Mapping of Geomorphologic landforms of Miyapur and Bollaram areas of Ranga Reddy District, Hyderabad, Andhra Pradesh by Remote Sensing and GIS Techniques

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Abstract

Geomorphological mapping was carried out in Miyapur And Bollaram Areas Of Ranga Reddy District, Hyderabad, Andhra Pradesh By Remote Sensing And Gis Techniqes. Based on visual interpretation of satellite imagery and field investigations the entire area has been classified as Pediplain shallow (PPS),Pediplain Moderate (PPM),Pediment Inselberg complex (PIC), Inselberg (I), Residual Hill (RH), Denudational Hill (DH). The study is characterized by delineating the units like pediment inselberg complex, pediment, inselberg, residual hill, dendational hill by field work and the topography by using true color data of Landsat & spot ETM (Enhance Thematic Mapper) merged image of 2004 has been taken with resolution of 6.5 m and SOI toposheets with No. 56k/6SW and 56k/7/NW as base maps aided by field checks through remote sensing technique and GIS is used to prepare the geomorphic map.

Key words: *Geomorphological mapping, remote sensing and Geographic Information System.*

Introduction:

In an integrated GIS/RS environment, ancillary data can be used to modify and supervise image analysis operations. GIS is used in attributing data and topological information. Attribute information stored in a database can be queried by means of a Database Management System (DBMS) which most Digital Image Analysis Systems (DIASs) do not provide. Ancillary information held in a GIS serves a knowledge as a base. Similar to traditional approaches, the ancillary data stored in a GIS can be used before, during, or after image analysis, or in some combination of these.

Initially, the two technologies (GIS and RS) developed independently. Remote sensing has been viewed as a science, which provides end products in the form of maps, statistics graphs, tabular summaries, and reports**.** Most GIS activities on the other hand focused on the creation of new base maps by digital map compilation in stereo-models and on building thematic databases by digitizing existing maps. It is the time now to correct, update and maintain these products, and to expand them by adding new kinds of information which were previously not collected. At the same time, the vast amount of information held in GIS can be utilized in the process of information extraction from remotely sensed images. Therefore, the two technologies provide complementary capabilities. Remote sensing should not be considered an end in itself, displaying classified images on a monitor and performing visual analysis is of limited value. Images or information extracted from images must be integrated in GIS with other information to support integrated data analysis operations. This has already been realized and a number of developments have been carried out in recent years to integrate image data with cartographic data within a GIS. According to a survey conducted by Parker (1989), nearly half of all GISs support both raster and vector data structures. GIS capable of processing both raster and vector data are being commonly referred to as "Integrated Geographic Information System" (IGIS**).** Rao (1985) emphasized the role of satellite imagery and aerial

photo interpretation in hard rock terrain. Reddy (1985) presented the basic principles and procedures for studying geomorphic, structural and water resources conditions based on Remote sensing Techniques. Gustafsson (1993) used a GIS analysis for the analysis of lineament data derived from SPOT imagery for groundwater potential mapping. In the present study attempt has been made to demarcate geomorphic features in the study area of Miyapur and Bollaram basins, Hyderabad, Andhra Pradesh. India.

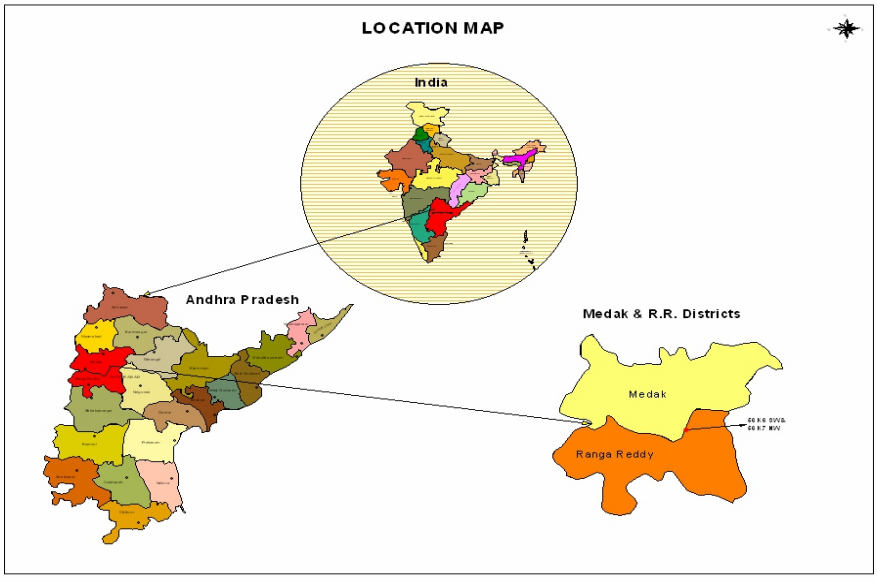
LOCATION :

