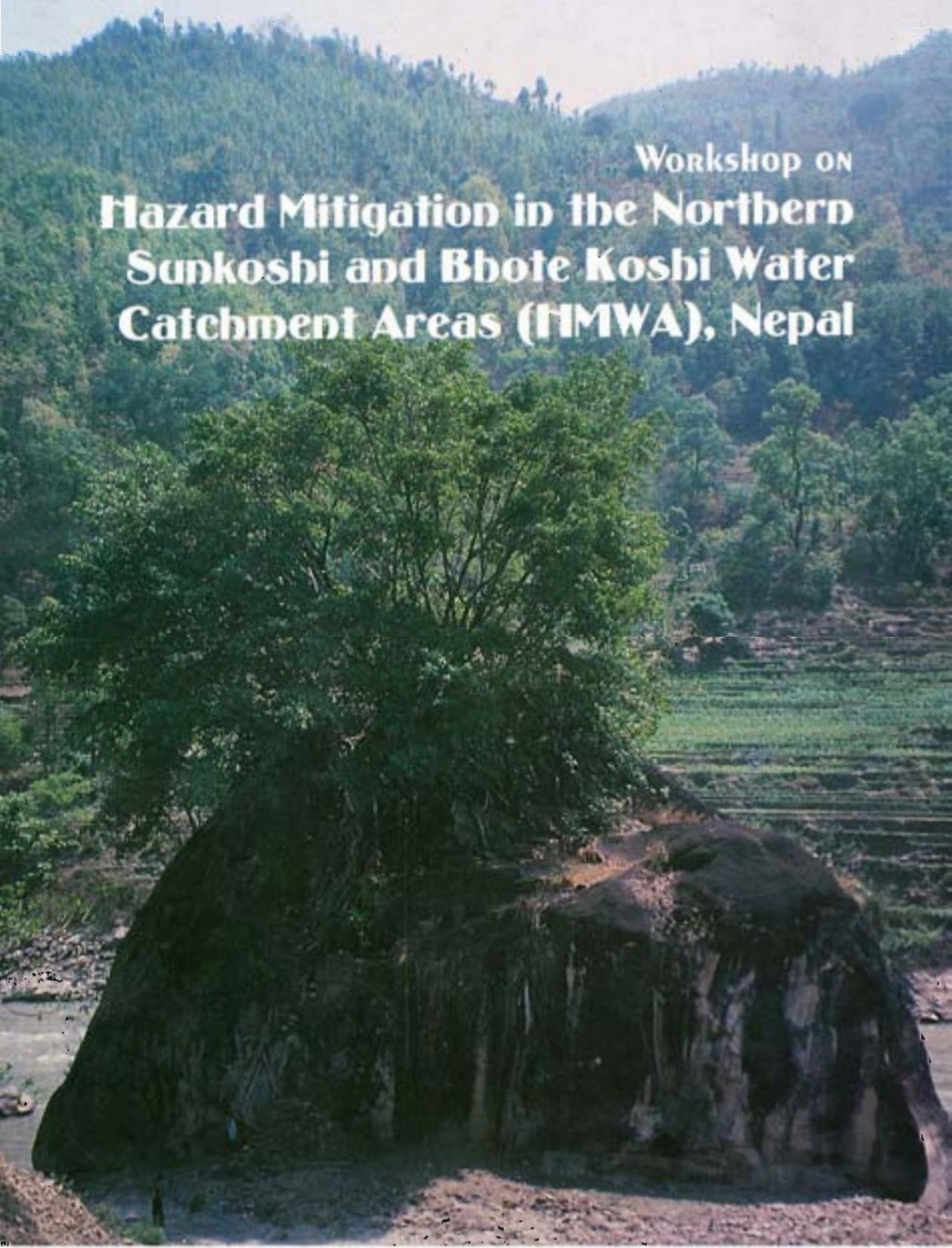




Workshop on
**Hazard Mitigation in the Northern
Sunkoshi and Bote Koshi Water
Catchment Areas (HMWA), Nepal**



Foreword

Workshop on Hazard Mitigation in the Northern Sunkoshi and Bote Koshi Water Catchment Areas (HMWA), Nepal

Organised by
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International Centre for Integrated Mountain Development

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Acknowledgements **Foreword**

Mountains all over the world are identified with hazards, and nowhere is that more critical than in the Hindu Kush-Himalayas, the youngest geological formation in the world. Landslides and floods have been common throughout the region since time immemorial. The traditional response mechanisms of the mountain people have been the building of villages in stable upland areas and trails mostly following the ridges and upper slopes of the hills.

Population growth and scarcity of fertile lands on stable geological formations have forced many people to work and live in more unstable areas, increasing the risks of suffering from these natural calamities. In addition, the building of roads and other infrastructure is causing new man-made landslides to occur.

The subject of hazard mitigation is very mountain-specific and therefore of prime interest to ICIMOD's mandate. Over the past ten years, the centre has addressed hazard mitigation from different perspectives, with a major emphasis on mountain risk engineering and landslide hazard management. Three projects in these fields are presently being implemented by ICIMOD.

