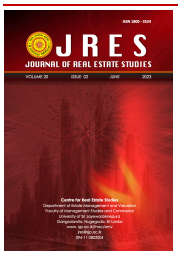

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Urban Neighbourhood Infrastructure Conditions and Residential Property Investment Performance in Jos City, Nigeria

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ABSTRACT

The performance of residential property investments is intricately tied to neighbourhood infrastructure. This study examines the impact of urban neighbourhood infrastructure on property investment performance in Jos, Nigeria. Through direct observations, secondary data analysis, and surveys conducted among 161 respondents (returned forms from selected residents and registered estate surveyors and valuers drawn from estate surveying firms) in Kufong, Gwang Layout, Low-cost, and Rayfield neighbourhoods, the study reveals varying levels of investment performance. Gwang Layout and Low-cost exhibit superior returns compared to Rayfield and Kufong, which experience higher market fluctuations (8% - 36%). Infrastructure condition indices for Rayfield and Kufong range between 72% and 89% and 81% and 94%, respectively. In contrast, some aspects of infrastructure in Gwang Layout and Low-cost fall below standards. The study underscores the significant impact of functional infrastructure on residential property investment returns (W=0.801 and rs=0.455), emphasising the necessity for periodic feasibility and viability assessments to determine sound real estate investments at the submarket level.

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1. INTRODUCTION

Infrastructure is a primary facility and system, including the aggregate services and facilities serving a city, district, or neighbourhood. It facilitates or catalyses many countries' economies to exert their influence efficiently and pervasively (Lemo, 2011). It is an essential condition for sustainable cities (Wesołowska, 2016). Infrastructure is a change model, and it ideally stands high amongst the noticeable indicators of advanced urban economies. Public investment in infrastructure facilitates all aspects and levels of city

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planning's progress towards a better living (Afolabi et al., 2018; Yang et al., 2020a). By all standards, it is the backbone of any liveable city. Its advent, adduced by Tian (2006), creates expected changes in residential property value. The link between infrastructure and property investment shows sufficient infrastructure provision and effective property market operation. In contrast, the backward link demonstrates a disconnect or severe deficiencies. Apart from being a great enabler of economic growth and better living conditions, infrastructure has the proclivity to attract social and economic investments of all forms and magnitude, thus underpinning the nexus between real estate investment and development (Ajakaiye, 2015; Novikova, 2022).

We cannot discount the importance of residential property as a viable investment option. Contextually, Bello et al. (2013) posited that property investment is the real estate property purchased or rented to earn an investment return and rental income on present or future sales and resales of property. Property investments are usually owned individually or under joint ownership or management. Therefore, infrastructure development is pivotal to real estate development. Ononugbo et al. (2002) and Ajayi et al. (2014) observed that specific principles and criteria guide property investment performance. These principles and guideline indicators comprise investment yields, value indices, and total returns for promoting property investment appraisal. It is instructive to state that return on investment is a function of location and varies accordingly from one location to where invested real estate is situated. Meanwhile, Erdogan (2020) and Džupka & Gróf (2021) posited that a tremendous increment in investments in real estate could trigger distinct improvements in sustainable infrastructural development. Huge investments in real estate within a short period and supported with sufficient public awareness create an opportunity for cities' developmental progress to be measured and controlled.

Investment refers to the overall success of an investment in residential property. Such performance transcends several aspects, including financial returns (American Association of Children's Residential Centers, 2009; Crook, Hughes and Kemp, 1998) and price fluctuations (Nichols, Oliner and Mulhall, 2012). Extrapolations from many studies (Tomlinson, 2001; Boye, 2002; Bennett, 2019; Islam et al., 2022; Khaled Al Shawabkeh et al., 2022) that have rigorously found ways of linking infrastructural development with residential property investment have categorised infrastructural constructs in urban and rural settings into three (3) broad ways: (1) Social infrastructure – predicated on population pull, security, recreational and health; (2) Economic infrastructure – associated with banking facilities, stock and labour exchange, entrepreneurial and other financial infrastructures; (3) Physical infrastructure – includes infrastructures that contribute to the physical improvement of a neighbourhood, district or nation's growth and development. It ranges from technological, drainage and sewerage, communication, power generation, transportation, and water supply to industrial infrastructures. Perspicuously, infrastructural constructs, as they strengthen residential property development, should be large-scale public systems with robust facilities capable of delivering quality services and a penchant for stimulating economic activities; protecting the environment, and improving the nation's living conditions (Water Engineering and Development Centre (WEDC), 2007). However, leading studies like Olujimi and Bello (2009) on cities' infrastructure, dovetailing infrastructural development with residential property investment adduced

infrastructure as social and economic support of an urban area. The studies, moreover, stratify urban infrastructure into physical and technical infrastructure – a concise departure from manifold classifications obtainable in rural settings. The physical infrastructure offers utility services. These include systems of transportation, solid waste disposal, sewage and sewerage, and power generation.

On the other hand, technical infrastructure includes technologically driven services instituted to fortify sustainable urban development. Among the noticeable technological infrastructures are communication, banking, and finance systems (Wesołowska, 2016). These dichotomous sets of infrastructure are often labelled proxy indicators or infrastructural indices. As such, they are considered a sine qua non for any meaningful infrastructural analysis. Ojo et al. (2018) asserted that measuring urban infrastructure performance is a function of factors of production that spur inclusive and economic growth, while Yang et al. (2020b) observed that it bridges the regional gap and precipitates economic growth and development. The study capsulises these urban infrastructural indices under four (4) headings: power, transport, industrial land, and information and communication technology (ICT).

