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Studying Land Use and Land Cover Change of Kopargaon Tehsil in Maharashtra State Using Geospatial Technology

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Abstract

Land Use and Land Cover (LULC) studies form the backbone of understanding environmental dynamics, urbanization, agriculture, forestry, and ecosystem management. The distinction between Land Use (LU) and Land Cover (LC) is Land Cover refers to the physical characteristics of the Earth's surface, such as vegetation, water bodies, bare soil, or built-up areas. Land Use describes how humans utilize the land, such as for agriculture, urban development, forestry, or recreation. The terms land use and land covers are often used interchangeably, but both concepts are used in different senses. Land cover means vegetation, urban infrastructure, water, open space, soil cover etc. and the land is primarily used for wildlife habitat or land use purposes such as agriculture, industry etc. Land use and land cover are changing day by day due to a growing population and growing needs. To study LULC based on remote sensing (RS) and geographic information system (GIS) techniques, land use and land cover techniques can help us to monitor Spatial-temporal changes in land cover. The main objective of present research paper is to study the land use changes after the construction of Samruddhi expressway in Kopargaon tehsil of Ahmednager district. For this study we use the Time series of annual global maps of land use and land cover (LULC) of ESRI. The downloaded satellite image covered Variable mapped of land use/land cover with Universal Transverse Mercator (UTM) Data Projection and there extension is whole globe .The source imagery: Sentinel-2 with Cell Size is 10m resolution. The satellite images are Thematic in data type .The above mention satellite images downloaded from Esri, Microsoft, and Impact Observatory which were published on March 2022. Land use and Land cover data use for the year 2017 and 2021 to find Land Use and Land Cover Change of Kopargaon Tehsil

KEYWORDS: Land Use Land Cover, Geographic Information System, Remote Sensing, Thematic Mapper, etc.

INTRODUCTION

Land is one of the major natural resources of the any country. Land use includes built-up areas like (residential areas, commercial areas, agricultural land, and recreational areas, and land cover mainly includes natural vegetation, water bodies, mountains, and hilly areas. A growing population in any geographical area affects its natural resources, such as land, and its use for obtaining food and other necessities of life. A look at the history of human evolution until today shows that drastic changes in land use and land cover are contributing to various environmental problems such as climate change, loss

of biodiversity, pollution of water and soil, and population growth. Monitoring and studying environmental changes and changes in land use and land cover (LULC) for the use and management of natural resources play an important role in formulating policies and programs necessary for environmental protection and development planning. There is great potential in the satellite data, which can be used to generate valuable information about land use and land cover (Yuan et al., 2005). In land use and land cover, the natural features of the earth's surface include vegetation, water, soil, and other physical features that can be studied.

OBJECTIVE OF STUDY

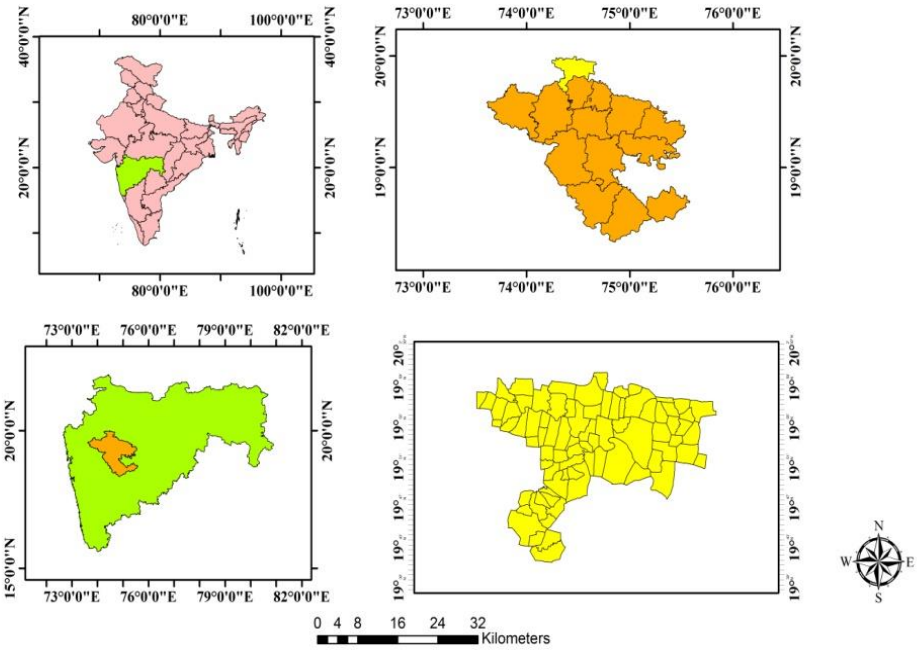
In the present study, land use and land cover changes due to urban expansion in Kopargaon teshil has been studied using Remote Sensing Technology and Geographical Information System tools. The major objectives are the following

