes, a review of landslide hazard management activities in China, and field assessment of landslides and flood events in south central Nepal following the extreme climatic events that took place in July 1993.

**V.C. Thakur**

One of the goals set by ICIMOD in its "resources" programme is to "improve the efficiency of mountain resources and environments by reducing and eventually reversing their degradation."

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# Preface

Abstract

The inherently unstable nature of mountain areas of the Hindu Kush-Himalayas is well recognised. The steep slopes, unstable geology, and intense monsoon rains combine to make the Hindu Kush-Himalayas one of the most hazard-prone areas in the world. Although natural hazards of varying intensity have occurred frequently in the past in Hindu Kush-Himalayan countries, more recently there has been an increase in human settlement of hazard-prone areas as a result of population pressure, as well as improvements in accessibility by road and the onset of other infrastructural developments. Consequently, natural and man-made disasters are on the increase and each event affects an even greater number of people than before. Floods and landslides during the monsoon season are the most common natural disasters affecting this region, often resulting in substantial economic and environmental losses and causing great suffering to many people.

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One of the goals set by ICIMOD in its Mountain Natural Resources' programme is to "Improve the conditions of mountain resources and environments by halting and eventually reversing their degradation." Programme activities envisaged to achieve the above goal are directed to:

- identification of measures to mitigate different types of natural hazards which result in the loss of natural resources;
- promotion of skills and methodologies for natural hazard assessment; and
- improvement of public awareness for better disaster preparedness in mountain areas.

ICIMOD's programme on "Landslide Hazard Management and Control" focusses on these concerns to help protect valuable natural resources from different types of natural hazards. This programme is based on activities already introduced at ICIMOD in 1994 with support from the Government of Japan.

This programme is concerned not only with examining the types and extent of landslide events but also with measures for their mitigation and control; and in addition the skills and methodologies needed for natural hazard assessment.

To improve the knowledge base on Landslide Hazard Management and Control, state-of-the-art reviews were commissioned in four countries of the Hindu Kush-Himalayan Region. These countries are China, India, Nepal, and Pakistan.

Suresh Raj Chalise of the Mountain Natural Resources' Division at ICIMOD coordinated the work carried out on these reviews and the current document entitled "**Landslide Hazard Management and Control in India**" was prepared by Dr. V.C. Thakur of the Wadia Institute of Himalayan Geology. Dr. Thakur has produced a comprehensive document on a topic that is crucial to the development of mountain areas and the well-being of mountain inhabitants.

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# Abstract

'Landslide Management and Control in India' examines the problem of landslides in a mountain environment in which rising populations and an increase in infrastructural construction have led to augmentation in the probability of landslide occurrence. The various landslide triggers (rainfall erosion, deforestation, earthquakes, overburden of and construction of inappropriate infrastructure, geological causes, etc) and parameters of occurrence are discussed; a number of case histories are given in illustration. Methodologies for Landslide Hazard Zonation and map preparation are discussed, along with landslide hazard rating. Methods of landslide hazard mitigation are covered and an outline for a training programme is proposed as part of the paper's principal recommendations.

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