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A Study of Land Cover Changes of Potential GrowingFringe Areas of Gorakhpur City by Using ArcGIS

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Abstract— A geographic information system (GIS) was used to calculate the change in land use and land cover (LU/LC) in Gorakhpur, an urban region, between 2001 and 2021. A field investigation based on local circumstances. The examination of cover sheets and satellite images along with the comparison of LU/LC revealed a considerable shift in the classification of land use between 2001 and 2021. In terms of city and town boundaries and forthcoming planning plans, it also represents future trends and patterns of urban agglomeration. The research study demonstrates how usefulGIS is for urban studies.

Keywords—ArcGIS, Satellite image, Earth explorer dataEtc.

1. INTRODUCTION

Up from the present 56%, it is predicted that 68% of people will live in urban areas by the year 2050. Urbanization is the cause of the rapid emigration of people from rural to urban areas. The fact that 4.4 billion additional people are anticipated to live in cities by 2050 is one of the main worries. 90% urbanization is anticipated in China and Asia. Sustainable progress is not conceivable without significant modifications to the organization and management of our cities. Urbanization is now a sustainable trend as a result of India's rapid population growth and the yearning for a higher standard of living. Due to population expansion and economic development, particularly in emerging countries, cities are currently growing swiftly. This is related to investments in public transit as well as the creation and promotion of egalitarian and diversified urban design. Urban and rural locations can be distinguished based on a location's economic activity and population density. These qualities must be present in all urban places, including megacities. Economic, social, and environmental development are the three pillars of sustainable development,respectively.

Due to the interdependence of the economic, social, and environmental sectors, small towns and rural areas need to connect more. By improving infrastructure and services and expanding access to non-agricultural jobs for rural residents, sustainable development can be supported in both urban and rural communities. Both urban and rural residents are obligated to use the following services: Urban and geographic planning, governmental and private investment in built form 4, and associated infrastructures all have an impact on urbanization. Cities are experiencing an increase in economic activity and innovation because they serve as hubs for trade, information movement, and transportation. . In addition to vital services, which are often simpler to access in cities than in rural areas, they also offer high- quality public and commercial services. Local economic and employment trends, rapid production growth, population growth, and emigration from agricultural areas are some of its distinctive traits. As a result, property values rise and there are various land uses. On the surface, peri-urbanization processes appear to be complex in character all over the world (in both developing and wealthy countries, for example). In recent years,

spectacular advances in the GIS analysis have made this software not only efficient and economical, but also a tool for achieving sustainable land and water resource management growth strategies. Geospatial technology (GIS) provides a powerful tool to track not only natural resources and changes in the environment, but also analyses data on othersocio-cultural variables.