1. To study land use and cover changes in Kopargaon Tehsil
2. To classify the land use and land cover.

STUDY AREA

Kopargaon Tehsil falls in the Nashik administrative division and in Ahmednagar district and is situated on the bank of river Godavari. The total geographical area of Kopargaon tehsil are area is 725.16 (S.q.k.m). The Kopargaon Tehsil lies between 19°54'9'' North latitude and 74° 28'38'' east longitude. The average rain fall in the tehsil is 475 mm. Kopargaon tehsil has 1 (municipal corporation) major town and 80 villages. Kopargaon tehsil has Yevala tehsil to the north, Niphad and Sinnar Tehsil to the west and Sangamner and Rahata taluka to the north, and Kopargaon taluka has a north-south length of 39.55 km and an east-to-west length of 29.40 km. The population of Kopargaon taluka as per the 2011 census is 3,024,390 out of which 1, 55,738 are males and 1, 66,389 are females.

Location Map of Study Area

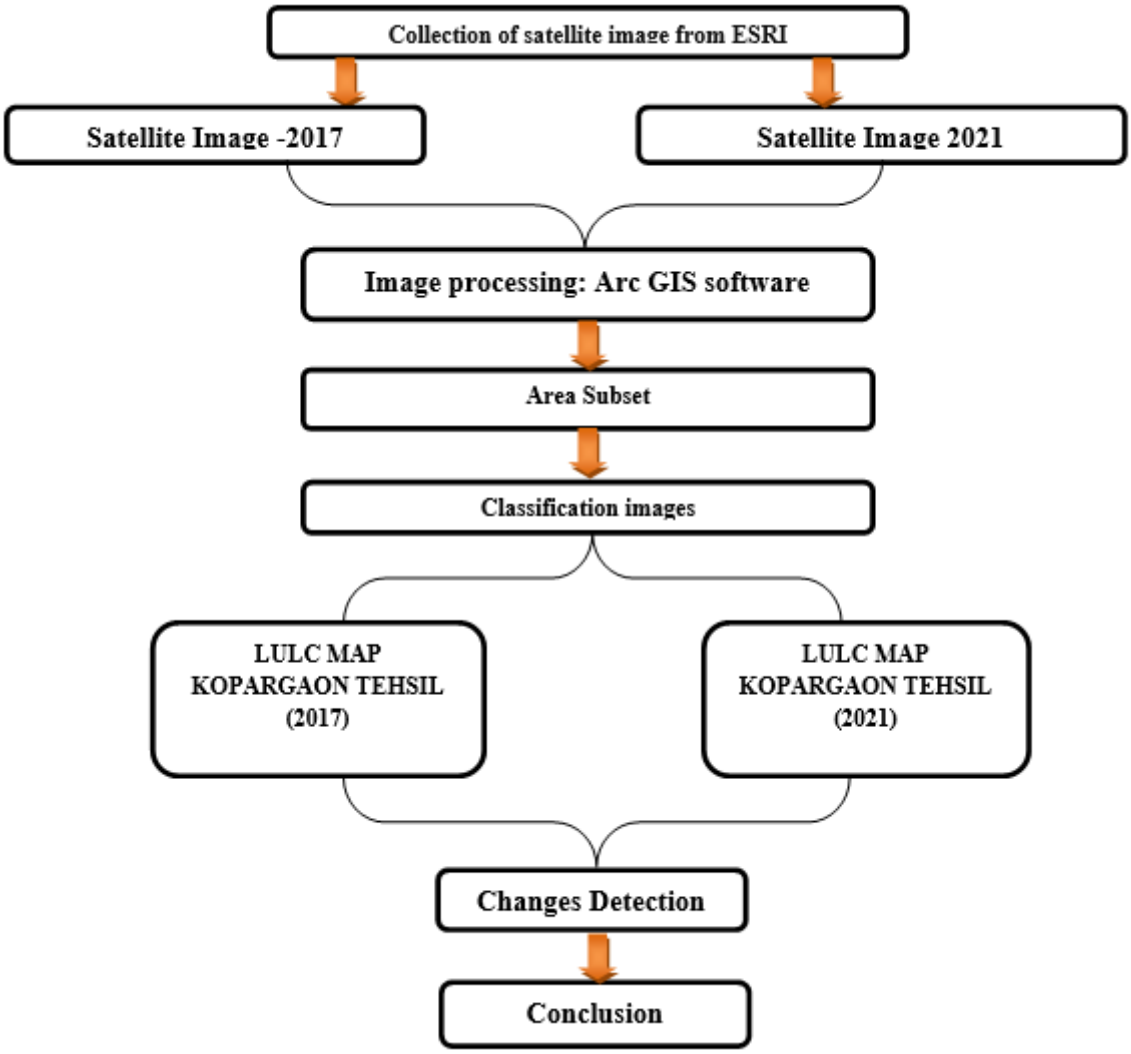


Location Map of study Area

DATABASE AND METHODOLOGY

To study land use and land cover change of Kopargaon Tehsil, we have used secondary data of satellite images of ESRI. To achieve the above objective, the following methodology has been adopted.

Flow Chart of Methodology



LAND USE LAND COVER CLASSIFICATION SCHEME

