

Identification of Geological and Geomorphological Landforms in Thanjavur District Using Remote Sensing & GIS

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Abstract— In this Paper Abstract has been researched to study of Identification of Geological & Geomorphological landforms in Thanjavur District using Remote Sensing & GIS Techniques. The Cauvery Delta is located in Thanjavur District. It is one of the important rice bowl of Tamilnadu. The total area of Thanjavur District is about 3396.57 Sq.km. The eastern part of Thanjavur is connected with Bay of Bengal. This study is carried out by using IRS P6 LISS IV Satellite image and Toposheet 1:50000 Scale. From this, the thematic maps (Geomorphology, Geology, and Drainage) are created. The Geomorphological features like Flood Plain, Alluvial plain, Deltaic plain and Eolian plain were studied. Similarly the Geological features like Fluvio marine, alluvial-fluvial, sriperumputhur / Sivaganga formation, Nasal formations were analysed. In the same way, the drainage pattern of Thanjavur district is found and the pattern was Dichotomous Using ARC GIS.

Keywords- IRS P6 LISS IV, ARC GIS

1 INTRODUCTION

Thanjavur District is one of the important Rice bowl of Tamil Nadu. The South Indian Ganges called Cauvery is flowing across the Thanjavur District. The major economical sources of Thanjavur District is agriculture; hence I have a lengthy irrigation canal. Thanjavur District is broadly classified into two major division namely deltaic regions and Non-Deltaic Regions. The Regions which lie along the Cauvery bed are Deltaic regions. For Such Deltaic Regions the water can be obtained from the Cauvery Rivers. The Regions with hills (or) Sea shores are said to be Non-Deltaic Regions. This study helps us to know to about the Erosional, depositional and types of rock formations around the Thanjavur District. The analysis is carried out using Visual Image Interpretation Keys by Remote Sensing. It is digitized and evolved by using ARC GIS software.

2 OBJECTIVES

To identify the Geological and Geomorphological land forms in Thanjavur district using Remote Sensing & GIS.

3 STUDY AREA

Thanjavur district lies along the East coast of Tamil Nadu. It is situated between $9^{\circ}50'$ and $11^{\circ}25'$ of Northern latitude and $78^{\circ}45'$ and $79^{\circ}25'$ of the eastern longitude. The district is connected by Ariyalur and Trichy district in the North side and by Tiruvarur and Nagapatinam district in the east side and pudukottai and trichy district in west side. The world famous 'Big Temple' is located in Thanjavur district. The famous monument of Grand Anaicut is also in Thanjavur district.

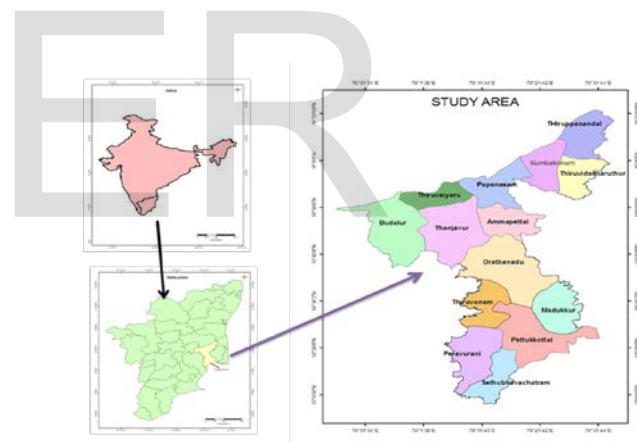


Figure 1. Study Area

4 MATERIALS AND METHODS

The study is based on visual image interpretation of Satellite Image. The Thematic maps are generated from the IRS P6 LISS IV images and survey of India Toposheet No.58 N/1, N/Z, N/3, N/4, N/5, N/6, N/7, N/8, N/9, N/11, 58 J/13, J/14, 58 M/8, M/12. The analysis is carried out on the basis of tone, texture, size, shape, drainage, pattern and association and Geomorphology features were obtained. The pattern is used to analyses the drainage pattern. The geological data is obtained from Geological survey of India. All thematic features are analysed using Arc GIS 9.3.

