**MOUNTAIN ENVIRONMENTAL MANAGEMENT IN THE
ARUN RIVER BASIN OF NEPAL**

John R. Dunsmore

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Cover Photograph: Farming landscape in Chungbang Village Panchayat. Dhankuta Town and the final stretch of the Dharan-Dhankuta road in the middle distance.

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ABBREVIATIONS AND ACRONYMS

ADBN	Agricultural Development Bank of Nepal
ADB	Asian Development Bank
ATS	Agricultural Technical School
CBS	Central Bureau of Statistics
DP	District Panchayat
FAO	Food and Agriculture Organisation (United Nations)
GIS	Geographic Information System
HMGN	His Majesty's Government of Nepal
ICIMOD	International Centre for Integrated Mountain Development
IRDP	Integrated Rural Development Programme
KHARDEP	Koshi Hill Area Rural Development Programme
LDO	Local Development Officer
LRDC	Land Resources Development Centre (now the Land Resources Department of the Overseas Development Natural Resources Institute, London)
LRMP	Land Resource Mapping Project
NEA	Nepal Electricity Authority
MFSC	Ministry of Forests and Soil Conservation
MPLD	Ministry of Panchayat and Local Development
ODA	Overseas Development Administration (United Kingdom)
PAC	Pakhribas Agricultural Centre
WECS	Water and Energy Commission Secretariat
WSCC	Women Service Coordination Committee
WTC	Women's Training Centre

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Summary

Statements on the fragility of Himalayan ecosystems, environmental degradation, particularly forest loss, resulting from a rapidly rising human population over-exploiting resources, and the danger of much of the rich biological diversity of the Hindu Kush-Himalayan region being destroyed, with the loss of unique species which could have made valuable contributions to the well-being of man and the environment, are liable today to sound almost like clichés. Nevertheless, it is against a background encapsulated in such statements that development in the Region must take place. The Arun River Basin study attempts to present a comprehensive account of the present situation in a specific area. On the basis of experience to date to achieve development without imperilling the very resources on which it depends, a number of suggestions are put forward as a contribution to discussions on ways of improving environmental management in such areas.

The Arun river, which rises in Tibet where over 80 % of its basin lies, predates the uplifting of the Himalayas: in its passage south into Nepal it has cut a deep, narrow gorge through the Himalayan range. From there it flows south for a further 155 kilometres, fed by a number of tributaries, before it joins with the Sun Koshi and Tamur to form the Sapt Koshi, one of the four major rivers of Nepal.

The Arun River Basin Study considers environmental management within this southernmost (Nepalese) part of the Basin. The Study Area has been defined as the three mountain Districts - Dhankuta, Bhojpur and Sankhuwasabha - of the Koshi Zone of eastern Nepal. Of the total area of the three Districts, 5 953 km², 5 028 km² are within the Basin. The area lies between 26° 50' and 27° 50' North latitude. In considering environmental management, the Study Area has been divided into two Zones - Northern and Southern.

The Northern Zone, defined as the part lying to the north of 27° 33' North, includes a substantial area in the High Himalaya physiographic division and includes Mount Makalu, 8 474 metres. In general, the Zone lies above 2 500 metres, is very fragile with high relief, over 73 % having slopes in excess of 40°. The climate varies from moist temperate to alpine to arctic. It is lightly populated but there is concern over the effect of shifting cultivation and damage by grazing livestock in parts of the Zone. It has been proposed that a substantial part in the west of the Zone be included in an extension of the Sagarmatha National Park. In planning such an extension, account would be taken of the welfare of the current users of the area's resources (particularly for summer grazing), conservation requirements and the potential for the development of tourism. Environmental management in the east of the Zone must take into consideration the needs of the transhumant herds and flocks, about which little has been recorded. The Study argues that there is now an urgent need for considering the whole of the Northern Zone as a single area, requiring a comprehensive review of the current position of its natural resources leading to a programme for sustainable environmental management. The reason for this is that the Northern Zone comprises the catchment area of the Arun-3 hydropower project, the construction of which will begin in 1989 with the building of a 170 km access road. The power project itself comprises a 65-metre high dam across the Arun river near Num, which will divert the river water through two 11-kilometre long tunnels to an underground powerhouse. The environmental impact of the hydro-electric scheme and the road will clearly be wide and complex both in regard to the physical structures themselves and their consequential effect: these will include direct effects during construction and subsequent impacts on the forest resources, farming systems and river resources. The possible consequences of a glacial lake outburst flood are also difficult to predict. Rather than divide responsibility for environmental impact assessment and other aspects to several agencies, it is suggested a Koshi Zonal organisation be established: its

TEXT MAP I: ARUN STUDY AREA AND COMMUNICATIONS.