A tangible link between infrastructure and residential property investment may seem to exist. A robust institutional framework often strengthens these links. In other words, there cannot be any considerable residential property development and investment without a robust institutional framework or organisational readiness driving infrastructural development. Although, within limited methodologies, Kauko (2004) evinced that the principle of multiple working hypotheses (MWH) and rule-based expert systems had found bountiful and innovative ways to establish that residential property development is an infrastructure function. More succinctly, MWH has further shown these infrastructures' contributory significance in academic literature. In other words, property investment performance depends considerably on the total cost of investment management, risk and return of the investment, considering the efficiency and functionality of available infrastructure within which investors must operate (Dubben & Sayce, 2009).

Hargitay & Yu (1993) and Adeogun et al. (2019) described property investment as acquiring assets whereby an institution or an individual's overall goal is to earn profit through capital gains or income. Property investment provides realistic and operational marketing and asset management that commands sustainable returns through two distinctive paradigms. On the one hand, income property investment (IPM) explains how leased-out residential properties command returns from a periodic rental income. On the other hand, speculative property investment (SPI) includes raw land and properties. It demonstrates how they realistically and primarily control returns from value appreciation resulting from their location, scarcity, modern finishing, aesthetic features, and infrastructural facilities. Moreover, investors can employ a surfeit of alternatives in an investment market to invest funds for meaningful returns. Initial capital outlay is one of the building blocks in property development before expected returns can be made.

Property investment involves anticipated rewards in the circular flow of income (rent), return from a single capital sum (sale), or both. It is instructive to note that not all investments have the penchant for guaranteeing returns or compelling investors to obtain returns. There will be

no guarantee for property investment sustainability if there are inherent problems with the dearth of infrastructure and functional deficiency in urban areas. As Bamgbe (2010) averred, the performance of residential property investments in Nigeria is often affected by inadequate quality infrastructure. Regrettably, the same scenario plays out in Jos city. For instance, Ajayi et al. (2014) study in Minna, Nigeria, focused on urban infrastructure and property rental values from 1998 to 2009. Regression analysis, a statistical instrument employed to measure the probable impact of some of the infrastructure on property rental values, revealed that access roads significantly influence rent variation to 43.9 percent. In other words, a 100 per cent increase in road access would lead to a 43.9 per cent rise in property rental values.

Furthermore, Public and private property investors have attempted to address Jos's infrastructural deficit. Avid observations conflated with anecdotal evidence on the Jos housing market evinced that it has formed a dispersed and fragmented pattern that has remained uninvestigated by previous scholarships. Also, investigations on the recondite pressure of population surge, exacerbated by ethnoreligious crises forcing residents to build new residential property in the peri-urban areas, have remained undocumented or work in progress. Downtown areas comprising Gangare, Sarkin Arab, Abba Nashehu, Rikkos, Anguwna Rimi, Dilimi, Yan Keke and Anguwan Rogo have suffered massive invasion due to violence that ravaged Jos city during the first decade of this century. This precarious situation left a charred infrastructure in its wake. It precipitated the exodus of investors who hustled their property investment to peri-urban areas (Kufong, Rayfield and Gwan layouts) of Jos city for new markets.

Against this background, the present study assesses the implication of urban neighbourhood infrastructure conditions on residential property investment performance. The study examines the infrastructure conditions and trends in residential property investment performance between 1999 and 2018, focusing on investment-driven residential properties in Jos city, Nigeria.

2. THE STUDY AREA

Jos city, the capital of Plateau State, lies between Latitudes 90 57"N- 90 50"N and Longitude 80 55"E-80 51"E in North Central Nigeria. Jos is the most populated town in the state and experiences significant growth in real estate development and property investment. Jos is endowed with infrastructure essential to a city and has shown an affinity for more due to the wave of expansion the city experiences (Figure 1). It was against this backdrop that we selected Jos city for this study. Besides, economic growth generates physical land and residential property development in this part of Nigeria, with an increased demand for land for residential housing, especially for residential property (accommodation) investment. With the scarcity of land in the property market for residential use, there is a need to monitor the individual, institution, and government policy on the effective utilisation of land (Kauko, 2003). Data were easily and readily accessible, emphasising returns of residential properties within ten years (2009 to 2018) in the study area. More so, most town planning regulations are primarily operated in urban areas.

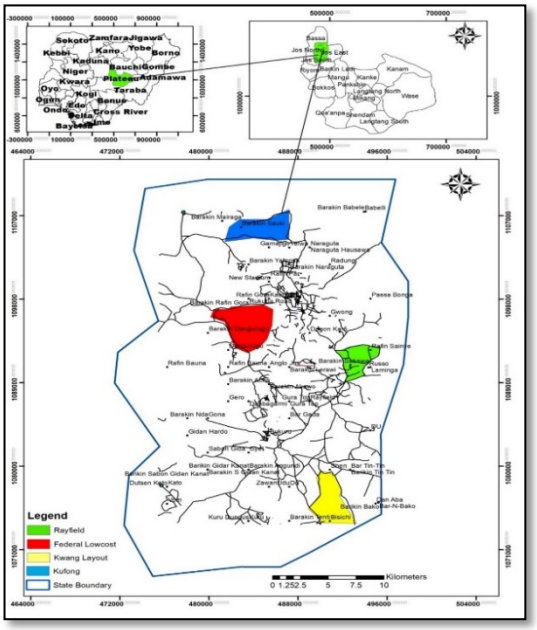
Meanwhile, personal observations revealed that the residential environment of Jos city has witnessed unprecedented changes as residential real estate growth becomes significant. These changes include speculative activities, congested developments, building conversions and

