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Land-use/cover Change in Raebareli District (Uttar Pradesh, India): A Remote Sensing and GIS-Based Study

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Abstract: ***Raebareli district is majorly agrarian economy, holding large tracts of rural land as Agricultural and respective natural geomorphologies which mainly included barren land, fallow land, shrub land, plantations, and wetlands along with forest. The landcover alone of Agricultural land was more than three-fourth of total land of whole district. The increment in the settlement pattern growth seems to be so natural and calm in progression with gradual changes as per population increase. Explicit and forced development seems not to be driving factor for the district.***
Keywords: Landuse-Landcover(LULC), ESRI, NASA, District Landcover change, Geomorphology

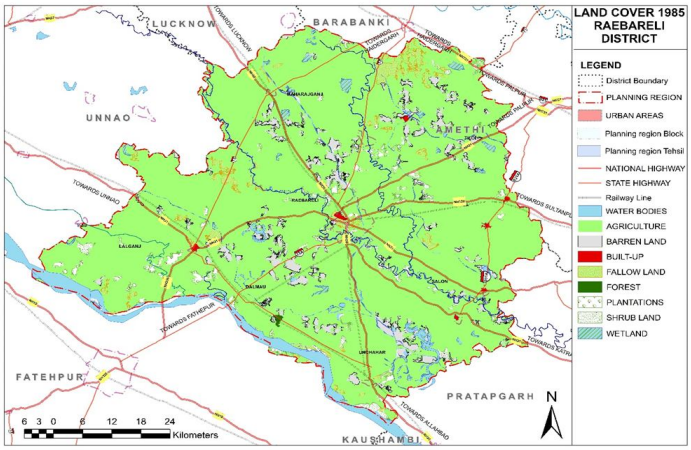
I. INTRODUCTION

There are numerous sources of information on current land use and land cover, as well as changes occurring at various levels. Local planning agencies rely on detailed information gathered during enumeration and observational field surveys. Changes in category definitions and data collection methods by source agencies, incomplete data coverage, varying data age, and the use of incompatible classification systems are all major issues that arise during the application and interpretation of these data sets.

The situation is the same in this planning region. Furthermore, because of the various classification systems in use, it is nearly impossible to aggregate the available data. These limitations (ISRO, 2023) of traditional approaches have been mitigated in part by the use of modern approaches such as remote sensing. According to the 2021 Master Plan, only Raebareli City's landuse is officially available. There is no information available for the remaining Nagar Panchayats. However, the boundaries of the remaining municipal bodies have been established. Thus, for the mapping of Landuse-Landcover (LULC) of the entire district, GIS-based mapping has been done from 1985 to 2021 using LULC data from NASA (NASA, 2022) and ESRI (ESRI, 2022) sentinel-2 satellite sources. The change in landuse-landcover over time has been depicted with some major analysis of changes and development.

II. LANDUSE-LANDCOVER STUDY FOR RAEBARELI DISTRICT

A. Landcover changes from 1985-1995



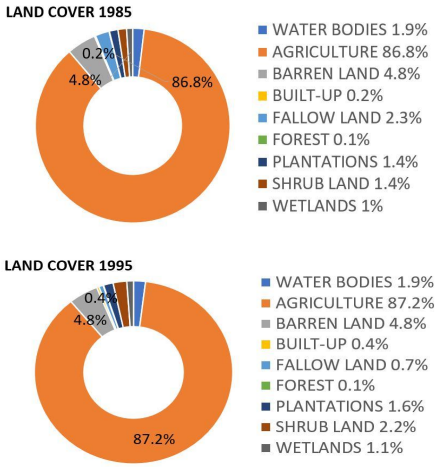


Fig. 1 a) Landcover 1985- Raebareli district region b) Distribution of Landcover 1985 & 1995 – Raebareli District Region

Source - Parent Source – EARTH DATA , NASA; reproduced in GIS by Author

From 1985-1995 (USGS, 2022), The built-up area of Raebareli city had been increased, along with in Unchahar due to commissioning of NTPC Power Plant in 1988. The significant increase in Built-up areas was from 0.2%(1985) to 0.4% (1995) for whole district. Although the agricultural land had also been increased from 86.8% to 87.8% with reduction in fallow land from 2.3% to 0.7%.

