ROLE OF SATELLITE REMOTE SENSING IN LAND SYSTEM MAPPING, LAND RESOURCES INVENTORY AND LAND USE PLANNING: A SAMPLE STUDY OF KEMANG RIVER BASIN, ARUNACHAL PRADESH

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ABSTRACT

Here an attempt has been made to highlight the importance of satellite remote sensing in land system mapping, land resources inventory and land use planning of a sample river basin (in Arunachal Pradesh) covering an area of 10,186 sq. km. The (Kemang) river basin has been divided into four land systems viz: structural, denudational, piedmont and fluvial. Each system has been analysed with respect to eight land water-resource parameters for proper land use and environmental management of the river basin. A tentative ‘productivity/development strategy ranking’ is also given for optimum planning of the basin.

INTRODUCTION

Satellite remote sensing plays an important role in wider spectrum of studies including that of land classification (land system/land type mapping), land resources survey, land use planning and environmental management. More often than not, such a study is more appropriate for any river basin because, river basins are fundamental geomorphic units not only for basic morphological studies, but also for applied (environmental) studies, essential for proper exploitation and utilisation of all the available land and water resources. It is in this context, that the present study has been taken up using satellite remote sensing (Landsat MSS) data.

OBJECTIVE AND STUDY AREA

The objective of the present study is to delineate the (Kemang) river basin (Fig. 1) into its component geomorphic units or land system units in order to analyse the various land and water resources to enable to give a tentative ‘productivity/development strategy ranking’ (for each land system) for proper land use planning and environmental management of the basin. This study also brings out that similar studies can be extrapolated to other river basins of the entire State of Arunachal Pradesh, which almost have similar relief, lithology, climate and land use.
Kemang river basin has been selected for this pilot study because (i) it is the longest river basin in the State and (ii) the river passes through a cross section of terrain (mountains-valleys-plains) which exhibit definite use and misuse of land. The basin lies in the SW part of Arunachal Pradesh between 26°25' to 28°N Lat, 92°39' to 93°25' E. Long (Fig. 1). The basin is drained by the perennial waters of Kemang river system which flows towards south and SSE before joining the westerly flowing Brahmaputra River. The length of the trunk stream is 217 km, while the total stream (net-work) length is 7,233 km with a total basin area of 10,186 sq. km. Kemang river is one of the tributaries of the (antecedent) Brahmaputra river system.

**METHODOLOGY**

The base map has been directly prepared from the visual interpretation of Landsat Imagery (Band 5 and 7, path/row: 146-041, 147-041) on 1:250,000 scale (Fig. 1). FCC’s on 1:1 Million scale were also interpreted for accurate boundary separation of different features. The basin has been divided into four mapping units (Fig. 1) based on ‘Land Systems’ approach, similar to that adopted by the Division of Land Use Research, CSIRO, Australia. The different land resource land use parameters (Table 1) were obtained from Landsat Imagery, topographic maps, ‘State Report on Agricultural Census’ (1976-77), Government of Arunachal Pradesh and finally from ground truth data. Land suitability, potential land use and development strategy ranking is based on the assessment of the parameters given in (Table 1).

**RESULTS AND DISCUSSION**

**Land System, Land Resources and Land Use Synthesis:**

The land system (mapping units) as defined by Christian and Stewart (in Gunn et al., 1969) is an area or group of areas with “a recurring pattern of topography (Landform), soil and vegetation”. The pattern of recurrence is because landform and land unit developed on similar parent rock, under identical climatic conditions and geomorphic processes show similarities in form and soil-vegetation association.

The Kemang river basin has been divided into four land systems (Fig. 1) based on the concept that similar landforms, surficial deposits and land use reflect similar patterns on Landsat Imagery. Each land system has been further divided into its component forms or land units (Fig. 1) that could be discernible and mappable from Landsat Imagery and toposheets.

1. **Structural hills/Mountain System:**

This system (Fig. 1:5) covers an area of 8906 sq km. It consists of high mountains and hills (elevation range from 1750 m to 7048 m) with rocky, narrow