

Detailed Geomorphic Mapping using Remote Sensing & GIS in Kolli Hill, South India

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Abstract— In the present study, geomorphological mapping using remote sensing techniques has been carried out in kolli hill. Uses of remote sensing and GIS methods has been proved indispensable in geomorphological study. Landforms are interpreted on the basis of interpretation element keys namely tone, texture, size, shape, color etc. and extract the specific information from the false color composites in the digital satellite images of LISS IV IRS P6 data. Geomorphological units are classified on the basis differential erosion processes. In the present investigation an attempt is being made to use the NRIS (Natural Resource Information System) standard for geomorphic mapping. The geomorphic units mapped from satellite image of Structural hills (276.84 Km²) occupying major portions of the area, and residual hills covers 0.48 Km² covered in northeastern part, pediment 23 Km² northern, southern and northeast portions of the area. Hilltop western (176.75 Km²) and central portions of the area. The above said information reveals that the digital satellite technology proves an efficient tool in mapping the landforms.

Key words: Geomorphology, Remote Sensing, GIS

I. INTRODUCTION

Geomorphology is the science that studies about the landforms and its origin. The study of the landforms evolution and enlargement is a contentious issue today in remote areas with limited field-based morphological quantities [6]. Geomorphological map is an active tool for management of natural resources and assists in various types of planning and development activities. Geomorphological mapping allows an improved understanding of Watershed management, ground water exploration, and land use planning. Remote sensing technology is suitable in generating geomorphological maps, because of the diverse and inaccessible terrain condition [7]. Remotely sensed data has unique advantage over conventional data collection techniques in the study of geomorphology [1]. Geomorphology-Landform is a three-dimensional feature of the earth surface formed by natural processes. Typically, landforms include volcanoes, plateaus, folded mountain ranges, streams, etc. [2]. The study of these landforms through this satellite technology is of immersive use and it is experienced by [3]. The Digital image processing techniques offers a detailed investigation of this type of study.

II. STUDY AREA

The area selected for the present study forms a major portion in the Namakkal District of the state of Tamil Nadu kolli hills (Fig. 1), except for a small pocket on the eastern part of the hill, which lies in Tiruchirappalli District. The study area is geographically situated between the north latitudes 11°11'N to 11°30'N and east longitudes 78°16'E to 78°29'E covering an area of 485 km². On the northern side,

it is bounded by Salem District and in the eastern and the south eastern sides; it is bounded by Tiruchirappalli District.

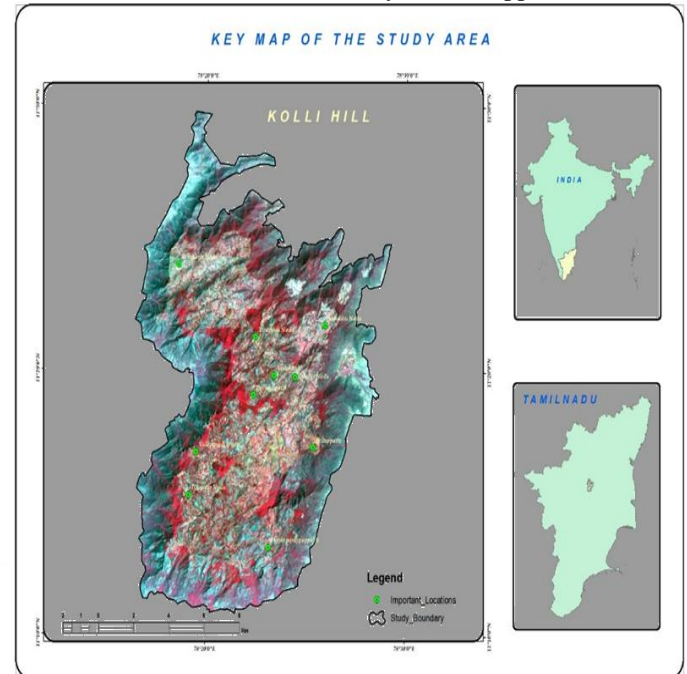


Fig. 1: Location map of the study area

III. METHODOLOGY

The digital satellite data were collected from NRSC (National Remote Sensing Centre, Hyderabad) of IRS-P6 LISS-IV MX (24th February 2004) data in digital forms. The topographic map of 58 I/7 and 8 at scale 1:50,000 published by Survey of India (SOI) have been utilized for the preparation of base work like boundary marking, major roads and major rivers. Digital data were registered for SOI toposheet and identified different hydro geomorphological units, mapping with image interpretation techniques, digital image processing, existing geology and geomorphology map using Erdas image processing software and ArcGIS Software.

IV. RESULT AND DISCUSSION

A. Buried Pediment:

A Buried pediment or eroded bedrock (which may or may not be covered by a thin veneer or alluvium) is type of land form originated in an arid or semi-arid region developed between mountain and basin areas and are characterized on the gentle slope. The hill ranges of the study area are commonly bordered by slopes and veneer soil, which extends downwards the neighboring basin floor. This landform is identified as mild red tone with the study area buried pediments covers an area of 0.55 km² in geomorphic maps (Fig. 2) and (Table 1).