Generally, there are two types of image classification methods. They are mainly used for land use and land cover classification. The first unsupervised classification method classifies land cover types from satellite imagery data when the user does not know how many land cover types exist in the field. And the second is supervised classification, a method of classifying land cover types using sample polygons (ground truth points) from land cover types.

Sr. No.	Class	Description
1.	Built-up area/ Settlement	All residential and non-residential concrete structures, industrial and commercial buildings including minor and major road networks in the built-up area; etc.

		included
2.	Water Body	This category of land cover includes areas covered by the water of river basins, canals, lakes, ponds and reservoirs.
3.	griculture land/ Vegetation area	This category mainly describes grasses, medicinal plants, and areas under various crops, man-made parks, and cultivated cropland, crop cultivation areas, grass-covered areas used for grazing and scattered rural settlements.
4.	land/Fallow land	Areas with or without sparse vegetation that are likely to be converted for various uses in future. This category includes non-crop land, barren rocky land and sandy areas along the banks of rivers/streams.

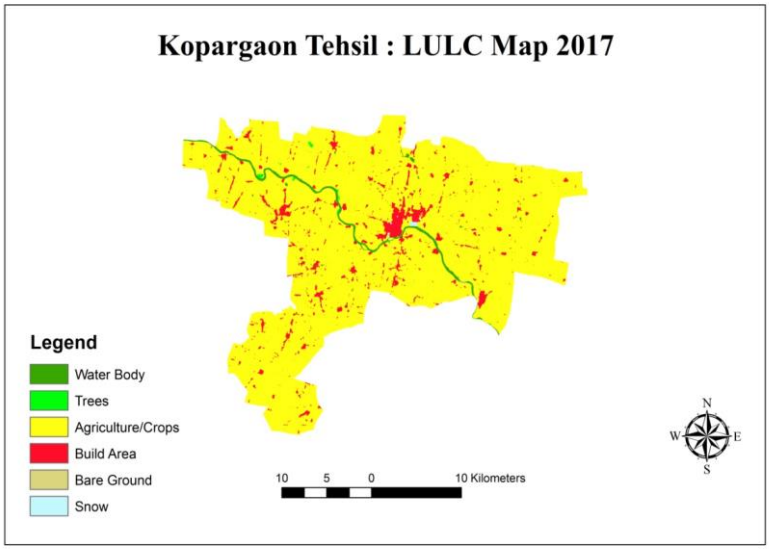
ANALYSIS

The purpose of studying the land use and land cover detection to find out the conversion pattern from agricultural land and forest area to the build-up area the table below shows that various types of land conversion during 2017 -2021 in Kopargaon Tehsil.

Land use and Land Cover (2017-2021)

