

A study on Remote Sensing on Coastal Geomorphological Landforms From Coleroon River Mouth to Cuddalore South Arcot, Tamil Nadu, India

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ABSTRACT

The present study area is the Coleroon river estuary to Cuddalore is located on the eastern part of the Cuddalore district of Tamilnadu. It is bound between the latitudes E 79° 30'00" and E 80° 00'00" and Longitudes N 11° 45'00" and N 79° 15'00" It is discuss the use of Remote Sensing data for coastal Geomorphological studies. Briefly describe the results or the study or the Geomorphology of the study area cuddalore Coast of Tamilnadu, using aerial photographs and LANDSAT images. Recording of various coastal and near shore geomorphological features and grouping them in different units. Development of offshore bars, beach ridges, spits, beach, sand dunes, tidal flats etc. Origin and development of cliffs, wave-cut platforms and coastal platea. iv. Working out lithological and structural influence on the. Geomorphology of the area. On the basis of tone, texture, size shape, drainage pattern and associations, various geomorphic features like beach, beach ridges, sand dune, marine terraces, swales etc are identified from aerial photographs in the scale 1:50000. Using the data acquired from the primary source of aerial photos, to understand the geomorphic features of east coast of Cuddalore region. Rivers are under tidal influence for most of their length towards the coast. The rivers run mostly straight with sharp bends and meandering are a rare phenomenon. The area is mostly characterized by the dendritic type of drainage pattern Remote sensing data enlargly helps us to determine the Geomorphology of the study area.

1. Introduction

Aerial photo is defined as the science of making photographs from the air, for studying the surface of the earth. The main uses of aerial photo are for pictorial representation of mosaic, photo interpretation and photogrammetric survey. The Aerial Photo are very useful in geological mapping as its provides better tonal contrast. Highly useful or vegetation, Forest related studies. Water and Vegetation can be easily distinguished due to the fact that Vegetation reflects infrared light while water absorbs it. The study area around Parangipettai is located in between 11° 17' to 11° 37' latitude and 79° 32' to 79° 48' longitude. It is sandwiched between two river basins namely Gadilam in the north and Coleroon in the south. The landforms are represented by both erosional and depositional nature like Chenniers Palaeo lagoonal plain, Coastal sand dunes, beaches, beach cliff, Palaeo-lagoonal plain and abandoned River channels. The Velar River

represents the main drainage pattern of the study region. The climate is humid tropical one and the relative humidity of the study area shows a fluctuation of 65-75%. The study area is underlined by various landforms the common rock types. An assortment of studies like interpretation of Geomorphic features from Aerial photos and satellite imagery from the different landforms were carried subsequently. During the course of field work, different lithological nature of tributaries, soil types and the post confirmation of different quaternary landforms, inferred from field work, were taken into account. The geomorphology of study region is shown by different landforms. The coastal sand dunes are well developed between Portonova and Cuddalore with the heights. A maximum number of beach ridges of six series are found to occur around the Rivers of Vellar and Coleroon. Cheniers are well developed on both sides of Vellar and Coleroon Rivers. The mangrove vegetation in Pitchavaram lagoon covers an area of 8 sq.km. The geomorphic analysis of topograph maps and of aerial photographs necessitates as a systematic analysis of the relief and of the drainage systems. The toposheets and the aerial photographs of a multitude of a data, the proper interpretation of which could only be arrived at, after a systematic analysis and evaluation. The interpretation data from aerial photographs are blotted into the base maps. Hence, landform studies are essentially warranted for understanding the possible changes in geomorphic processes during the recent past and their human response. The study of coastal geomorphology will enable the prediction and assessment of damages due to the sea-level rise.