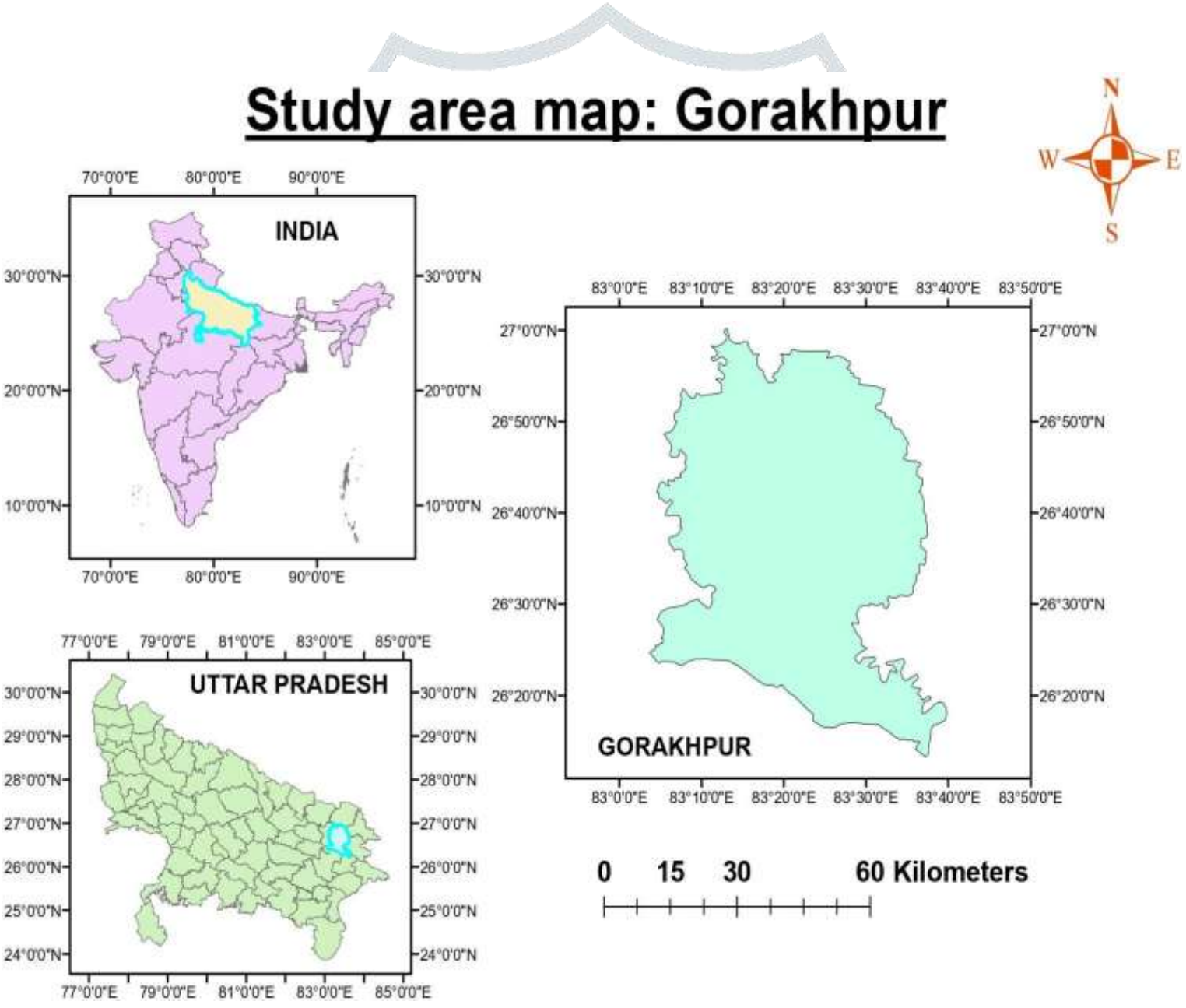
2. STUDY AREA & COLLECTIONS

A. *STUDY AREA*

With a geographic area of around 3483.8 square kilometers, Gorakhpur City is the district of the Uttar Pradesh province inIndia. It is situated between latitudes 26° 45' 57.0384" N and 26.765844 and 83° 21' 53.7984" E and 83.364944. About 100 kilometers from the Nepalese border, 193 km from Varanasi,260 km from Patna, and 270 km from Lucknow separate Gorakhpur from those cities.

B. *DATA COLLECTION*

- Satellite data/Image
- Maps and report.
- URS.EARTHDATA.NASA.GOV
- EARTH EXPLORARE DATA.GOV.IN
- DIVA GIS



MEATHDOLOGY

GIS mapping was done to identify the land use and cover zones. The following techniques were used to carry out the study.

A. Processing of the preliminary (EARTH EXPLORER / URS NASA) imaginary

URS NASA (2001), EARTH EXPLORE DATA (2001 and 2021), and The United States Geological Survey Earth Explorer provided the data. The files from Landsat are all pre-referenced. To analyses the data for the entire study, Arc GIS 10.8 was used.

