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Assessing the Factors that Account for Variations in Residential Property Investment Returns Relative to Infrastructure Conditions in North Central Nigeria

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Abstract

Variation in the returns on residential property investment in the same region or location in spite of availability of infrastructure is a course for action. This paper assessed the factors that account for the variations in residential property investment returns in relation to infrastructure conditions in the North Central Nigeria. Data were collected and analysed from 765 closed-ended questionnaires administered through stratified sampling technique in Abuja, Jos and Ilorin respectively. Descriptive and inferential methods were adopted to analyse data collected. The result revealed a better rate of return on residential property investment in Abuja than Jos and Ilorin and a significant variation in the rate of returns existed across the 3 cities. Analysis also show that infrastructure conditions are better in Abuja, good in Jos and fair at Ilorin as assessed using condition index developed through the scoring analysis and measured against the standard rating developed by AAPPA (2010). Further, result from factor analysis indicates that, infrastructure conditions has accounted for 74.087% variation in the rate of return on residential property investments in the study area. Two (2) main categories of infrastructure types are responsible for such variation with the first 'Aesthetic factor' accounting for 54.56% with infrastructure type such as recreation, drainage, waste disposal and streetlight. The second types are labelled 'Freedom Factor' with power (electricity), access roads, security, education, health, and water supply. The study concluded that variation in residential property investment returns is influenced by availability and functionality of infrastructure. A recommendation of stakeholders in real estate investment consultation was made to assist in making best investment decision relative to infrastructures that are responsible for higher returns on property investment.

Keywords: Infrastructure, neighbourhood, property investment, residential property, returns

1.0 INTRODUCTION

Real estate investors just like other investors in shares and stock markets, and securities such as government bonds, are pre-occupied with trends in the rate of return on their investments. However, for all these forms of investments, expectations for returns (income) are same but their environment or market differs significantly. Certain conditions/elements within these markets or environments may also contribute at a certain measure to improve the volume of transactions and rate of returns; whereas others may contribute to depreciate the same. In real estate market, infrastructure and indeed the economy contribute in one form or the other to influence positively property values. Relatedly, the macroeconomic indices such as inflation rates, GDP, interest rates on real estate loans, interest rates on commercial loans also have an impact on property values (Udoekanem et al., 2015).

Infrastructure on the other hand, is proven at some point and location to have positive or negative effect on the rate of return on property investment (Jeong & Kim, 2009; Olujimi & Bello, 2009; Sanjay, 2013). This is because infrastructure has been variously described and as well, considered as one of the indices of the urban economy, and hence, the framework upon which returns on real estate investment is supported (Bello & Bello, 2006).

Returns on investment indicate the percentage of invested funds that are returned to the property investor after deductions of associated costs have been fully made. According to Adebayo (2006), return on property investment is dependent upon many associated characteristics with the property itself and the neighbourhood where such property is located. These include other facilities and services, and accessibility as well as economic activities within the neighbourhood. This means that infrastructure has the capacity to attract investments to certain locations that will also enhance viable returns on such investments especially in real estate (Tomlinson, 2001). However, the inherent problem has often been of inadequacy and the functionally deficient nature of infrastructure in some locations or towns which makes property investment unsuitable or less viable. In some cases, even locations with infrastructure do not stimulate a good

return on property investment (Ajayi et al., 2014). This might either be ascribed to inadequacy factor in the availability of infrastructure (Oduwaye, 2002), or poor or non-functional state of the available ones.

In other cases, infrastructure types such as those in the neighbourhood and those available on the property itself may create certain variations in their level of effect on rental values. Olujimi and Bello (2009) and Amenyah and Fletcher (2013) measured the effects of infrastructural facilities on the rental values of residential properties and used neighbourhood facilities such as water, electricity, access roads, and on the property such as burglar proofs, toilets, bathrooms, etc. these studies revealed a significant influence on property values. The justification for the study is based on the premise that an extensive literature exists on the relationship between infrastructure and property values/returns on property investments either positive or negative. However, the current study's context varies from the existing studies in that it tends to investigate the categories of facilities and services that contribute significantly to the variation of rates of return on residential property investments using cities within the same region. The study, therefore, aims to assess if variation exists significantly in the rates of return that can be attributed to some categories of infrastructure and their conditions. To achieve this, the trend in the rates of return from 2009-2018 in the study area will be assessed and their variation examined; construct of infrastructure condition indices will be carried out to ascertain the conditions of infrastructure that sustain the returns in residential property investment.

