InSight Bulletin: A Multidisciplinary Interlink International Research Journal
Peer Reviewed International, Open Access Journal.
ISSN : 3065-7857 / Website: https://ibrj.us / Volume-2, Issue-12 / December - 2025

Original Article

Spatial Analysis of Land use and Land Cover Changes in Kopargaon Tehsil: 2015 and 2025

Sachin Subhash Sonawane
Assistant Professor, Department of Geography
Rayat Shikshan Sanstha's, S.S.G.M College,
Kopargaon Dist. Ahilyanager (M.H)

Manuscript ID:
IBMIIRJ -2025-021212

Submitted: 10 Nov. 2025

Revised: 15 Nov. 2025

Accepted: 20 Dec. 2025

Published: 31 Dec. 2025

ISSN: 3065-7857

Volume-2

Issue-12

Pp. 50-55

December 2025

Correspondence Address:
Sachin Subhash Sonawane
Assistant Professor, Department of Geography Rayat Shikshan Sanstha's, S.S.G.M College, Kopargaon Dist. Ahilyanager (M.H)
Email: sachinsonawane121@gmail.com

OPEN ACCESS

Quick Response Code:

Web. https://ibrj.us

DOI: 10.5281/zenodo.18372883

DOI Link:
https://doi.org/10.5281/zenodo.18372883

Abstract

Land Use and Land Cover (LULC) change detection is important study that helps us to know landscape changes, environmental conditions, and human environment interactions in any geographical locations. Generally, Rapid population growth led to rapid urbanization, agricultural expansion, infrastructural expansion, and socio-economic growth have contributed to transformations in many semi-urban regions of Maharashtra state. This study analyzes the decadal LULC dynamics from Kopargaon Tehsil, which is located in the northern part of Ahilyanagar district (Formerly Ahmednagar district), using Remote Sensing techniques. To fulfil below objectives, we downloaded Satellite imagery form https://earthexplorer.usgs.gov/ for the years 2015 and 2025 and it was classified using supervised classification methods in arc gis software 10.4.1 to identify major LULC categories with their spatial variations. The results show significant changes in agricultural land, built-up areas, vegetation cover, and fallow lands, reflecting the region's developmental pressures and changing land management practices. Spatial analysis highlights the influence of transportation network development, Urban growth, and agricultural diversification in study area.

Keywords: *Spatial Analysis, Landsat-7, Geographical information system, Remote Sensing*

Introduction

Land Use and Land Cover (LULC) change analysis provides a scientific basis to understand how land resources are utilized and transformed over time under the influence of natural conditions and human influence over it. Kopargaon tehsil of Ahilyanager district, characterized by varied topography, semi-arid climate, and a predominantly agrarian economy, has experienced noticeable shifts in land use patterns due to population growth, agricultural development, expansion of built-up areas due to constructions, and water resource development. These transformations have impact on environment, resource, and regional planning. An academic assessment of LULC change in the study area is therefore important for understanding spatial trends and identifying responsible factors for it.

Objective Of Study

The present study aims to study the decadal change in LULC from Kopargaon

1. To classify the LULC of study region for 2015 and 2025
2. To identify the major spatial changes in LULC over the decade.

Study Area

The Kopargaon Tehsil is located in the northern part of Ahilyanagar (formerly Ahmednagar district) district, Maharashtra. Geographically, it lies between 19°45' N to 19°58' N latitude and 74°22' E to 74°40' E longitude. The tehsil forms part of the upper Godavari River basin, influencing its hydrology, land use practices, and agricultural productivity. Kopargaon Tehsil is surrounded by several tehsils. To the north it touches Yeola, and to the northwest Sinnar, both in Nashik district. On the east and southeast it is bordered by Rahata, while Shrirampur lies to the south within Ahilyanagar district.