2. Aim and Objectives

The various geomorphic lands formed in Quaternary period register the imprints of past geological processes. A widely varying nature of landforms and the deposition along the beaches and inland represents the successive phase's transgression and regression of sea level. The presence of Palaeo-channels and Cheniers or the study of fluvial processes can be of help to identify the Palaeo-river courses or the migration river pattern and inherent relation between sea-level oscillations and channel shifting. The advancement of scientific techniques has helped to study the quaternary landforms through Aerial photos and imagery. These tools provide an insight the coastal evolution, sea level variation, possible neotectonic activities, by the typical uplift and upliftment of landforms in a particular area. In this study we have planned to develop an Aerial photograph interpretation for Geomorphological investigation. To understand the effectiveness of computer aided Aerial photographic techniques for interpretation of the Geomorphological impact for the study area. To identify the coastal geomorphic and the tsunami affected feature of the study area.

2.1 Study Area

The area of study, extending for 45 km from the Cuddalore in the north to the Coleroon river mouth in the south between $11^{\circ} 17'$ to $11^{\circ} 37'$ latitude and $79^{\circ} 37'$ to $79^{\circ} 48'$ longitude. The coastline of northern Tamilnadu is characterized by long sandy barrier beaches, where the coastline is formed by low cliffs cut into marine terraces. These barriers are bordered in the west by coastal sand dunes, lagoons, deltaic plain, Cuddalore sandstone uplands and pediments and in the east by the Bay of Bengal Fig 1. This study is mainly based on visual interpretation of aerial photographs. Supplementary data's were generated from the LANDSAT images and Survey of

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India No.58 M/14&15. This ensured the accuracy of results with least possibilities of misinterpretation by overlooking important and prominent features. A field study involving identification and mapping of the various geomorphic features present in the area was conducted with the help of Survey of India toposheets No: 58 M/14&15. The aerial photo of Coleroon river to Cuddalore of the scale 1:50000 were interpreted, from then the geomorphic entities were also mapped, and the features were confirmed by field checks. Data was also obtained from the satellite imagery. It is by compilation of data from field map, aerial photos, and satellite imagery, a geomorphic map of the Cuddalore was prepared (Fig.2). On the basis of tone, texture, size shape, drainage pattern and associations,, various geomorphic features like beach, beach ridges,, sand dune, marine terraces, swales etc are identified from aerial photographs in the scale 1:50000. Using the data acquired from the primary source of aerial photos, images and toposheets, the land forms of the study area.