■2.0 LITERATURE REVIEW

Property investments just like other forms of investments are targeted at profit optimisation in form of returns and for this to be actualised; the property market has to be active and efficient. Efficiency in the market is a function of return, risk, and total cost of an investment management structure subject to fiduciary and other constraints within which investors must operate (Dubben & Sayce, 1991). Therefore, investment efficiency should be considered as a combination of financial efficiency and non-financial efficiency which can also be related to infrastructure availability and functionality as it plays a critical role in the overall property market performance. Ge and Du (2007) opined that property returns is an essential aspect of the property markets worldwide and determined by a variety of infrastructure factors, and the determination of those factors is a significant part of property valuation.

Physical infrastructure is described as a social "overhead capital", and it includes public utilities such as power, telecommunication, water supply, sanitation, and sewerage; and public works such as access roads, dams, drainage, recreation facilities, streetlight, and health infrastructure (World Bank, n.d.). Infrastructure can also be described as the totality or aggregate of all services and facilities that permit a city to function efficiently and effectively (Ajibola et al., 2013; Nubi, 2002), whereby the relationship has been known to be positive between improved infrastructure and economic growth (Canning & Pedroni, 2008). Therefore, the growth in the economy will transmit to the growth in the real estate investment sector and good returns (Johnson et al., 2000).

Most studies have shown that a significant relationship exists in the area of infrastructure and property values/rates of return. For instance, many researchers (Adeogun et al., 2019; Johnson et al., 2000; Oduwaye, 2002; Udoka, 2013) have assessed the relationship between infrastructure and property investment. These infrastructures include; access roads, water supply, electricity, drainage, and waste management systems, recreational and health facilities. Their findings all showed that the relationship is positive where infrastructure are adequate, or at least near adequate and in good conditions, and negative where same are inadequate and in a poor state. Other studies such as those of Henneberry (1998), Corgel et al. (1998), and Gatauwa and Murungi (2015) also include other infrastructures such as transport, energy, information and communication as well as industrial development and educational facilities. These were confirmed to have a huge influence on property returns. From all these studies, infrastructure adopted were in various categories, while some use much broader-based infrastructure, others limit their assessment using the basic neighbourhood types.

However, in whichever category that these infrastructures belong to, some are known to exert more impact on rental/capital values of properties. Ajayi et al. (2014) found access roads to impact more on rental values, contributing 43.9% variation than electricity, water supply, recreational facilities among others that did not present significant effect. An example of this is that revealed by Henneberry (1998) where prior to the construction of a super tram in South Yorkshire that will improve movement of people and goods however, the anticipation of its construction resulted in a fall in house prices (both rental and capital values). The understanding so far is that while some infrastructure improves property values, others rather impact negatively. Although, the negative effect may be peculiar to some cases with property types, for instance, in the case of the construction tram, its operations may not be suitable for residential environment but commercial hence, commercial activities will bid for higher values thereby depreciating residential property values.

Following the above, the current study seeks to assess if variations in return on residential property investment within a given area can be attributed to infrastructure conditions. Specific neighbourhood infrastructure where selected and those known to be common among the residential neighbourhoods selected within the north central region of Nigeria.

■3.0 METHODOLOGY

3.1 Profile of the Study Area

Jos, Abuja and Ilorin are some of the main cities in North Central Nigeria - where Jos is the capital of Plateau State located within 313 km north-east of Abuja, famous for tin and columbite mining, quarry, and other manufacturing and agro-allied industries. In the last quarter of 2018, mining and quarry contributed to 8.5% to the nation's GDP while manufacturing contributed to 8.9% with plateau state playing a one of the major roles. The metropolis comprises a substantial part of Jos North and South municipals, and is home to most commercial and mortgage banks branches and regional offices. Its slogan is the centre for peace and tourism.

Abuja, on the other hand, is the seat of the nation's administration with six area councils and its metropolis encompasses Abuja municipal area council. It has an annual population growth rate of 4.6% (2018). Its economy is significantly driven by both the public and private sectors and with huge investment in real estate with residential and commercial properties dominating the market. The city also has a functional transport infrastructure that includes a wide range of internal network of roads.