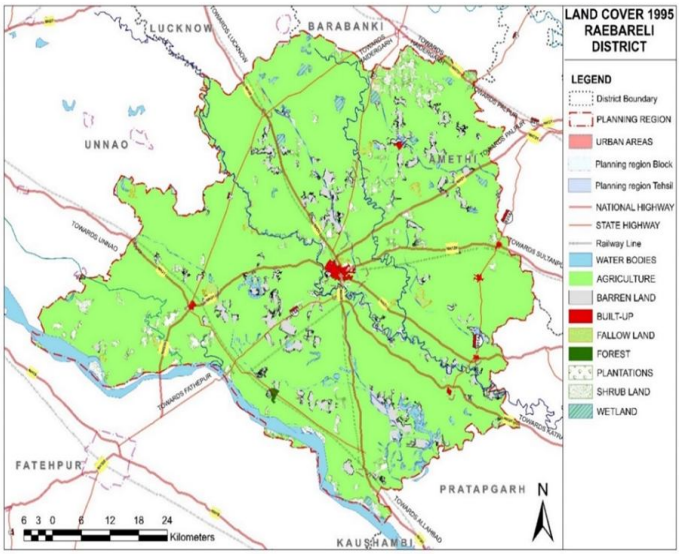


Fig. 2 Landcover 1995- Raebareli district region
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B. Landcover Changes from 1995-2005

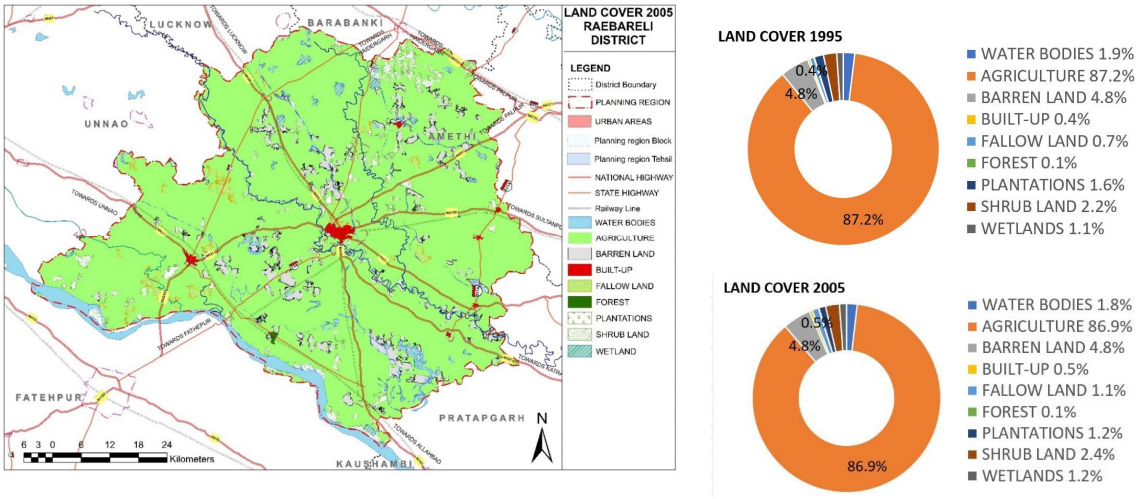

Fig. 3 a) Landcover 2005- Raebareli district region b) Distribution of Landcover 1995 & 2005 – Raebareli District Region
Source - Parent Source – EARTH DATA , NASA; reproduced in GIS by Author

From 1995-2005, there was not major change in Landuse-Landcover(LULC), However, Builtup area continued to grow from 0.4% to 0.5% , with slight reduction in Agricultural land from 87.2% to 86.9%, along with increase in fallow land from 0.7% to 1.1%. There was an increase in the area of wetlands from 1.1% to 1.2%. Also, slight fluctuations in scrub land and plantations as well. Rest of the landcover almost remained the same.

C. Landcover Changes from 2005-2017

From 2005-2017, there was magnificent increase in the built-up areas, with growth in settlement all over the district. The better connectivity from Lucknow is also the reason for growth. Gradual progression in population also contributed in development. The built-up areas have been increased from 0.5% to 13.1%.

The massive increment can been seen in Lalganj where Modern Coach Factory was setup by Indian Railways in 2007. There was also a reduction in Crop land from 86.9% to 80.3%. Rest all other landcover types had been reduced along with water bodies. Even Barren land had been reduced to 3.8% from 4.8%. However, the forest area had increased from 0.1% to 0.8%.