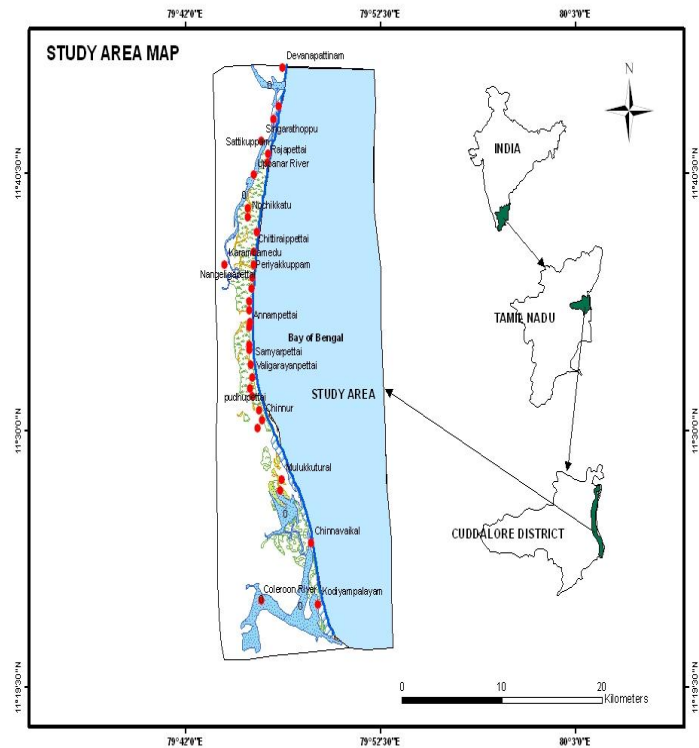


Figure 1: Map showing the details of study area

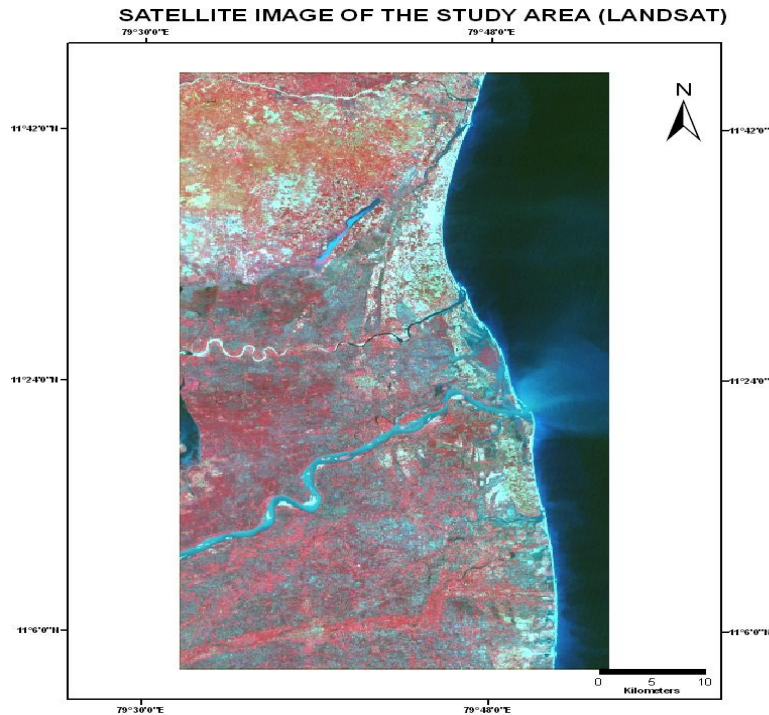


Figure 2: Satellite map of the study area

3. Methodology

This study is mainly based on visual interpretation of aerial photographs. Supplementary data's were generated from the LANDSAT images and Survey of India No.58 M/14&15. This ensured the accuracy of results with least possibilities of misinterpretation by overlooking important and prominent features. A field study involving identification and mapping of the various geomorphic features present in the area was conducted with the help of Survey of India toposheets No: 58 M/14&15. The aerial photo of Coleroon river to Cuddalore of the scale 1:50000 were interpreted, from then the geomorphic entities were also mapped, and the features were confirmed by field checks. Data was also obtained from the satellite imagery. It is by compilation of data from field map, aerial photos, and satellite imagery, a geomorphic map of the Cuddalore was prepared (Fig.2). On the basis of tone, texture, size shape, drainage pattern and associations, various geomorphic features like beach, beach ridges, sand dune, marine terraces, swales etc are identified from aerial photographs in the scale 1:50000. Using the data acquired from the primary source of aerial photos, images and toposheets, the land forms of the study area.

3.1 Geomorphology

The coastal lowlands of Tamilnadu with elevation upto 20 m from MSL (except Cuddalore sandstone uplands which rise upto 80 m) exhibit wide ranging features to marine origin. The shore zone part of the area consists of long sandy barrier beaches and beach ridges interspersed with low beach cliff. These barrier beach complexes are bordered in the west by

wide ranging coastal landforms as listed in Table 3.2.a. As the coast is of open nature, wave dominated forms are abundant.

Table 1: Classification of coastal landforms of Study Area

Process	Erosional	Depositional
Marine	- Active beach cliff Cliff: - Abandoned cliff terraces	Beaches Beach ridges Cheniers Paleo-barrers, Paleo-tidal flats Mud flats
Fluvio-marine	-	Deltas River mouth bars
Fluvial	-	Abandoned river channels, natural levees, gravel high
Others	Lagoons Tidal creeks	-
Planation	Cuddalore sandstone	Pediment high land

Figure 3: Geomorphology of the study area

4. Results and Conclusion

Aerial Photo-element analysis such as tone, texture, shape, size, form, pattern and associated features aided considerably in identifying and describing the following geomorphic units