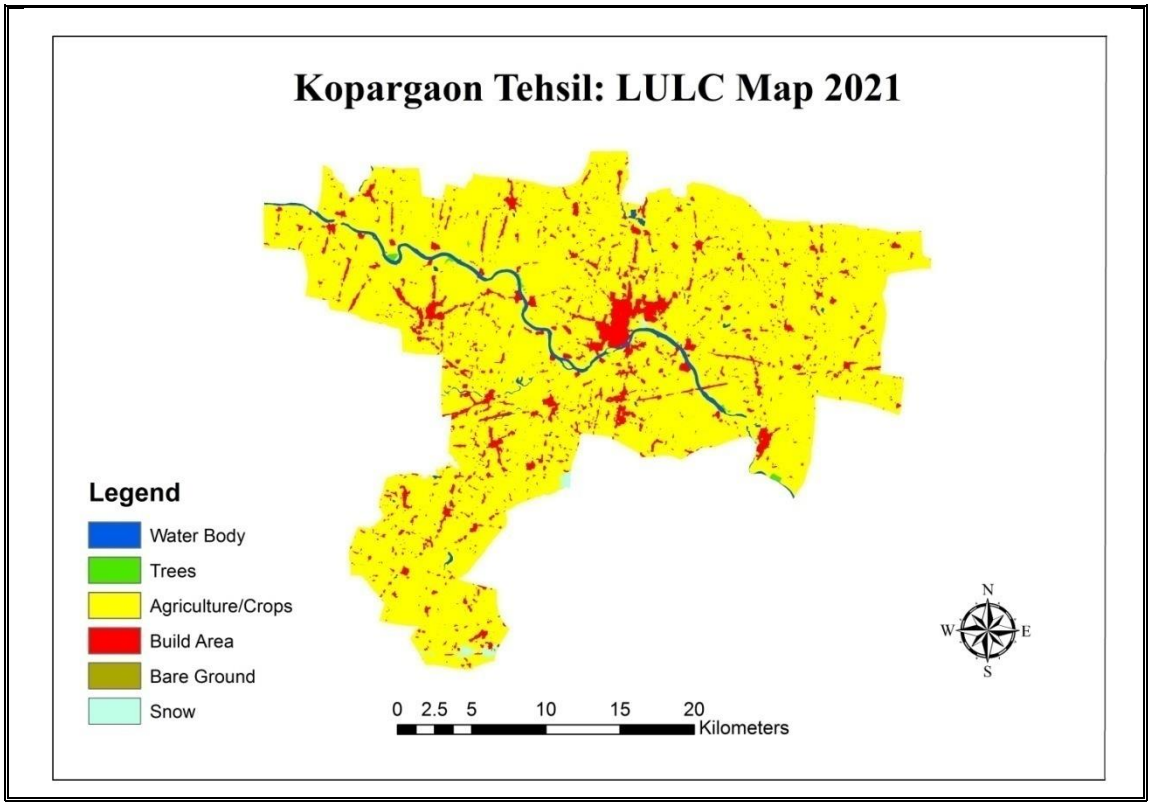
Sr.No	Class	Year				
		2017		2021		Change Area In %
		Area (sq.km)	Area in Percentage	Area (sq.km)	Area in Percentage	
1	Water Body	11.0523	1.51	12.02	1.65	+ 0.14
2	Trees	0.95	0.13	1.03	0.14	+ 0.01
3	Agriculture/Crops	677.415	92.8	651.9	89.3	- 3.5
4	Build Area	39.0443	5.36	64	8.51	+ 3.15
5	Bare Ground	0.1113	0.015	0.038	0.08	+ 0.065
6	Snow	0	0	0	0	0
Total		**728.57**	**100**	**728.57**	**100**	….

Map-1: Land use and Land Cover of Kopargaon Tehsil-2017



In the land use and land cover analyses, it was found that in the year 2017, Kopargaon Taluka's total geographical area was 728.57 (S.q.k.m), in which area under Water Body 11.0523 (1.51 %), Trees 0.95 (0.13 %), agriculture or cultivated land was 677.415 (92.8 %), build-up area 39.0443 (5.36 %)

Map-2: Land use and Land Cover of Kopargaon Tehsil-2021



In the land use and land cover analyses, it was found that in the year 2021 Kopargaon Tehsil has a total geographical area is 728.57 (S.q.k.m), in which area under Water Body are 12.02 (S.q.k.m) (1.65 %), Trees 1.03(S.q.k.m) (0.14 %), agriculture or cultivated land was 651.9 (89.3 %), build-up area 64 (S.q.k.m) (8.51 %)

CONCLUSION

In the land use and land cover analyses, it was found that in the year 2017, Kopargaon Taluka's total geographical area was 728.57 (S.q.k.m), in which the area under agriculture or cultivated land was 677.415 (S.q.k.m) (92.8 %), build-up area 39.0443 (S.q.k.m) (5.36 %), Water Body 11.0523 (S.q.k.m) (1.51 %). If you compare this data to the data in the year of 2021, then there are so many changes we can find, that the change in the area under agriculture or cultivation is 651.9 (89.3%) The agriculture area mainly decreased by (- 3.5) % and it converted into the build-up area. The build-up area is 64 (S.q.k.m) (8.51 %), i.e. the build-up area has increased by (+3.15) %. This implies that land use changes due to an increasing population.

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