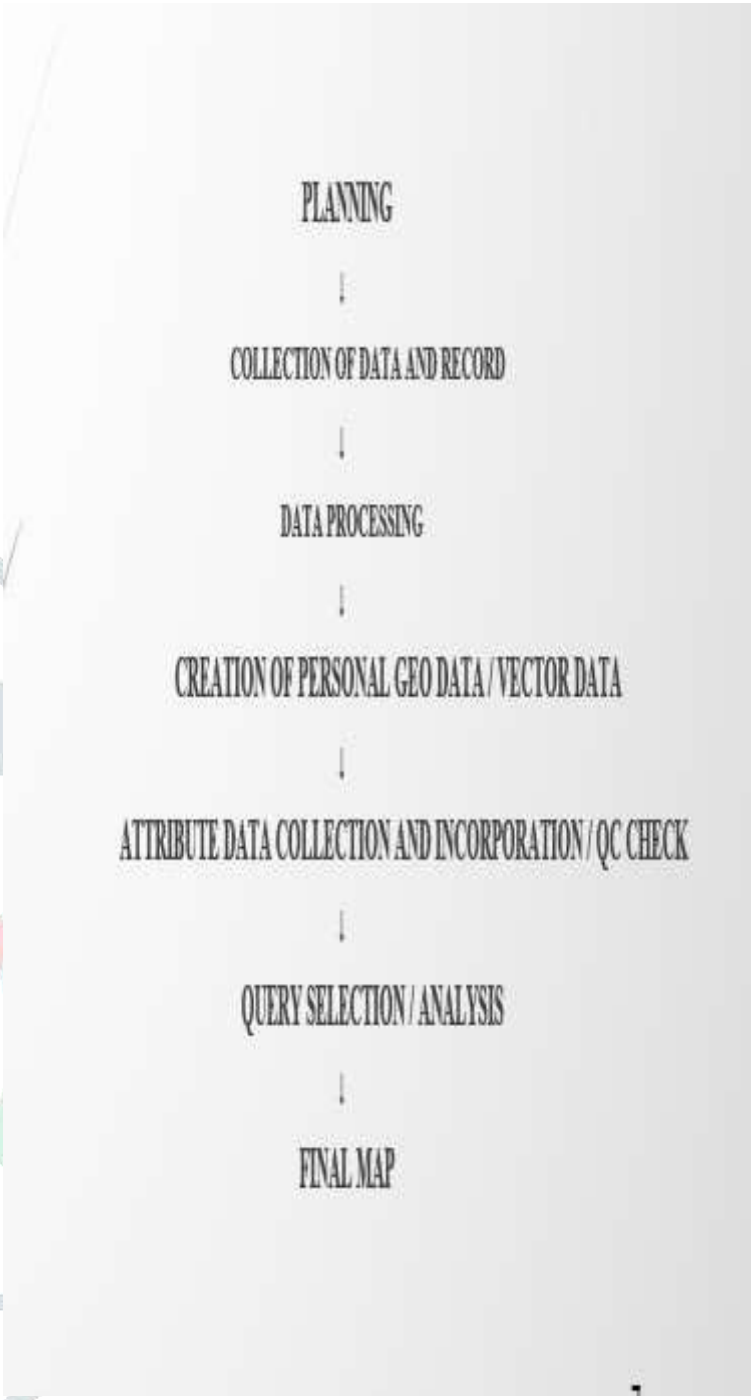
B. Processing of pre-referenced data (EARTH EXPLORER / URS NASA) Imaginary

Data from EARTH EXPLORER/URS NASA only modes MCD12Q1 V6 were used for land use mapping, whereas data from EARTH EXPLORER/URS NASA modes land cover V6 from 2001 and 2021 were employed. In order to ascertain the changes in land use/land cover over the course of a decade, as well as the various forms of land use, supervised image classification methods employing the maximum likelihood method were applied.

C. Visual interpretation and ground verification of images

Preliminary visual image interpretation was carried out to identify land use/land cover classes and land degradation based on common picture interpretation keys such tone, texture, size, pattern, association, supplementary, and legacy data. To find features, supervised and unsupervised approaches for digital picture categorization were used.

