GIS DATABASE OF KEY INDICATORS OF SUSTAINABLE MOUNTAIN DEVELOPMENT IN NEPAL

Mountain Environment and Natural Resources' Information Service (MENRIS)

INTERNATIONAL CENTRE FOR INTEGRATED MOUNTAIN DEVELOPMENT (ICIMOD)

February 1996

Copyright © 1995

International Centre for Integrated Mountain Development (ICIMOD)

All rights reserved

Cover: Map of the Hindu-Kush Himalayan (HKH) Region (Inset: Nepal)

Source: The Digital Chart of the World (DCW),
The Environmental Systems Research Institute (ESRI), Inc.

Published by:

Mountain Environment and Natural Resources' Information Service (MENRIS)
International Centre for Integrated Mountain Development (ICIMOD)
G.P.O. Box 3226
Kathmandu, Nepal
Tel.: 977-1-525313
Fax: 977-1-524509, 524317
E-mail: icimod@mos.com.np

ISBN 92-9115-516-0

The views and interpretations in this paper are those of the author(s). They are not attributable to the International Centre for Integrated Mountain Development (ICIMOD) and do not imply the expression of any opinion concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

February 1996

GIS DATABASE OF KEY INDICATORS OF

SUSTAINABLE MOUNTAIN DEVELOPMENT IN NEPAL

Mountain Environment and Natural Resources' Information Service (MENRIS)

International Centre for Integrated Mountain Development (ICIMOD)

Kathmandu, Nepal

February 1996

Foreword

This document has been produced as part of ICIMOD's Regional Collaborative Programme for the Sustainable Development of the Hindu Kush- Himalayan (HKH) Region by the Mountain Environment and Natural Resources' Information Services (MENRIS) of ICIMOD. MENRIS is an outreach programme of ICIMOD, mainly focussing on the dissemination and application of GIS technology in the HKH Region.

This is the first of a series of eight documents that have been envisaged for mountain areas of the eight countries of the HKH Region. In publishing this volume, ICIMOD is fulfilling a part of its mandate to facilitate the dissemination of relevant information for sustainable development of the HKH Region. While all the information presented in the following pages is also in tabular form with respective government institutions, this is the first time that many important data sets have been brought together in one volume and on a common geo-referenced platform. The spatial dimension provided by the graphics provides decision-makers and planners with an easy access to information.

Several organisations have supported ICIMOD's endeavours to prepare this volume, and I would like to acknowledge the financial support of the United Nations Environment Programme/Environment Assessment Programme-Asia Pacific (UNEP/EAP-AP), the Asian Development Bank, and the GTZ. I would also like to thank the Government of Japan for supporting the Landslide Hazard Management and Control Project which produced the Climatic Atlas for Nepal, from which some of the maps on climate have been reproduced here. The support and encouragement of the following organisations in Nepal in providing all the data are gratefully acknowledged: The Topographical Survey Branch of the Department of Survey, Central Bureau of Statistics, Ministry of Education, Ministry of Health, Department of Hydrology and Meteorology, Department of Roads, and Department of Soil and Conservation and Watershed Management.

GIS, as a dynamic tool for data storage and presentation, allows us to update individual datasets whenever new information becomes available, and the information presented in this volume will be regularly updated. To do so, all institutions and organisations with a major mandate in data collection and storage are encouraged to contact MENRIS with their valuable suggestions and recommendations.

Within ICIMOD, Mr. Sushil Pradhan, the GIS Programme Analyst in MENRIS, has been mainly responsible for preparing this volume under the guidance and suggestions of Mr. Pramod Pradhan, Head of MENRIS, and Mr. Basanta Shrestha, Systems' Specialist. Mr. Hubert Trapp, GIS Specialist, MENRIS and Dr. Pitamber Sharma, Regional Planner, ME/ICIMOD, deserve special thanks for providing the necessary guidance and advice to bring out this volume. I would also like to thank those who have worked to produce the climate maps, particularly Prof. Suresh Chalise of the Mountain Natural Resources' (MNR) Division/ICIMOD, Mr. Madan Lal Shrestha, Deputy Director General of the Department of Hydrology and Meteorology, and Mr. Birendra Bajracharya of MENRIS. The other staff members who have helped with digitisation and manual data entry include Anirudra Man Shrestha, Govinda Joshi, Mona Thapa, Mona Lacoul, Uday Tegi, and Sabina Pradhan.

I very much hope that this volume will be useful for all those individuals, institutions, and organisations that are engaged in the development of ICIMOD's host country, Nepal.

Egbert Pelinck
Director General
ICIMOD

Contents

Page No.