B. Buried Pediplain:

Buried pediplain refers to a flat or gentle sloping surface that is the end of product of erosion formed by calescence of several pediments at the flat of hill slopes. Buried pediplain in the study area is characterized as a vast area of low-lying flat terrain with a gentle slope, in the study area, the buried pediplains are developed over basaltic terrains. The study area covers a 1.43 km² in geomorphic maps (Fig. 2) (Table 1).

C. Hilltop Weathered:

Hilltops weathered come in many shapes, but most have an area of relatively much gently sloping or flat ground. Many hill tops, particularly in area or very old landscapes, have the extensive area of flat ground. The Hilltop weathered features covers an area of 176.75 km² in kolli hill (Fig. 2) (Table 1).

D. Liner Ridge/ Dyke:

Liner ridge is fined to the as a long linear features and its terrain are formed due to detachment and isolation of various fluvial processes. These mainly include elongated. Dykes are tabular or sheet like bodies of magma that cut through and across the layering of adjacent rocks. They form when magma rises into a present fracture, or creates a new crack by forcing its way through existing rock, and then solidify. Sometimes preferentially along the zones of structural weakness. It covers an area of 5.75 km² in geomorphic maps (Fig. 2) (Table 1).

E. Pediment:

Pediplains are formed due to intensive weathering under semi-arid climatic conditions, representing final stage of the cyclic erosion [4]. These are identified in the imageries due to grey tone on false-color composite. Pediplain has developed in the north, south and North Eastern portions of the area. It covers an area of 23.2 km² in geomorphic maps (Fig. 2) (Table 1).

F. Residual Hill:

Residual hills are the end products of the process of pediplanation, which reduces the original mountain masses into a series of scattered knolls standing on the pediplains Mith and Clark, 2005. Residual hills occur as small hills comprise of more resistant formations formed due to differential erosion are found in the western and south western portions of the study area. In the imageries, these features occur as dark greenish brown patches with forest cover. The area covered a 0.48 km² in geomorphic maps (Fig. 2) and (Table 1).

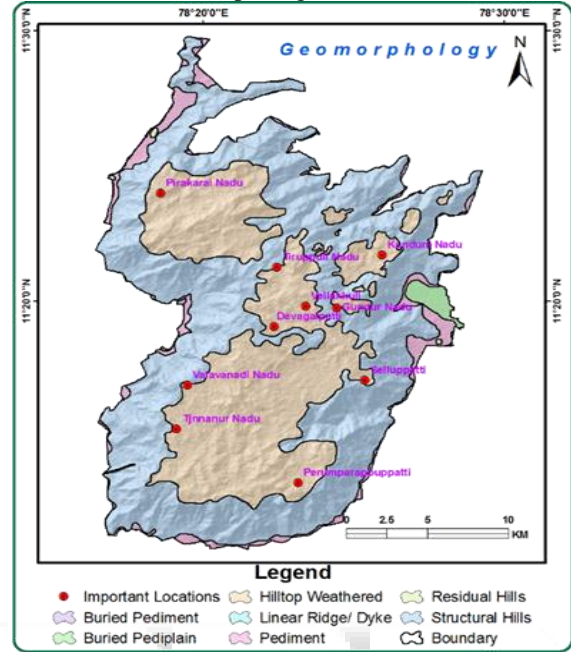
G. Structural Hill:

Structural hills are representing the geologic structures such as bedding, joint, lineaments, etc. (Mith and Clark, 2005). In the study area, they are located in the eastern parts of the study area having the greenish and reddish tone with rough texture on the satellite image. The area under structural hills covers 276.84 km² in geomorphic maps (Fig. 2) (Table 1).

Geomorphology Classes	Area in Km ²	% of total area
Buried Pediment	0.55	0.11
Buried Pediplain	1.43	0.29

Hilltop Weathered	176.75	36.44
Liner Ridge/Dyke	5.75	1.19
Pediment	23.0	4.78
Residual Hill	0.48	0.10
Structural Hill	276.84	57.08

Table 1: Geomorphological class of kolli hill



V. CONCLUSION

The detailed geomorphic investigation of the present study using IRS-P6 LISS-IV MX satellite data in Kolli hill of South India is highly helpful in understanding the landform studies. Land-use planning is continuous processes of natural and human causes. For future land-use planning, it is necessary to appreciate the present geomorphic units and extents. Remote Sensing and GIS have the ability of mapping geomorphic units. It is providing the large view of earth surface geographies on the satellite and has various tools, technique to discover the geographic features. The geomorphic units mapped from satellite image of Structural hills (276.84 Km²) occupying major portions of the area, residual hills 0.48 Km² covered in northeastern part, pediment 23 Km² covers in northern, southern and northeast portions of the area. Hilltop geomorphology noticed in western (176.75 Km²) and central portions of the area. This will be of high use for land-use planning for human activities.

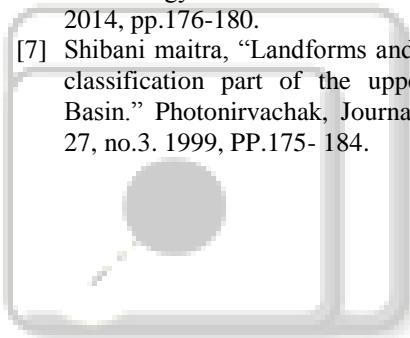
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