STUDY AREA COMPRISES: 3 DISTRICTS:
DHANKUTA - BHOJPUR - SANKHUWASABHA

possible functions are listed below.

The Southern Zone, predominantly High and Middle Mountains, is, by contrast, heavily populated. Most of the people live dispersed on the hillsides at altitudes between 300 and 2 200 metres. The agro-ecological conditions vary greatly with altitude and aspect. The climate ranges from hot, dry subtropical to cool, moist temperate. The principal economic activity continues to be traditional mixed farming. The farming system employed varies with the agro-ecological conditions but all involve arable crop production on terraced hillsides. Most crop production is rainfed and the maintenance of soil fertility depends on organic manures obtained from the local forest/scrub resources or via livestock. Forest and livestock products are also important contributors to the household economy. The farming system can only be sustained if there is an adequacy and appropriate balance of the household's resources of arable land, livestock and forest / grazing area. The current situation gives rise to concern because:

- a. mean population per square kilometre of arable land is already very high, between 200 and 399 in 94 % of the Village Panchayats;
- b. pressure on land is exacerbated by the skewed distribution, with 43 % of households (5-7 people) having less than 0.5 ha available to them and 15 % controlling 44.4 %, including much of the better land;
- c. cropping intensities are already high - 133-250 % - and the potential for increasing the area under irrigation is very limited;
- d. it has been calculated that, with traditional levels of management, the maintenance of fertility of the arable land requires a ratio of arable to forest/scrub/grassland of 1:3 to 1:6. On average, it is now 1:2.5;
- e. while there is uncertainty over the actual number of livestock in the Southern Zone, it is known that fodder resources are inadequate in the latter part of the dry season;
- f. 27 % of the Southern Zone is covered by

unmanaged, over-grazed pasture, *Eupatorium* spp or forest with a canopy closure of 20-50 % - all of which indicate over-exploitation;

- g. the management of much of the forest/scrub/grassland areas - 40-50 % of the total area - is legally the responsibility of the Forest Department but in practice they are essential resources for the maintenance of the farming systems;
- h. little or no soil and water conservation is practised on the usually outward sloping, rainfed arable areas;
- i. population increase is likely to continue at much the present level until the end of the century: by then the 1981 population of 440 000 may well reach, without migration, 620 000;
- j. opportunities for outmigration to the traditional destinations - India and the *terai* (Gangetic plains of southern Nepal) - are likely to be substantially reduced with a consequent greater increase in the resident population; and
- k. in spite of the recent and proposed road construction, access to most parts remains limited to foot trails.

Nevertheless, the technical means of improving the management and productivity of arable, forest and grazing areas are known. Their adoption and the achievement of sustainable environmental management basically requires a more effective and sensitive support for the households and the communities of the Area. The Study therefore considers, within the context of the recent Decentralisation Act, appropriate roles and tools for local councils, Government agencies and others in order to achieve effective environmental management through:

- a. the preparation and maintenance of appropriate resource data bases (Geographic Information Systems);
- b. coordinated development planning - perspective and annual;

- c. identification and support to Users Groups linked to a resolution of the question of rights over forest/scrub/grassland areas;
- d. recognition and encouragement of the role of women;
- e. coordinated and also sectoral conservation activities, including the establishment of a National Park
- f. the setting up of a Koshi Zonal organisation;

In the circumstances of the Arun river basin, it is felt that a Zonal organisation would be more appropriate than a Watershed Authority. Such an organisation would oversee:

- (i) environmental impact and socioeconomic studies
- (ii) support to Districts in planning, implementing and evaluating development programmes
- iii) the development of alternative sources of income, e.g. rural industries and integrated tourism, which either do not depend on the exploitation of natural resources or assist in their conservation and urbanisation
- (iv) area infra-structural development planning
- (v) marketing research on behalf of the hill farmers

In view of the present situation in the Arun River Basin, particularly with the imminent implementation of the Arun-3 hydropower project, it is recommended that this interim study should be followed up by a comprehensive and detailed enquiry to identify the means of ensuring effective environmental management of the area.

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In 1978, when His Majesty's Government of Nepal, assisted by the Overseas Development Administration of the United Kingdom, initiated the Koshi Hill Area Rural Development Programme - which covered the three Districts of the Arun River Basin together with Terhathum District - little had been recorded about the area. Ten years later, there is a rich store - both formal and informal: on this I have been able to draw. I have been particularly thankful for that derived from the people and professional staff working in the Koshi hills. I am much indebted to Mr. S.P. Acharya, Coordinator, KHARDEP 1982-86 and now Joint Secretary of the Ministry of Panchayat and Local Development: I owe a great deal also to past and present staff of the Koshi Hill Development Programme, including those at Pakhribas Agricultural Centre.

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