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Planning Framework for Residential Development in Peri-Urban Areas: A Case of Bakshi Ka Talab, Lucknow

Ar. Jahnavi Singh[1], Ar. Mahima Thussu[2]

[1]Master of Urban and Regional Planning, [2]Professor, Faculty of Architecture and Planning
Dr. A.P.J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India

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Abstract - *Rapid urbanization has accelerated residential development in peri-urban areas, creating significant challenges for land use planning, infrastructure provision, and environmental sustainability. Bakshi Ka Talab (BKT), located on the northern fringe of Lucknow, has experienced substantial residential expansion due to increasing housing demand, improved road connectivity, and the outward growth of the city. This study aims to analyze residential development patterns in BKT and propose a planning framework for sustainable peri-urban growth. The research integrates literature review, comparative case studies, geospatial analysis, and primary household surveys to examine land use change, built-up expansion, infrastructure availability, and development challenges. Temporal analysis of satellite imagery for the years 2011, 2018, and 2025 reveals a continuous increase in built-up area accompanied by the conversion of agricultural land into residential uses. Primary survey findings indicate inadequate infrastructure, fragmented development, and uneven service provision across different parts of the study area. Based on these findings, a planning framework emphasizing infrastructure-first development, regulated land use conversion, growth corridor management, and zone-based planning has been proposed. The study demonstrates that integrating spatial analysis with field investigations can support informed planning decisions and promote balanced residential development in rapidly urbanizing peri-urban regions.*

Key Words: Peri-urban development, Residential growth, Land use change, Urban sprawl, GIS, Planning framework, Bakshi Ka Talab.

1. INTRODUCTION

Urban expansion has become one of the defining characteristics of contemporary city growth in developing countries. Increasing population, economic development, and rising housing demand have forced cities to expand beyond their administrative boundaries, resulting in the transformation of surrounding rural landscapes into peri-urban settlements. These transitional areas exhibit both rural and urban characteristics and are often subjected to rapid land use conversion, fragmented residential development, and increasing pressure on infrastructure.
Peri-urban residential development has become particularly significant in Indian cities where land prices in the urban core continue to rise while peripheral land remains relatively affordable. Consequently, agricultural land is progressively converted into residential layouts, plotted developments, and mixed land uses. However, such growth frequently occurs without adequate planning control, resulting in irregular layouts, inefficient infrastructure networks, inadequate public facilities, and environmental degradation.

Bakshi Ka Talab (BKT), situated on the northern fringe of Lucknow, represents one of the fastest transforming peri-urban regions in Uttar Pradesh. Over the last decade, the area has experienced noticeable residential expansion driven by urban spillover from Lucknow, improved transportation connectivity, and increasing demand for affordable housing. Although this transformation has created opportunities for economic and residential development, it has also generated several planning challenges including scattered growth, infrastructure deficiencies, conversion of agricultural land, and inadequate development control.

Most previous studies have concentrated on urban expansion and land use change using remote sensing and GIS techniques. However, relatively fewer studies integrate spatial analysis with field-based investigations to formulate practical planning strategies for managing peri-urban residential development. Addressing this gap, the present study combines geospatial analysis with household surveys and infrastructure assessment to understand the spatial dynamics of residential growth in Bakshi Ka Talab.

The primary objective of the study is to analyze residential development patterns between 2011 and 2025 and develop a planning framework that supports sustainable residential expansion. The framework seeks to balance urban growth with infrastructure provision, environmental conservation, and efficient land use management, thereby providing planning recommendations applicable to similar peri-urban settlements across India.

2. METHODOLOGY

The study adopted an integrated research methodology combining both spatial and field-based approaches. Initially, an extensive review of literature was conducted to identify the major indicators influencing peri-urban residential development, including land use change, built-up density, accessibility, infrastructure, and environmental conditions.

Three national and international case studies were examined to understand planning approaches adopted in rapidly urbanizing peri-urban regions. These case studies provided useful insights regarding residential growth management, land conversion, and infrastructure planning.

Secondary data analysis involved demographic assessment, land use and land cover (LULC) classification, built-up growth analysis, urban sprawl assessment, and direction of growth analysis using GIS and satellite imagery for the years 2011, 2018, and 2025. Spatial analysis helped identify patterns of agricultural land conversion, expansion of built-up areas, and emerging residential corridors.

To validate spatial findings, primary data were collected through household surveys, physical observations, reconnaissance surveys, and stakeholder interactions. Information regarding housing characteristics, infrastructure availability, transportation, accessibility, public services, and residents' perceptions was collected and analyzed.

Finally, findings from literature review, case studies, spatial analysis, and field investigations were integrated to formulate a comprehensive planning framework for sustainable residential development in Bakshi Ka Talab.

3. RESULTS

3.1 Land Use and Residential Development Pattern

The temporal analysis of land use and land cover (LULC) indicates that Bakshi Ka Talab has undergone significant spatial transformation between 2011 and 2025. Agricultural land, which previously dominated the study area, has gradually been converted into residential layouts, plotted developments, and mixed land uses. The expansion of built-up areas has primarily occurred along major transportation corridors and around existing settlements, reflecting the influence of Lucknow's outward urban expansion.

