

CHAPTER II

OBJECTIVES, DATABASE AND METHODOLOGY

2.1 OBJECTIVES OF THE STUDY

The objectives adopted for the study are-

- To examine the geoenvironmental settings of the selected western and eastern Himalayan river basins.
- To compare and contrast the representative western Himalayan river basin viz. the Alaknanda with the river basin of the eastern Himalayas viz. the Subansiri in respect of their hydro-meteorological characteristics.
- To assess the salient features of the biological, environmental and socioeconomic characteristics of the western and eastern Himalayan basins.
- To study basin land use changes, settlement pattern and ecological characteristics of the eastern and western Himalayas.
- To evaluate the impact of natural and anthropogenic factors on the Western and eastern Himalayas, especially in regard to climate change.

2.2 HYPOTHESES

The research is based on the following hypotheses –

- The geoenvironmental settings of western Himalayan region are significantly different from the eastern Himalayan region.
- The eastern Himalayan region has strictly contrasting hydrometeorological conditions compared to the western Himalayan region.

- Both the regions have different biological, environmental and socioeconomic characteristics.
- Land use, settlement pattern and ecological characteristics of the eastern and western Himalayan regions differ significantly.
- Owing to the global warming, the temperature in the Himalayan region is gradually increasing which will lead to appreciable climate change in the region with significant impact on man, environment and society.

2.3 GENERAL METHODOLOGY AND DATABASE

The study is based on geospatial as well as conventional database. The geospatial database comprises of remote sensing satellite data from different sensors. Mapping, fieldwork, Digital Terrain models are being prepared for each watershed and different thematic layers are draped on them to derive spatial data on the necessary watershed parameters. Classification of remotely sensed watershed data and their integration with various conventional datasets under the GIS platform comprises essential elements of the methodology adopted for this study.

A base map is very much essential to gather a first hand knowledge of an area. To meet this need a base map is prepared with the help of Survey of India (SOI) toposheets using ArcGIS 9.3 and ERDAS 9.1 softwares. To have an idea about relief, slope and aspect of the basins DEM maps are prepared after proper mosaicing the ASTER GDEM layers using ERDAS 9.1 software. Geological and soil maps for both the basins are extracted under GIS platform using GSI and NBSS source maps. To study the morphometric parameters, drainage network maps for the four small catchments viz. Gayung, Sipu, Bhardari Gad and Kyar Gad of both the Subansiri and the Alaknanda

basins were also prepared by on screen digitization of streams based on the SOI toposheets of 1:50,000 scale. Water samples are collected during the field survey at accessible sites along the rivers and selected environmental parameters of water quality of both the rivers are analyzed in chemical laboratory using standard methods of APHA, 1995. IHA (The Indicators of Hydrologic Alteration) software is used to generate few hydrological graphs. Landuse/Landcover (LU/LC) classes are generated by the unsupervised classification based on spectral properties, taking Isodata algorithm with hundred (100) classes, iteration six (6) for accurate classification. The classified map is validated with the imagery using visual interpretation technique and finally a classified map was prepared. NDVI maps are prepared for the study area of the year 2000 using raster calculation of ArcGIS 9.3 software. The databases used for socioeconomic and demographic study of both the Subansiri and the Alaknanda basins are mostly derived from various Govt. documents, published and unpublished reports and research publications, supplemented with those collected during field study. Graphs related to demography, literacy, bus services, medical services etc. are prepared based on the Census India reports found in census India website <http://censusindia.gov.in>. The database used cover only the years for which data are available in the public domain. The long term impacts of natural and anthropogenic activities on the study area are examined based on analysis of relevant data and information available from research articles, published and unpublished reports especially in regard to areas like climatic variation, landuse changes, developmental activities etc.

2.4 DATABASES AND SOURCES

The data base comprises of both primary data collected in the field as well as a variety of collateral data obtained from various Govt. departments, academic institutions as well as published documents.

- A base map is prepared with the help of Survey of India toposheets. The toposheets used to study the two representative basins viz. the Subansiri and the Alaknanda of eastern and western Himalayas respectively are –(i) 83E/I, 83E/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 83I/1, 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 14 and 16, 83A/13, 83F/13, 83 J/1, 83J/11, 82H/8, 82H/16 of 1:50,000 scale and 83 E and 83 I of 1:250,000 scale for the Subansiri basin while (ii) 53N/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 53 J/14, 15, 16 of 1: 50,000 scale and India and Pakistan toposheets No. NH 44-5, 6 of 1:250,000 scales for the Alaknanda basin.
- Morphometric parameters are calculated and necessary interpretations are drawn based on the Survey of India toposheets of 1: 50,000 scales for the four representative sub basins viz. Gayung and Sipu of the Subansiri basin and the Bhardari Gad and Kyar Gad of the Alaknanda basin. But due to the unavailability of necessary toposheets of same scales, the drainage network of the entire Subansiri basin could be not digitized, only the major streams are drawn based on the available toposheets and satellite imageries.
- Digital Elevation Models (DEM) for both the basins is prepared from ASTER GDEM of 30 meter resolution.

- Discharge data of the Subansiri and the Alaknanda rivers are collected from the Brahmaputra Board, Govt. of India; Water Resource Department, Govt. of Assam, and various published and unpublished official documents and reports.
- Meteorological data such as rainfall, temperature etc. for both the Subansiri and the Alaknanda basins are collected from IMD Guwahati and various published and unpublished documents and reports.
- Water quality data are generated based on analysis of water samples collected from different locations in the two rivers during field survey and relevant GPS points were taken on each sampling station.
- Satellite images of LANDSAT ETM+ from Global Land Cover Facility (GLCF) website for the year 2000 and 2013 are used for the Alaknanda basin, while Satellite image of LANDSAT ETM+ from Global Land Cover Facility (GLCF) for the year 2000 and L8 OLI/TIRS from LANDSAT archive of Earth explorer, USGS website, is used of the year 2014 for the Subansiri basin and necessary thematic layers of LU/LC are prepared using ArcGIS 9.3 and ERDAS 9.1 software.
- Relevant Photographs were taken during the field surveys to understand the biogeophysical environment, socioeconomy and hazard scenarios of both the basins.

- Information related to geography, demography, climate and ecology of the study areas were collected from various research publications and scientific reports, both published and unpublished.

- Data related to demography and socioeconomy of the study areas are obtain from Census India website for the year 2000 and 2011 to analyse and interpret the socioeconomic conditions of the basins.