How to cite this article:
Sonawane, S. S. (2025). Spatial Analysis of Land use and Land Cover Changes in Kopargaon Tehsil: 2015 and 2025. InSight Bulletin: A Multidisciplinary Interlink International Research Journal, 2(12), 50–55. https://doi.org/10.5281/zenodo.18372883

Table No.1 About Kopargaon Teshil

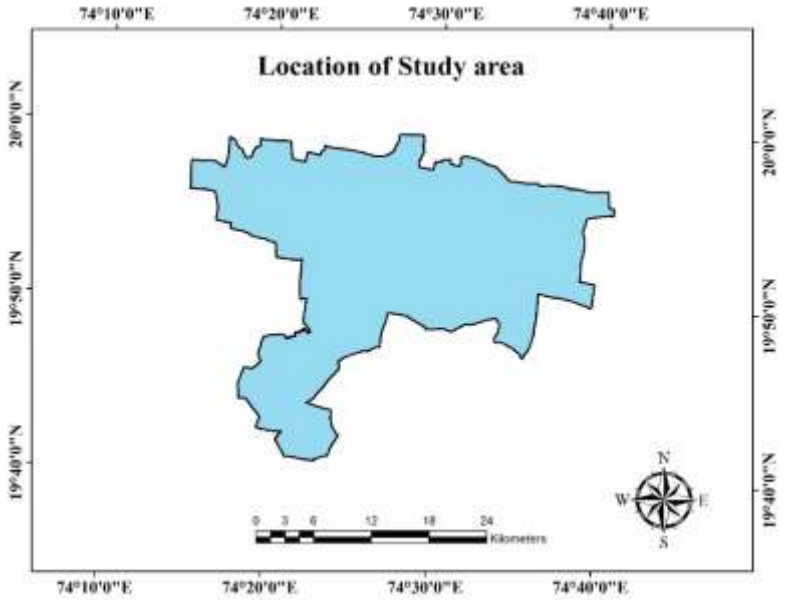
Attribute	**Details**
State	Maharashtra
District / Subdivision	Ahilyanager district
Tehsil headquarters (town)	Kopargaon
Geographic coordinates	19°53′–19°54′ N, 74°28′ 74°29′ E
Area (total tehsil)	**728.16 sqkm**
Elevation (town)	**493 m** above mean sea level
Major river(s)	Godavari River
Number of villages	Around **81 villages**
Total population 2011 Census	**302,452** (population of Kopargaon tehsil, 2011).
Urban population (Kopargaon town) 2011	**65,273** (Kopargaon municipal council, 2011).
Sex ratio (females per 1000 males)	**965**.
Literacy rate 2011	**79.8%** overall; male ~87.6%, female 71.7%
Scheduled Castes / Scheduled Tribes (%)	SC **13.36%**, ST **11.37%** (2011 figures).
Languages (major)	**Marathi** (majority)
Main economic activities	**Agriculture**) sugar factories, Agro-enterprises
Average rainfall	**400–475 mm**
Transport links	Kopargaon railway station, State Highway, Maharashtra Samruddhi Expressway
Tourism / pilgrimage (nearby)	**Shirdi** and local temples and riverside attractions.

(**Source:** Census of India, 2011; IMD, and District Socio-Economic Review, 2011-2012)

The terrain of Kopargaon is gently undulating, with elevations varying between 480 to 520 meters above mean sea level. The Godavari River, flowing along the northern boundary, is the most significant water body in the region, supporting irrigation and drinking water needs. The soils are mainly deep black cotton soils and alluvial deposits, suitable for cash crops such as sugarcane, as well as cereals and horticulture. Climatically, the region falls under the semi-arid tropical climate zone, receiving an average annual rainfall of 550–650 mm, primarily during the southwest monsoon (June–September). Summers are hot, winters are mild, and rainfall variability directly affects agricultural patterns and groundwater availability in study area.

Socially and economically, Kopargaon Tehsil is one of the most developed areas in the northern part of the Ahilyanager district. Kopargaon town acts as a major educational, commercial, and transportation hub for surrounding area. The presence of key transport routes like the Manmad Daund railway line, Ahilyanager Manmad State Highways, and proximity to the Samruddhi expressway has accelerated urban expansion and infrastructural development in recent years.

Map No.1 Location Map of Study area



The region hosts Sanjivani University, several educational institutions, sugar factories, Agro-based industries and cooperative societies, shaping tehsils socio-economic status. The tehsil comprises a mix of urban, peri-urban, and rural settlements, making it an ideal location for analyzing LULC study.