The comparison of satellite imagery for 2011, 2018, and 2025 reveals a continuous increase in residential development accompanied by a corresponding decline in agricultural land. The pattern of development demonstrates that urban growth has not occurred uniformly; instead, compact development is observed in the core settlement, while scattered and fragmented development characterizes the fringe and peripheral areas.

3.2 Built-up Growth and Urban Sprawl

Spatial analysis shows that residential expansion in Bakshi Ka Talab is predominantly corridor-oriented. Development has followed major roads connecting the area with Lucknow city, resulting in ribbon development and scattered residential clusters. Such growth has increased built-up density in accessible locations while leaving several vacant and underutilized parcels between developed areas.

The sprawl pattern reflects weak development control and unplanned land subdivision. Fragmented growth increases the cost of infrastructure provision and reduces the efficiency of public service delivery. Without appropriate planning interventions, continued expansion is likely to intensify land consumption and further reduce agricultural land resources.

3.3 Infrastructure Assessment

Field observations and household surveys indicate that infrastructure development has not kept pace with residential growth. Although road connectivity has improved considerably due to the proximity of Lucknow, several residential colonies continue to experience inadequate drainage systems, irregular water supply, insufficient street lighting, and limited public open spaces.

The survey further revealed that residents generally prefer the area because of comparatively affordable land prices, peaceful surroundings, and good regional accessibility. However, inadequate urban services and limited community facilities remain major concerns affecting the quality of life.

3.4 Primary Survey Findings

Primary survey results highlight considerable variation in residential characteristics across different zones of the study area. The core settlement exhibits relatively better infrastructure and higher built-up density, whereas fringe and peripheral zones display dispersed housing, vacant plots, and limited public facilities.

Residents identified inadequate drainage, poor internal road conditions, insufficient solid waste management, and the absence of organized recreational spaces as major development issues. Stakeholder interactions also indicated the need for stronger development regulations to prevent irregular subdivision of agricultural land and uncontrolled residential expansion.

3.5 Discussion

The combined findings from spatial analysis and field investigations demonstrate that Bakshi Ka Talab is experiencing a typical pattern of peri-urban transformation driven by urban spillover from Lucknow. While residential growth has generated opportunities for economic development and housing, it has simultaneously created challenges related to infrastructure provision, environmental sustainability, and land management.

The study confirms that relying solely on geospatial analysis is insufficient for understanding peri-urban dynamics. Integrating GIS-based assessment with household surveys and stakeholder consultations provides a more comprehensive understanding of development patterns and planning requirements. Such an integrated approach enables

planners to identify priority intervention areas and formulate context-specific planning strategies.

4. PLANNING FRAMEWORKS

Based on the findings from literature review, case studies, geospatial analysis, and primary surveys, an integrated planning framework has been developed to guide sustainable residential development in Bakshi Ka Talab. The framework focuses on balancing future urban growth with infrastructure provision, environmental conservation, and efficient land management.
The proposed framework consists of the following strategic components:

Infrastructure-First Development: Basic urban infrastructure such as roads, drainage, water supply, sewerage, street lighting, and solid waste management should be provided before permitting large-scale residential development. This approach ensures that future settlements develop in an organized and service-oriented manner.

Controlled Land Use Conversion: Agricultural land conversion should be regulated through appropriate zoning regulations and development control measures. Priority should be given to compact and contiguous urban expansion while preserving environmentally sensitive and productive agricultural land.

Growth Corridor Planning: Residential development should be encouraged along designated transportation corridors where infrastructure already exists or can be economically extended. Planned corridor development will reduce scattered urban sprawl and improve accessibility.

Zone-Based Development Strategy: Different planning strategies should be adopted for core, fringe, and peripheral areas. Existing settlements require infrastructure upgradation and redevelopment, whereas newly developing areas require stricter planning regulations, proper subdivision controls, and planned layouts.

Strengthening Institutional Coordination: Effective implementation of the planning framework requires coordination among local authorities, development agencies, and stakeholders. Continuous monitoring using GIS and periodic field assessments should support evidence-based planning decisions.
Implementation of these strategies will facilitate sustainable residential growth while improving infrastructure efficiency and minimizing environmental impacts.

4. CONCLUSION

Peri-urban areas are becoming the primary zones of urban expansion in rapidly growing Indian cities. Bakshi Ka Talab represents a typical example of this transformation, where increasing residential demand has accelerated the conversion of agricultural land into built-up areas. The study demonstrates that residential growth has occurred rapidly between 2011 and 2025, resulting in fragmented development patterns, infrastructure deficiencies, and increasing pressure on urban services.

The integration of GIS-based spatial analysis with household surveys and field investigations provided a comprehensive understanding of residential development dynamics. The study identified significant challenges related to unplanned land conversion, urban sprawl, inadequate infrastructure, and weak development control.

The proposed planning framework offers practical strategies for guiding future residential development through infrastructure-first planning, regulated land use conversion, growth corridor management, and zone-based development. Adoption of these recommendations can improve the sustainability and efficiency of peri-urban development while supporting balanced urban expansion.

The methodology adopted in this study can also be applied to other peri-urban settlements experiencing similar development pressures, thereby contributing to more sustainable urban planning practices.

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