BIAR Publisher
Matondang Journal
e-ISSN : 2828-1942
p-ISSN : 2828-979x

Urban Renewal Through Effective Circulation System: A Case Study of Kobape, Ogun State, Nigeria

Oluwagbemisola A. Odularu[1], Gabriel Olaoye[2], Engr Obianuju Chukwuka[3]
[1,2,3]Department of Architecture, Caleb University Imota, Lagos State, Nigeria
Email: oluwagbemisola.odularu@calebuniversity.edu.ng, gabriel.olaoye@calebuniversity.edu.ng, obianuju.chukwuka@calebuniversity.edu.ng

Abstract: *Rapid urbanisation in Nigeria's peri-urban regions has intensified infrastructure deficits, resulting in fragmented development, limited accessibility, and persistent housing challenges. Although urban renewal is widely adopted as a response, it often overlooks the structural role of circulation systems in shaping urban form. This study examines how road network configuration influences urban renewal patterns in Kobape, Ogun State. A mixed-methods approach combining GIS-based network analysis, field observations, and policy review was employed. Network performance was evaluated using graph-theoretic metrics, including intersection density, link-node ratio, gamma index, and centrality measures. Results reveal a structurally imbalanced network with low connectivity (intersection density: 4.2 junctions/km²; link-node ratio: 1.18; gamma index: 0.41) and high dependence on a single arterial corridor (betweenness centrality: 0.78). This has produced corridor-dominated development, with growth concentrated along the expressway and limited integration of interior areas. The study establishes that connectivity rather than infrastructure provision alone determines urban renewal outcomes. It proposes a connectivity-centred framework emphasising hierarchical networks and internal integration to support equitable and sustainable urban development.*

Keywords: *Urban renewal; Circulation systems; Road network connectivity; Peri-urban development; Infrastructure-led urbanisation; GIS-based spatial analysis*

I. Introduction

Urbanisation is advancing at an unprecedented rate globally, with sub-Saharan Africa emerging as the fastest urbanising region. Nigeria, as the continent's most populous nation, reflects this trend, particularly within its peri-urban fringes where urban expansion is rapid and largely unregulated (UN-Habitat, 2022; Turok & McGranahan, 2013). In these transitional zones, population growth continues to outpace infrastructure provision, resulting in settlements characterised by inadequate transportation networks, limited accessibility, and persistent housing deficits (Adekola et al., 2019; Ekeh & Jegede, 2025). As a result, emerging urban forms are often fragmented, inefficient, and spatially unequal.

Urban renewal has been widely adopted as a strategy for addressing these challenges. It is now understood as a multidimensional process involving the coordinated transformation of physical, economic, social, and environmental systems (Ogunnaike et al., 2025; WCED, 1987). However, in practice particularly in Nigeria urban renewal has often been implemented through narrowly focused interventions centred on demolition and redevelopment, with limited attention to the underlying structural systems that shape urban performance (Adekola et al., 2017; 2019). This has reduced the effectiveness of renewal efforts in achieving long-term spatial integration and sustainability.

In response, recent urban theory has increasingly emphasised the role of circulation systems as a fundamental determinant of urban development outcomes. Infrastructure-led development theory positions transport networks, especially road systems, as primary structuring elements

DOI: *https://doi.org/10.5281/zenodo.20264226*

that shape land-use patterns, guide investment, and define accessibility across urban space (Kasraian et al., 2016). Similarly, graph-theoretic network urbanism views urban streets as interconnected systems whose structural properties such as connectivity, centrality, and redundancy can be quantitatively analysed to explain movement patterns and spatial integration (Porta et al., 2006; Marshall, 2005). Together, these perspectives highlight circulation systems as critical drivers of both the intensity and distribution of urban development.

Empirical studies in West African peri-urban regions support this view. Development tends to be corridor-driven, with growth concentrated along major transportation routes, while interior areas remain relatively underdeveloped (Oduro et al., 2014; Adugbila et al., 2023). Although this pattern demonstrates the catalytic role of arterial infrastructure, it also reveals a key limitation: corridor-based growth often produces linear urban forms with weak internal connectivity, reinforcing spatial inequality.