vertical extension of residential buildings brought about by the lopsided relationship between housing demand and supply. Speculative activities are demonstrated with the fragmentation of standard plots into smaller plots by landowners or speculators for subsequent sale to prospective homeowners to develop residential houses. Residential buildings were also constructed in breach of extant planning regulations set out by the Plateau State Development Board. There was also a high conversion rate of residential dwellings to commercial (shops), especially properties situated along main streets. This trend accelerated shortly after unknown persons burned down the Jos Ultra-Modern market in February 2002 (Idegu, 2013). Thousands of traders were displaced from the market into the streets of Jos, creating new demand for shops. Lastly, with the resulting increase in demand for residential dwellings, house owners within the inner city have started converting their obsolete houses into Storey buildings of between 2 to 4 stories to meet demand.

Infrastructural development occasioned by tin mining has provided diverse ways of survival. Moreover, high population growth and ethnoreligious crises have overstretched these extant infrastructural facilities and rendered them vestigial.

The peri-urban areas, for instance, have witnessed a surge in the growth of urban land uses and activities. This has been an ongoing process for quite a long time due to the rapid increase in urban population and urbanisation. In the last two decades, the growth rate has accelerated more in the peri-urban areas. It thus can be attributed to the influence of violence as people try to escape from inner-city neighbourhoods that are prone to violence and are most affected during crises. There have been massive movements of Christians from the inner city areas of Gangare, Sarkin Arab, Abba Nashehu, Rikkos, Anguwna Rimi, Dilimi, Yan Keke and Anguwan Rogo Areas. Many of them lost their properties there in the 2001 and 2008 crises.

Figure 1: Selected Neighbourhoods in the Context of Jos Metropolis



Source: Plateau State Town Planning Authority Unit (2020)

3. LITERATRE REVIEW

Real estate is a significant component of the world's income and wealth (Kapplan and Schwartz, 2005). It also accounts for over one-third of the world's wealth and is the most valuable investment class. According to Corgel, Ling and Smith (2001), real estate accounts for 49% of global wealth, or S21.41 trillion. $44 trillion, with equities and bonds accounting for 25.5% and 18.8%, respectively. Real estate differs from other types of investment assets in various ways, including fixed location, property heterogeneity, high unit value, illiquidity, and the use of suitable valuations to assess real estate performance (Georgiev,

Gupta and Kunkel, 2003; Riddiough, Moriarty and Yeatman, 2005; Francis and Ibbotson, 2009; Sagi, 2020).

Regardless of owner-occupancy, residential property investment stands out and accounts for a large share of global real estate. Residential property in the United Kingdom is worth around £942 trillion (United Nations Conference on Trade and Development [UNCTAD, 2020). Residential property is also essential in the British economy (Redman & Manakyan, 2006). Similarly, McWhite (2006) said that real estate is a significant component of the cost base of the service and industrial sectors, accounting for 44% of the non-financial assets of UK enterprises.

The rental values in the Nigerian residential property market, notably in North Central Nigeria, have steadily increased, with the commercial sector giving a significant return on investment potential (Nwaogu, Esiovwa and Esiovwa, 2021). Poor property development and management practices impede progress, notably in Bauchi, Gombe, and Kaduna states (Madichie and Madichie, 2016). The absence of a reliable property investment database has further hampered comprehension of the market's poor performance (Agava, Bello and Dairo, 2021). Furthermore, with strong economic policies energising the property market, the effect of macroeconomic variables on residential property returns in Abuja is substantial (Olatunji et al., 2017).

Due to weak and non-functional infrastructure, Jos city in Plateau State, North Central, Nigeria, suffers severe issues in its residential property submarket (Ajibola et al., 2013). This is worsened further by the existence of slums and hilltop communities, which present distinct planning and management issues (Oladosu et al., 2015; Dung-Gwom and Jugu, 2017). The absence of legal paperwork for structures and the fear of property loss contribute to rejecting urban regeneration initiatives (Oladosu et al., 2015). These problems are exacerbated by the rise of slums, contributing to environmental degradation (Orewere, Ogunrayewa and Owonubi, 2019). As a result, it is necessary to identify and address the critical property investment return growth determinants that represent the distinct nature of Jos's residential property submarket, the availability and quality of infrastructure, and the character of the property market.

Based on the findings of all previous empirical studies reviewed in this study, it was discovered that each city and even every neighbourhood within a city, has its unique characteristics in terms of neighbourhood characteristics, infrastructure availability and condition, and is subject to different returns on investment due to variation in fundamental property investment return determinants (Flaherty, 2004; Olujimi and Bello 2009; Hui et al., 2014; Udoka, 2014, and Samjay, 2014).

Nevertheless, Jos city in Plateau State still suffers from inadequate and non-functional infrastructure (Ajibola et al., 2013), and the growing property investment vis-à-vis extant infrastructure demands investigations. In light of this, it is critical to identify critical property investment return growth variables that reflect the peculiar nature of Jos residential property submarket, the availability and quality of infrastructure, and the character of the city's residential property investment market.

4. METHODS

The research design adopted is experimental and organised in a framework that establishes links between urban neighbourhood infrastructure conditions and property investment

returns (performance) across the selected areas in Jos city.

