Remote Sensing and GIS based Waste Land Mapping for Krishnagiri Taluk, Tamil Nadu

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Abstract : Present study, focuses on assessment of wasteland in Krishnagiri taluk of Tamilnadu. The study area geographically lies between 12°19'12" & 12°49'12"W latitudes and 78°2'60" & 78°21'1" E longitudes LISS IV satellite data acquired in the year 2017 was used for the purpose. Supervised classified was performed for clustering of various earth features. The results indicate that 20% of the total area falls under waste land category. Wastelands are further classified into three types namely barren land, rocky waste, cultivable waste and sand area. Cultural waste occupies more than 50% of the total waste land which can be brought into potential use if proper measures are taken.

***IndexTerms* - Remote Sensing, GIS, Waste Land, Classification, LU/LC Clustering**

I. Introduction

India is the second most populous country in the world. Its economy is agrarian in nature. Increasing demand for food and has necessitated adoption of scientific measures for increase in land productivity and bringing more areas under cultivation/forests. However land degradation due to desertification, soil salinity, waterlogging, floods/drought, excessive soil erosion due to deforestation, unscientific agricultural practices etc. have resulted in the creation of vast stretches of wastelands and a decrease in per capita cultivable land besides ecological imbalance. Nearly 53Mha are wasteland and 22Mha of land have problems of salinity, alkalinity, soil erosion, waterlogging, shifting cultivation or presently unused because of their undulating nature. Only 11% of India's geographic area is under effective tree cover. Forest degradation has increased by 14% over last 8–10 years. The land area prone to floods has doubled from 20 Mha to about 40 Mha in last 10 years. Awareness of this fact has resulted in the formation of the "National Wasteland Development Board" (NWDB) under the aegis of National Landuse and Wasteland Development Council (NLWC) with the Chairmanship of the Prime Minister of India.

Wasteland is a degraded land which can be brought under vegetative cover, with reasonable effort, and which is currently underutilized and the land which is deteriorating for lack of appropriate water and soil management or on account of natural causes. The wastelands statistics indicated that about 63.85 million hectares of land, which account for 20.17% of the total geographical area (328.72 million hectares) exist as wastelands in India (Manual NRSA, 2007). According to Indian Wasteland Atlas (2010) the wasteland area is now increased to 24% of the total geographical area. If these wastelands could be brought under cultivation or other uses like afforestation and horticulture, it can help in the socio- economic development of the people and accelerate the overall economic growth of the country. According to the NRSC report, there are 2.42 million hectares (17%) of wasteland in Tamil Nadu. The percentage of wastelands to the total geographical area at district level is 30-40 percent in Ooty, Tiruvarur and Nagapattinam districts, 20-30 percent in Erode, Salem, Dharmapuri, Tiruvannamalai, Tiruchirapalli and Pudukottai, 10-20 percent in Kanyakumari, Ramanathapuram, Sivagangai, Virudhunagar, Madurai, Dindigul, Coimbatore and Namakkal and less than 10 percent in the remaining districts. The government has initiated projects to improve the productive capacity of wastelands by raising plantations on government-owned lands and by redistributing wastelands to farmers. The study area is economically backward and it is anotified drought prone district and hence possesses multiple problems in various resources. Lack of irrigation water is the major problem in the study area. The area is experienced by chronic droughts and severe shortfall of rainfall. Due to the resource scarcity, lack of technological and scientific knowledge as well as lack of information dissemination, farmers of this region are unable to make use of the dry land tract with alternate land use options.

Mapping of wasteland changes at regional and local scale are essential for a wide range of applications. The information on wastelands in the form of maps and statistical data is vital for spatial planning, management and optimal utilization of land. Several studies have been conducted on wasteland mapping using remotely sensed data (**Gupta et al,**1998; **Nathawat et al,**2010;**Sastry et al** 2011; **Kumaraswami et al**, 2011; **Unnamalai**and **Namasivayam**2012).

The main objective of the present study is to map total wasteland available in KrishnagiriTaluk of the Tamilnadu State. Wastelands are quantified under three categories namely Barren/Rocky Waste, Culturable Waste and Sandy Area without Vegetation.

II. STUDY AREA

The present study area is Krishnagiritaluk in Tamilnadu, which extends between 12°19'12"N 12°49'12"N latitude and 78°2'60"E to 78°21'1"E longitude, encompasses an area of 1737.26 sq km.