Data Source

The present study is based on decadal satellite images classification data which was downloaded from the USGS Earth Explorer. The Landsat-7 ETM+ imagery (30 m spatial resolution) with WGS1984 UTM 43N projection system was used for both study years. The imagery was selected considering 10 % cloud cover and appropriate seasonal conditions to ensure accurate classification.

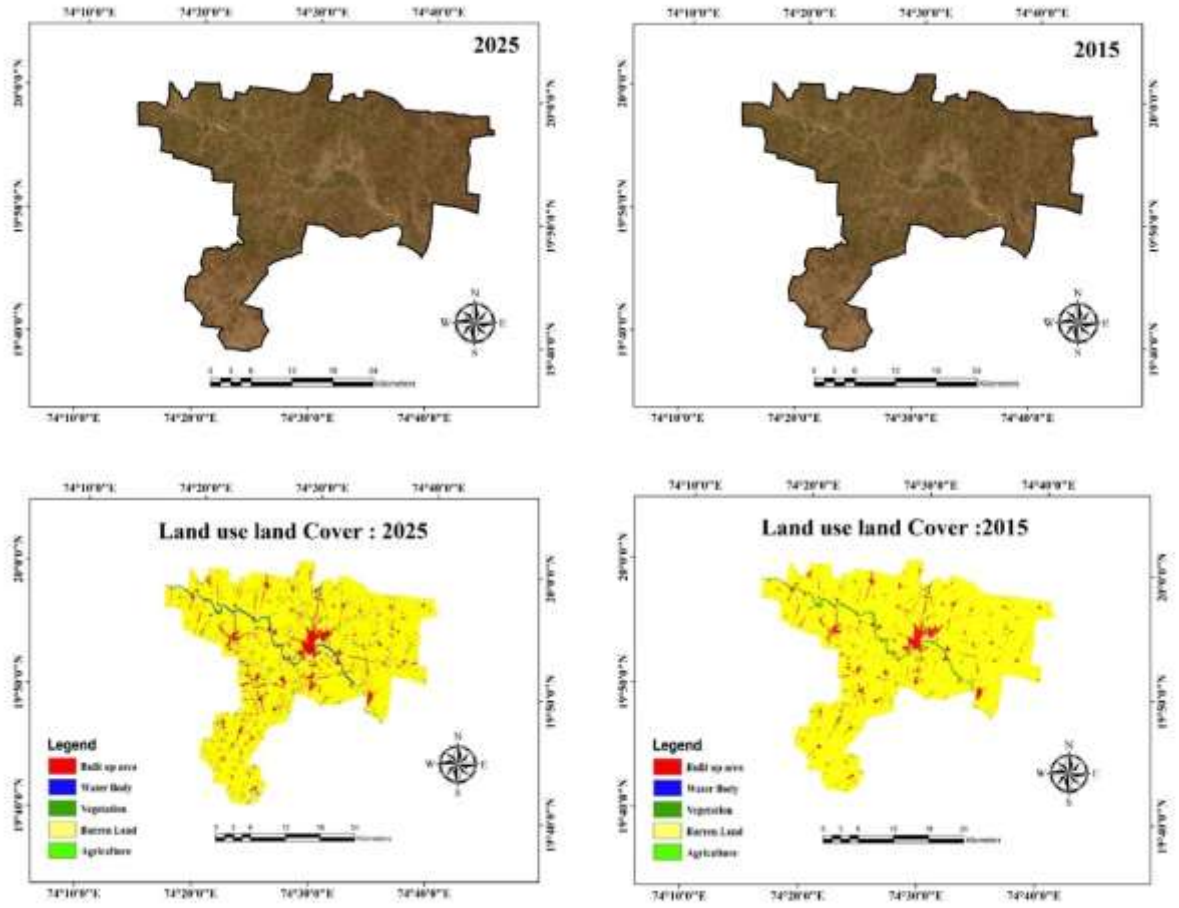
Table No.2 Technical Specifications of Landsat: 7 ETM+ Imagery