Despite these insights, a notable gap remains in the literature. Most studies focus on the broad relationship between transport infrastructure and urban expansion, with less attention given to how the internal structure of circulation networks influences the quality, equity, and sustainability of urban renewal in peri-urban contexts. In Nigeria, empirical studies that combine network-based spatial metrics with urban renewal analysis are still limited. Kobape, located in Obafemi-Owode Local Government Area of Ogun State, provides a relevant case for addressing this gap. Over the past two decades, the area has undergone rapid transformation driven by the dualisation of the Abeokuta–Sagamu Expressway and state-led housing initiatives. This transformation has been reinforced by state-level development policies that position the corridor as a strategic urban growth axis and gateway into Abeokuta (Ogun State Broadcasting Corporation, 2019; Access Network Services Limited, 2025). While this has stimulated significant development along the corridor, it has also produced uneven spatial outcomes. High-accessibility zones have attracted concentrated growth, while interior areas remain poorly integrated and underserved.

The core problem addressed in this study is therefore the corridor-dominated nature of urban renewal in Kobape. While infrastructure-led growth has been effective in stimulating development, it has also created spatial imbalance due to weak internal network integration. This raises concerns about the long-term sustainability and inclusiveness of such development patterns. Against this background, this study examines how circulation systems shape urban renewal patterns in Kobape, with particular focus on road network structure and its influence on accessibility and spatial integration. The study aims to: (i) analyse the historical relationship between infrastructure investment and urban development; (ii) evaluate road network structure using GIS-based connectivity and centrality metrics; and (iii) propose planning strategies to promote more balanced and sustainable urban renewal.

.

II. Review of Literatures

2.1 Urban Renewal in Nigeria

Urban renewal is a multidimensional process aimed at addressing urban decline through coordinated physical, socio-economic, and environmental interventions. Contemporary approaches extend beyond traditional slum clearance to include redevelopment, rehabilitation, revitalisation, and conservation (Ekeh & Jegede, 2025; Ogunnaike et al., 2025). These strategies are intended to improve urban functionality, liveability, and long-term sustainability.

In Nigeria, however, urban renewal has historically been constrained by institutional and structural challenges. Many initiatives have relied on clearance-driven approaches, often resulting in the displacement of residents without adequate resettlement or social safeguards

(Adekola et al., 2017; 2019). A critical limitation has been the insufficient integration of infrastructure particularly circulation systems into planning and implementation, leading to persistent spatial inefficiencies and uneven development outcomes.

Recent policy developments indicate a gradual shift toward more integrated approaches. In Ogun State, urban renewal initiatives increasingly combine housing provision with supporting infrastructure such as roads, drainage, and utilities (Ibitoye et al., 2025). This reflects a growing recognition that effective urban renewal must be infrastructure-led, spatially coordinated, and functionally integrated.

2.2 Circulation Systems and Urban Form

Circulation systems play a fundamental role in shaping urban structure by influencing accessibility, which in turn affects land-use patterns, economic activity, and spatial organisation (Marshall, 2005; Kasraian et al., 2016). Well-connected networks enhance mobility, reduce travel costs, and promote spatial integration, thereby attracting investment and supporting urban growth. In contrast, poorly connected or fragmented networks restrict movement, reduce accessibility, and contribute to spatial marginalisation (Porta et al., 2006).

Graph-theoretic analysis provides a robust framework for evaluating circulation systems by modelling road networks as interconnected systems of nodes (intersections) and links (road segments). This approach enables the quantitative assessment of network performance through key metrics such as intersection density, link-node ratio, and betweenness centrality. These indicators capture different dimensions of connectivity, redundancy, and movement concentration, and are particularly useful for explaining how variations in network structure influence development patterns and spatial equity.

2.3 Peri-Urban Growth in Southwest Nigeria

Peri-urban areas in Southwest Nigeria are undergoing rapid spatial transformation, driven largely by the outward expansion of Lagos and improvements in regional connectivity. This has accelerated land-use change and intensified development pressure in neighbouring regions, particularly in Ogun State (Arowolo et al., 2021).

Road infrastructure plays a central role in this transformation by enhancing accessibility and attracting residential and commercial development. Housing estates—both public and private—have emerged as key drivers of spatial expansion, reinforcing accessibility as a primary determinant of land-use patterns. This process is further shaped by housing policy frameworks and construction strategies that influence affordability and development patterns in emerging urban areas (Ibimilua & Ibitoye, 2015; Ibitoye et al., 2022).

A dominant spatial pattern in these areas is corridor-based (or ribbon) development, where growth is concentrated along major transport routes while interior areas remain relatively underdeveloped (Oduro et al., 2014; Adugbila et al., 2023). While this pattern supports rapid expansion, it often results in weak internal connectivity, inefficient spatial structure, and uneven development. These limitations highlight the need for more integrated planning approaches that extend beyond corridor-focused growth to include well-connected internal circulation networks. In addition, socio-cultural factors embedded in the built environment also influence how such developments evolve and are experienced within local contexts (Ogunyemi et al., 2023).