Primary data collection for this study employed a multi-pronged approach, encompassing field surveys, structured questionnaires, targeted oral interviews, and direct observation. Ground truthing was facilitated by comprehensive field surveys, enabling an accurate assessment of infrastructural conditions within the designated neighbourhoods. Two distinct sets of questionnaires were meticulously designed and implemented. The first, directed towards registered estate surveyors, sought historical property valuation data (rental and capital) spanning 2009-2018. The second set, administered to residents within the study areas, gathered valuable insights on their lived experiences. The structured questionnaires, comprising closed and open-ended queries, were administered to the practising Estate Surveyors and Valuers (to draw from their experiences and professional feedback) and sampled residents of the selected neighbourhoods. Some respondents filled out the questionnaires instantly, while some returned the completed questionnaires after several days or weeks. In addition, related questions were asked through phone interviews regarding rent payment, infrastructure availability, and satisfaction level with their neighbourhood infrastructure. Semi-structured oral interviews were conducted with select real estate practitioners in Jos to enrich the data landscape. These targeted inquiries focused on rental and capital values, including their determinants, within the chosen neighbourhoods, yielding valuable qualitative data from industry experts. Residents within each selected neighbourhood were further engaged through direct observation techniques. This included inquiries regarding the state and functionality of available infrastructural elements, allowing the study to pinpoint specific infrastructure components influencing residential property investment returns through a rating and ranking system.

The primary data collected for the study include the following:

1. Annual rental trend on investment for the residential property being studied for the ten years (2009 – 2018);

2. Annual returns on investment in the residential property in focus for the stated period (2009 – 2018);

3. Types and conditions of available infrastructure in the selected neighbourhoods,

4. Number of residential rented properties meant for investment purposes in the selected neighbourhoods.

Meanwhile, the data retrieved were complemented with data from secondary sources. The data were sourced from property portfolios of the practising estate surveyors and valuers dealing with the identified property submarket on record of the number of residential properties meant for investment purposes in the study areas. The record and information obtained include rental analysis and sales records within the years under review. Others include data on the number of houses in the various neighbourhoods.

In line with Ojo et al. (2018), this study adopted some proxy indicators that formed the basis of the structured questionnaire used in the survey. However, adopting the city infrastructure quality index (CIQI) for sub-market level infrastructural analysis was unamenable, as CIQI datasets are only available at the city level. Secondly, infrastructural change is more pronounced at the neighbourhood or sub-

market level. Against this, a survey method employed structured questionnaires to obtain primary data, using a simple systematic random sampling technique at the interval of K=3. Also, the study obtained the sample size using the Frankfort-Nachmias and Leon-Guerrero (2006) model, thus amounting to 251, of which 161 (64%) questionnaires were retrieved (Table 1 and model description below refer).

Data obtained were analysed descriptively and inferentially. A ranking method of data analysis (Likert scaling) was used. The minimum benchmark for an acceptable condition standard and infrastructure index were taken for ranking evidence. Similarly, the Kendall coefficient of concordance was applied to test the relationship among the ranking factors. For variations in residential performance in the selected neighbourhood (Rayfield, Low-cost, Gwang Layout and Kufong) (Table 1), Analysis of Variance (ANOVA) was employed. Spearman's rank-order correlation was finally adopted to determine the relationship between neighbourhood infrastructure conditions and residential property investment returns (performance) in the selected areas of Jos city.

For clarity, the study employed the Kendall Coefficient of Concordance to test the relationship among the ranked factors. The model and factors are summarised as follows:

$$W = \frac{[12\sum T_1^2 - 3K^2n(n+1)^2]}{[k^2n(n-1)]}$$

Where:

T12 is the squared sum of ranks for each of the factors,

n is the number of factors being ranked;

k is the number of towns from which the ranking of the factors was taken.

The coefficient ranges from 0(perfect disassociation) to 1 (perfect association)

Table 1: Sample Size of Residential Property selected across the Study Areas

Study Area	Selected Neighbourhoods	Sampling Frame	Sample Size	Number Returned
Jos city	Rayfield	72	68	43
	Low-cost	60	55	36
	Gwang Layout	62	57	38
	Kufong	88	71	44
	Total	**282**	**251**	**161**

Source: Field Survey (2019)

The sample size for each residential sub-market in Jos city was quantitatively determined using the model developed by Frankfort-Nachmias and Leon-Guerrero (2006) for sample size determination as follows:

$$n = (Z^2 pqN) / (e^2 (N-1) + Z^2 pq)$$

Where N = population size
n = sample size
p = 95% confidence level of the target population
q = 1- p
e = Acceptable error Z = 1.96 (the standard normal deviation at 95% confidence level)

5. RESULTS AND DISCUSSION

5.1 Rate of Returns on Two-Bedroom (2 B/R) Residential Property

The aggregated rate of returns on investment-driven 2 B/R) residential property accommodation across the selected neighbourhoods in Jos city and the results obtained are summarised in

Table 2. Further analysis of Table 2 shows that Gwang Layout enjoyed a tremendous rise in investment returns (Figure 2). This astronomical rise within three (3) years (2015-2018) can be attributed to access to quality infrastructure that residential properties enjoyed. Promisingly, the Rayfield neighbourhood also showed signs of amassing high investment returns. However, the remaining neighbourhoods have perspicuously shown a lopsided rate of returns with no positive change in view.