Ilorin is another city used as a case study and is located about 500 km south-west of Abuja, and is the oldest among the three studied cities and also experiencing an influx in urban population. The economy of Ilorin has witnessed a significant influence by the western states due to semblance in socio-cultural characteristics. The city plays host to a couple of pharmaceutical companies and agro-allied industries, its economy is also driven by both the private and public sectors. The property market in Ilorin is vibrant and dominated by residential, commercial and industrial activities run by the private investors.

3.2 Data Sources and Methods

The study adopts a survey and quantitative methods structured within the framework that reflects infrastructure factors that account for variation in residential property investment returns in Jos, Abuja, and Ilorin the selected cities of North Central Nigeria. A set of questionnaire was designed and structured with both closed and open-ended items, and administered among residents (tenants) and firms of estate surveying and valuation. In Jos, the surveyed areas were Kufong, Gwang Layout, State Low Cost, and Rayfield residential neighbourhoods. For Abuja; Maitama, Wuse II, Kubwa and Sabon Lugbe were surveyed while Government Reservation Area, Adewole Housing Estate, Sabo Oke, and Fate Basin areas were selected in Ilorin. The questionnaires sought information on the annual rental values of 2-bedroom residential properties measured from 2009-2018 considered being the most predominant in the market, and their capital values. The questionnaire also sought information on the conditions of infrastructure such as electricity (power), water supply, access roads, drainages, security, street lighting, health, education, recreational, and waste disposal facilities. The conditions of these infrastructures were measured on a 5-point Likert scale with 5 indicating Very Good, 4=Good, 3=Fair, 2=Poor, and 1=Very Poor. A total of 1,357 questionnaire copies were distributed and only 765 (56.3%) were properly filled and returned for analysis with Jos = 253 (*33.1%*), Abuja = 264 (*34.5%*) and Ilorin = 248 *(32.5%*) respectively.

Descriptive methods were used such as percentages and mean for infrastructure condition indices (ICI) and rate of returned on investments (RRI). The ICI is an index number that indicates current condition of the infrastructure measured relative to its ideal 'perfect' condition.

$$ICI = \frac{Current\ infrastructure\ condition}{Perfect\ infrastructure\ condition}$$

The outcome from the ICI is then measured against the infrastructure condition rating standard by Australasian Association of Higher Education Facilities Officers (AAPPA) as basis for infrastructure condition index. See AAPPA in Table 1 below.

Table 1 Infrastructure/Neighbourhood condition rating standard
(Source: Adapted from the AAPPA - Australasian Association of Higher Education Facilities Officers, 2010)

Condition	General Description	Rating	Condition Index
Very Poor	Neighbourhood in bad state, unit for occupancy, Absence of infrastructure and facilities, pollution and environmental degradation.	1	0.00 - 0.19
Poor	Deteriorated neighbourhood, structural problems, none functional infrastructure, contamination and pollution elements.	2	0.20 - 0.49
Fair	Average neighbourhood condition, evidence of significant defects on infrastructure, malfunctioned of infrastructure facilities, minor environmental and pollution elements.	3	0.50 - 0.74
Good	Minor deterioration of neighbourhood, major maintenance on infrastructure does not require, good condition of infrastructure.	4	0.75 - 0.94
Very Good	The neighbourhood is not deteriorated, infrastructure is new and in a good state, absence of contamination and pollution issues.	5	0.95 -1.00

The rate of returns on residential property investment across the selected areas and the estimated return was calculated using net income as determined, divided by the capital value, and then multiplies by 100 to relay the output in percentages. An aggregate across the neighbourhoods for each city was then computed as presented in Table 2. A variation in the aggregated rate of return among cities as measured from 2009 to 2018 was also determined using Analysis of variance (ANOVA). Further, factor analysis technique was applied to determine those categories of infrastructure that accounted for variation in the rate of return on investment in the study area. This was achieved by measuring 10 infrastructure condition variables from twelve (12) neighbourhoods in each of the cities surveyed and data were subjected to Principal Component Analysis (PCA) with Varimax Rotation to extract the factors.

■4.0 RESULTS AND DISCUSSION

4.1 Analysis of Rates of Return on Residential Property Investments

The results of analysis presented in Table 2 revealed a double-digit annual rate of return on residential property investment which indicates a better market with the exception of Ilorin. In 2010, Ilorin shows a single-digit rate of return as a result of poor performance for that year.