1. The 3483.3 km2 surrounding the city.
2. Open/cultivated land cover density.

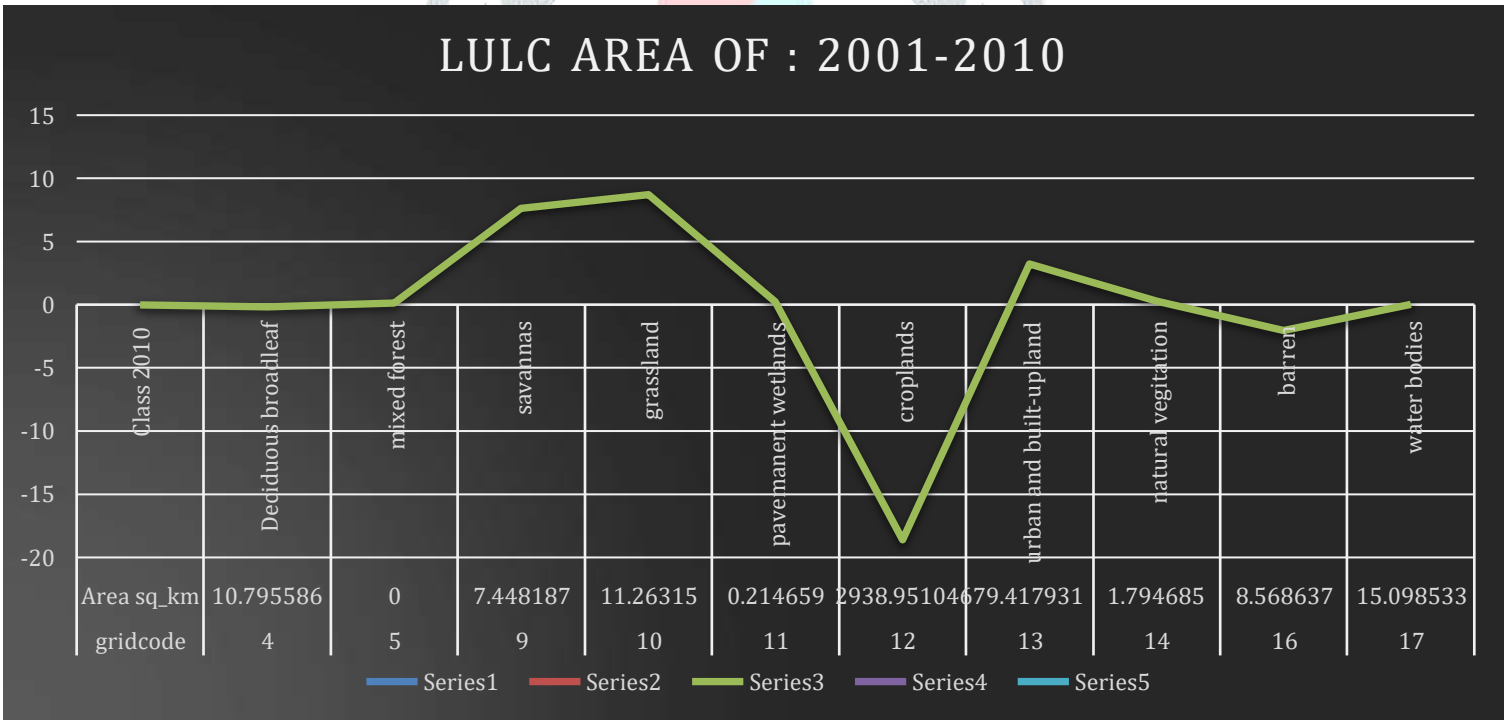


DATA ANALYSES

At the local, regional, and global levels, changes in land use and land cover have a substantial impact on the environment. Regional and global biodiversity loss, hydrologic cycle disturbance, and increases in soil erosion and sediment loading are all significantly impacted by these changes. Effects of changing land usage. Continuous and multi-scale land use changes can have particular and cumulative effects on wildlife quantity and quality, watershed function, waste generation, and air and water quality.