2.4 Research Gap

Although there is extensive scholarship on urban renewal and transportation infrastructure, limited attention has been given to the relationship between circulation network structure and the spatial quality of urban renewal in peri-urban Nigerian contexts. Existing studies tend to examine urban renewal from socio-economic or policy perspectives, or analyse transportation systems in isolation, with minimal integration of network-based spatial metrics. Furthermore, while corridor-driven growth is well documented, insufficient attention has been paid to how deficiencies in internal road network structure constrain equitable development

within rapidly urbanising settlements. As a result, there remains a limited understanding of how circulation systems influence not only the pattern but also the inclusiveness of urban development in peri-urban areas.

2.5 Theoretical Framework

To address the identified gap, this study is grounded in three complementary theoretical perspectives: infrastructure-led urban development theory, graph-theoretic network urbanism, and sustainable urban renewal theory. Together, these frameworks provide a conceptual foundation for analysing how circulation systems influence spatial development, accessibility, and the equity of urban renewal outcomes.

a.Infrastructure-Led Urban Development Theory

Infrastructure-led urban development theory posits that the provision of physical infrastructure particularly transportation networks, utilities, and drainage systems precedes and stimulates urban growth. Rather than merely responding to existing demand, strategic infrastructure investment creates the conditions necessary for residential development, commercial activity, and institutional expansion (Kasraian et al., 2016; Turok & McGranahan, 2013).

In peri-urban contexts such as Kobape, where formal planning capacity is often limited, arterial road infrastructure plays a decisive role in shaping development patterns. Major road corridors enhance accessibility, increase land values, and attract both public and private investment. Consequently, infrastructure provision becomes a primary driver of urban renewal, influencing not only the pace but also the spatial distribution of development.

b. Graph-Theoretic Network Urbanism

Graph-theoretic network urbanism provides a structural framework for analysing circulation systems by modelling road networks as interconnected systems of nodes and links. This approach enables the quantitative evaluation of network performance through metrics that capture connectivity, redundancy, and accessibility (Porta et al., 2006; Marshall, 2005). Key indicators include intersection density, which reflects network granularity and walkability; link-node ratio, which measures connectivity and alternative route availability; and the gamma index, which evaluates overall network completeness. Centrality measures such as betweenness centrality and closeness centrality provide further insight into movement concentration and accessibility efficiency.

In this study, these metrics are used to diagnose the structural characteristics of Kobape's road network and to explain how variations in connectivity influence spatial development patterns and levels of integration.

c. Sustainable Urban Renewal Theory

Sustainable urban renewal theory emphasises the need for urban transformation processes to address physical, economic, social, and environmental dimensions simultaneously, while promoting inclusiveness and long-term resilience (WCED, 1987; Ekeh & Jegede, 2025). Unlike conventional approaches that prioritise physical redevelopment, this perspective advocates for integrated interventions that enhance infrastructure, improve accessibility, and ensure equitable access to services.

Applied to circulation systems, this framework requires that infrastructure development extend beyond primary corridors to include well-connected internal road networks, pedestrian pathways, and supporting services such as drainage. This ensures that the benefits of urban renewal are distributed more evenly across the settlement, rather than being concentrated solely in high-accessibility zones.

.

III. Methodology

3.1 Research Design

This study adopts a mixed-methods research design to examine how circulation network structure influences urban renewal patterns in Kobape, Ogun State. The approach integrates quantitative GIS-based network analysis with qualitative field observation and policy review. This combination enables a dual-level analysis: a structural evaluation of road network performance based on graph-theoretic principles, and a contextual interpretation of how infrastructure provision shapes development patterns within the framework of infrastructure-led urban development.

By combining these methods, the study assesses not only the physical configuration of the circulation system but also its implications for spatial integration, accessibility, and the inclusiveness of urban renewal outcomes, as emphasised in sustainable urban renewal theory.

3.2 Study Area

Kobape is a rapidly transforming peri-urban settlement located along the Abeokuta–Siun–Sagamu Expressway in Obafemi-Owode Local Government Area of Ogun State, southwestern Nigeria. Geographically, it lies approximately 10 kilometres east of Abeokuta, the state capital, and forms part of a strategic growth corridor linking Abeokuta to the Lagos–Ibadan Expressway via the Sagamu interchange. This location situates Kobape within a broader peri-urban expansion zone influenced by the outward growth of Lagos.

