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Solid Waste Dumping Site Suitability Analysis For Chengalpettu Town Using GIS

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***Abstract*-- Solid waste dumping is a common problem in all the developing countries. Chengalpattu taluk have no proper solid waste dumping system. The main objective of our study is to prepare a suitable location for dumping solid waste for Chengalpattu taluk. The base map of the study area have prepared from toposheet and converted into digital format. Geology, Land use , soil, tanks and geomorphology maps of the study area are prepared from satellite imagery. The rank and weightage are determined by pairwise comparison matrix for various thematic maps and overlaid using GIS. The overlaid map is categorized as unsuitable, less suitable, moderately suitable and most suitable. The most suitable area is considered to be the best site for solid waste dumping.**

***Keywords*-- Overlay analysis, Pairwise comparison matrix, Solid waste, Suitable, Thematic maps.**

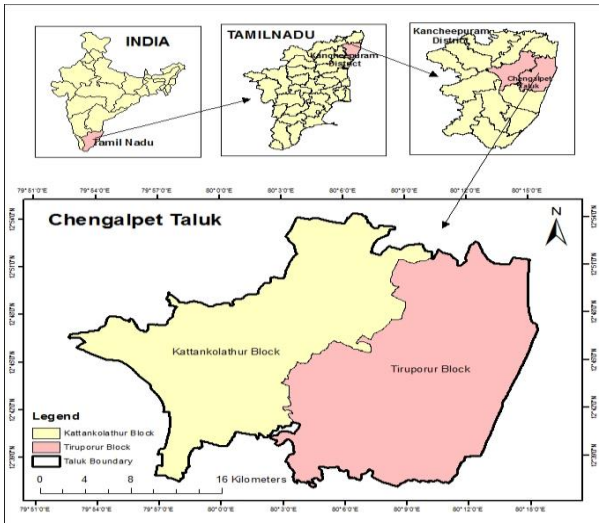
I. INTRODUCTION

Waste disposal is one of the major problems faced by every community. The developing community lacks in selection of suitable place for dumping site. Proper selection of waste disposal site helps in developing a safe and healthy environment. The Chengalpattu town is one of the developing community which lacks suitable solid waste dumping site. Using GIS technique the study area is analyzed and the best solid waste dumping sites are found using GIS software.

II. STUDY AREA

Chengalpattu is a taluk in Kanchipuram district which is situated in the north east of Tamil Nadu state in India. It lies between 12°38' to 12°51' N and 79°51' to 80°15'E (Fig. 1). The average elevation of study area is 36meters and total population is 571257 in 2011 census. A river called Palar is passing through the northern side of Chengalpattu and it also has a lake in its north eastern side which is called Kolavai Lake. The temperature lies between 30° to 39 ° c. Chengalpattu generally experiences hot and humid climatic conditions throughout the year. Temperature reaches at maximum between April to July and the day time heat is oppressive during summer season the temperature comes down during December to February.

An average humidity of 55% to 85 % is prevailed throughout the year. The soil type in this area is highly inferior and highly stony or mixed with lime, gravel, soda and laterite.



III. METHODOLOGY

The data of the study area are acquired from internet, LANSAT images. The geology, geomorphology, soil, land use, tanks details are collected for the study area. The weightage analysis for each parameter is done by Pairwise comparison matrix. Various thematic maps are prepared for each parameter by classifying each into four categories. The thematic maps are then overlaid using GIS software. The overlay analysis is done and the layers are classified into four categories namely unsuitable, less suitable, moderately suitable and most suitable.

IV. THEMATIC MAPS

The following thematic maps have been prepared from satellite image via., 1. Landuse/land cover, 2. Geology, 3. Geomorphology 4. Soil and 5. Tanks.

