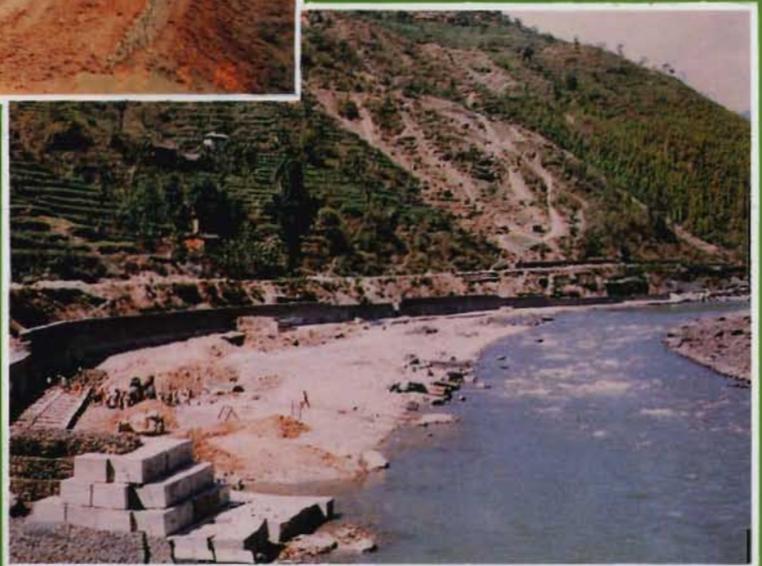
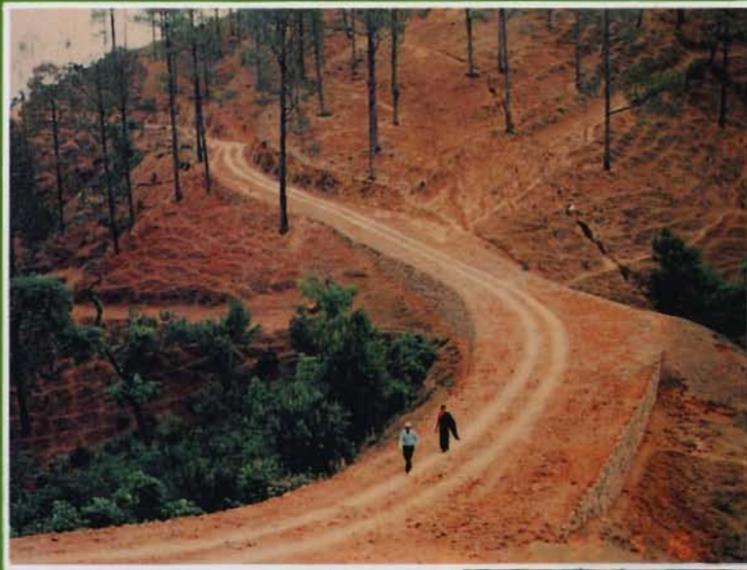


## **Sustainable Approaches to the Construction of Roads and Other Infrastructure in the Hindu Kush-Himalayas**



Birendra B. Deoja

**ICIMOD OCCASIONAL PAPER NO. 24**

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Infrastructural development in the Hindu Kush-Himalayas is an undertaking associated with what sometimes seems like an inauspicious array of hazards. Every piece of infrastructure is likely to be subjected to a variety of natural and human-induced hazards, including landslides. Such problems are exacerbated by deforestation, natural events, and other human interventions that lead to mass movements of soils, rocks, etc. This presents a huge challenge for planners in the HKH Region where the instability of the terrain is most sensitive to faulty planning.

In accordance with ICIMOD's primary objectives as: (i) a multidisciplinary centre for integrated mountain development, (ii) a focal point for mobilising, coordinating and stimulating applied problem-solving research, (iii) a focus for the development of human resources to provide expert services in mountain development, and (iv) a centre for the promotion of the tasks of ICIMOD is to highlight the need for appropriate and sustainable approaches to Mountain Technology. This current volume examines the appropriateness of different approaches to constructing roads and infrastructure in mountainous regions. In doing so, it has drawn upon experiences from across the HKH Region but concentrates primarily on the Himalayas.

## **Sustainable Approaches to the Construction of Roads and Other Infrastructure in the Hindu Kush-Himalayas**

**Birendra B. Deoja**

**ICIMOD OCCASIONAL PAPER No. 24**

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Cover photograph: Top : Environmentally-friendly, low-cost road built with local participation, Palpa (D.C. Joshi - East Consult)  
Bottom : Road constructed after rigorous engineering and geological considerations, the Arniko Highway (B. Sherchan - ITECO)

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## Foreword

Infrastructural development in the Hindu Kush-Himalayas is an undertaking associated with what sometimes seems like an insurmountable array of hazards. Every piece of infrastructure established is at a risk from washouts and failures resulting from erosion, gullying, and landslides. Such problems are exacerbated by deforestation, natural events, and other human interventions that lead to mass movements of soils, rocks, etc. This is a huge challenge for planners in the HKH Region where the instability of the terrain is most sensitive to faulty planning.

In accordance with ICIMOD's primary objectives as: (i) a multidisciplinary centre on integrated mountain development, (ii) a focal point for mobilising, concluding, and coordinating applied and problem-solving research, (iii) a focal point for training, and as (iv) a consultative centre to provide expert services on integrated mountain development in the HKH Region - one of the tasks of ICIMOD is to undertake networking and information exchange activities on appropriate Mountain Technology. This current volume examines the appropriateness of different approaches to constructing roads and infrastructure in mountainous regions. In doing so, it has drawn upon experiences from across the HKH Region but concentrates primarily on the case of Nepal.

For a predominantly mountainous country like Nepal, where the establishment of infrastructure is characterised by high initial costs, frequent damages due to harsh terrain and heavy monsoon rains, long construction time, and low economic returns; and where the establishment of infrastructure is seen as a *sine qua non* for development; there is a need for serious rethinking about land-use plans, development strategies, and infrastructural practices.

This paper by Birendra Deoja is aimed at creating awareness about the various considerations necessary for the sustainable development of infrastructure in mountainous regions. In writing this Occasional Paper for ICIMOD, Mr. Deoja has drawn on a wealth of experience gathered during his term of office at the Department of Roads, HMG/Nepal, and during his tenure at ICIMOD where he was Team Leader for the compilation of the Mountain Risk Engineering Handbook. This present document will make a valuable addition to the rather scant body of knowledge on the construction of roads in the Hindu Kush-Himalayas.

Egbert Pelinck  
Director General

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Foreword

I am grateful to Dr. E.F. Tacke, the previous Director General of ICIMOD, and Dr. M. Banskota, Director of Programmes, ICIMOD, for providing me with the opportunity to write this paper for ICIMOD. I am thankful to my engineer colleagues in the Department of Roads, Durga Prasad K.C., Bindu S. Rana, and Kamal Pande, for providing me with valuable photos of the road washouts that occurred during July 1993. Similarly, thanks are due to Bijaya Sherchan of ITECO Nepal for photos from the Thankot-Naubise Road and the Arniko Highway.

I express my thanks to P.C. Joshi of East Consult for providing photos of low-cost road construction on the Palpa Road and for his many valuable contributions on the social approach to low-cost, village level and participatory road programmes as well as environmental awareness through action-research.

Special thanks are due to Jyoti Ghimire, engineer, for assisting me in writing this paper. Ghanashyam Acharya deserves special thanks for organising and compiling the paper.

Birendra B. Deoja

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