Table 2: Rate of Returns on 2B/R Residential Property Investment in Selected Areas of Jos City

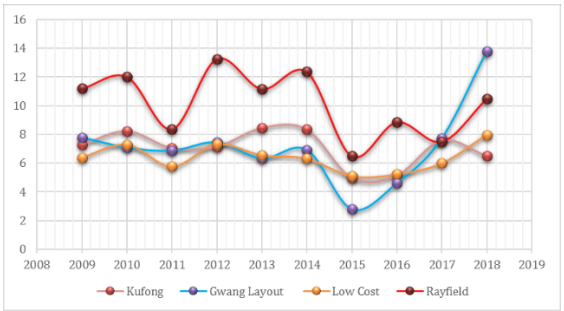
Year	Kufong	Gwang Layout	Low-Cost	Rayfield
2009	7.29	7.79	6.39	11.19
2010	8.24	7.09	7.29	12.02
2011	7.05	6.86	5.76	8.36
2012	7.15	7.45	7.31	13.26
2013	8.46	6.32	6.54	11.17
2014	8.35	6.93	6.31	12.36
2015	4.97	2.79	5.09	6.49
2016	5.13	4.59	5.22	8.86
2017	7.59	7.72	5.99	7.50
2018	6.50	13.80	7.96	10.50
Average rate of return	7.04	7.13	6.39	10.17
Standard deviation	1.24	2.82	0.93	2.25
Coefficient of variation	0.18	0.39	0.15	0.22

Source: Source: Authors' Compilation (2019)

Table 2 indicates the trend in the 2 B/R property market. The results show that Kufong, Gwang Layout and Low-Cost operated on a single-digit rate of returns over the period under review. However, a different scenario played out in the Rayfield neighbourhood. It showed double-digit rate returns, indicating a better market in 2009, 2010, 2012, 2013, 2014 and 2018. The individual market analysis used standard deviation and coefficient of variation on 2B/R properties across the selected residential market areas to show the risk contents.

In the Kufong neighbourhood, Table 2 reveals that an investor risks 18% to earn a 7.04% return on residential property. Similarly, investors in the Gwang neighbourhood risk 39% to gain a 7.13% investment return. Nonetheless, Low-cost and Rayfield residential property market investors risk 15% and 22% to earn 6.39% and 10.17% return, respectively, on property investment. On this note, the Low-cost residential property market is preferred because the investor is taking the least risk relative to average returns in other neighbourhoods. The Gwang Layout and Rayfield residential property markets, at 10.17 % and 7.13%, respectively, appeared riskier than other property investment markets in Jos city.

Figure 2: Rate of Returns on 2 B/R Residential Property Investment in Selected Neighbourhoods in Jos City

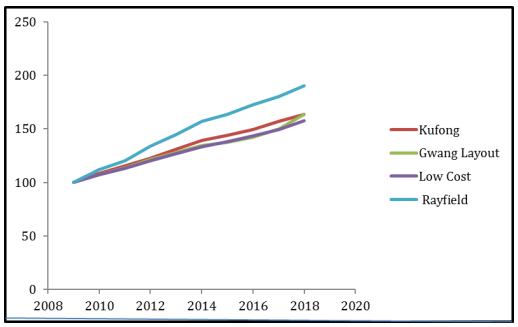


Source: Authors' Computation (2019)

The aggregated rate of returns on 2 B/R residential property investment across the selected neighbourhoods in Jos city was analysed in terms of trends (chart), as depicted in Figure 3. Overall, the 2B/R property market return moved upward throughout the study. For the individual market, the 2B/R market in Rayfield moved quicker than other market locations over the period, indicating that the market is in higher demand and has experienced frequent market transactions. Kufong residential market

also moved slightly faster than the two market locations over the same period. The Low-Cost and Gwang Layout markets did not move at the same pace as other market locations, indicating that these markets experienced a change in market demand over the period.

Figure 3: Trend in 2B/R Residential Property Market Return Index in Jos



Source: Field Survey (2019)

5.2 Rate of Returns on Four Bedroom (4 B/R) Residential Property

Table 3 shows the aggregated rate of returns on 4B/R residential property investment across the selected neighbourhoods in Jos city. Figure 4 suggests that the Gwang neighbourhood has witnessed a staggering rise in investment returns, just as observed on 2B/R. It shows that both 2B/R and 4B/R in the Gwang neighbourhood have enjoyed quality access to infrastructure between 2015 and 2018. However, Rayfield has a different outlook as investment return in the neighbourhood is flatlining compared to the appraisal of its 2B/R, which has started rising. Similarly, the remaining neighbourhoods with a grim future on investment returns on 2B/R show a promising trend on 4B/R as both Gwang and Rayfield neighbourhoods have a favourable rise in investment returns on 4B/R (Figure 4). The trend is explained in the subsequent sections.

Table 3: Rate of Returns on 4B/R Residential Property Investment in Jos city

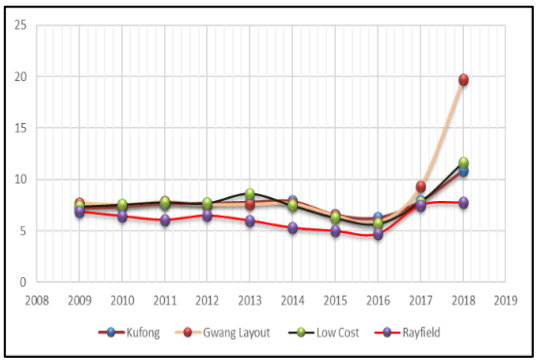
Year	*Kufong*	*Gwang Layout*	*Low-Cost*	*Rayfield*
2009	7.21	7.71	7.34	6.86
2010	7.37	7.53	7.51	6.42
2011	7.67	7.83	7.76	6.05
2012	7.69	7.56	7.66	6.46
2013	7.79	7.57	8.59	5.97
2014	7.86	7.65	7.43	5.28
2015	6.56	6.49	6.25	4.97
2016	6.27	5.83	5.66	4.68
2017	7.89	9.34	7.77	7.47
2018	10.89	19.72	11.62	7.75
Average rate of return	7.72	8.73	7.76	6.19
Standard deviation	1.24	3.97	1.58	1.02
Coefficient of variation	0.16	0.45	0.20	0.16

