Mapping Land Cover Changes

Land Use and Land Cover in the HKH

The Hindu Kush Himalayan (HKH) region is highly heterogeneous with a wide range of habitats, diverse micro-climates, and varied ecological conditions, resulting in a high level of biodiversity. The mountains are facing pressures from various drivers of change, including land cover and land use changes. Assessing land cover and monitoring its dynamics are essential for the sustainable management of natural resources, protecting the environment, conserving biodiversity, and sustaining livelihoods, particularly for people living in rural parts of the HKH.

SERVIR is a regional visualization and monitoring system that integrates Earth observations, such as satellite imagery and forecast models, with in situ data and other information to support timely decision making. SERVIR is a joint initiative of USAID (United States Agency for International Development) and NASA (National Aeronautics and Space Administration). SERVIR-Himalaya is implemented in partnership with ICIMOD with an aim to bridge the gap between scientific knowledge and decision making through applications of Earth observation information in the Hindu Kush Himalayan region. Driven by the motto 'Connecting Space to Village', SERVIR-Himalaya works as a regional resource centre by developing relevant geospatial applications and creating enabling environments for their use.

Data Used

Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper (ETM) data downloaded from the United States Government Survey (USGS) Global Visualization Viewer (GloVis) were used to develop land cover data. In addition, the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) and Shuttle Radar Topographic Mission (SRTM) Digital Elevation Model (DEM) with 30 m and 90 m resolutions were used as supplementary data.

The development and analysis of a harmonized land cover database at national and regional levels over different time slices will improve understanding of complex change processes and support informed decision making. In this context, ICIMOD has developed land cover data from 1990, 2000, and 2010 for Nepal, Bhutan, and HKH regions of Pakistan and Bangladesh. Data for Myanmar is available from 2010.
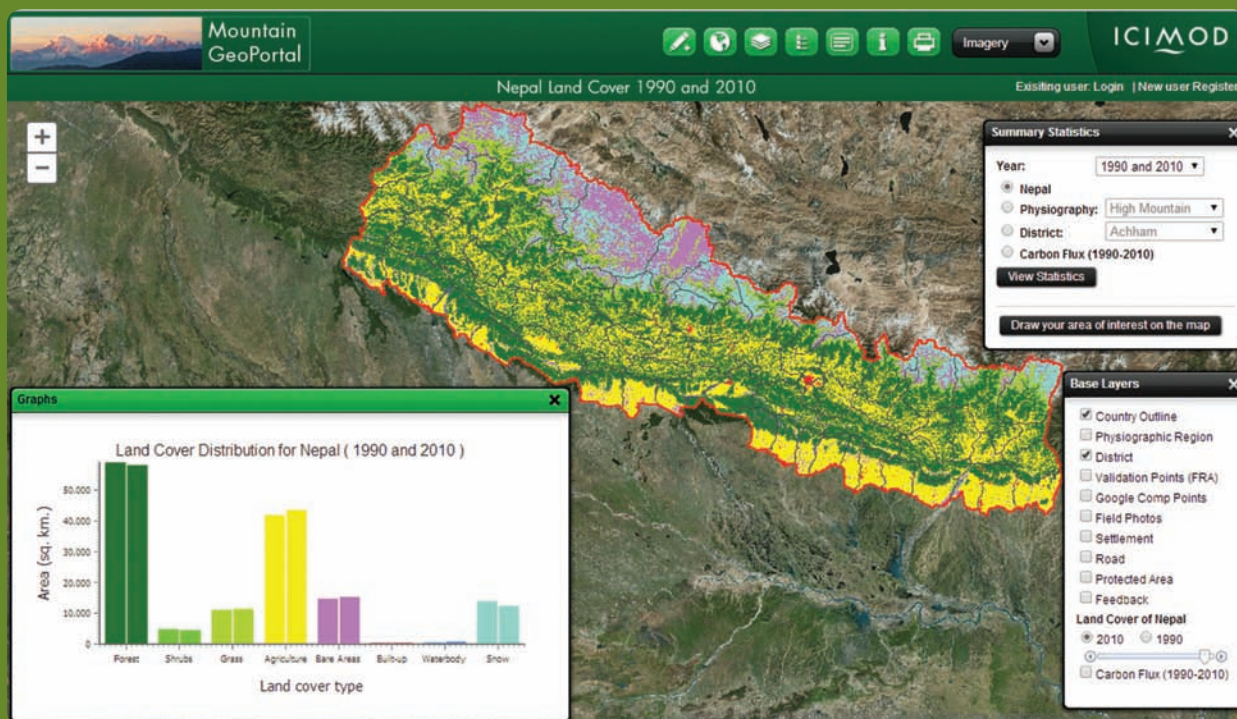
Land Cover Classification System

Defining the land cover legend is fundamental to any land cover mapping exercise. One of the problems with land cover mapping in the HKH region, and also globally, is the lack of consistency in the definition of land cover classes, which limits comparability between regions and over time.

Various national and regional consultation workshops were held involving countries in the HKH region to develop consistent and harmonized regional temporal land cover databases. A harmonized and standardized classification scheme with 12 classes using the land cover classification system was also developed.

Satellite Image Classification

For image classification, the object-based image analysis technique was adopted using eCognition developer software. Multi-resolution segmentation was used for delineating image objects, and mean indices were calculated within each segment. Required rules were then assigned to develop the land cover data.

Scope and Application of Land Cover Data

Land cover data have a wide range of applications in socio-ecological studies. Currently, ICIMOD is using these datasets to identify forest changes and as activity data to reflect the carbon flux from forests in the region. The datasets also enable governments, researchers, and planners to obtain deforestation rates, which is an important issue to monitor in the context of reducing carbon emissions from forest degradation and deforestation. The data are also useful for local-level planning and management of resources as well as for identifying appropriate strategies for adaptation to climate change impacts.

Web Mapping Application

National decadal land cover datasets are regularly shared with stakeholders in the respective countries. These datasets are also made available through web mapping applications that features query and visualization tools.

http://apps.geoportal.icimod.org/mmlandcover/
http://apps.geoportal.icimod.org/BhutanLandCover/index.html