Historically, Kobape was a predominantly agricultural settlement characterised by dispersed traditional compounds and extensive vegetation cover. However, the construction and subsequent upgrading of the Abeokuta–Sagamu corridor marked a significant turning point in its development trajectory. Improved road infrastructure enhanced accessibility and triggered rapid land-use transformation, with built-up areas expanding considerably over the past two decades (Arowolo et al., 2021). This pattern reflects the principles of infrastructure-led urban development, where arterial road investment acts as a catalyst for urban growth.

More recently, state-led housing initiatives and private estate developments have accelerated urbanisation. Organised housing schemes, institutional facilities, and emerging commercial activities are now concentrated along the expressway, reinforcing its role as the primary axis of development.

Despite this growth, the internal spatial structure of Kobape remains uneven. While areas along the corridor benefit from relatively high accessibility and infrastructure provision, interior zones are characterised by weak road connectivity, irregular layouts, and limited access to services. This spatial contrast between well-developed corridor zones and under-integrated interior areas highlights the central role of circulation systems in shaping urban development patterns.

These characteristics make Kobape an appropriate case for examining how road network structure influences spatial development, accessibility, and the inclusiveness of urban renewal, as investigated through the methods outlined in the following sections.

3.3 Data Sources

Road network data were obtained from OpenStreetMap and validated using Google Earth satellite imagery (2023–2024) to ensure spatial accuracy. Additional spatial and administrative datasets including housing layouts, road alignments, and planning boundaries were sourced from relevant Ogun State planning authorities. These datasets were complemented by secondary data on land-use change within Obafemi-Owode Local Government Area, providing a broader context for analysing infrastructure-led development patterns.

Field surveys were conducted to verify road conditions, connectivity patterns, and infrastructural characteristics within the study area. These observations were particularly important for assessing the functional performance of the circulation system beyond its

mapped structure, including issues of accessibility and internal network integration relevant to sustainable urban renewal. The classification and hierarchy of road networks were further guided by established national standards, particularly the Federal Roads Maintenance Agency framework for road categorisation (FERMA, 2020).

3.4 Analytical Tools and Procedures

Spatial data processing and network modelling were carried out using QGIS (version 3.x) and ArcGIS Network Analyst. The road network was structured into nodes (intersections) and links (road segments), consistent with graph-theoretic network urbanism, to enable quantitative analysis of connectivity and centrality.

The network was further classified into a hierarchical system comprising arterial, collector, and local roads. This classification reflects the functional differentiation of circulation systems emphasised in infrastructure-led urban development theory, where primary corridors drive large-scale development, while secondary and local networks determine the extent of internal accessibility and spatial integration.

3.5 Network Metrics and Analysis

Network performance was evaluated using graph-theoretic metrics aligned with the theoretical framework outlined in Section 2.5. Intersection density was used to assess network granularity and walkability potential, while the link-node ratio measured connectivity and route redundancy. The gamma index was applied to evaluate overall network completeness, indicating the extent to which the network approaches its maximum possible level of connectivity.

Centrality measures were also employed to capture movement dynamics and accessibility patterns. Betweenness centrality was used to identify dominant movement corridors and assess the degree of reliance on primary routes, reflecting the principles of infrastructure-led development. Closeness centrality was used to evaluate accessibility efficiency across the network, providing insight into how easily different locations can be reached within the system.

Together, these metrics provide a systematic and quantitative basis for analysing how circulation network structure influences spatial development patterns and levels of integration.

3.6 Analytical Framework

The analysis is guided by the theoretical framework outlined in Section 2.5, which integrates infrastructure-led urban development theory, graph-theoretic network urbanism, and sustainable urban renewal theory.

Infrastructure-led urban development theory is used to interpret how the provision and hierarchy of road infrastructure shape the spatial distribution of development and investment within Kobape. Graph-theoretic network urbanism provides the methodological basis for analysing the structural properties of the road network through connectivity and centrality metrics. Sustainable urban renewal theory informs the evaluation of the equity and inclusiveness of these development patterns, particularly in relation to accessibility, internal network integration, and the distribution of infrastructure benefits.

The integration of these frameworks ensures that the analysis moves beyond descriptive assessment to a theoretically grounded evaluation of how circulation systems influence both the form and quality of urban renewal outcomes.

IV. Result and Discussion

4.1 Road Network Structure and System Performance

The structural analysis of Kobape's road network indicates a system with moderate overall connectivity but significant internal inefficiencies. To establish a quantitative basis for this assessment, key network performance indicators were computed and are summarised in Table 1.