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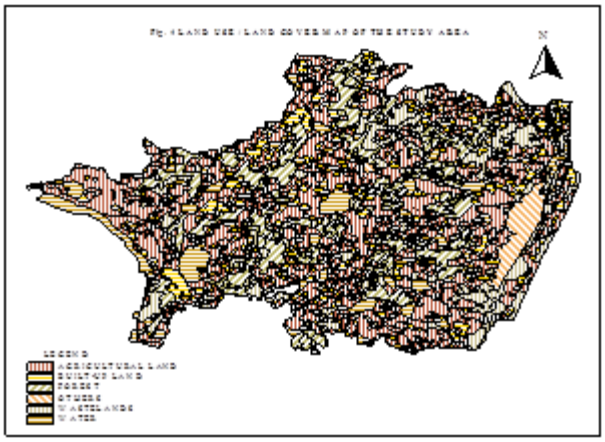
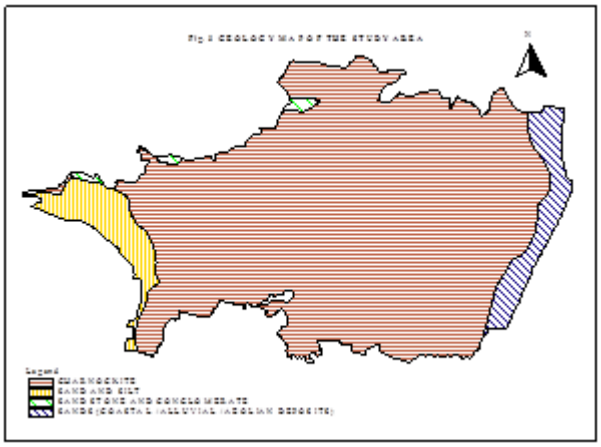
A. Land Use / Land Cover

The land surface is categorized based on its usage. The land cover of the study area comes under the category Agricultural land, Waste land ,Build-up land, Forest, Water body, Others like grass land ,barren land ,etc (Fig. 2).



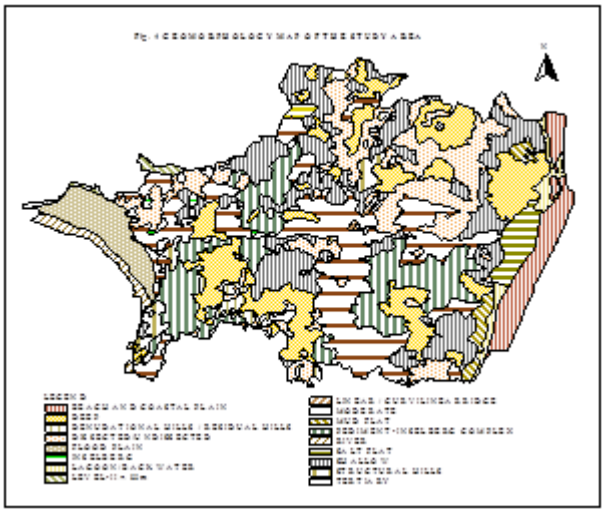
B. Geology

The study area comprises of the following litho units like soil, alluvium (sand and silt); sand stone; charnockites; sand stone and conglomerate are found in the study area. Based on this category the thematic map is prepared (Fig. 3).



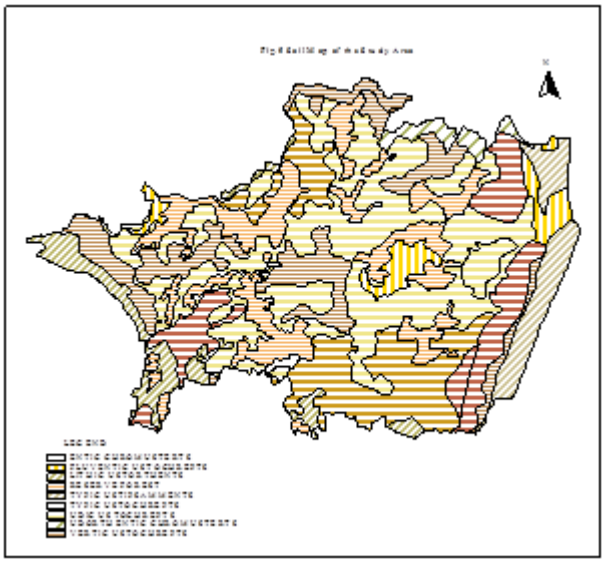
C. Geomorphology

The surface features of the earth are referred as Geomorphology. The study area contains plains, hills and plateaus, piedmont zone, etc. Piedmont zone refers to the loose soil surrounding foot of the mountains (Fig. 4).



D. Soil

The topmost layer of the earth which is formed by weathering of rocks is known as soil. The study area includes four different category. Entisols are partially clayey soil formed from sedimentary rocks. Inceptisols has no accumulation of clay, iron oxide, aluminium oxide. Reserveforest is the area covered by thick trees, plants, etc. Vertisols are expansive clayey soil which expands more during rainy season (Fig. 5).