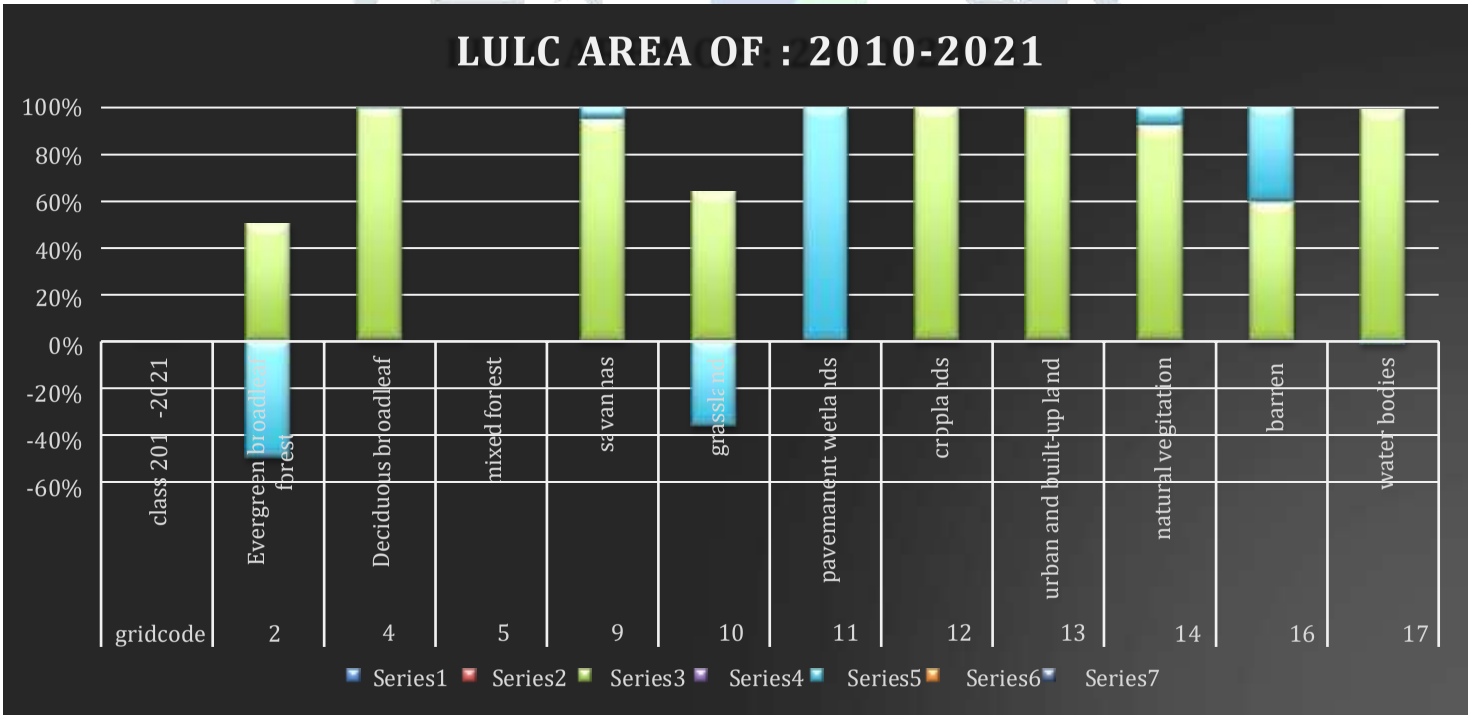
COMPRASSION LULC B/W 2001-2010

grid code	Class	Area sq_km2001	Area sq_km2010	Area sq_km 2001-2010
4	Deciduous broadleaf	10.646004	10.795586	-0.149582
5	mixed forest	0.137465	0	0.137465
9	savannas	15.076621	7.448187	7.628434
10	grassland	19.97193	11.26315	8.70878
11	pavemanent wetlands	0.429317	0.214659	0.214658
12	croplands	2920.345346	2938.951046	-18.6057
13	urban and built-up land	82.623552	79.417931	3.205621
14	natural vegitation	2.069393	1.794685	0.274708
16	barren	6.5162	8.568637	-2.052437
17	water bodies	15.138428	15.098533	0.039895



COMPRASSION LULC B/W 2010-21

grid code	Class	Area sq_km2010	Area sq_km2021	area sq_km 2010-2021
2	Evergreen broadleaf forest	0	0.214659	-0.214659
4	Deciduous broadleaf	10.795586	10.791981	0.003605
5	mixed forest	0	0	0
9	savannas	7.448187	7.068297	0.37989
10	grassland	11.26315	26.150053	-14.886903
11	pavemanent wetlands	0.214659	0	0.214659
12	croplands	2938.951046	2927.608984	11.342062
13	urban and built-up land	79.417931	79.378862	0.039069
14	natural vegitation	1.794685	1.647717	0.146968
16	barren	8.5686637	5.078019	3.4906447
17	water bodies	15.098533	15.300478	-0.201945