Table 1. Road Network Structural Characteristics of Kobape, Ogun State

Metric	Value	Benchmark / Standard	Interpretation	Planning Implication
Intersection Density (junctions/km²)	4.2	6–10	Below standard; low permeability	Limits walkability and accessibility
Link-Node Ratio	1.18	≥1.4	Low redundancy	Few alternative routes
Gamma Index (γ)	0.41	0.70–0.80	Incomplete network	Missing internal links
Betweenness Centrality (primary corridor)	0.78	-	Very high concentration	Overdependence on arterial
Closeness Centrality (interior zones)	0.29	≥0.5	Low accessibility	Suppressed interior development
Average Shortest Path Length (interior)	3.8 km	0.8–1.5 km	Excessively long	Inefficient local mobility

Source: (Author's synthesis, 2026)

As shown in Table 1, all key indicators fall below recommended thresholds for functional urban networks, particularly in terms of permeability, redundancy, and accessibility. These deficiencies are further illustrated through a comparative visualisation of selected metrics in Figure 1.

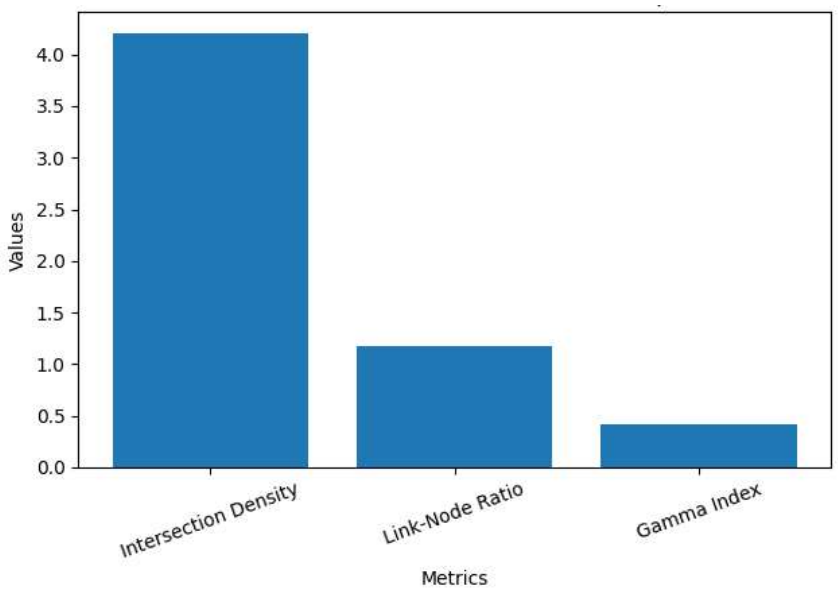

Figure 1: Comparative analysis of network performance indicators relative to recommended benchmarks.

Source: (Author's synthesis, 2026)

The results indicate that Kobape's road network operates as a low-redundancy, partially connected system, with movement heavily concentrated along the Abeokuta–Sagamu

Expressway. The low closeness centrality (0.29) and high average shortest path length (3.8 km) further highlight inefficient internal accessibility, particularly within interior zones.

Collectively, these findings reveal a topologically imbalanced network, where mobility efficiency is concentrated along a single corridor, limiting resilience and undermining equitable access—key considerations for sustainable urban renewal.

4.2 Spatial Inequality and Connectivity Gradients

The spatial structure of Kobape exhibits a pronounced connectivity gradient, with accessibility declining sharply from the primary corridor into interior zones. The expressway functions as the dominant accessibility spine, supporting concentrated development.

In contrast, areas located between 200 and 800 metres from the corridor exhibit low accessibility, as evidenced by reduced centrality values and longer path lengths. These areas are characterised by fragmented road networks, dead-end configurations, and limited supporting infrastructure, resulting in poor internal circulation.

This pattern reflects the corridor-driven urbanisation model identified in the literature, where development intensity is strongly aligned with transport infrastructure. However, in the absence of an integrated secondary network, this model produces uneven accessibility distribution, reinforcing spatial inequality and limiting the diffusion of development benefits.

4.3 Accessibility as a Determinant of Development Intensity

The relationship between accessibility and development intensity is examined by analysing the spatial distribution of housing estates relative to the primary road network. This relationship is illustrated in Figure 2.

