

## **4. GEO-INFORMATION TECHNOLOGY - AN INTEGRATING TOOL**

The advent of information technology has altered the scope of information processing. Computers are now able to process maps (spatial data) and tabular data (non-spatial data) and merge them together to give added value. Geo-information technology has given added dimensions to the visualisation of information. A geographic information system (GIS) is a computer-based tool for mapping and analysing whatever exists and events that happen on earth. GIS technology facilitates the merging of map and tabular data quickly, thus processing spatial information. These abilities distinguish GIS from other information systems and make it useful for multi-sectoral analysis and planning strategies.

Remote sensing systems are used to observe the Earth's surface from satellites and make it possible to collect and analyse information. Remote sensing is a complementary

technology for capturing data about the earth's surface. The data obtained from remote sensing are in a digital raster format and can be integrated into a GIS environment. Recent advancements in space technology have provided a lot of new information that is less expensive and easier to use than previous data.

Remote Sensing (RS) observations from satellites provide data about the earth in a spatial format. Remote-sensing techniques are more cost effective than ground-based techniques over large areas. The RS data have benefits in terms of synoptic views and large area coverage; the proverbial 'bird's eye-view' of features. The speed with which RS data can be made available (from 3-20 days' interval) make it useful for processing and monitoring features on earth over a given period of time. High-resolution satellite data are another feature emerging in recent years. These make it possible to examine more spatial and temporal variations than ever before. Global Positioning System (GPS) technology computes and captures a position anywhere on the earth's surface within a 24-hour period. This has brought about rapid advancements in surveying and mapping. At the same time, there has been a sharp decline in the price of hardware, an increase in computing power, and improvements in software – making it easier for the user to handle. As a result, GIS and related technologies can be handled by desktop computers.

Developments in geo-information (GIS/RS/GPS) technologies in recent years and rapidly growing convergence among them have facilitated the integration of bio-physical and socioeconomic information and their analysis on a common platform. Hence, planners and decision-makers can visualise alternative strategies.

These factors have helped to create a suitable context for the management of geographic information, i.e., systematic collection, updating, processing, analysing, and distribution of spatial data. As a result, design and development of spatial databases have emerged as priorities and are appreciated by many different sectors. Today, many organizations have shown a keen interest in adopting the technology and putting it into effective use. This study makes an attempt to integrate geo-information technologies and encourage information exchange among stakeholders. The study attempts to provide the opportunity and benefits of improved availability of information and application of such technologies for the overall planning and development of the Kathmandu Valley.

#### **4.1 Application of GIS in a Mountain Environment**

The diversity, marginality, and strategic importance of mountains, together with vastly different rates of change in their physical, biological, and societal systems, present challenges for GIS and related technologies. In contrast to the widespread use of GIS in other areas, the use of the technology for mountain environments is limited. Compared to the plains and lowlands, the physical characteristics of the mountains are complex and need to be analysed using a three-dimensional approach or methodology to arrive at an approximate representation of the topography, slope, and aspects (Heywood *et al.* 1994).

The application of geo-information technologies to the mountain environment involves special considerations because of its topographic variations. Much depends on the knowledge of particular characteristics and our understanding of how mountain systems work. Geo-information technologies are gradually being modified to address the conditions of mountain areas. In this context, MENRIS is engaged in disseminating technology in the HKH region and developing some of the potential applications mentioned below.

- Land use/cover analysis
- Snow and glacial lake inventory
- Mountain hazard mapping

- Mountain natural resource management
- Infrastructure planning and accessibility analysis

All these applications require a sound information base in terms of both spatial and temporal dimensions. (See Annex 1 for a glossary of technical terms used in the text.)