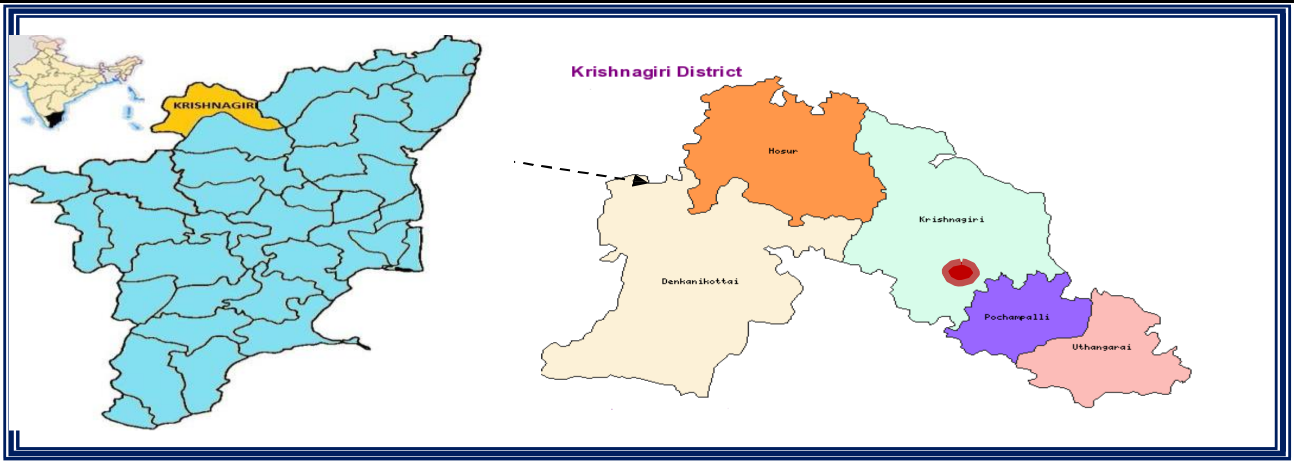

Fig. 1: Location Map of the Study Area

2.1 Rainfall and Climate

The area receives the rain under the influence of both southwest and northeast monsoons. The normal annual rainfall over the district varies from about 750 to about 900mm. The climate is comparatively more pleasant due to general dryness of atmosphere and appreciable drop in temperature in the monsoon season. The year may be divided into four seasons namely dry season from January to March, summer season April and May, southwest monsoon season from June to Sept. and northeast monsoon season from October to December.

During summer season (April to May) the maximum temperature is about 37°C, and the mean daily minimum temperature of about 25°C in the plains. There is a gradual decrease of both day and night temperatures from June onwards till December, when the mean daily maximum temperature is about 30°C and the mean daily min. is about 19°C in plains. The day temperature increases gradually from January onwards. The lowest temperature is reached in January when the mean daily minimum is about 19°C. However, in higher areas day and night temperatures are lower by about 2 to 3°C. In these areas weather is comparatively pleasant round the year.

2.2 Geomorphology

The prominent geomorphic units identified in the study area are structural hills anddenudationalland forms like buried pediments in the plains and inselbergs and plateaus represented byconical hills aligned with major lineaments.

Soils

Soils have been classified into Black soil, mixed soil, red loamy soil, gravelly and sandy soils. Vast stretches of loam soils and black soils occur in the study area.

Geology

The study area is underlained by Archaean crystalline formations with Recent alluvial deposits of limited areal extent and thickness along the courses of major rivers (Plate-II). The occurrence and movement of ground water are controlled by various factors such as physiography, climate, geology and structural features. Weathered and fractured crystalline rocks constitute the important aquifer systems in the district. Ground water generally occurs under phreatic conditions in the weathered mantle and under semi-confined conditions in the fractured zones at deeper levels. The thickness of weathered zones in the district ranges from less than a meter to more than 15 m. The yield of large diameter dug wells in the district, tapping the weathered mantle of crystalline rocks ranges from 100 to 500 lpm.

III. .METHODOLOGY

The methodology essentially includes georeferencing of the LISS IV satellite data (2017) using UTM Projection and WGS 84 datum by using Survey of India Topographical Map, supervised classification and clustering of Landuse/Landcovercategories through on-screen visual interpretation and digital enhancement techniquesand subsequent delineation of wasteland categories and finally the ground truth verification of the Wasteland Map. The schematic methodology adopted for the generation of Wasteland Map is shown in Fig.2.