Table 2 Aggregated rates of returns on residential property investment across

Year	Jos	Ilorin	Abuja
2009	10.34	13.44	28.75
2010	16.42	9.60	27.88
2011	27.10	22.28	33.25
2012	36.76	19.06	26.77
2013	27.73	15.26	23.34
2014	17.77	24.12	29.93
2015	28.37	13.97	31.24
2016	17.81	20.87	38.67
2017	34.98	21.50	26.43
2018	37.84	24.44	21.53
Average rate of return	25.51	19.45	21.83
Standard deviation	9.52	4.01	2.65
Coefficient of variation	0.37	0.21	0.12

To establish individual market performance in terms of risk content, analysis was carried out with the use of standard deviation and coefficient of variation. The outcome shows that for Jos residential property market, an investor will be taking a risk of 37% to have 25.51% return on their investment. Here, the risk is outrageous compared to the level of returns. A prospective investor in Ilorin residential market on the other hand will undertake a risk of 21% to earn 19.45% return on investment. The risk here is minimal compare to the level of returns. In Abuja residential property market however, an investor may face a risk of 12% to earn 21.83% return on their investment. Given what is obtainable in Table 2, Abuja residential market will be considered desirable and better because investors will take a minimal risk comparable for an average return on their investments. Jos residential market possesses higher risk than the other property markets, and may probably due to level of insecurity in the area (Usman, 2014). Residential property investment market in Ilorin revealed high level of instability suggesting a high level risk. This also means that, the market has unusual volatility whereas; Abuja residential property market is faring better than Jos and Ilorin in terms of risk comparatively.

4.2 A Test of Variation in the Rates of Return across the Study Areas

To ascertain if variation exists among the computed rates of returns for Jos, Ilorin, and Abuja, analysis of variance was conducted and the result revealed that significant evidence of variation exists among the cities under study. This is shown by the calculated F-ratio of 6.262 which is greater than the F-critical of 3.354. See Table 3 below.

Table 3 Results of ANOVA of rate of return across the study area

Source of Variation	*SS*	*Df*	*MS*	*F*	*P-value*	*F crit*
Groups	575.20704	2	287.604	6.262	0.006	3.354
Residual	1239.96813	27	45.925			
Total	1815.1752	29				

This also shows that the f-stat at 6.262 is significant at p-value = 0.006 less than 0.05. This indicates that trends in the rates of returns for Jos, Ilorin and Abuja residential property market vary significantly. Though different property markets may present different returns on property investments, the presumption here was to test if the location of these cities will reveal a similar trend in the rates of return.

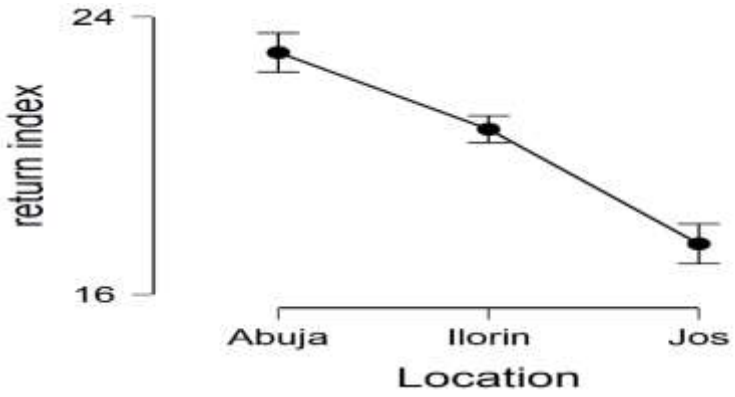

Figure 1 Descriptive plot of the average return index in three different locations

4.3 Analysis of Infrastructure Condition

A selection of 10 infrastructure items was assessed across the residential neighbourhoods and these infrastructures are considered to have significant presence within most of the residential neighbourhoods and can be accessed by every resident. Aggregate for each of the cities was computed and presented in Table 4 which has shown different infrastructure conditions over and below the ideal conditions.

