Land use and land cover analysis of Chiplun tehsil of Maharashtra using remote sensing and GIS

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■ **ABSTRACT :** The land use and land cover of Chiplun tehsil were determined by using the Landsat images of 20, 30 and 40 m resolution, downloaded from GLCF-data imaginary via FTP server by selecting suitable path and row values on Google. The entire area of Chiplun tehsil was classified under the various land use and land cover classes such as water bodies, barren land, forest, settlement and agriculture land covering the area of 8.81, 250.98, 346.47, 26.06 and 487.32 km^2, respectively. Total area for this classification was found to be 1119.64 km^2 with Arc GIS 10.3 software with the per cent error of 0.02 per cent compared to actual area of Chiplun tehsil.

■ **KEY WORDS :** Land use, Land cover, Area, Chiplun

The phrase land use and land cover generally refers to the categorization or classification of human activities and natural elements on the landscape within a specific time frame. It is based on establishment of scientific and statistical methods for analysis of appropriate source materials. Land use and land cover changes have become an important issue in studies on global environmental changes in recent years (Cegielska *et al.,* 2018). Land use and land cover change is a key driver of global change and has significant implications for many international policy issues. Therefore, the Indian Government has launched various land use and land cover change assessment projects throughout the nation in order to monitor and manage the natural and environmental resources (Kaliraj *et al.,* 2017).

Remote sensing includes all methods of obtaining pictures or other forms of electromagnetic records of earth's surface from a distance, the treatment and processing of the picture data. Whereas, GIS is a computer based information system which attaches a variety of qualities and characteristics to geographical location and helps in planning and decision making (Patra, 2015). Rapid population growth leads quickened the pace of land transformation on the natural land use and land cover features due to expansion of settlements and infrastructure. In recent decades, the changes in land use and land cover due to human activities have wrought in the earth's life support system causes major issues (Kaliraj *et al.,* 2017).

In RS, a land cover is determined based on image pixel and its reflectance value and visual appearance. The most accurate, but time-consuming process of estimating the amount of land cover from the remotely sensed image is heads-up digitizing. Hence, researchers mainly try to develop new methods for accurate estimation and modelling of urban growth. Researchers

use different types of methods such as band combination, index-based classification, supervised classification, unsupervised classification, machine learning and decision tree classifier for classifying satellite image (Gupta *et al.,* 2018).

Using geographical information system, flexible geographical database can be generated for the land use and land cover issues. Hence, this tool is immensely helpful to bring out the results along with socio-economic survey. Knowledge of both land use and land cover is important, for proper planning information on both the above aspects. Land use and land cover are distinct yet closely linked characteristics of the earth's surface (Anonymous, 2014).

■ METHODOLOGY

Study area:

As shown in Fig. 1, Chiplun tehsil is located between the longitude $73^0 19' 48"$ E to $73^0 45'$ E and latitude $17^0 37' 12"$ N to $17^0 13' 12"$ N on western coast of India in southern part of the Ratnagiri district Maharashtra state.
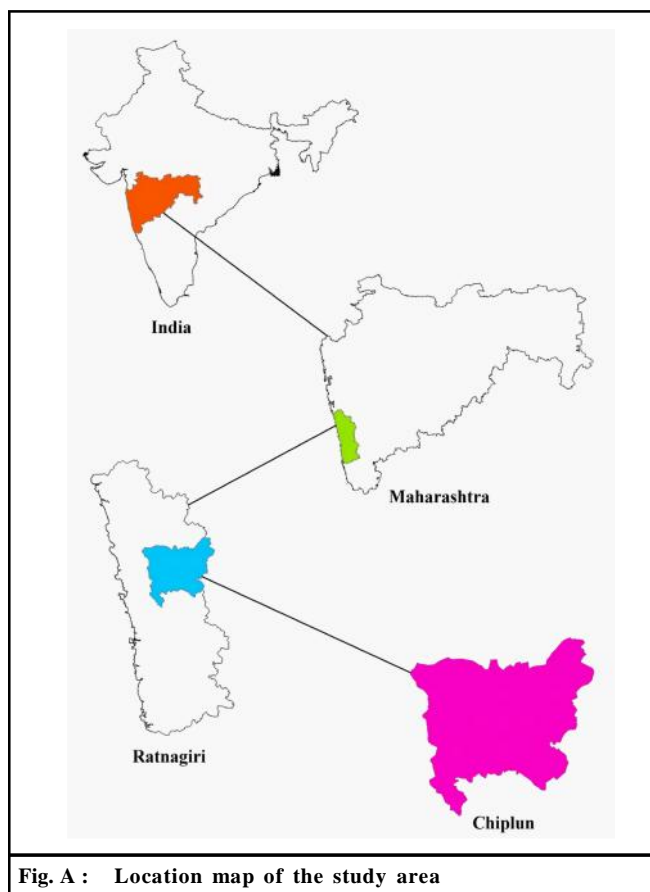

Fig. A :   Location map of the study area

The total area of Chiplun tehsil is 1119.95 km^2 (*https://shodhganga.inflibnet.ac.in*). It receives an average annual rainfall of about 3804 mm. The average minimum and maximum temperatures are 7.5^0C and 38.5^0C, respectively. The relative humidity varies from 55 per cent to 99 per ent. The soil in the region is highly drainable lateritic and non-lateritic soils (Mandale, 2016).