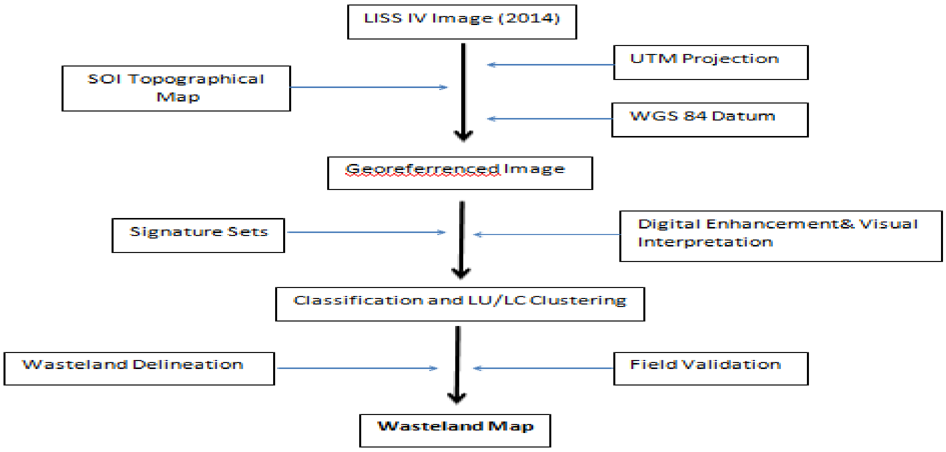

Fig. 2: Flow Chart of the Methodology

IV. RESULTS AND DISCUSSION

The supervised classification and thematic clustering based Landuse/land assessment resulted in identification of 15 types of features in the study area. The Landuse/landcover map of the study area is shown in figure 3 and the details are presented in table 1. It is observed that out of the total 1738.74 sq km area, 333.38 sq km falls under Waste Land Category. Further the Wasteland is categorized in to three categories namely barren/rocky waste, culturable waste and sandy area without vegetation. Culturable waste is 11% of the total area whereas barren/rocky waste is 8% of the total area. However sandy area without vegetation is as less as 1% (figure 4).

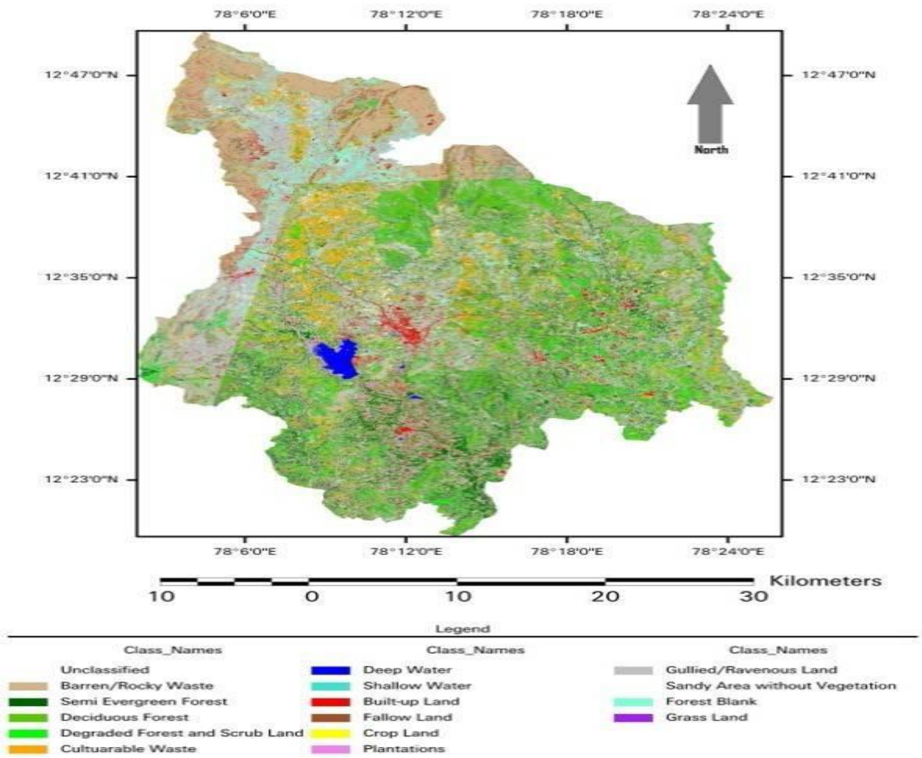

Fig. 3: Landuse/landcover (LULC)

The Landuse/landcover map of the study area is shown in figure 3 and the details are presented in table 1. It is observed that out of the total 1738.74 sq km area, 333.38 sq km falls under Waste Land Category.

