

## **Land Use Policies and Their Impact on Urban Sustainability: A Case Study Analysis of Mixed-Use Development in the New Town of Parand**

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### **Extended Abstract**

#### **Introduction**

The rapid pace of urbanization globally has posed significant challenges to achieving sustainable urban development, particularly in new towns designed to alleviate population pressures on metropolitan areas. In Iran, new towns like Parand have been established to absorb the overflow population from major cities such as Tehran, aiming to provide employment opportunities, reduce urban sprawl, and enhance living conditions. However, these new towns often face issues such as inadequate infrastructure, dependency on parent cities for jobs and services, car-oriented urban design, and spatial segregation of land uses, which undermine their sustainability. Land-use policies, particularly those promoting mixed-use development, have emerged as a critical strategy to address these challenges. Mixed-use development integrates various urban functions—residential, commercial, educational, recreational, and others—within a cohesive spatial framework to foster dynamic, accessible, and resilient urban environments. This approach aligns with global paradigms such as sustainable development, new urbanism, and smart growth, which advocate for compact, walkable, and socially inclusive urban spaces. The present study focuses on the new town of Parand, located 33 kilometers southwest of Tehran, to investigate the effectiveness of land-use mixing in promoting urban sustainability across its social, economic, and physical dimensions. The research addresses three key questions: (1) How do land-use policies influence urban sustainability in Parand? (2) What is the impact of mixed-use policies on Parand's sustainability? (3) How do the components of mixed-use policies correlate with the dimensions of sustainable urban development? By analyzing these questions, the study aims to provide insights into optimizing land-use policies for sustainable urban development in new towns.

#### **Methodology**

This study adopts an applied-developmental research approach, aiming to contribute to the theoretical understanding of land-use policies in new towns while offering practical

guidance for urban planners and policymakers in Parand. The research employs a mixed-methods design, combining quantitative and qualitative data collection and analysis. Data were gathered through both documentary studies (library research, including books, articles, theses, and official urban plans) and field surveys using a validated questionnaire with established reliability and validity. The statistical population comprises the residents of Parand, with an estimated population of 250,000 in 2021, as reported by Iran's Statistical Center. Using Cochran's formula, a sample size of approximately 383.57 individuals was calculated, rounded up to 400 respondents for the survey.

Spatial data related to land use were prepared using ArcMap software, with the "Near Feature" tool to measure the distance of each urban block (based on the 2016 census) to the nearest urban land use (e.g., green spaces, educational facilities, healthcare centers, commercial areas, religious sites, main streets, and public transportation stations). A total of 1,517 urban blocks were analyzed across seven land-use types. Additionally, 12 indicators related to social, economic, and physical sustainability were extracted from census data, including employment rates, literacy rates, sex ratio, homeownership, and housing size.

Data analysis involved multiple tools: Geographic Information System (GIS) and spatial statistics for spatial analysis, SPSS for statistical computations, and AMOS for structural equation modeling to explore relationships between variables. The Shannon Entropy method was used to prioritize and weigh sustainability indicators based on their data dispersion. The Geographically Weighted Regression (GWR) model was applied to assess the spatial relationships between land-use mix and urban sustainability, providing insights into the localized impacts of land-use policies.

## Results and discussion

The findings reveal significant spatial variations in sustainability across Parand, with 65.6% of the city classified as "completely unsustainable" and only 2.6% as "completely sustainable." The southeastern, central, and northwestern areas exhibit high levels of unsustainability, primarily due to imbalanced land-use distribution and inadequate infrastructure. Conversely, certain central and western zones show relatively sustainable conditions, driven by better access to services and infrastructure.

The GWR analysis highlights the critical role of accessibility in fostering urban sustainability. Access to main streets emerged as the most influential factor (adjusted  $R^2 = 0.96$ ), as well-designed road networks facilitate mobility, reduce traffic congestion, and lower air pollution. Green and recreational spaces ranked second (adjusted  $R^2 = 0.926$ ), contributing to psychological and physical well-being, supporting tourism, and mitigating environmental impacts such as stormwater runoff. Access to public transportation stations was the third most impactful factor (adjusted  $R^2 = 0.929$ ), reducing reliance on private vehicles and enhancing environmental sustainability. Educational facilities (adjusted  $R^2 = 0.91$ ) and healthcare services (adjusted  $R^2 = 0.89$ ) followed, underscoring their importance in meeting community needs and improving quality of life. Commercial land uses (adjusted  $R^2 = 0.86$ ) supported economic vitality by providing goods, services, and employment opportunities, while religious land uses had the least impact (adjusted  $R^2 = 0.85$ ), though still significant in fostering social cohesion.

The analysis of sustainability indicators showed that literacy rates for both men and women are relatively high across Parand, but employment rates, particularly for women, remain low, reflecting socioeconomic disparities influenced by land-use policies. Homeownership and larger housing units ( $>100 \text{ m}^2$ ) are concentrated in central and

western areas, indicating spatial inequalities in housing access. The sex ratio is more balanced in central zones, suggesting stable family structures in those areas.

The regression modeling confirmed a significant relationship between mixed-use policies and urban sustainability. The default model ( $CMIN = 5080.427$ ,  $DF = 426$ ,  $p < 0.05$ ,  $CMIN/DF = 11.926$ ) demonstrated a good fit with the data, validating the hypothesis that mixed-use policies significantly influence sustainability. Furthermore, regression weights indicated strong correlations between access to transportation and services and the environmental, managerial, economic, and social dimensions of sustainability. These findings align with previous studies, such as Jafari et al. (2020), which emphasized the role of land-use planning in shaping urban sustainability, and Wu et al. (2022), which highlighted the positive impact of mixed-use and green spaces on life satisfaction.

## Conclusion

This study underscores the pivotal role of mixed-use land policies in promoting sustainable urban development in new towns like Parand. The uneven distribution of land uses has led to significant spatial disparities, with large portions of the city remaining unsustainable due to inadequate access to essential services and infrastructure. The GWR model highlights the critical influence of accessibility—particularly to main streets, green spaces, and public transportation—on social, economic, and physical sustainability. These findings advocate for a strategic revision of land-use policies in Parand, emphasizing functional mixing to enhance spatial equity, reduce car dependency, and improve quality of life.

To achieve sustainable development, planners should prioritize integrated land-use planning that fosters compact, walkable, and accessible urban environments. Expanding green spaces, improving public transportation networks, and promoting pedestrian- and cyclist-friendly infrastructure can further enhance urban livability. Future research should explore the relationship between mixed-use policies and energy consumption, air quality, and social capital to deepen the understanding of their ecological and social impacts. Comparative studies with other Iranian new towns could also identify best practices for sustainable urban development. By adopting mixed-use strategies aligned with principles of new urbanism and sustainable development, Parand can transition toward a more equitable, resilient, and livable urban future.

**Keywords:** Land-Use Policies, Mixed-Use Development, Urban Sustainability, New Town of Parand, Geographically Weighted Regression, Sustainable Development

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