Sr. No	Parameter	Details
1	**Satellite Name**	Landsat-7
2	**Sensor**	Enhanced Thematic Mapper Plus (ETM+)
3	**Launch Date**	15 April 1999
4	**Orbit Type**	Sun-synchronous, near-polar
5	**Orbit Altitude**	~705 km
6	**Revisit Time**	16 days
7	**Spatial Resolution**	30 m (Multispectral), 15 m (Panchromatic), 60 m (Thermal)
8	**Radiometric Resolution**	8-bit
9	**Swath Width**	185 km
10	**Coordinate System**	WGS 1984 (default for downloaded data)
11	**Spectral Bands**	8 Bands (Bands 1–8)
13	**Data Availability**	Open-access (USGS Earth Explorer) https://earthexplorer.usgs.gov/
14	**Suitable Applications**	LULC mapping, vegetation analysis, water bodies, regional planning

Classification Techniques Applied

the present study of the LULC, the supervised classification methods were used.

Map No. 2 Land use/Land cover Changes in Kopargaon Tehsil 2015 vs 2015



Decadal Changes In Lulc: 2015

The land use analysis shows that, Built-up area dominates with 570.16 sq. km (78.30%), indicating extensive urbanization and infrastructural development. In contrast, Vegetation covers 64.55 sq. km (8.86%), followed by Agricultural land at 39.53 sq. km (5.43%) and Barren land at 34.79 sq. km (4.78%), reflecting limited green and cultivable areas compared to urban spaces. Water bodies account for only 19.14 sq. km (2.63%), highlighting the minimal share of water resources in the total geographical area of 728.16 sq. km, which points to significant urban dominance over natural and agricultural landscapes.

Map No.3 Land use land Cover :2015

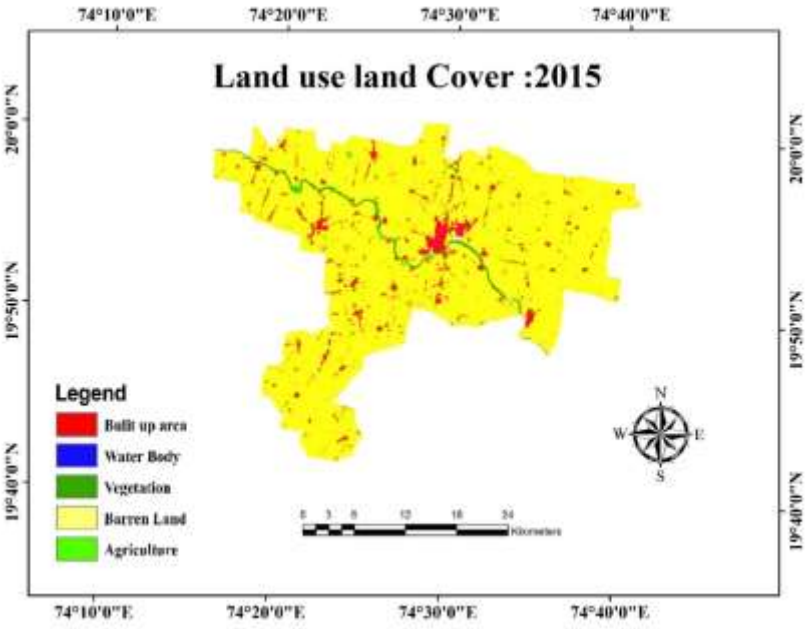


Table No.4 Land use land Cover: 2015

Sr. No	Type of Land use	Area	Percentage
1	Built up area	570.16	78.30
2	Water Body	19.14	2.63
3	Vegetation	64.55	8.86
4	Barren land	34.79	4.78
5	Agriculture	39.53	5.43
	Total	**728.16**	**100.00**

(**Source**: Computed by Researcher)

Decadal Changes in Lulc: 2025

The land use data for the given period shows that the Built-up area occupies the largest share with 624.36 sq. km (85.74%), indicating rapid urbanization and infrastructure expansion. Vegetation covers 52.07 sq. km (7.15%), while Barren land accounts for 30.42 sq. km (4.18%), reflecting a moderate presence of open or unused lands. Agricultural land has declined significantly to only 15.08 sq. km (2.07%), and Water bodies occupy the smallest portion at 6.24 sq. km (0.86%). Overall, the data highlights a clear dominance of urban land use over agricultural, vegetation, and water resources within the total 728.16 sq. km area.