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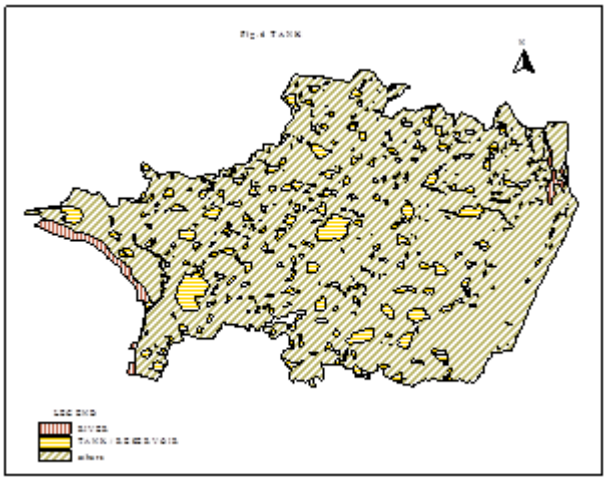
E. Tank

The water bodies and the tanks are considered from the study area for preparing this map. The reservoirs are also taken into consideration. The dumping of waste affects the water quality of the area. So it is necessary that the dumping site should be far waay from water body. The tank map is given below (Fig. 6).



V. Overlay Analysis

Each thematic maps are categorized into four category based on their effect in selection of suitable site for dumping. The categories area listed in the table. 1.

TABLE. 1
CATEGORIES FOR OVERLAY ANALYSIS

Parameter	Category			
	Unsuitable 1	Less suitable 2	Moderately suitable 3	Most suitable 4
Land use/ Land cover	Agricultural area/Build up area	Water	Forest	Waste land/Others
Geology	Coastal/ Alluvial/ Aeolian deposits	Sand stone and Conglomerate	Sand and silt	Charnockite
Geomorphology	River	Hills and plateau	Piedmont zone	Plains
Soil	Reserve forest	Inceptisols	Vertisols	Entisols
Tank	River	Tank/Reservoir	-	Others

VI. Weightage Analysis

The weightage analysis for each parameter is done by pairwise comparison method. The table.2 explains the pairwise comparison of the study area. The weightage is calculated from by correlation matrix analysis and is given in the table. 3.

TABLE. 2
PAIRWISE COMPARISON

Less important			More important		
	Land use/ Land cover	Geology	Geomorphology	Soil	Tank
Land use/ Land cover	1				
Geology	1/2	1			
Geomorphology	1/3	1/2	1		
Soil	1/4	1/3	1/2	1	
Tank	1/5	1/4	1/3	1/2	1

TABLE. 3
WEIGHTS DERIVED BY CALCULATING THE PRINCIPAL EIGEN VECTOR OF PAIRWISE COMPARISON MATRIX

Factor	Eigen Vector Weight	Percentage (%)
Land use/ Land cover	0.42	42
Geology	0.16	16
Geomorphology	0.10	10
Soil	0.26	26
Tank	0.6	6
Total		**100**

VII. Result

A. SUITABILITY ANALYSIS

The five thematic maps are overlaid using GIS. The land use, geology, geomorphology, soil and tanks maps are overlaid and analyzed and the final map obtained by overlaying is dissolved to get the suitability map. The overlay analysis helps in categorizing the entire study area into four categories of suitability. The output map is classified into four categories as 1. unsuitable, 2. less suitable, 3. moderately suitable and 4. most suitable (Fig. 7).

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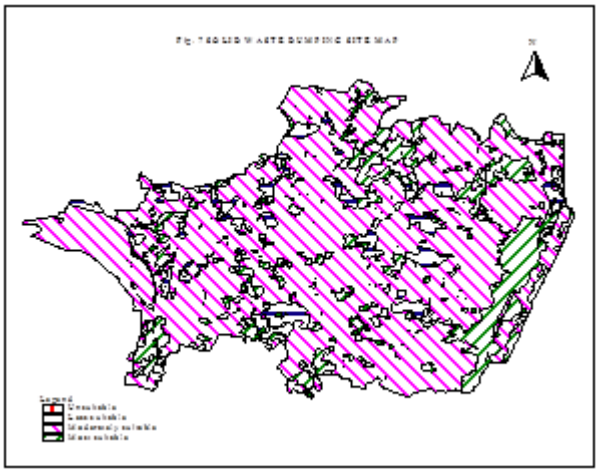

VIII. Conclusion

The findings have shown the ability of GIS and remote sensing as a veritable tool for analyzing the criteria for decision support. The sites are easy to access; manage for disposal of solid wastes. These places are far way from any water sources and other variables put into analysis. They are located in southern and south east of the town and are dry agricultural areas, bare land and grass land.

Hence, the capacity to use GIS and remote sensing technology for the effective identification of suitable solid waste dumping site will minimize the environmental risk and human health problems. The project gives the most suitable sites for dumping the solid waste of Chengelpattu town.

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