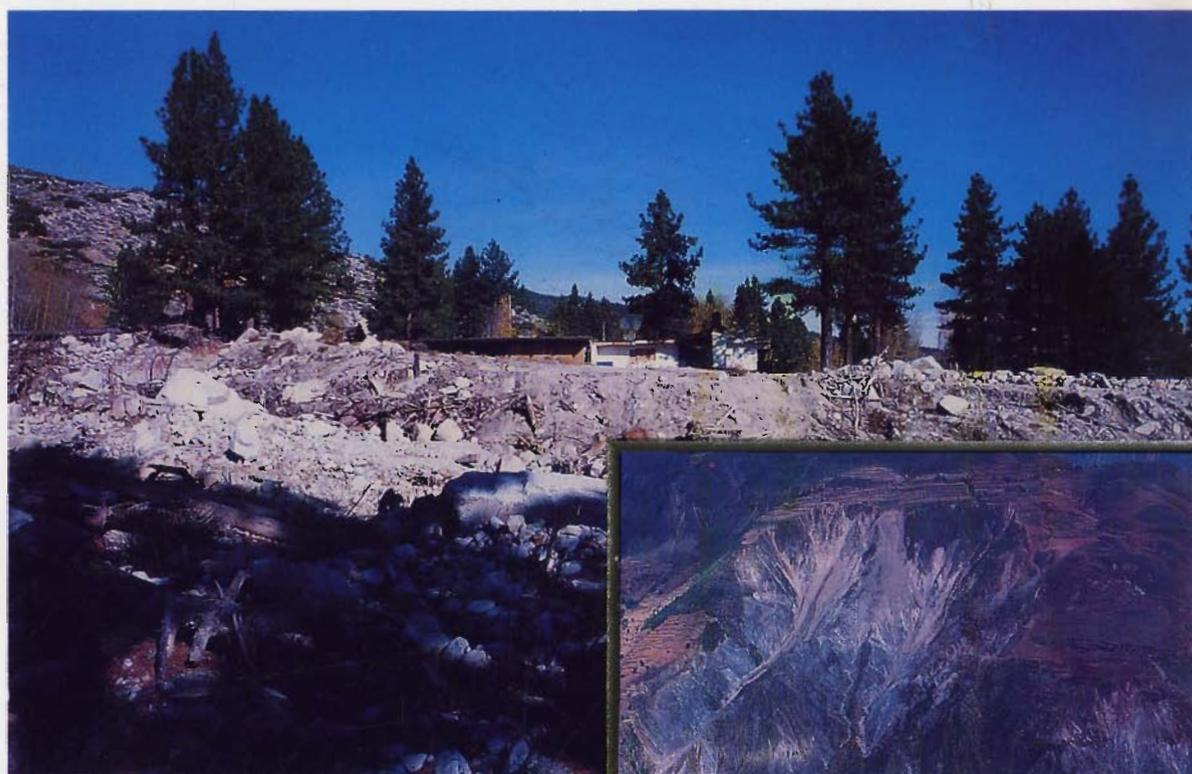


Landslide Hazard Mapping and Management in China



Li Tianchi

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Cover Photograph: Houses, farmland, and a highway damaged by rainfall-induced debris flow - Aba Tibetan Autonomous Region, Sichuan Province

Inset: Villages and farmland affected by deep-seated landslides adjacent to deeply-incised ravines — large quantities of material are transported to the lower watershed and cause serious damage every year - Dongchuan, Yunnan Province

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Landslide Hazard Mapping and Management in China

The Himalayas, the most mountainous region in the world, contains the world's largest population 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. Floods, floods and landslides during the monsoon season are the most common natural disasters in this region, often resulting in substantial economic and environmental losses and causing great suffering among people.

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

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, focusing on improving road construction along unstable mountain slopes, a review of landslide hazard management activities in China, and field management of landslide-related events in south central Nepal following the extreme climatic events that took place in June 1994.

One of the main aims of ICIMOD in its Mountain Natural Resources Programme is to improve the knowledge of mountain resources and environment. The following Programme activities envisaged in the

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- identification of measures to mitigate disaster risks of natural hazards which exist in the form of natural resources,
- promotion of skills and technologies for natural hazard assessment, and
- improvement of public awareness for disaster disaster preparedness in mountain areas.

ICIMOD's programme on "Landslide Hazard Management and Control" focuses on three dimensions: to improve public awareness about hazards from different types of natural hazards. This programme is based on activities already launched at ICIMOD in 1994 with support from the Government of Japan.

The programme is concerned first with identifying the types and extent of landslide hazards that exist 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, a series of reviews were commissioned as four countries of the Hindu Kush-Himalayan region, namely Pakistan, China, India, Nepal, and Thailand.

Suresh Png Chatter of the Mountain Natural Resources Division at ICIMOD coordinated the work carried out on these reviews and the current document entitled "Landslide Hazard Mapping and Management in China" was prepared by Prof. Li Tianchi of the Institute of Geology of the Chinese Academy of Sciences. Prof. Li Tianchi has produced a comprehensive document on a topic that is critical to the development of mountain areas and the well-being of mountain people.

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Preface

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.

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.

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 Mapping and Management in China**" was prepared by Prof. Li Tianchi of the Institute of Geology of the Chinese Academy of Sciences. Prof. Li Tianchi has produced a comprehensive document on a topic that is crucial to the development of mountain areas and the well-being of mountain inhabitants.

Abstract

Landslides are one of the main natural disasters in China, responsible for huge social and economic losses for mountain populations. This paper reviews the available information on effective measures for reducing economic and social losses caused by landslides. These measures include landslide mapping (identification, types of landslide maps, techniques of mapping); physical prevention and control measures (problem avoidance, surface-water drainage works, subsurface drainage, support structures, excavation, river structure works); landslide hazard anticipation (long-, medium-, and short-term prediction; prediction of the extent of landslides); and assessment and mitigation measures for landslide-dam failure disasters.

Institutions concerned with landslide hazard mapping and control, forecasting, mitigation, research, and training (government agencies, research institutions, central and provincial governments, NGOs, and scientific societies) have also been listed.

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