Map No. 4 Land use land Cover :2025

Table No. 5 Land use land Cover: 2025

Sr. No	Land Use Type	Area in sqkm	Percentage
1	Built up area	624.36	85.74
2	Water Body	6.24	0.86
3	Vegetation	52.07	7.15
4	Barren land	30.42	4.18
5	Agriculture	15.08	2.07
	Total	**728.16**	**100.00**

(**Source**: Computed by Researcher)

Conclusion

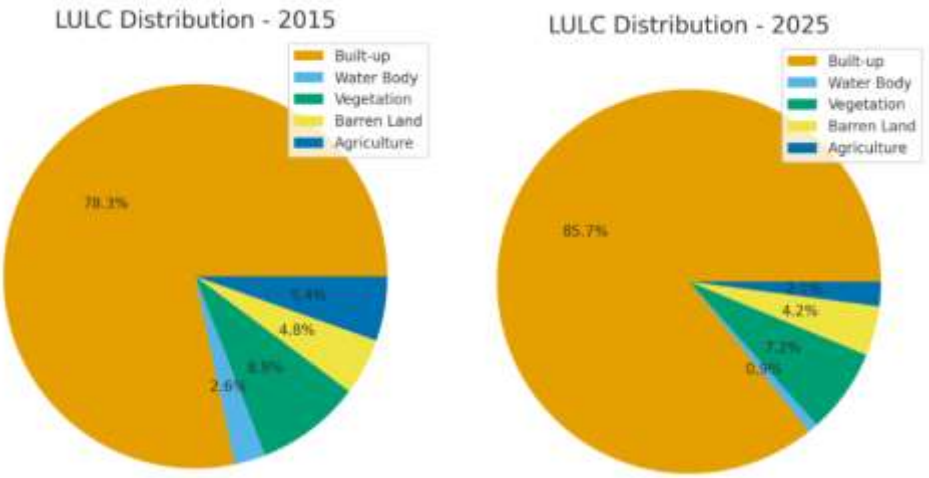
The detail analysis of LULC from 2015 and 2025 indicating the variation in the different land use categories. The constructed area shows a remarkable increase from 570.16 sq. km (78.3%) in 2015 to 624.36 sq. km (85.74%) in 2025, registering a positive change of 54.2 sq. km and a growth of 7.44%. This indicates rapid urbanization and infrastructural development in the region over the past decade. Conversely, the Water Body area has declined sharply from 19.14 sq. km (2.63%) to 6.24 sq. km (0.86%), marking a reduction of 12.90 sq. km and 1.77% in percentage terms, suggesting either water scarcity, encroachment, or conversion of water bodies for other land uses. Similarly, Vegetation cover has decreased from 64.55 sq. km (8.86%) to 52.07 sq. km (7.15%), with a negative change of 12.48 sq. km and 1.71%, possibly due to deforestation, urban expansion, or agricultural shrinkage.

Table No. 6 LULC Decadal variation from 2015 to 2025

Sr. No	Land Use Type	2015		2025		Decadal Change in Percentage	
		Area in sq.km	%	Area in sq.km	%	Change in Area	Change in %
1	Built up area	570.16	78.3	624.36	85.74	**+54.2**	**+7.44**
2	Water Body	19.14	2.63	6.24	0.86	**−12.90**	**−1.77**
3	Vegetation	64.55	8.86	52.07	7.15	**−12.48**	**−1.71**
4	Barren land	34.79	4.78	30.42	4.18	**−4.37**	**−0.60**
5	Agriculture	39.53	5.43	15.08	2.07	**−24.45**	**−3.36**
	Total	**728.16**	**100**	**728.16**	**100**	**0**	**0**

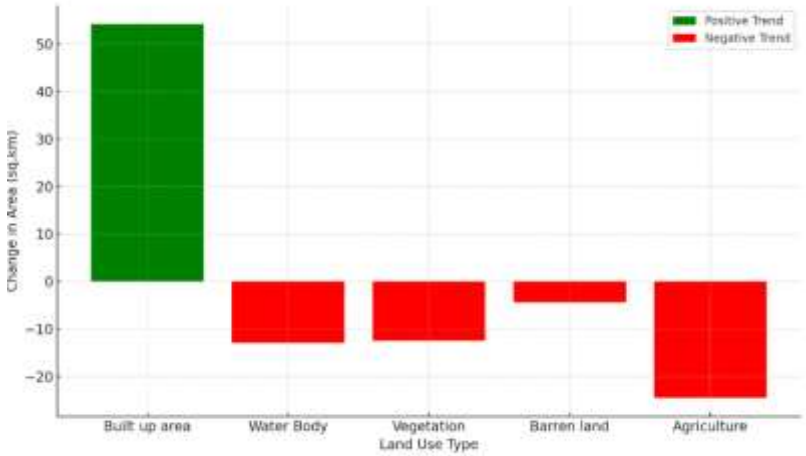
(**Source**: Computed by Researcher)