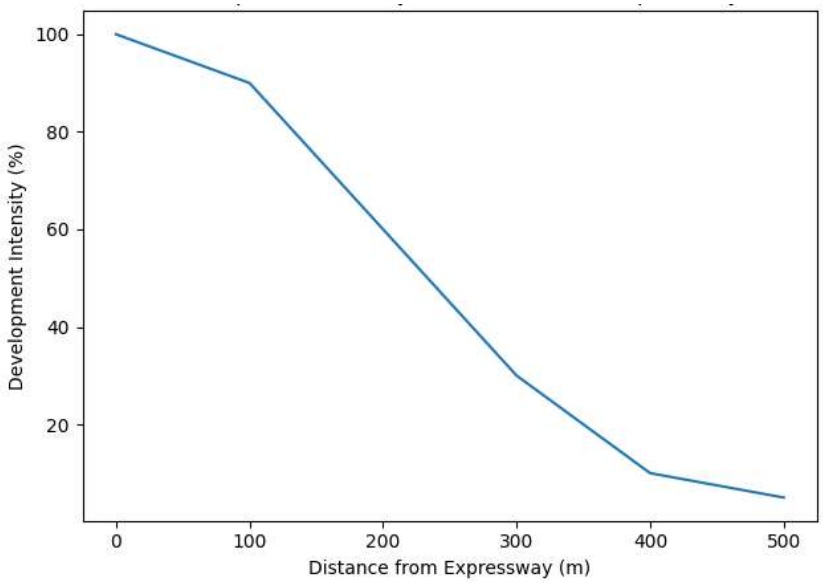

Figure 2: Relationship between development intensity and distance from the primary expressway.

Source: (Author's synthesis, 2026)

Figure 2 shows a clear decline in development intensity with increasing distance from the expressway. Empirical observations indicate that all major housing developments are located within approximately 150 metres of the corridor, with minimal formal development beyond 300 metres in the absence of secondary road connections.

This pattern confirms that accessibility functions as a primary determinant of development viability, effectively defining the spatial limits of organised urban growth. However, it also reinforces a linear, corridor-based urban structure, which limits spatial integration and constrains long-term urban efficiency.

4.4 Synthesis: Circulation Systems, Urban Form, and Sustainability

The evidence from Table 1 and Figures 1–2 confirms that circulation infrastructure is the primary structuring mechanism of urban form in Kobape. The Abeokuta–Sagamu Expressway not only facilitates movement but also drives development patterns, investment concentration, and land-use transformation. However, the concentration of connectivity along a single corridor creates critical structural challenges, including spatial inequality, network fragility, and reduced sustainability. Accessibility is unevenly distributed, the system depends heavily on one arterial route, and weak internal connectivity increases travel distances and limits integration. These challenges are compounded by intensive heavy-duty traffic, particularly from quarry operations within the Abeokuta axis, which accelerates road deterioration and increases maintenance pressure (Vanguard, 2023). This further weakens the resilience and long-term performance of the circulation system. Overall, while circulation systems enable urban renewal, their current configuration in Kobape produces systemic imbalances. Corridor dominance reinforces linear development while constraining integration within interior zones. Addressing this requires a shift to a network-integrated model, where connectivity is distributed across a hierarchical road system to improve accessibility, redundancy, and spatial equity. These findings are consistent with broader empirical evidence on urban renewal and infrastructure planning within Ogun State and similar contexts (Ibitoye & Olaoye, 2025), reinforcing the need for connectivity-driven planning beyond primary transport corridors.

V. Conclusion

This study has demonstrated that circulation systems constitute the primary structural determinant of urban renewal outcomes in peri-urban environments, with Kobape providing a clear empirical case. The transformation of the settlement has been driven predominantly by the Abeokuta–Sagamu Expressway, confirming the central role of arterial infrastructure in catalysing housing development, commercial activity, and institutional investment. However, the findings reveal that infrastructure provision alone is insufficient to achieve sustainable urban renewal. Despite the efficiency of the primary corridor, the overall network is characterised by low intersection density (4.2 junctions/km^2), weak redundancy (link-node ratio of 1.18), and incomplete structural integration (gamma index of 0.41). These conditions have produced a corridor-dominated urban form in which development is spatially concentrated along high-accessibility zones, while interior areas remain marginalised and under-served.

The study therefore establishes that corridor-based urban renewal is inherently limited, as it generates uneven spatial outcomes and introduces systemic vulnerability through over-reliance on a single movement axis. Sustainable and inclusive urban development requires a transition from linear infrastructure expansion to integrated network-based planning, where accessibility is distributed across the entire settlement. The principal contribution of this research lies in advancing a connectivity-centred understanding of urban renewal, demonstrating that the effectiveness of infrastructure is determined not by its presence, but by its structural configuration and level of integration within the broader circulation network. This insight has direct implications for peri-urban planning across Nigeria and other rapidly urbanising regions in sub-Saharan Africa.