Source: Field Survey (2019)

In Table 3, the rate of returns is the single-digit rate of return across the study areas. Only Kufong, Gwang Layout, and Low-Cost maintained double-digit numbers in 2018, indicating the year with the best performance. The analysis of individual market performance based on risk content using standard deviation and coefficient of variation showed the risk content on 4 B/R

residential property accommodations across the selected residential market areas of Jos city. Kufong and Rayfield residential markets revealed that an investor is at risk of 16% to gain 7.72% and 6.19% return on investment, respectively. In the Gwang Layout residential market, an investor risks 45% to have an 8.73% return on investment. In the Low-cost residential property market, an investor risks 20% to acquire a 7.76% return on investment. In extrapolating these results, the Kufong residential market is considered a desirable and improved residential property market because investors take the slightest risk at a comparable average return on the investment. Gwang Layout residential market appeared more uncertain than other property markets in other neighbourhoods.

Figure 4: Rate of Returns on 4 B/R Residential Property Investment in Selected Neighbourhoods in Jos City

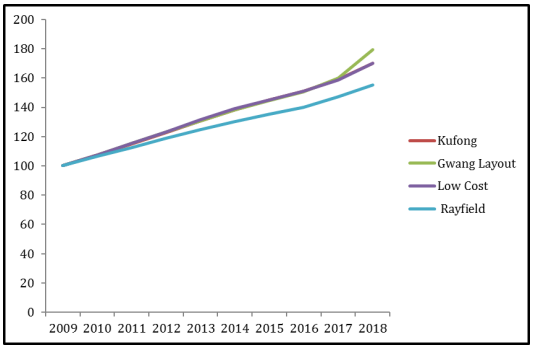


Source: Authors' Computation (2019)

The aggregated rate of returns on residential property investment across the selected neighbourhoods in Jos city is depicted in Figure 5. The 4B/R property market return moved upwardly throughout the study. The 4B/R market in Kufong, Low-cost and Gwang Layout moved in the same direction over the period, indicating that the market is highly demanded and experienced more frequent market transactions than Rayfield. The preceding further suggests that Rayfield 4B/R is majorly owner-occupied. Table 4 shows the variance analysis in the residential property market study to analyse the results further.

Table 4 shows a significant variation in the average 2B/R property market across the study of the selected neighbourhoods. There was a significant variation in average returns across the study areas since the p-value at 0.00055 is less than the 0.05 significance level. 4B/R property market also showed significant variance in property return across the study areas at a p-value of 0.002408 ($p<0.05$). These findings imply that neighbourhood differences associated with available infrastructure provided inequality in the distribution, which caused preference in location and different property market performances.

Figure 5: Trend in 4B/R Property Market Return Index in Jos



Source: Field Survey (2019)

Table 4: Analysis of Variance in Residential Property Market Performance in Jos City

Types	Source of Variation	SS	Df	MS	F	P-value	F crit
2B/R	Between Groups	85.54466	3	28.51489	7.4041	0.00055	2.86266
	Within Groups	138.6433	36	3.85120			
	Total	224.188	39				
	Between Groups	65.3243	3	21.77477	5.8083	0.00240	2.86266
4B/R	Within Groups	134.9598	36	3.74888			
	Total	200.2841	39				

Source: Field Survey (2019)

Further analysis in Table 4 showed that the five-point Likert scale analysis measures infrastructure conditions across the selected neighbourhoods in the study area.

5.3 Infrastructure Condition Index (ICI) in Jos City

Table 5 indicates the reliability test to establish the degree of internal dependability among the items through Cronbach's Alpha. All items across the selected neighbourhoods maintained a high level of internal consistency at 80%, 76%, 85% and 88% for Kufong, Gwang-Layout, Low-Cost and Rayfield, respectively, at the minimum acceptable alpha of 0.75 (75%). The hypothesised mean or benchmark is calculated as 5+4+3+2+1= 15/5=3.

Any infrastructure condition with a mean higher than the average threshold or hypothesised mean is called infrastructure with a better condition. Therefore, all infrastructure showed good condition across the selected neighbourhoods in Jos city. The study adopted the hypothesised mean condition index (benchmark) at 0.6 (3/5) for a five-point Likert scale to determine infrastructure in good condition. More than 60% (0.60) showed a better condition index. Infrastructure Condition Indices (ICI) in *Kufong, Gwang-Layout, Low-cost and Rayfield* range between 0.62 and 0.81 (62%-81%); 0.73 and 0.88 (73% -88%), 0.60 and 0.79 (60% - 79%), and 0.79 and 0.87 (79%-87%), respectively. The results further signify that the infrastructure condition in *Rayfield* is better than *Gwang*-Layout, *Gwang* Layout is better than *Low-cost* and *Kufong*. Therefore, the correlation between infrastructure and property investment was determined in Table 6. Extrapolating these results and matching them with investment returns on 2 B/R and 4 B/R show that returns are rising in *Gwang* and *Rayfield* neighbourhoods due to higher ICI than other neighbourhoods lagging.