Table 2: Classification of various areas in the study area

Marine	Fluvial	Aeolian
Waves Tidal flats Beaches, and Beach ridges Spits and Bars	Drainage River terraces Channel bars	Dunes (recent and old)

The landforms in the study area are primarily of depositional nature, such as deltaic alluvial plains, Cheniers, Palaeo-lagoonal plains, beach ridges, sand dunes, beaches, Palaeo-barriers, Palaeo-tidal flats, river mouth bars and natural levees. The Vellar River is ephemeral in nature and flows south easterly at the lower reaches. Geomorphology of the coastal land forms consists of three major types such as Aeolian, fluvial, and coastal. Aeolian land forms deal with inland sand dunes, while the fluvial land forms pertain to flood plain and the coastal and forms to cusp, beach, coastal dunes, ridges, mudflat, vegetation, tidal creek and mangroves (Mohan et al, 2000). The present study describes some of the changes to coastal geomorphic features, such as sand dunes and channels, by compared Aerial photo and high resolution LANDSAT satellite imagery. Tidal flat .

These are extensive, nearby horizontal, marshy or barren tract or land that are alternately covered and uncovered by the rise and fall of the tide. On air photos, the tidal flats show dark tonal contrast the lighter channels, bordering the present river. Old tidal flats are marked by light tone. They are 2-3 m above the present sea level. Beach .This unit is restricted to a narrow belt ranging from a few meters to about 100 m along the coast. Aerial photographs taken at the low tide display different features in detail and-in some, submerged portions are also seen. Beach Ridges These are sub parallel ridges; sand, shell or pebble, varying in amplitude from a few inches to many meters. A number of beach ridges are identified for beyond the present shoreline. On aerial photographs beach ridges appear as light to medium grey speckled areas with medium texture. Drainage Rivers are under tidal influence for most of their length towards the coast.. The rivers run mostly straight with sharp bends and meandering are a rare phenomenon. The area is mostly characterized by the dendrite type of drainage pattern. River Terraces These are topographic surfaces marking the former levels of valley floor or flood plain. Field checks reveal that the horizontal or nearly horizontal alluvial terraces on either side of the rivers are about 2 to 5 m

above the present high water level and are covered with alluvial deposit. Channel Bars The deposits of sand and gravel along the river channel are designated as channel or meander bars, depending on their position and origin. On air photos, they are seen as streaky multiple channels while under stereomodels they appear to have some relief. The presence of meander bars on the convex side of the channels indicates the migration of the river towards the convex end. Coastal Dunes A series of sand dunes which vary in size and degree of stability occur parallel to the coast. Within these dunes a set of old and recent or active dunes can be distinguished. Recent dunes exhibit a very light tone in aerial photos, are located close to the beaches and rise to a height of about 10-15 m. The older dunes are marked by very dark tone. The optimum photographic scales to be chosen shall depend on the subject of study i.e. the scale should be in conformity with the size of the features to be interpreted. The landforms in the study area were primarily of depositional nature, such as Tidal flats, Wave-cut terraces, Beach, Beach Ridges, Drainage, River Terraces, Channel Bars, and Coastal Dunes. Geomorphology of the coastal land forms consists of three major types viz., Aeolian, fluvial, and coastal. Aeolian land forms deal with inland sand dunes, while the fluvial land forms pertain to flood plain and the coastal land forms to cusp, beach, coastal dunes, ridges, mudflat, mud flat with vegetation, tidal creek and mangroves. A series of sand dunes which vary in size and degree of stability occur parallel to the coast. Within these dunes a set of old and recent or active dunes can be distinguished. Recent dunes exhibit a very light tone in aerial photos; Rivers are under tidal influence for most of their length towards the coast. The rivers run mostly straight with sharp bends and meandering are a rare phenomenon. The area is mostly characterized by the dendritic type of drainage pattern; Remote sensing data enlarges helps us to determine the geomorphology of the study area.

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