1.	INTRODUCTION	1
1.1	The MENRIS Programme	1
1.2	The UNEP Programme	2
2.	NEPAL - AN OVERVIEW	3
3.	GIS DATABASE	3
3.1	Scope of Data	4
4.	RELATION BETWEEN SPATIAL AND NON-SPATIAL DATA	5
4.1	Socioeconomic Data Integration	5
4.2	Data Integration Issues	5
5.	ESTABLISHMENT OF A TOPOGRAPHICAL DATABASE FOR NEPAL (1:250,000)	6
5.1	Objectives	6
5.2	Database Issues	6
5.3	Data Limitations and Lack of Data	7
6.	METHODOLOGY	8
6.1	GIS Database Creation	8
6.1.1	Spatial database creation	8
6.1.2	Non-spatial database creation	8
6.2	Systems Used	9
7.	NEPAL DATASETS	9
8.	UPDATING THE DATABASE	10
9.	CONCLUSIONS	10

Maps

Page No.

I. LOCATION

- Map1: Nepal In HKH Region
Map2: Administrative/Political Boundary

11

12

II. PHYSIOGRAPHY

- Map 3: Administrative/Political Boundary by Physiographic Regions
Map 4: Elevation Zones
Map 5: Land Utilisation, 1978/79
Map 6: Ecological Regions
Map 7: Protected Areas
Map 8: Settlements by Physiographic Regions
Map 9: Road Network
Map 10: Airports

13

14

15

16

17

18

19

20

III. CLIMATE

- Map 11: Average Temperature for July
Map 12: Average Temperature for January
Map 13: Mean Annual Precipitation
Map 14: Mean Monsoon Precipitation
Map 15: Highest 24-Hour Precipitation
Map 16: Mean Relative Humidity for July
Map 17: Mean Relative Humidity for January
Map 18: Mean Sunshine Duration for July
Map 19: Mean Sunshine Duration for January

21

22

23

24

25

26

27

28

29

IV. DEMOGRAPHY

- Map 20: Population Density
Map 21: Average Household Size
Map 22: Sex Ratio
Map 23: Dependency Ratio

30

31

32

33

Map 24: Percentage of Urban Population By Districts	34
Map 25: Population Change Between 1981 - 1991	35
Map 26: Average Annual Population Growth Rate	36
Map 27: Mean No. of Children Ever Born Per Woman	37
Map 28: Mean Infant Mortality Number Per Woman	38

V. SOCIOECONOMIC CHARACTERISTICS

V.1 ECONOMICALLY ACTIVE POPULATION

Map 29: Total	39
Map 30: Male	40
Map 31: Female	41

V.2 PERCENTAGE OF LITERATE POPULATION

Map 32: Total	42
Map 33: Male	43
Map 34: Female	44

V.3 GROSS SCHOOL ENROLLMENT: PRIMARY LEVEL

Map 35: Total	45
Map 36: Male	46
Map 37: Female	47

V.4 GROSS SCHOOL ENROLLMENT: SECONDARY LEVEL

Map 38: Total	48
Map 39: Male	49
Map 40: Female	50
Map 41: Student - Teacher Ratio	51
Map 42: Number of Population Per Health Posts	52
Map 43: Urban Centres by Population Size	53

VI. AGRICULTURE

- Map 44: Percentage of Total Area Under Cultivation
 Map 45: Percentage of Cultivated Area Under Food Crops
 Map 46: Percentage of Cultivated Area Under Cash Crops
 Map 47: Percentage of Cultivated Area Under Irrigation
 Map 48: Average No. of Livestocks (Cows/Buff) Per Household
 Map 49: Average No. of Small Animals (Goats/Sheeps) Per Household
 Map 50: Average No. of Poultry Per Household
 Map 51: Number of Biogas Plant Installation

VII. HYDROLOGY

- Map 52: Drainage Network
 Map 53: The Watershed Conditions of Districts

54

55

56

57

58

59

60

61

62

63

Appendices

Page No.

Appendix 1.1	Database Structure of the OUTLINE Attribute Table	64
Appendix 1.2	Database Structure of the DISTRICT Attribute Table	65
Appendix 1.3	Database Structure of the ROADS Attribute Table	68
Appendix 1.4	Database Structure of the RIVER Attribute Table	69
Appendix 1.5	Database Structure of the CONTOURS Attribute Table	70
Appendix 1.6a	Database Structure of the NATPARK Polygon Attribute Table	71
Appendix 1.6b	Database Structure of the NATPARK Arc Attribute Table	72
Appendix 1.7	Database Structure of the SETTLEMENTS Attribute Table	73
Appendix 1.8a	Database Structure of the ECOLOGY1 Attribute Table	74
Appendix 1.8b	Database Structure of the ECOLOGY2 Attribute Table	75
Appendix 1.9	Database Structure of the SPOTHT Attribute Table	76
Appendix 2.1	Standard District Code for Nepal	77
Appendix 2.2	Standard ID Values and Symbols	78
Appendix 3.1	Ecological Legends	79