Application of Geographic Information Systems (GIS) and Remote Sensing

Training Manual for Managers (Vol I)

Mountain Environment & Natural Resources² Information Service (MENRIS)
International Centre for Integrated Mountain Development (ICIMOD)

Environment Assessment Programme - Asia and Pacific (UNEP/EAP-AP)

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MOUNTAIN ENVIRONMENT AND NATURAL RESOURCES' INFORMATION SERVICE (MENRIS)
INTERNATIONAL CENTRE FOR INTEGRATED MOUNTAIN DEVELOPMENT (ICIMOD)

ENVIRONMENT ASSESSMENT PROGRAMME - ASIA AND PACIFIC (UNEP/EAP - AP)

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Foreword

As much as 10 per cent of the world's population and a much larger percentage of the world's poor live in mountain regions. Besides those living in the mountains, an additional 30 per cent of the world's population is affected by or dependent on mountain resources and their management. The Hindu Kush-Himalayan (HKH) region itself sustains approximately 150 million people and affects the lives of more than three times that number in the plains and river basins below.

The HKH Region is not only the world's highest mountain region, but also its largest and most complex. It extends over a distance of 3,500 km, from Afghanistan in the west to Myanmar in the east, and ranges from the Tibetan Plateau of China in the north to the Ganges Basin of India in the south.

Due to the difficult topography of mountain regions, their inaccessibility, and lack of an accurate information base, the decision-making process and implementation of development plans often do not meet the desired expectations. The inherent diversity, marginality, and varying biophysical and socioeconomic values present great impediments to the use of Geographic Information Systems (GIS). The ability to design and implement effective policies and programmes in this dynamic environment is dependent on prompt and thorough analyses of current resource assets, their limitations, and changes. The implementation of GIS can be facilitated if the data are collected, merged, and analysed to provide information and output in a form that decision-makers can understand and use.

Geographic Information Systems (GIS) is one tool that addresses the problems of unscientific and inadequate use and management of the natural resources and environment of the HKH Region. The process of using information in planning and decision-making must be institutionalised, and the information must be in a readily available form. This is where a Geographic Information System (GIS) comes into play. It integrates biophysical and socioeconomic data and indicates alternative strategies for decision-makers.

Despite widespread use of GIS in the global context, in mountain environments it is somewhat limited. The implementation of GIS should be considered in a different perspective for mountain regions than in the lowlands. The lack of experience in handling truly three-dimensional GIS, given the prevailing technology, and dearth of trained manpower and accurate multi-sectoral data hinder appropriate application.

Furthermore, the institutional hurdles are greater than the technological hurdles. A complementary approach between various institutions is indispensable for success in implementing GIS.

The technology is gaining increasing importance, because it is estimated that more than 70% of all decision-making processes are either influenced or dictated by some sort of geographic information. The basic advantage of the technology is its ability to manage and perform complex processing of spatial data and their visualisation impact. Without an integrating methodology, identifying viable technological and institutional options for sustainable development of mountain areas is not possible.

Today, a considerable amount of data on the natural resources of the HKH Region is available through satellite, and this is essential for monitoring the ever-changing resource base. Advances in satellite image-processing and computer analysis have made it possible to evolve a realistic, accurate, and uniform database. Resource assessment and monitoring data are becoming widely available and are being distributed in formats affordable even by local resource-planning and management agencies.

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Purpose of the Workshop

The purpose of the current workshop is four-fold as follows:

- i. to make participants aware of GIS and RS technologies for data analysis,
- ii. to brief the participants on how GIS could be used effectively for decision-making and modelling purposes,
- iii. to advocate the use of GIS technology for planning purposes and implementation strategy, and
- iv. to provide hands-on experience and demonstration on applicability of GIS technology.

A three-day awareness-cum-training programme on GIS and RS technologies is being organised for project leaders, project managers, and other senior executives. The programme seeks to provide the latest information on GIS and RS technologies and their application to various disciplines, including hands-on exercises on the use of GIS and RS technology for planning and decision-making. Participants are expected to have some previous exposure to Information Technology and basic computer skills in order to take full advantage of the awareness-cum-training programme.

Expected Impact

The participants will be exposed to GIS and RS technologies through a series of lectures and hands-on exercises. The training programme will highlight the usefulness of the technology as a planning tool as well as its potential applications. The training programme will emphasise the need for coordination and complementary approaches amongst the institutions that are important for database development, database standards, and exchange of information. The training programme will provide senior executives with relevant inputs in GIS activities in their own field. It is expected that the training programme will be able to fulfill ICIMOD/MENRIS's facilitating role for promoting information exchange on modern technologies useful for sustainable development of mountain areas.

Training Module

Day 1

Introductory Remarks

MENRIS Activities

Introduction to GIS

Intelligent Infrastructure

Lecture

A Movie

Coffee Break

GIS Concepts

Introduction to ARC/INFO and Arcview

Lecture

Lecture/Exercise

Lunch Break

Using a GIS

Exercise

Day 2

Data Capture and Automation

Digitisation

Lecture

Demonstration

Coffee Break

Spatial Database Concept

Introduction to Remote Sensing

Lecture

Lecture

Lunch Break

Remote Sensing Application

Introduction to the Global Positioning System (GPS)

GPS Receivers and Data Collection

Demonstration/Exercise

Lecture

Demonstration

Day 3

Geographic Analysis
Database Query

Lecture
Exercise

Coffee Break

Buffer Operation

Exercise

Lunch Break

Overlay Exercise

Day 4

Digital Terrain Model

Exercise

Coffee Break

Network Application

Exercise

Lunch Break

Implementing a GIS
Implementation of Specific Issues

Lecture
Comments/Experience from Participants

Day 5

Introduction to ARCVIEW

Lecture/Lab Exercise

Coffee Break

Continuation of ARCVIEW Exercise
Group Discussions

Concluding Session

Feedback from Participants
Certificate Distribution