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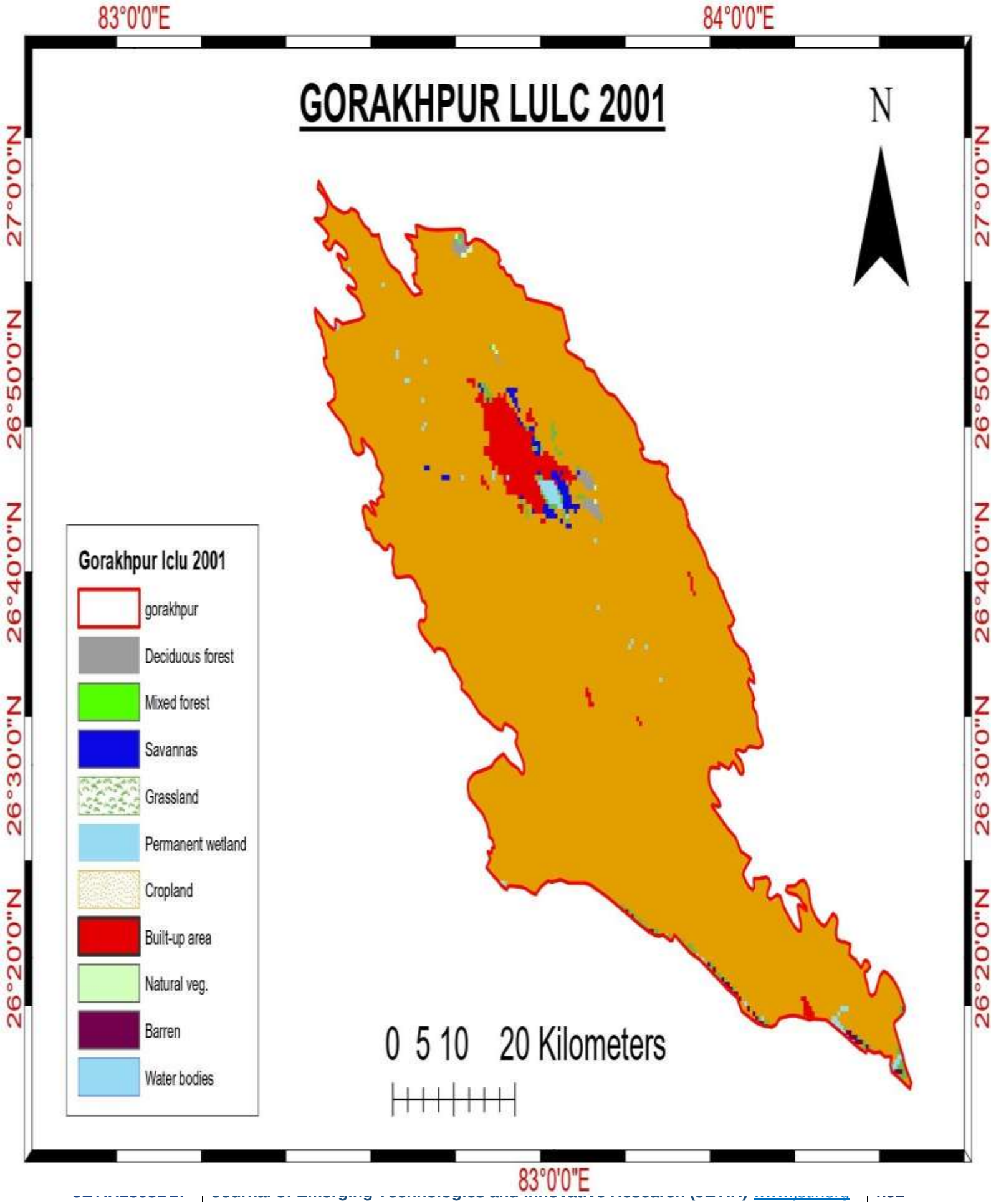
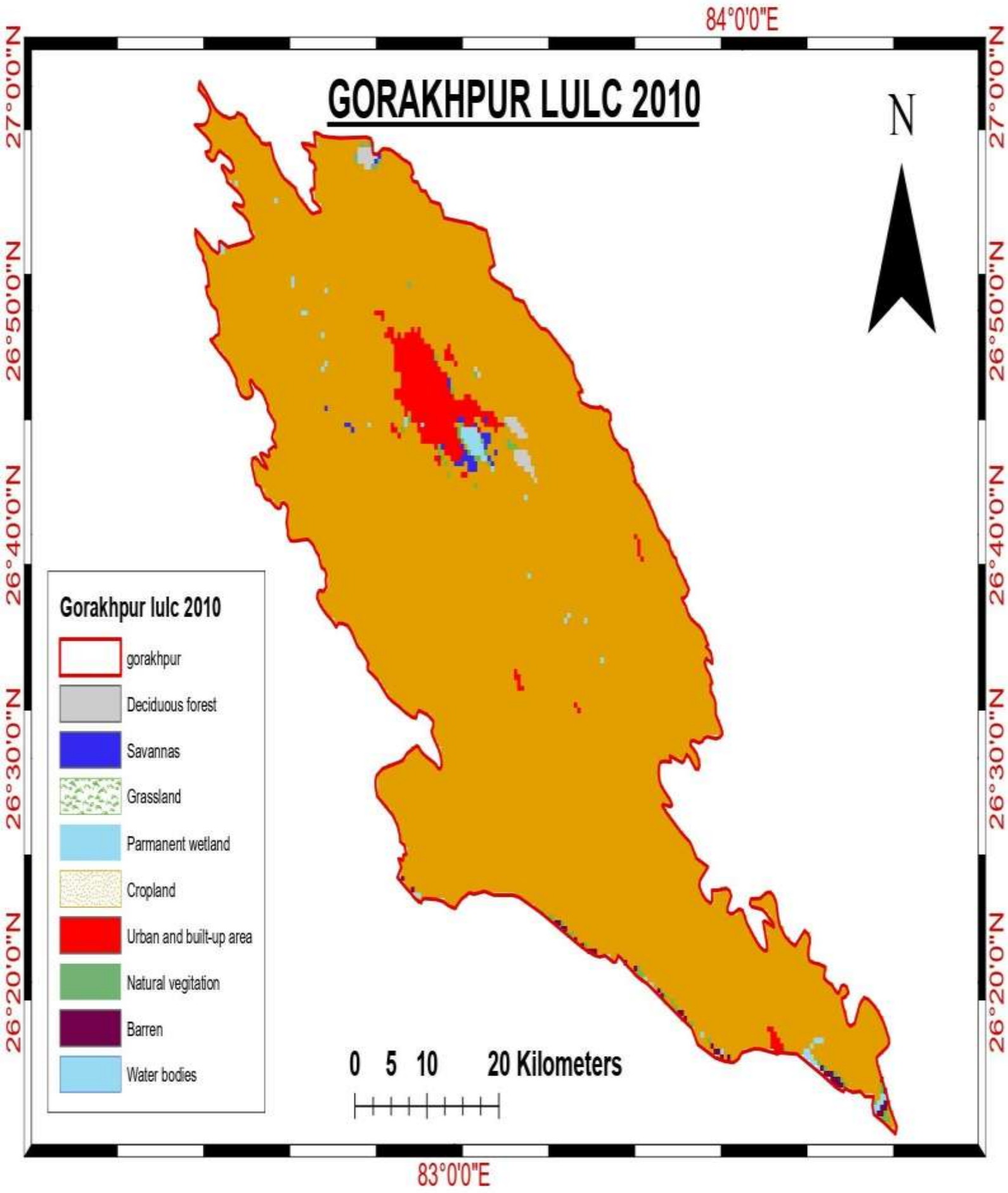
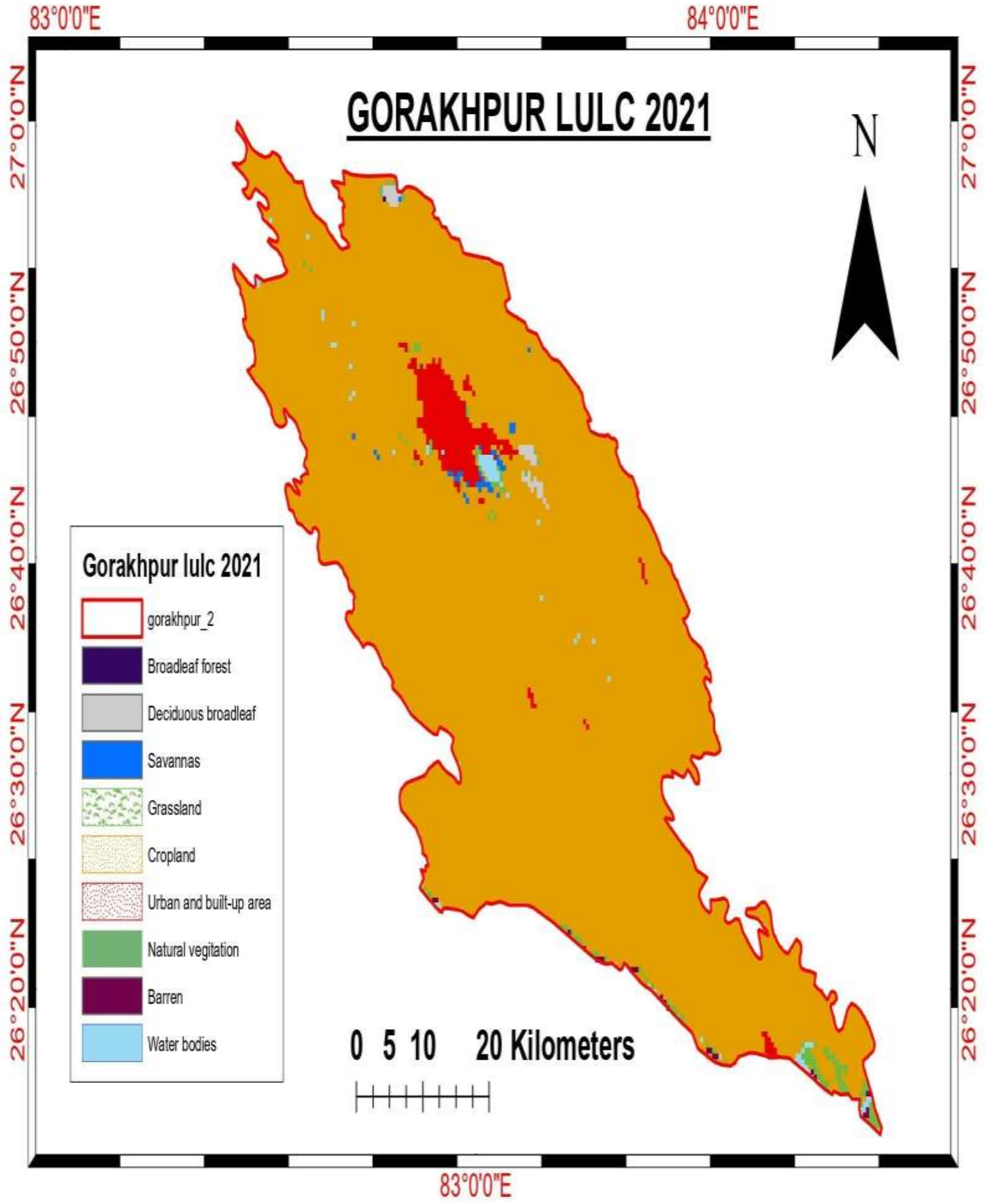
Land Use Land Cover Users can learn information from (LULC) maps of a location to better grasp the existing terrain. The national spatial database's annual LULC information enables annual monitoring of the temporal dynamics of agricultural ecosystems, forest conversion, surface waters, etc. A net agricultural area estimate is made in addition to the annual land use/land cover mapping, which is done at a scale of 1:250000. Information on land usage and land cover is published every five years at a scale of 1:50000. Planning for water and land resources at the village or valley level can benefit from the compilation of land use and land cover at a scale of 1:10000. Brownfields have been observed at scales of 1:50000 and 1:25000. Information about land use and cover at 1:10000 scales.