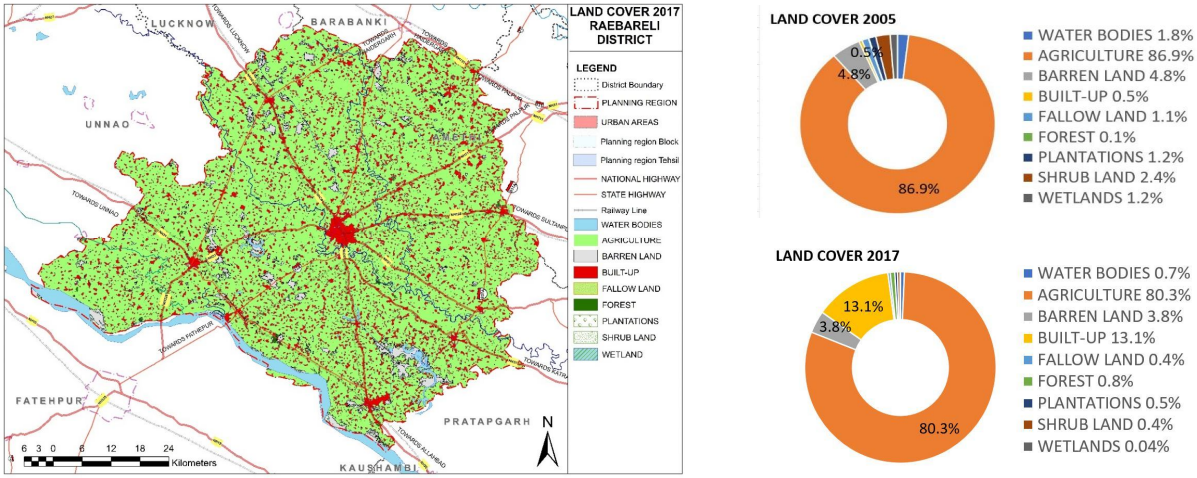

Fig. 4 a) Landcover 2017- Raebareli district region b) Distribution of Landcover 2005 & 2017 – Raebareli District Region
Source - Parent Source – EARTH DATA , NASA; reproduced in GIS by Author

D. Landcover Changes from 2017-2021

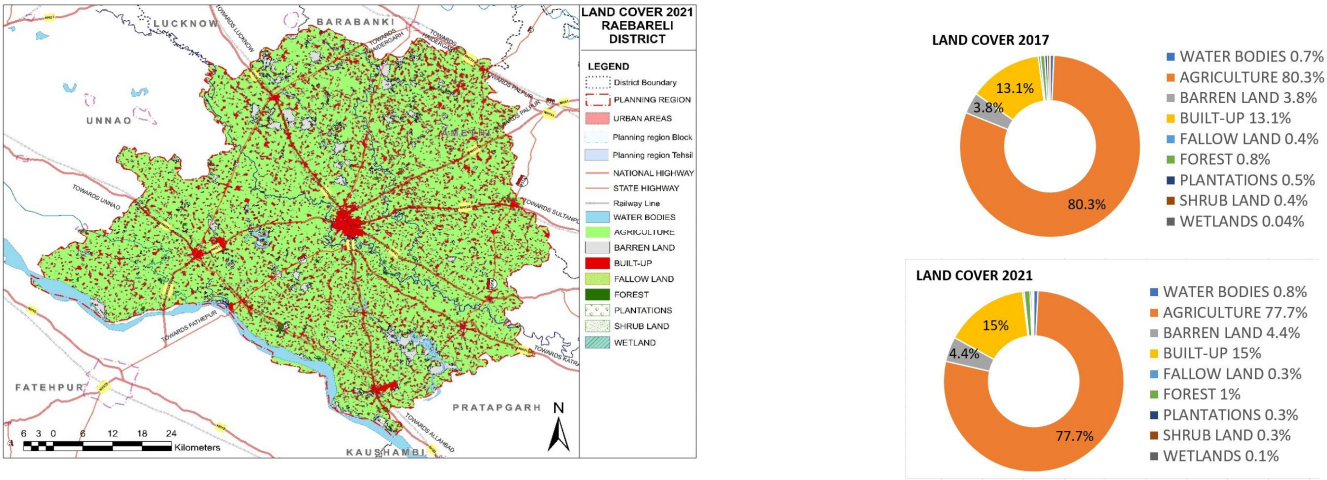

Fig. 4 a) Landcover 2021- Raebareli district region b) Distribution of Landcover 2017 & 2021 – Raebareli District Region
Source - Parent Source – EARTH DATA , NASA; reproduced in GIS by Author

In these five years (ESRI, 2022), Agricultural land continued to decrease from 80.3% to 77.7% , fallow land from 0.4% to 0.3%. Also plantations and shrub land was reduced by slight margins. The wetlands have been increased from 0.04% to 0.1%. Barren lands have also increased from 3.8% to 4.4%. Builtup areas have been increased from 13.1% to 15%. The major reason was steady development that has been happened. Despite having the grown up built-up areas, forest cover have been increased from 0.8% to 1%.

III.INFERENCES DERIVED FROM CHANGES IN LANDUSE-LANDCOVER

The overall evolving landuse-landcover shows a steady progress in Built-up areas , followed by wetlands and forest cover. All these are compensated majorly by Agricultural land and some traits of plantations, shrub land, fallow land, etc. However the barren land remained in unchanged position.