5 RESULT AND DISCUSSION

Geology:

Geology mapping involves the identification of landforms, rock types and the portrayal of geologic units and structures on a map or other display in their correct spatial relationship with one another (Illisand et al, Eighth edition). The geological formation is about Easternghats of Tamil Nadu. The Easternghats consists mainly of sedimentary rock type and also it covers the seashore deltaic region. Therefore the availability and formation of rock in these areas may be group of sedimentary rock or alluvial fluvial. The parameters of rock are obtained from Geological Survey of India Publication No: 30, Published in 1974, with this parameter and IRS P6 LISS IV as reference the geology map were generated using Arc GIS software. The following geological features were identified in Thanjavur District

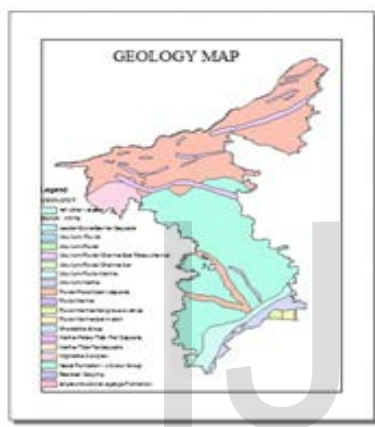


Figure 2. Geology Map

Khondalite Groups

In Tamilnadu, khondalite group is well developed in the south, ie south of palghat Cauvery lineament which is considered by some workers as Terrane boundary between the Archaean craton in the north and Proterozoic mobile belt in the south (Harris et al 1994, GSI)

The khondalite group essentially consists of rocks of sedimentary parentage such as quartzite and garnet -sillimanite gneiss I graphite + cordierite. Due to course of time and sedimentation the sedimentary rocks is converted to as metamorphic rocks

Sivaganga Formation

It is comprised of basal boulder bed conglomerate micaceous, sandstone and shale. The shale bars a lot of plant fossil impressions. These forms indicate lower cretaceous & marine influence at the time of deposition. it exposed around sivaganga trichirapalli and paler sub basins.

Migmattite Complex

The migmattite complex shown the map at places includes gneisses & granitoids generated during this period. A number of small granite plutons were emplaced as culmination of migmatization during this period.This is called as

migmatite complex

Nesal Formation

It is the Pondicherry sub-basin. It is made up at argillaceous & micaceous sand stone with bands & lenses of limestone, clay sandy clay & silt stone with fine grained argillaceous sandstone.

Marine Deposits

It's along the coast and aeolian deposits of Teri and other types of sand near the coast .The red sand (or) Teri as known locally occupies a great part of the coastal districts of Ramanaathapuram, Tuticorin and Tirunelveli

The marine deposits formation is made up of red stained quartz with an admixture of fine red clayey dust and fine grains of iron ore.

Alluvium Fluvial

The processes of river & streams are deposited to create the landforms or bed rocks

Alluvium Fluvio Marine

The combined action of river and sea are deposited to form the bed rocks near the mouth of a river.

Table 1 Rock Types

S.No	ROCK-TYPE	AREA (Sq.km)
1.	Fluvial Flood Basin Deposits	11071.00
2.	Fluvio Marine	229.00
3.	Migmatite complex	1157.00
4.	Alluvium Fluvial	1782.00
5.	Alluvium Marine	871.00
6.	Alluvium Fluvio Marine	1277.00
7.	Marine Tidal Flat Deposits	15.00
8.	Aeolian Dune	9.00
9.	Sriperumbudur/Sivaganga Formation	26.00
10.	Nesal Formation	11071.00
11.	Khondalite Group	2.00
12.	Residual Capping	47.00

Geomorphology

Geomorphology deals specifically with the study of surface features of earth, primarily of the land surface. Detailed investigations regarding development and deposition of mountains, plains, plateaus, valley and basins and various other landforms associated with them; fall in the domain of geomorphology. (Parbin Singh 8th Revised edition).Geomorphology features were obtained to use visual interpretation from the satellite image IRS P6 LISS IV and ARC GIS 9.3 software. The following features like as alluvial plain, Coastal plain, Deltaic plain, Aeolian plain, Flood plain, Pedi plain & Upland

Coastal Plain

It is an area of flat low lying land adjacent to a seacoast & separated from the interior by other features.

