

Rural Transformation Through Peri-Urbanization in Patna, Bihar: Land-Use Dynamics, Socio-Economic Change, and Governance Challenges

Abstract

Background: Urbanization is a globally pervasive phenomenon associated with industrialization, modernization, and integration; its sprawling trajectories continuously reconfigure the spatial and socio-environmental contours of human settlements, especially in the Global South. Nowhere are the consequences of this transformation more vividly expressed beyond the formal jurisdictional boundaries of the city into surrounding hinterlands along rural frontiers, producing ‘hybrid spatialities’ primarily known as ‘peri-urban interface’, are characterized by the coexistence of mixed land usages, which are neither rural nor urban in their appearances, generating complex networks of interconnections and interdependencies that resist conventional categorization. In the Indian cities, the peri-urban areas emerge as locations where the agrarian, residential and industrial activities co-exist with weak access to formal institutions and assertive interventions of the metropolitan authorities, which generate enduring governance opportunities and challenges.

Objectives: The main objectives of this thesis are: (a) to analyse urban sprawl dynamics and its characteristics by employing spatial metrics of the Patna Urban Agglomeration (PUA); (b) to assess the environmental (ecological) and socio-economic impacts of sprawl on adjoining rural landscape; (c) to explore residents' perceptions of land-use change dynamics and the key factors influencing it; and (d) to examine how the evolving dynamics of the peri-urban area affect the structure, performance, and requirements of the existing local governing institutions with a focus on Panchayati Raj Institutions (PRIs).

Methodology: This study adopts a mixed-methods approach combining spatial analysis, quantitative surveys, and qualitative in-depth interviews to rigorously investigate the dynamics of peri-urbanization and its implications for local governance structures. The present study was conducted in the Patna Planning Area (PPA), which spreads across thirteen Community Development Blocks (C.D. Blocks) of Patna District in the state of Bihar, located in eastern India.

Findings: The area has experienced profoundly transformation, with built-up land expanded more than threefold, from 67.98 km² (5.94%) in 1979 to 289.45 km² (25.28%) in 2021, largely at the expense of vegetation and agricultural land. Spatial metric, which include intensity indices, density gradients, entropy, and Moran’s I indicate a dispersed growth in irregular, donut-shaped patterns along the principal road networks. Land-use change dynamics have exerted a decisive influence

on the thermal ecology of the study area. These processes of land-use have had a decisive impact on the thermal ecology of the study region. Mean LST has risen substantially, by 4.31⁰C in the pre-monsoon period and 1.36 ⁰C post-monsoon between 1993–2021. In addition, within each LULC category, the LST and UTFVI during the pre-monsoon (summer) were higher in the surrounding agricultural land compared to the PPA's primary built-up areas, which signifies the presence of the urban cool island effect. The primary household-level data from fifteen Gram Panchayats (GPs) indicate a sharp decline in agrarian employment, landholdings, and rising dependence on nonfarm occupations. In terms of resident's perceptions and factors influencing it, approximately 60% of respondents demonstrate a command of LULC concepts, underlying drivers, and resultant impacts. However, disparities persist along gender and educational axes—women and those with limited formal schooling markedly exhibit lower level of conceptual mastery. Attitudes lean positive (81% satisfaction), driven by economic incentives, but practices—actual land-use shifts—correlate strongly with land ownership and income, underscoring resource-dependent agency. At the institutional level, the study exposes a paradoxical governance regime: peri-urban zones remain simultaneously under-regulated, as Panchayati Raj Institutions struggle to address emergent urban pressures, and hyper-regulated, as overlapping metropolitan, state, and planning bodies impose fragmented interventions. This “betwixt-and-between” condition engenders regulatory gaps, institutional frictions, and contested land-use politics, reinforcing spatial inequalities and limiting the capacity for sustainable development.

Conclusion: The rapid growth of peri-urban region, as demonstrated the PUA, underscores the significant spatial, environmental, and socio-economic shifts reshaping the rural-urban interface. These shifts demand adaptive governance frameworks that move beyond the urban–rural binary, strengthen existing local institutions, and address the complexities of overlapping governance mandates. Without such reform, peri-urban spaces will remain critical but poorly governed frontiers of India's urban future.

Keywords: Peri-urbanization; Land-use change dynamics; Urban sprawl; Urban ecology; Socio-economic transformation; Governance reconfigurations; Southern urban theory