Table 5: Infrastructure Condition Index (ICI) in Jos City

S/N	Infrastructure	*Kufong* (Alpha-α @0.80)					*Gwang Layout* (Alpha-α @0.76)					*Low-cost* (Alpha-α @0.85)					*Rayfield* (Alpha-α @0.88)				
		N	Sum	Mean	ICI	Status	N	Sum	Mean	ICI	Status	N	Sum	Mean	ICI	Status	N	Sum	Mean	ICI	Status
1.	Water supply	169	682	4.04	0.81	Good	165	644	3.90	0.78	Good	171	634	3.71	0.74	Fair	161	645	4.00	0.80	Good
2.	Electricity	169	523	3.09	0.62	Fair	165	600	3.64	0.73	Fair	171	514	3.01	0.60	Fair	161	689	4.28	0.86	Good
3.	Access Road	169	594	3.51	0.70	Fair	165	686	4.16	0.83	Good	171	675	3.95	0.79	Good	161	665	4.13	0.83	Good
4.	Security Infrastructure	169	627	3.71	0.74	Fair	165	722	4.38	0.88	Good	171	611	3.57	0.71	Fair	161	637	3.95	0.79	Good
5.	Drainage System	169	584	3.46	0.70	Fair	165	690	4.18	0.84	Good	171	646	3.78	0.76	Good	161	691	4.29	0.86	Good
6.	Waste Disposal	169	600	3.55	0.71	Fair	165	613	3.72	0.74	Fair	171	576	3.37	0.67	Fair	161	691	4.29	0.86	Good
7.	Recreation Facilities	169	591	3.50	0.70	Fair	165	691	4.19	0.84	Good	171	652	3.81	0.76	Good	161	690	4.29	0.86	Good
8.	Education Infrastructure	169	635	3.76	0.75	Good	165	623	3.78	0.76	Fair	171	647	3.78	0.76	Good	161	650	4.04	0.81	Good
9.	Health Infrastructure	169	600	3.55	0.71	Fair	165	608	3.68	0.74	Fair	171	611	3.57	0.71	Fair	161	657	4.08	0.82	Good
10.	Street Light	169	609	3.60	0.72	Fair	165	665	4.03	0.81	Good	171	590	3.45	0.69	Fair	161	698	4.34	0.87	Good
	Valid N (list-wise)	169					165					171					161				

Source: Field Survey (2019)

The result relating to the strength of the relationship between the infrastructure index and property performance index presented in Table 6 shows a robust and significant relationship between water supply and property return across the study areas in Jos. The preceding statement consolidates that access to a potable water supply remains the minimum requirement for life. Similarly, electricity maintained a strong positive significant relationship with property return in Low-cost and Rayfield. Access road and neighbourhood security maintained a strong positive significant relationship with property return across the study areas of Jos at < 0.001. Ditto for drainage in Gwang Layout, Low-cost and Rayfield at 0.010. On the other hand, waste disposal maintained a significant relationship with property return in Gwang Layout at 0.034.

Recreational and educational facilities maintained a strong positive relationship with property return at 0.025 and 0.263 in Rayfield and Low-cost, respectively. However, health facilities did not maintain a strong positive significant relationship with property return across the study areas in Jos. Street light showed a strong positive significant relationship with property return in Gwang Layout, Low-cost and Rayfield at 0.021. The result indicates that the abovementioned infrastructure will likely cause a significant positive change in return on property investment across the study areas. Therefore, they positively and strongly correlate with property investment performance in the selected neighbourhoods in Jos City.

Meanwhile, based on the distinction and classification made in the literature build-up and in line with studies of Tomlinson (2001), Boye (2002), Bennett (2019), Islam et al. (2022), Khaled Al Shawabkeh et al. (2022), physical infrastructures like electricity, water supply and road infrastructure have the propensity to generate high investment returns stemming from the strong and positive correlation they maintained with property return.

Table 6: Correlation between Infrastructure and Property Investment Performance in Jos

Infrastructure	Water supply	Electricity	Access Road	Security Infras	Drainage System	Waste Disposal	Recreation Facilities	Education Infras	Health Infrastructure	Street Light
Kufong ®	.65(.032)	.58(.041)	.71(.022)	.56(.045)	.231(.452)	.34(.385)	.41(.214)	.31(.308)	.21(.422)	.42(.266)
N	183	183	183	183	183	183	183	183	183	183
Gwang Layout®	.72(.002)	.51(.054)	.67(.024)	.61(.026)	.58(.046)	.49(.073)	.37(.122)	.41(.101)	.31(.213)	.62(.027)
N	165	165	165	165	165	165	165	165	165	165
Low-cost ®	.67(.030)	.47(.048)	.65(.034)	.75(.001)	.59(.023)	.41(.104)	.34(.263)	.48(.047)	.38(.243)	.61(.027)
N	151	151	151	151	151	151	151	151	151	151
Rayfield ®	.76(.001)	.42(.039)	.60(.030)	.75(.001)	.68(.010)	.44(.341)	.58(.025)	.43(.263)	.212(.432)	.62(.021)
N	123	123	123	123	123	123	123	123	123	123

® = Return on Property Investment, N= number of properties

Source: Field Survey (2019)

Social and economic infrastructure like recreational, educational and health infrastructures have a relatively weak correlation with property returns but have remarkably influenced property returns across the residential neighbourhoods.