Landuse/landcover Category	Area (Sq Km)
Barren/Rocky Waste	138.78
Semi Evergreen Forest	107.22
Deciduous Forest	117.31
Degraded Forest and Scrub Land	215.37
Cultuarable Waste	173.25
Deep Water	10.70
Shallow Water	11.23
Built-up Land	51.35
Fallow Land	111.03
Crop Land	218.31
Plantations	123.24
Gullied/Ravenous Land	144.83
Sandy Area without Vegetation	24.35
Forest Blank	124.89
Grassland	77.88
Total Area	**1738.74**
Total Wasteland Area	**336.38**

Table 1: Landuse/Landcover details of the Study Area

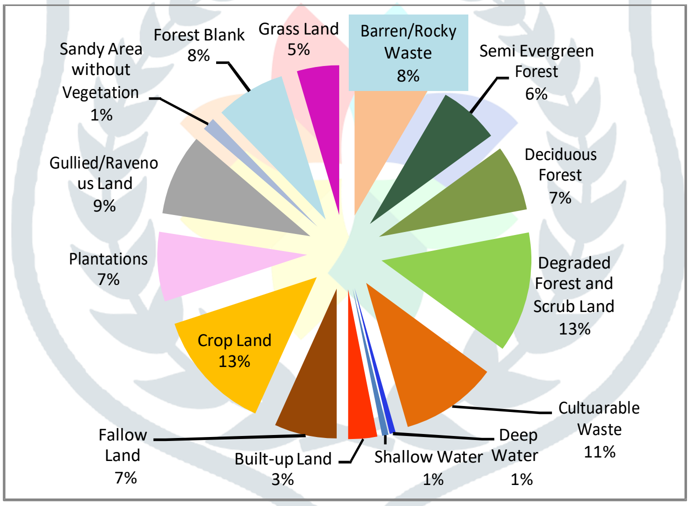

Fig. 4: Percentage Distribution of Landuse/landcover Categories

The landuse and landcover categories which includes the build-up land ,crop land, plantation with total wasteland area of 336.38 Sq.kms.

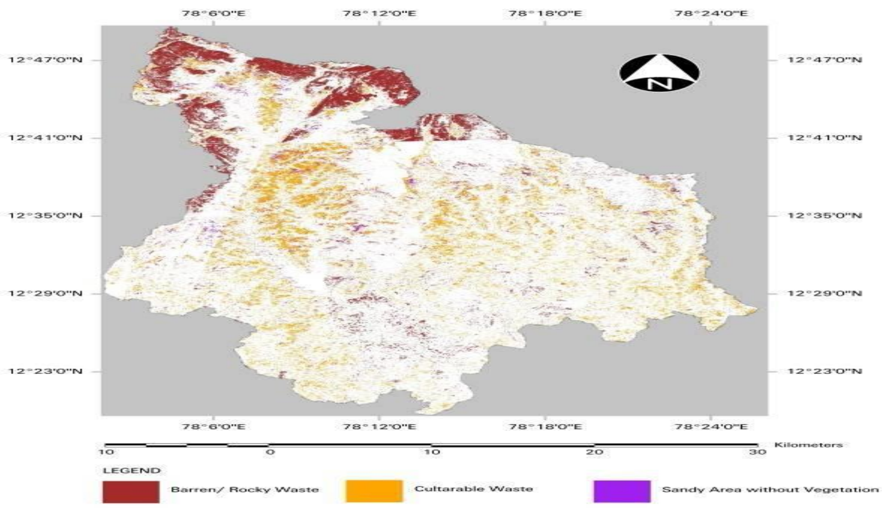

Fig. 5: Wasteland Map of the Study Area

The barren/rocky waste is mainly restricted to north and northwestern parts of the study area. These parts are characterized by elevated residual hills. Cultivable wasteland is mainly distributed in the middle portion of the study are along with fallow and croplands. Further it can be noted that about 155 sq. km area falls under gullied/ravenous lands. Since good number of drainages are observed in lands, it is not categorized under wasteland.

V. CONCLUSION

The study indicates that the remote sensing is an effective and economical tool for waste land assessment. It can be concluded that although 20% of the total area is under waste land, the actual waste land is below 10% culturable waste land is 11% of the total area which is mainly seen in the middle portion of the study area along with crop & fallow land. There is a great potential to convert this culturable waste as an useful land.

VI. REFERENCES

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