The present document reports on a workshop that discussed the results of a two-year study on Hazard Mitigation in the Northern Sunkoshi and Bhote Koshi Water Catchment Areas, which was carried out by ITECO, Switzerland, under a separate agreement with the Swiss Programme's contribution to the UN's International Decade on Natural Disaster Reduction (IDNDR) Programme. ICIMOD, under its Mountain Natural Resources' (MNR) Programme, is very pleased to have been associated with this project by providing the secretariat of its steering committee and hosting the workshop and organising the field trip. The project has made an important breakthrough in conventional thinking about glacial deposits and geomorphological processes in the hills of Nepal. This may have important repercussions on planning roads, dams, and other infrastructure that needs a sound foundation. The very lively discussions that took place, and of which this report can only be a summarised representation, showed that the subject is of considerable interest to scientists and development planners from many different backgrounds and institutions. It was also made clear that the findings and issues raised were not only relevant to the study area but also to other parts of the Hindu Kush-Himalayas, including the upstream area in the Tibetan Autonomous Region of China.

ICIMOD is very grateful to the Swiss Development Cooperation for the financial support received to be associated with this project and to Mr. A. Wagner, Dr. A. Pugin, Dr. B.N. Upreti, and their colleagues in the study team from Switzerland and Nepal for the scientific outcome of their studies and their strong commitment to ensure that the results be used for improving the capabilities of Nepalese institutions to plan and implement measures to mitigate landslides in Nepal; and to share this knowledge with other parts of the Hindu Kush-Himalayas.

Egbert Pelinck
Director General

Acknowledgements

The production of this workshop report is the result of the efforts of a number of people. Greta Rana wrote the report with the assistance of Anita Pandey and inputs from Veneeta Singha. The report is a comprehensive synthesis of their language reporting and the inputs of the technical rapporteurs, S.R. Pant, V. Dangol, and A.N. Bhandari. Sushil Joshi is responsible for the layout. The workshop was coordinated by Professor Suresh Raj Chalise. Hopefully the report will justify the efforts of all those involved in its publication.

The project was funded by the Swiss National Science Foundation on the Prevention of Natural Catastrophes through the Swiss National Service of Hydrology and Geology and partly by the Swiss Development Cooperation. A Consulting Committee of HMG line agency representatives followed the work of the project.

The project carried out research on the fragile thick quaternary deposits of the Bhoite Koishi and Upper Sunkoshi Catchment areas, on geological and hazard mapping, and surveying specific instability damaging landslides threatening the Arniko Highway. Design of small-scale engineering and bio-engineering measures for controlling these instabilities was also finalised. The project also included hydrological studies linked to debris flows and instabilities on specific streams and sites. Several teachers and graduates of the Department of Geology of Tribhuvan University, as well as other Nepalese professionals, were trained on-the-job on the above topic and, consequently, formed the survey team of the project. Six Swiss expatriates, e.g., geologists and geomorphologists, a bioengineer, and hydrologists participated in the project as trainers and implementers.

As a result of the research, it was recognised that the fragile and thick quaternary deposits of the Bhoite Koishi and Upper Sunkoshi Catchment areas are highly vulnerable to landslides and debris flows.



Abstract

The final workshop of the "Nepal-Switzerland Cooperation Project on Hazard Mitigation in Northern Sunkoshi and Bhote Koshi Water Catchment Areas" (HMWA) was held in ICIMOD from the 8th to the 10th of May 1996.

This project, which lasted for two and a half years, was implemented by ITECO Eng. Ltd, a Swiss company which has a long-term experience in the Himalayan region, particularly in Nepal, in collaboration with ICIMOD, ITECO-NP, and the Swiss National Service of Hydrology and Geology. It was funded by the International UNO Decade on the Prevention of Natural Catastrophes through the Swiss National Service of Hydrology and Geology and partly by the Swiss Development Cooperation. A Consulting Committee of HMG line agency representatives followed the work of the project.

The project carried out research on the fragile thick quaternary deposits of the Bhote Koshi and Upper Sunkoshi catchment areas, on geological and hazard mapping, and surveying specific instabilities damaging farmland and threatening the Arniko Highway. Design of small-scale engineering and bio-engineering measures for controlling these instabilities was also finalised. The project also included hydrological studies linked to debris flows and instabilities on specific streams and sites. Several teachers and graduates of the Department of Geology of Tribhuvan University, as well as other Nepalese professionals, were trained on-the-job on the above topics and, consequently, formed the survey team of the project. Six Swiss ex-patriates, e.g., geologists and geophysicists, a bioengineer, and hydrologists participated in the project as trainers and implementors.

As a result of the research, it was confirmed that the fragile and thick quaternary deposits were of glacial origin. Very deep glacial Paleo-valleys infilled by glacial or glacio-fluviatile sediments could be identified down to low altitudes thanks to the seismic reflection method, and confirmed the output of electrical soundings carried out earlier on the occasion of the Arniko Highway Project. Such Paleo-valleys are located below or besides the present riverbeds. The study of sediment exposures with typical glacial depositional features, the presence in deposits of pollens indicating a cold climate vegetation, and other findings are convergent facts indicating that the valleys were glaciated in the remote past. The Charnawati Rehabilitation Project as well as the HMWA project could also identify a typical till and thick glacial sediments in the Charnawati catchment area. It is, therefore, highly probable that other valleys in the northern hills were also glaciated at low altitudes during the same period.

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