Table 4 Aggregate ICI across the study areas

Infrastructure	Jos				Abuja				Ilorin			
	N	Sum	Mean	ICI	N	Sum	Mean	ICI	N	Sum	Mean	ICI
Water supply	10	140	14.0	0.81	10	122	12.2	0.78	10	145	14.5	0.59
Electricity	10	135	13.5	0.62	10	160	16.0	0.73	10	125	12.5	0.65
Access Road	10	120	12.0	0.70	10	157	15.7	0.98	10	110	11.0	0.61
Security	10	105	10.5	0.74	10	140	14.0	0.88	10	140	14.0	0.67
Drainage System	10	150	15.0	0.70	10	129	12.9	0.84	10	170	17.0	0.62
Waste Disposal	10	130	13.0	0.71	10	100	10.0	0.74	10	155	15.5	0.62
Recreation Facilities	10	167	16.7	0.70	10	171	17.1	0.94	10	147	14.7	0.61
Education	10	152	15.2	0.75	10	158	15.8	0.76	10	155	15.5	0.64
Health	10	140	14.0	0.71	10	132	13.2	0.74	10	100	10.0	0.61
Street Light	10	125	12.5	0.72	10	140	14.0	0.81	10	152	15.2	0.64
Valid N (list-wise)	10				10				10			

From the result in Table 4, Jos presents an ICI ranging from 0.62 minimum indexes to 0.81 maximum indexes. Abuja's aggregate ICI ranges from 0.73 to 0.98 while Ilorin presents aggregate, ranging from 0.59 to 0.67 condition indices. Further, extracts were made from the ICI in Table 4 and summarised to measure against standard rating of the AAPPA (2010).

Table 5 Infrastructure conditions in the study areas
(Source: Extracted from Table 4)

Infrastructure	Jos		Abuja		Ilorin	
	ICI	Remark	ICI	Remark	ICI	Remark
Water supply	0.81	Good	0.78	Good	0.59	Fair
Electricity (power)	0.62	Fair	0.73	Fair	0.65	Fair
Access Road	0.70	Fair	0.98	Very Good	0.61	Fair
Security	0.74	Fair	0.88	Good	0.67	Fair
Drainage System	0.70	Fair	0.84	Good	0.62	Fair
Waste Disposal	0.71	Fair	0.74	Fair	0.62	Fair
Recreation Facilities	0.70	Fair	0.94	Very Good	0.61	Fair
Education	0.75	Good	0.76	Good	0.64	Fair
Health	0.71	Fair	0.74	Fair	0.61	Fair
Street Light	0.72	Fair	0.81	Good	0.64	Fair

The output in Table 5 above has revealed better infrastructure conditions for Abuja comparatively, 7 of the 10 infrastructure items assessed turns out to be in good and very good condition especially for access roads and recreational facilities that are very good while water supply, security, drainage system, and educational facilities, as well as street lighting, are in a good state. Jos has good water supply and educational facilities. The outcome for Ilorin on the other hand, shows that all the 10 infrastructure items assessed are in a fair state.

In order to determine those categories of infrastructure whose conditions have accounted for variation in the rate of return on residential property investment in the study area, the study relied on the following:

i. The fact that there is an existing relationship between infrastructure and rate of return on property investment (Adeogun et al., 2019; Olujimi & Bello, 2009; Sanjay, 2013);
ii. The assumption that infrastructures are the main driver of return on property investment in an ideal market.

Thus, 10 infrastructure items were generated and their conditions were assessed among the residential neighbourhoods in the study area. Data measured were subjected to PCA with Varimax rotation which yielded an extraction of 2 components that accounted for an overall variation of 74.087% in the rates of return in the study areas. Factor 1, with an eigenvalue of 9.573 has a variance of 54.56% while Factor 2 constitutes a variance of 19.52% with an eigenvalue of 2.364. The Path Diagram below (Figure 2) presents the 2 factors labelled as RC1 and RC2 depicting the categorisation of infrastructure and their variable loadings. Security trail towards RC1 and RC2, power (electricity) infrastructure also trail towards RC1 and RC2 while education and access road infrastructure strongly trail towards RC1 only, but water supply, waste disposal, recreation, health, drainage and streetlight infrastructure trail towards RC1 only.