The relationship and level of agreement presented in Table 7 were tested using the Kendall Coefficient of Concordance to test the relationship among the ranking factors and Spearman's Rank Order Correlation to test the level of agreement toward infrastructure conditions. Kendall's Coefficient of Concordance (W) revealed that W = 0.801 indicates statistical evidence of a fair association in ranking the infrastructure condition across the study area in Jos. However, the Spearman rank correlation establishes a fair association in ranking the infrastructure conditions across the selected neighbourhoods. Furthermore, Table 7 shows the average rank correlation of variables among all possible areas, rs = 0.455, which indicates a weak agreement with the selected neighbourhoods' infrastructure conditions. In this context, the result implies that, though each neighbourhood has its peculiarity regarding infrastructure conditions, the overall ranking of these factors across the selected neighbourhoods in the study areas is relatively related.

It is a given that the relative importance of the different types of Infrastructure is, without a doubt, established. Nevertheless, electricity, water supply, and road infrastructure did not reflect on real estate returns in the study area as expected, ordinarily. These observations stemmed from survey findings and could be attributed to a national malaise where self-help has become the order of the day in catering to household needs on the aforementioned infrastructural services and did not necessarily boost investment returns in the study area.

However, this may not be generally applicable but instead provided a nuance replicated in a few other areas found in the literature.

Table 7: Test of Relationship among the Ranked Infrastructure Conditions in Jos city

Infrastructure	Jos							
	Kufong	*Gwang* Layout	*Low-cost*	*Rayfield*	T_1	$\sum T_1^2$	W	r_s
Water supply	1	6	4	7	18	324		
Electricity	9	10	8	3	30	900		
Access Road	6	4	1	4	15	225		
Security Infrastructure	3	1	5	8	17	289		
Drainage System	8	3	3	1	15	225		
Waste Disposal	5	8	7	1	21	441	0.801 (0.011)	0.455 (0.065)
Recreation Facilities	7	2	2	1	12	144		
Education Infrastructure	2	7	3	6	18	324		
Health Infrastructure	5	9	5	5	24	576		
Street Light	4	5	6	2	17	289		

Source: Field Survey (2019)

Infrastructure facilities condition index in Rayfield, Kufong and Gwang Layout are higher than the ideal condition index of 60% benchmark by the international standard at 77% -85%, 67%-82% and 63% - 81%, respectively. However, a few were found below the standard benchmark. Property investment in Low-Cost is the best-performing property market at minimum risk-return ratio analysis due to the influence of infrastructure. This finding aligns with a study on Akwa-Ibom, Nigeria, by Udoka (2013), which examined the relationship between urban neighbourhood infrastructure provision and real estate investment returns. Udoka concluded that infrastructure services boosted property investment performance. Rayfield showed a high level of volatility

by having the highest risk-return ratio at a given comparable return. It also reflected the tenets of the studies by Hammer et al. (2011) and Johnson et al. (2000) that the annual returns from property investment, hitherto referred to as its performance, are significantly influenced by infrastructure.

Kufong and Rayfield markets exhibited the same level of performance. In other words, there is no significant difference between the two markets. Gwang Layout appeared to be a volatile and risky market for residential property investment with the risk per investment unit. The Low-cost property market maintained a comparable return at a minimum risk-return ratio ranging from 16%-25%. It is, therefore, appraised as a desirable property market investment. This corroborated Ononugbo et al. (2010) study that property performance indicators such as yields, value indices, and total returns lead to a favourable increase in real estate property investment. Also, findings reveal that residential property investment with higher performance values preponderates areas of frequent market transactions. It is essentially noticed where efficient infrastructural conditions have been duly observed. These areas are found across the selected neighbourhoods in Jos city.

6. CONCLUSTION AND RECOMMENDATION

The quiddity of this study is predicated on establishing a tangible link between urban neighbourhood infrastructure and residential property investment performance in Jos city, Nigeria. Extrapolations from this study suggest that infrastructure significantly influences property investment performance. The performance also varies with the provision of infrastructure. Findings from Gwang Layout, Kufong and Rayfield Neighbourhoods show high-risk profiles that can be checked with a well-structured and diversified residential property portfolio. This portfolio can guarantee long-term returns over risky short-term residential property investments.

Further conclusion underscores that infrastructure facilities are the backbone of every successful real estate investment, as shown in this study. The availability of infrastructure has significantly influenced property investment performance in the selected neighbourhoods of Jos city, Nigeria. Therefore, the result of the study has shown that the returns or performance of ideal residential property investment hinges on the quality and functional infrastructure in any urban neighbourhood. Infrastructure development is pivotal to a conducive real estate development and investment environment. The more adequate and better the infrastructure is, the less the perceived risk attached, and the more attractive the residential area.

Given the above, there is a need to strengthen the quality of neighbourhood infrastructure for residential property investment returns since it has been proven to have a penchant for attracting residential investment and boosting performance. Periodic feasibility and viability appraisals should be essential in determining the viable real estate worth investment. Reasonable consideration should be given to neighbourhood infrastructure as an integral part of an appraisal report when deciding on real estate investment, not perception. Also, professional Estate Surveyors and Valuers must revel in maximising the existential benefits of neighbourhood infrastructure, which comforts the residents and would-be end-users of real estate. However, due to the exigency and timing of this study, it could not ascertain the impact of insecurity crises currently bedevilling Jos city on residential property investment and its toll on the state of infrastructural facilities. A gap we intend to fill with our

subsequent study that will appraise the abstruse role of incessant insecurity on residential properties in Jos city, Nigeria.

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