The study area is located in two different districts which are a part of Medak and Rangareddy district. The location map is shown in fig 1. The Bollaram area is part of catchment area of pedda vagu stream, which inturn is a catchment of Nakkavagu which is tributary of Manjira River. Miyapur area is located at higher topographical level compared to Bollaram area. The Miyapur basin is the part of the catchments area of Pamla vagu stream which inturn meets Nakkavagu. Both Miyapur and Bollaram basins join in Nakkavagu. It is situated about 30 km to the North-west of Hyderabad city. It is located around 78°15′790″ to78°21′36″ E Longitudes and 17°29′295″ to17°32′367″ N Latitude .It is found in the SOI Toposheet nos.56K/6 SW and 56K/7NW. The area of Nakkavagu basin is about 734 sq.km and covering , Ramachandrapuram, Jinnaram and Sangareddy mandals of Medak district. Miyapur basin comes under Rangareddy district. mean daily maximum temperature is around 40°c and minimum is 28°c during summer. During winter the temperature varies from 29°c to 14°c. December and January are the coldest months in this area. The average annual rainfall is 860 mm. 580mm is received from southwest monsoon and 280 mm in Northeast . It precipitates predominantly in the month of July, August and September. The rainfall is confined to Southwest monsoon. During this monsoon the humidity is very high and varies between 60 to 80 %.Storms and depressions originating in the Bay of Bengal during September and November affect the weather over the area causing widespread heavy rains with strong winds.

METHODOLOGY:

Using true color data of Landsat & spot ETM (enhance Thematic Mapper) merged image of 2009 has been taken with resolution of 6.5 m SOI toposheets with No. 56K/6SW and 56K/7/NW as base maps aided by field checks.

a. Preparation of maps using collateral data derived from field and laboratory processing this data sets .
b. Geomorphic features extracted by visual interpretation of satellite data aided by field checks.
c. Land use land cover based on the satellite imagery
d. Digitizing of all the diiferent themes by using Autocad
e. Importing the autocad data in Arc Info by using GIS software package.



f. Overlay analysis of different thematic layers and outputs show areas and sites sutiable for artificial recharge

Editing has been done in ARC INFO environment and subsequently files were exported into Arc View for better understanding stream ordering has been done according to Strahler (1952).

CLASSIFICATION OF GEOMORPHOLOGICAL UNITS:

Landform mapping of an area is of great importance and provides insight to the geomorphic evolution and hydrogeological conditions of the area. By delineating geomorphic units of the area under investigation became easy to study the occurrence and movement of groundwater depending mainly on landforms.

Based on visual interpretation of satellite imagery and field investigations the entire area has been classified as

Pediplain Shallow (PPS)
Pediplain Moderate (PPM)
Pediment Inselberg Complex (PIC)
Inselberg (I)
Residual Hill (RH)
Denudational Hill (DH)

PEDIPLAIN (PP):

The term pediplain is most generally used to describe a series of coalescening pediments (Thornbury 1954). Depending upon insitu conditions such as rock type, topography, structureal features and geomorphic features acted upon them. The development of individual landforms units differ considerably.

Based on visual interpretation techniques like tone, textures, size, shape, vegetation, the following geomorphic units are identified **(Fig 1)**

1. Pediplain shallow

The landscape unit is identified by its characteristic white to yellowish to light red tone, medium to coarse texture with irregular shape on the satellite image . This is a gently sloping surface of weathered pediplain with 0-10m thick weathered material and usually covered with red soils. These landforms spread the entire area .

2. Pediplain Moderate (PPM)

It is almost flat to gently undulating plain formed by the coalescence of several pediments and varying in thickness of weathered material from 10 to 20m. This landscape unit is identified by its light red to dark red with medium coarse texture. Aquifer material is weathered and fractured rock. Weathering is not uniform. Recharge is good ground water prospects are good.

1.Pediment Inselberg Complex (PIC)

It is a gently sloping smooth cut rock surface with or without thin veneer of soil cover. Dotted with a number of small isolated hills called as inselberg, which cannot be separated and mapped as separate units. These units are recognized as straw yellow tone from the imagery. Recharge is poor. Aquifer material is fissured rock. Groundwater prospects limited as pediment part only. Groundwater prospects are poor.

2.Denudational Hill

Denudational hills are identified from the satellite imagery by its dark grey in tone, coarse grained texture with irregular shape. They occupy south western portion of the investigated area. They are marked with sharp to blunt lines with rugged tops indicating that the surface run off at the upper reaches of the hills caused rill erosion. Dome shaped hills developed due to exfoliation and sheeting present in massive igneous rocks. Primarily they consist of granites and gneisses occurring as extensive massive elevated hill ranges. Recharge is poor. Aquifer material is weathered rock at the foothill portions**.** The study is characterized by delineating the units like pediment inselberg complex, pediment, inselberg, residual hill, dendational hill by field work and the topography by using true color data of Landsat & spot ETM (Enhance Thematic Mapper) merged image of 2004 has been taken with resolution of 6.5 m and SOI top sheets with No. 56k/6SW and 56k/7/NW as base maps aided by field checks through remote sensing technique and GIS is used to prepare the geomorphic map.

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