GORAKHPUR LULC 2010
N
84°0'0"E
83°0'0"E
27°0'0"N
26°50'0"N
26°40'0"N
26°30'0"N
26°20'0"N
Gorakhpur lulc 2010
gorakhpur
Deciduous forest
Savannas
Grassland
Parmanent wetland
Cropland
Urban and built-up area
Natural vegitation
Barren
Water bodies
0 5 10 20 Kilometers


GORAKHPUR LULC 2021
N
83°0'0"E
84°0'0"E
27°0'0"N
26°50'0"N
26°40'0"N
26°30'0"N
26°20'0"N
Gorakhpur lulc 2021
gorakhpur_2
Broadleaf forest
Deciduous broadleaf
Savannas
Grassland
Cropland
Urban and built-up area
Natural vegitation
Barren
Water bodies
0 5 10 20 Kilometers

CONCLUSION

In this article, ARCGIS and remote sensing are used to classify the land use and land cover across time in Gorakhpur, Uttar Pradesh. In order to demonstrate the dynamics of land use/land cover change, a post-classification comparison is performed. According to the findings, Gorakhpur is rapidly urbanizing, which is causing a rapid loss of rural and agricultural area. Other places are being swiftly encroached upon by the metropolis, which is causing a raging sprawl and environmental deterioration. Built-up areas in cities have grown from 11% to 334%, primarily as a result of a high rate of rural-to-urban migration. In turn, this has led to a loss in water bodies, farms, vegetation, agriculture, fallow land, developed land, grassland, and wetlands/lowlands. With little effort made to reduce the risk, the city's rapid population increase has mostly been accommodated in informal settlements.

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