Recommendations

Based on the findings, the following recommendations are proposed to enhance urban renewal through effective circulation system design:

1. Hierarchical Network Development: A structured four-tier road hierarchy should be implemented, comprising primary arterials, secondary collectors, local access roads, and pedestrian pathways. Secondary collector roads should be developed at intervals

of 400–600 metres to redistribute movement flows and reduce dependence on the primary corridor.

2. Network Completion and Connectivity Enhancement: A targeted programme of road network completion should be prioritised, focusing on approximately twelve identified missing links within interior zones. These interventions are expected to reduce average travel distances from 3.8 km to approximately 1.4 km and increase intersection density to above 6 junctions/km², thereby improving accessibility and supporting balanced development.
3. Connectivity-Based Planning Standards: Planning regulations should incorporate enforceable connectivity thresholds, including a minimum link-node ratio of 1.4, a maximum cul-de-sac length of 120 metres, and a requirement for pedestrian access within 400 metres of residential plots. These standards should be embedded within state planning frameworks to ensure long-term network integration.
4. Integration of Pedestrian Infrastructure: Pedestrian and non-motorised transport infrastructure should be integrated into all levels of the circulation network. The provision of sidewalks, footpaths, and safe crossings is essential for improving mobility, safety, and inclusiveness in peri-urban environments.
5. Institutional Coordination and Governance: Stronger coordination among planning authorities, road agencies, and private developers is required to ensure consistency in network design and implementation. A unified framework for circulation planning should be established to guide development across the study area.
6. Infrastructure Maintenance and Financing: To address the impact of heavy vehicular activity particularly from quarry operations, axle-load regulations should be enforced, and weighbridge systems introduced. A dedicated road maintenance fund, supported by levies on high-impact economic activities, should be established to ensure long-term infrastructure sustainability.

Limitations and Future Research

While this study provides important insights into the role of circulation systems in urban renewal, certain limitations should be acknowledged. The analysis is based primarily on spatial network metrics and secondary data sources, with limited incorporation of real-time traffic flow data and user behaviour. Additionally, the study focuses on a single case study area, which may limit the generalisability of findings across different urban contexts. Future research should address these limitations by incorporating empirical mobility data, including travel patterns and mode choices, to provide a more comprehensive understanding of circulation system performance. Further studies are also needed to examine the relationship between accessibility and housing affordability, particularly in rapidly urbanising peri-urban areas.

Comparative analyses across multiple settlements within Ogun State and other regions of Nigeria would help to validate the broader applicability of the connectivity-led urban renewal model. Additionally, longitudinal studies tracking land-use change, infrastructure investment, and socio-economic outcomes over time would provide deeper insights into the long-term impacts of circulation-driven urban development.

References

Adekola, P. O., Allen, A. A., & Tinuola, R. F. (2017). Socio-economic and health implications of urban renewal on internally displaced persons in Ogun State, southwestern Nigeria. Journal of Internal Displacement, 7(1), 13–26.

Adekola, P. O., Lim, J., & Stephenson, J. (2019). Urban renewal in Nigeria: A slash and burn approach? Environment, Development and Sustainability, 21(3), 1365–1381. https://doi.org/10.1007/s10668-018-0130-2

Access Network Services Limited. (2025, October). Access Network Services eyes Kobape, Abeokuta for new city development. New Telegraph. https://newtelegraphng.com

Adugbila, E. J., Martinez, J., & Pfeffer, K. (2023). Peri-urban growth and road corridor development in West Africa: Patterns and implications. Cities, 137, 104292. https://doi.org/10.1016/j.cities.2023.104292

Arowolo, O. A., Deng, X., Olatunji, O. A., & Obafemi, A. A. (2021). Urban expansion and rural landscape transformations in selected communities of Obafemi Owode Local Government Area of Ogun State, Nigeria. SN Social Sciences, 1(8), 198. https://doi.org/10.1007/s43545-021-00198-3

Ekeh, E. Y., & Jegede, F. (2025). Assessing urbanisation trends, urban renewal and sustainable urban development in Nigeria. International Journal of Architecture and Planning, 5(1), 13–22.

Federal Roads Maintenance Agency (FERMA). (2020). Road classification standards for Nigeria. Federal Republic of Nigeria.

Ibimilua, A. F., & Ibitoye, O. A. (2015). Housing policy in Nigeria: An overview. American International Journal of Contemporary Research, 5(2), 52–59.