Deltaic Plain

It consists of active or abandoned deltas which are either overlapping or contiguous to one another. A delta is a relatively flat area at the mouth of a river or a river system in which sediment land is deposited & distributed (Vol VI: Engineering geology: Delta Sedimentation).



Figure 3. Geomorphology Map

Pedi Plain

The pedi plain is formed from the sedimentary rock exposure are generally due to intensive weathering under semi-arid climatic conditions representing final stage of the cyclic erosion. These are identified in the images with the grey tone on false color composites.

Upland

It consists of coastal erosion & depositional material.

Aeolian Plain

It processes pertain to the activity of winds and more specifically to the winds ability to shape the surface of the earth. Winds may erode, transport & deposit materials and are effective agents in regions with sparse vegetation and a large supply of fine, unconsolidated sediments.

Flood Plain

Alongside stream channels are relatively flat areas known as flood plain. Flood plain develops when streams over-top the levees are spreading discharge & suspended sediments over the land surface during floods. The flat surface adjacent to stream/river composed of unconsolidated fluvial sediments subjected to periodic flooding in very good for groundwater development. This unit consists of sand, silt & clay & facilitates channel be infiltration.

Alluvial Plain

A flat to gently sloping surface consists of unconsolidated sediments. It composed of promising zone or shallow unconfined aquifer.

Table 2 : GEOMORPHOLOGICAL FEATURES

S.No	GEOMORPHOLOGICAL FEATURES	AREA (Sq.km)
1.	Flood Plain	1382.00
2.	Alluvial Plain	7783.00
3.	Deltaic Plain	2391.00
4.	Pedi Plain	14853
5.	Upland	419.00
6.	Coastal Plain	1367.00
7.	Aeolian Plain	2.00

Drainage

The relationship of all these streams with each other and with the region as a whole gives rise to the drainage pattern (or) the drainage system of that area. The drainage pattern takes an important place amongst the various interpretation elements used as a criteria for identification on geological and geomorphological phenomena. Factors to be considered are amongst other, the density which is measured for the erodibility of rocks; the amount of geological control or the drainage pattern and the integration and homogeneity of pattern. (M.Anjireddy Second Edition 2002). Since the Thanjavur District has the Cauvery River and agriculture activities are more. So it has more branches of Cauvery River. By using visual interpretation keys to identify the drainage pattern is obtained Dichotomic.

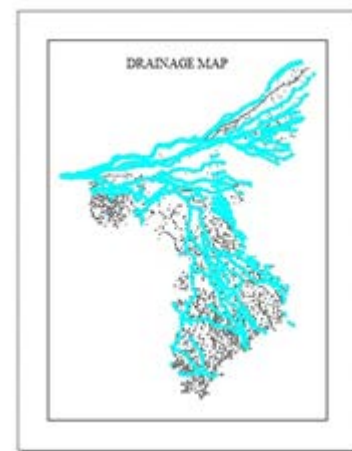


Figure 4. Drainage Map

Dichotomic Pattern

The dichotomic pattern of radiating drainage chan-

nels occurs in alluvial fans, some channels may have a blind end because the water largely percolates into the coarse fan material. Other streams may then originate as springs in the lower part of the fan. (Kunwar Krishan Rampal).

VI CONCLUSION

The study is carried out to identify the various landforms from different thematic maps. The spatial data were collected from satellite image IRS P6 LISS IV. The data were analysed by using GIS software. With the above references, it is concluded that the Thanjavur district consists of group of sedimentary rocks and alluvial fluvial formations. With the reference of geomorphological features the Thanjavur district lies in the eastern coast of tamilnadu; it is a deltaic region and part of coastal area. Hence the district has the geomorphological features like Flood plain, Coastal plain, Alluvial plain, Deltaic plain, Beach ridges and bay. These features can be used to identify the flood zone. And also the drainage pattern is identified as Dichotomic pattern.

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