Software and system:

Arc-GIS 10.3 is used for data creation, data analysis and output generation. Arc-GIS is advanced tool used for mapping, geographic analysis, spatial analysis, hydrology, overlay analysis, data editing, etc.

Preparation of land use and land cover map:

Land use and land cover is one of the most important thematic inputs in watershed study as it provides the present status of land utilization and its pattern. Land use and land cover (LULC) change has become a global concern because of its diverse environmental impacts. Conversion of natural habitats into anthropogenic landscapes to cater to the increasing human demand for resources is one of the main factors behind the degradation of water quality (Gashaw *et al.*, 2017).

■ RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Land use and land cover classification of chiplun tehsil :

Table 1 shows land use and land cover classification of Chiplun tehsil using Arc GIS 10.3 software. The area was classified into five land use and land cover classes such as water bodies, barren land, forest, settlement and agricultural land covering an area of 8.81, 250.98, 346.47, 26.06 and 487.32 km^2, respectively. These five classes

Table 1: Land use and land cover classification		
Sr. No.	Land use and land cover	Area (km^2)
1.	Water bodies	8.81
2.	Barren land	250.98
3.	Forest	346.47
4.	Settlement	26.06
5.	Agricultural land	487.32
	Total	1119.64

contributed the total area of 1119.64 km^2. From above classes, it was observed that highest land use was under agriculture. The barren land covered 250 km^2. It is, therefore, necessary to bring the barren land under cultivation and hence, necessary steps should be implemented. The calculation of land use and land cover has an error of 0.02 per cent using GIS. Fig. 1 gives the land use and land cover map of Chiplun tehsil.
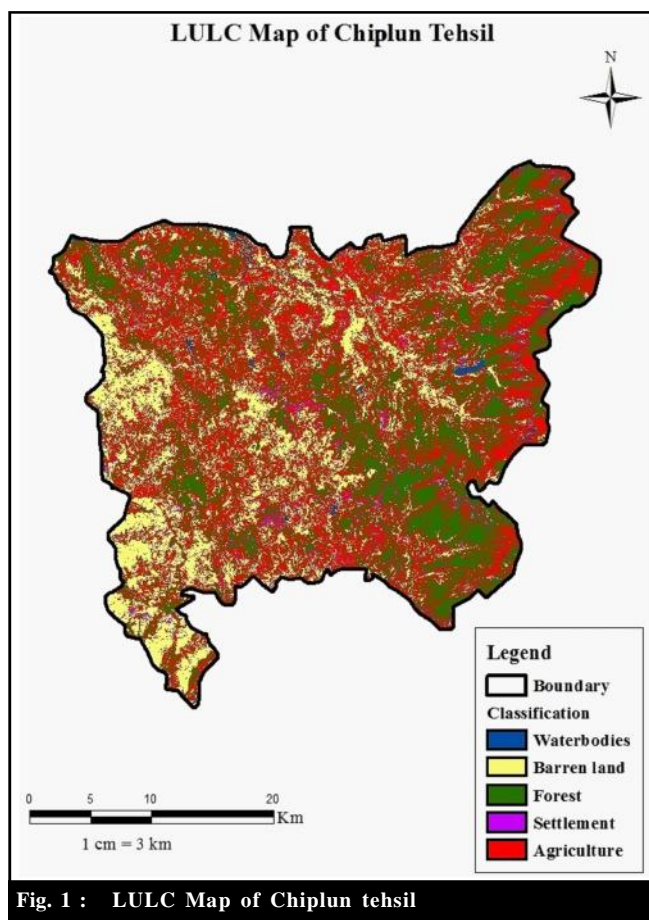

Fig. 1 :   LULC Map of Chiplun tehsil

The per cent error for determining the land use and land cover:

$$\text{Per cent error} = \frac{\text{Actual value} - \text{Calculated value}}{\text{Actual value}} \times 100$$

$$= \frac{1119.95 - 1119.64}{1119.95} \times 100$$

$$= 0.02\%$$

Conclusion:

The land use and land cover classification of Chiplun tehsil such as water bodies, barren, forest, settlement and agriculture land covered an area of 8.81, 250.98, 346.47, 26.06 and 487.32 km^2, respectively. The calculation of land use and land cover had an error of 0.02 per cent compared to the actual area of Chiplun tehsil.

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