

Analysing and Predicting the Geospatial Transformation of the Rural-Urban Fringe of Delhi: Lessons for other megacities

Globalisation, coupled with industrialisation, has triggered the land use transformation of Delhi's rural-urban fringe in an unsustainable and unplanned manner. This research analysed the long-term and large-scale geospatial transformation of the rural-urban fringe of Delhi and its surrounding districts.

Why the study:

Delhi's unchecked growth has resulted in significant land use and land cover changes, contributing to environmental degradation, spatial fragmentation, and the erosion of the fringe's identity. As Delhi is projected to become the largest urban agglomeration in the world by 2035 with a population of nearly 43 million, it is critical to assess its rural-urban interface. Existing studies have largely focused on Delhi's administrative boundaries, overlooking its extended rural-urban dynamics and connections with emerging neighbouring cities.

What we did:

The study adopted a quantitative approach using advanced GIS and Remote Sensing methods to analyse Delhi and its surrounding districts from 1990-2020.

- A retrospective analysis (1990–2020) of land use changes across five classes: water, vegetation, built-up, agriculture, and barren.
- Exploratory spatial analysis of rural-urban structure, connectivity, and spatial landscape metrics.
- Predictive urban growth modelling up to the year 2040 to simulate future land use scenarios and assess their impacts.
- Long-term environmental performance analysis (2001–2020) based on various vegetation and environmental indices.

What we found:

The research highlighted the significant transformation of Delhi's rural-urban fringe and showed that the city's growth cannot be viewed in isolation. It showed the massive conversion of land use from agricultural to built-up in the last 30 years and its impact on the environment. It also noted the rise of new cities of significance in Delhi's fringe. It uncovered the vulnerability of the fringe areas while also recognising their unique potential and evolving identity. The study demonstrated strong interdependence between Delhi and its surrounding areas.

What this means:

This research offered new, in-depth insights into the transformation of Delhi's fringe beyond administrative limits. It called attention to the rural-urban fringe as a crucial spatial landscape and provided a scalable methodology that can be applied to other global megacities. The study advances the discourse on sustainable urban development and directly contributes to the United Nations Sustainable Development Goal 11 – Sustainable Cities and Communities.

Urban Expansion of Delhi and its Surrounding Areas from 1990 to 2020