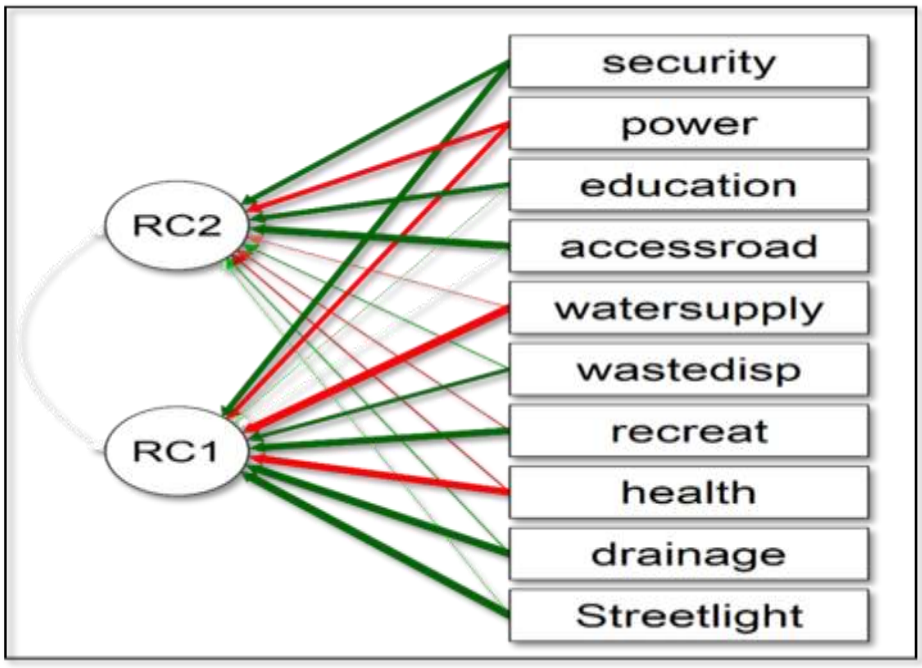

Figure 2 Path diagram of the factor loadings

Also in the rotated component matrix for factor loading into the 2 components, values presented in Table 6 indicate various correlations between the variables and their respective components. The values range from 0 to ± 1 therefore, variables at this point tend to load under components they correlate significantly. The relationship can either be positive or negative as such, variables with positive values indicate a direct relationship with such components while those with negative coefficients indicate inverse relationship.

Table 6 Loading values of the ten (10) variables on each of the factors

	Component	
	1	2
Power	-.620	**.709**
Recreation facilities	**.900**	-.322
Access Road	.011	**.939**
Drainage	**.914**	.370
Security	.690	**.700**
Water Supply	-.930	**.257**
Waste Disposal	**.643**	.392
Streetlight	**.903**	.161
Health	-.906	**.378**
Education	.146	**.754**

From the output in Table 6 above, infrastructure such as recreation (.900), drainage (.914), waste disposal (.645), and streetlight (.903) shows significant positive correlation loadings under component 1 and herein labelled **Aesthetic Factor** (or aesthetic infrastructure category). The second is correlated with variable loadings such as power (.709), access roads (.939), security (.700), education (.754), health (.378) and water supply (.257). Although 'health' and 'water supply' exhibit considerably weak correlation coefficients, the relationship is positive under component 2 than the inverse as shown under component 1. Given the nature of infrastructure under this component, it is hereby labelled **Freedom Factor**. These infrastructures tend to impact residents both physically and mentally (biologically) and are required not for aesthetics but for human development and comfortable liveability. Therefore, with a total variance of 54.56%, the aesthetic infrastructure category has the most impact on variation in the rates of return on residential property investment. The freedom category on the other hand, has a lesser effect with a variance 19.52%. The implication here is that despite infrastructure have been known to relate with return on property, the availability and condition of some may impact more than others.

■5.0 CONCLUSION

This study has assessed rates of returns on residential property investments in 3 cities in North Central Nigeria. The study has shown that, though the cities are within the same region, the rate of returns varies among them hence, the conditions of neighbourhood infrastructure facilities accounts for 74.087% variation in residential property investment returns. The provision of adequate and functional infrastructure is the mainstay of successful and ideal real estate investment climate. The results of the study have shown that variation in residential property investment returns is anchored on the quality of infrastructure conditions based on those that constitute aesthetic types and those labelled as the freedom infrastructure. Therefore, the implication of the outcome of the study is that, quality neighbourhood infrastructures can influence differences in residential property investment returns in an ideal property investment market situation.

The study's finding has exposed the pertinence for provision of quality infrastructure and maintenance in urban areas as it has become necessary due to the level of impact they have on man and sustainable real estate investments. Real estate sector is known to contribute to the national GDP, and the market performance of the sector has been proven to hinge on the provision and maintenance of infrastructure. Sequel to this, it is therefore exigent that the government and her partner agencies to improve on the development of infrastructure towards enhancing efficiency in the performance of the real estate sector. Investors in the sector will be adequately informed towards consultations when making viable decisions regarding their investment environments relative to infrastructures that are responsible for higher returns on property investment.

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