Ibrahim, A. H., Odunze, W. C., Farouk, N. M., & Liman, A. A. (2022). Analysing the pattern and urban planning implications of sprawl on quality of life in Kaduna metropolis, Nigeria. FUDMA Journal of Sciences, 6(2), 127–137. https://doi.org/10.33003/fjs-2022-0602-930

Ibitoye, O. A., Abiola, O. A., Babamboni, A. S., Alagbe, O., Dare-Abel, O., Solomon, B. A., Afolabi, T. A., & Oyewole, A. (2025). Integrated housing and infrastructure delivery in Ogun State: Implications for urban renewal and peri-urban development. African Journal of Environmental Sciences and Renewable Energy (AJESRE).

Ibitoye, O. A., Abiola, O. A., & Babamboni, A. S. (2023). Demographic characteristics of housing estates developed with ISSB technology in selected southwestern Nigerian cities. FUDMA Journal of Sciences, 7(2), 275–283. https://doi.org/10.33003/fjs-2023-0702-2038

Ibitoye, O. A., Alagbe, O., & Dare-Abel, O. (2022). Comparative cost advantages of interlocking stabilized soil block and sandcrete block for building construction in South-West Nigeria. International Journal of Scientific Research and Engineering Development, 5(5), 549–558.

Ibitoye, O. A., Solomon, B. A., Afolabi, T. A., & Oyewole, A. (2022). Documentation of local architectural vocabularies for residential building components in Yoruba cultures. FUDMA Journal of Sciences, 6(1), 404–414. https://doi.org/10.33003/fjs-2021-0601-2037

Ibitoye, O. A., & Olaoye, O. G. (2025). Urban renewal and environmental assessment in Ogun State. African Journal of Environmental Sciences and Renewable Energy (AJESRE). https://afropolitanjournals.com/index.php/ajesre/article/view/748

Kasraian, D., Maat, K., Stead, D., & Van Wee, B. (2016). Long-term impacts of transport infrastructure networks on land-use change: An international review of empirical

studies. Transport Reviews, 36(6), 772–792. https://doi.org/10.1080/01441647.2016.1168887
Legit.ng. (2026, February). A glimpse into Governor Dapo Abiodun's housing reforms. Legit.ng. https://www.legit.ng
Marshall, S. (2005). Streets and patterns. Routledge.
Oduro, C. Y., Adamtey, R., Ocloo, K., & Adarkwa, K. K. (2014). Urban growth and the transportation system in peri-urban Kumasi, Ghana. Journal of Social Sciences, 41(2), 213–225.
Ogun State Broadcasting Corporation. (2019, January). Amosun speaks on Ogun State's development master plan. OGBC. https://ogunradio.ng
Ogunnaike, A., Morka, E. J., & Sigha, A. (2025). Urban renewal as a strategy for revitalizing Nigerian cities: Lessons from global and local case studies. Journal of Built Environment and Geological Research, 8(4). https://doi.org/10.70382/ajbegr.v8i4.040

Ogunyemi, O. G., Iweka, A., Adejumo, T., Adenubi, O. O., & Chukwuka, O. P. (2023). Symbolic forms in church architecture: A case study of Saint Augustine Catholic Church, Ikorodu, Lagos State. Caleb International Journal of Development Studies, 6(1), 161–178.
Olaniyi, T., & Agbaje, A. A. (2024). Integrated solutions for urban sustainability in Lagos, Nigeria: Enhancing housing accessibility and transportation efficiency. International Journal of Innovative Business Strategies. https://doi.org/10.20533/ijibs.2046.3626.2024.0081
Porta, S., Crucitti, P., & Latora, V. (2006). The network analysis of urban streets: A primal approach. Environment and Planning B: Planning and Design, 33(5), 705–725. https://doi.org/10.1068/b32045
Premium Times. (2026, March). Roads, rhetoric and reality: Inside Abiodun's infrastructure push across Ogun. Premium Times. https://www.premiumtimesng.com
The Peoples Voice. (2026, January). Ogun State strengthens housing development as Prince Court Estate, Kobape, records rapid growth. The Peoples Voice. https://www.thepeoplesvoice.com.ng
Turok, I., & McGranahan, G. (2013). Urbanisation and economic growth: The arguments and evidence for Africa and Asia. Environment and Urbanization, 25(2), 465–482. https://doi.org/10.1177/0956247813490908
UN-Habitat. (2022). World cities report 2022: Envisaging the future of cities. United Nations Human Settlements Programme.
Vanguard. (2023, September). As Ogun moves to preserve Abeokuta–Sagamu road. Vanguard Newspapers. https://www.vanguardngr.com
World Commission on Environment and Development (WCED). (1987). Our common future. Oxford University Press.