IV.CONCLUSION

Due to constant or gradual development in some sections of the region, there is a large potential in terms of land availability and a large scope of development, which can increase sustainable growth while also providing an economic boost to this agrarian economy. As a result, the respective ideas in lieu of land development and land conversion would be a great deal to cope with it, considering land resource a healthy contributor to increase economic and elevate this backward region. This necessitates adequate landuse planning.

As land development has become a major indication for this region, the entire region may be separated based on the potential of development that is projected to occur in this region over the next two to three decades in order to ensure adequate landuse management. This categorization ranges from a densely developed zone to a limited zone with no development at all. This holistic approach to landuse development and management would be a critical driver for the whole region, serving as umbrella guidance for the individual ULBs and the remainder of the rural regions.

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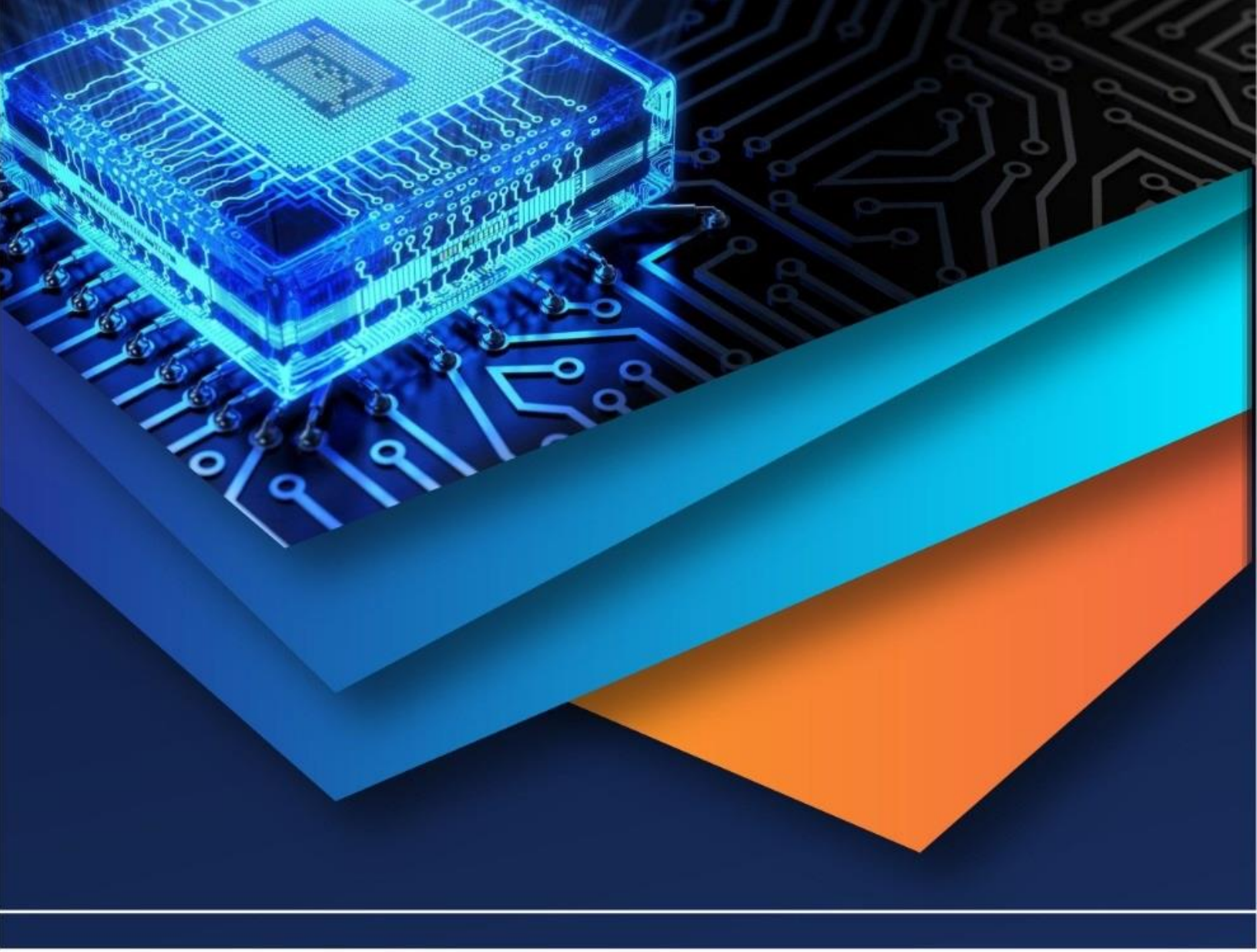

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