Figure No. 1 Land use land Cover Decadal Trend: 2015 and 2025



The Barren land also shows a slight decrease from 34.79 sq. km (4.78%) to 30.42 sq. km (4.18%), losing 4.37 sq. km or 0.60%, while Agricultural land experienced a major decline from 39.53 sq. km (5.43%) to 15.08 sq. km (2.07%), with a negative change of 24.45 sq. km and 3.36%, highlighting urban sprawl and changing land utilization patterns. Overall, the total geographical area remained constant at 728.16 sq. km, but the proportion of land use types changed considerably, reflecting a strong trend of urban growth at the expense of water bodies, vegetation, and agriculture.

Figure No. 2 Positive and Negative trend in LULC 2015 and 2025



Acknowledgment
The author expresses sincere gratitude to Rayat Shikshan Sanstha's S.S.G.M. College, Kopargaon, for providing the academic environment and necessary facilities to carry out this research work. Special thanks are extended to the Department of Geography for their continuous encouragement and support throughout the study.
The author gratefully acknowledges the guidance, suggestions, and moral support received from colleagues and friends during the preparation of this research. Lastly, heartfelt thanks are conveyed to family members for their constant motivation and support throughout the completion of this study.
Financial support and sponsorship
Nil.
Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

References

1. **Rutuja S Gadhave et al. (2022).** Land use land cover and change detection of Rahuri Tehsil using remote sensing and GIS. The Pharma Innovation Journal, 11 (9), 3156–3163.
2. **Manish Kushwaha et al. (2014).** To Study the Use of Land by using Remote Sensing and GIS Technique. JETIR, 8 (9), a613–a625.
3. **Payal A. Mahadule et al. (2020).** Land Use/Land Cover Change of Rabi Season of Rahuri Taluka of Ahmednagar District Maharashtra. Current Journal of Applied Science and Technology, 39 (27), 20–27.
4. **Chandrakant Mogalrao Bansode et al. (2020).** Detection of Land-use/Land-cover Changes by Using RS and GIS Techniques: A Case Study of Shrigonda Tahsil, Maharashtra State, India. Juni Khyat UGC Care Group I Listed Journal, 10 (6), 1–8.
5. **Jadhav Madhuri S (2016).** Detection of Changes in Land Use / Land Cover: A Case Study of Shrigonda Taluka Ahmednagar District. Review of Research Monthly multidisciplinary Journal, 6 (3), 1–5.
6. **Chandrabhan B Chaudhari (2014).** Land Use and Land Cover (LULC) Changes in Maharashtra State: Using Satellite Data of IRS. International Journal of Multidisciplinary Research (IJMR), 2 (11I), 1–5.
7. **T. Suneela et al. (2016).** Detection Of Land Use and Land Cover Changes Using Remote Sensing and Geographical Information System (GIS) Techniques. International Journal of Electrical, Electronics and Data Communication, 4 (12), 18–22.
8. **Prakash Nivrutti Salve et al. (2024).** Studying Land Use and Land Cover Change of Kopargaon Tehsil in Maharashtra State Using Geospatial Technology. International Journal for Multidisciplinary Research, 6 (6), 1–6.
9. **Archana Shivaji Waghmare (2025).** Land Use Dynamics in Beed District, Maharashtra: Spatial Patterns, Drivers, and Implications. International Journal of Research Publication and Reviews, 6 (8), 2832–2837.
10. **Chetan Bajeerao Jagtap et al. (2025).** Geographical analysis of LULC in Nashik District (2024) of Maharashtra state. The Academic International Journal of Multidisciplinary Research, 3 (9), 32–42.