British Journal of Environmental Sciences
Vol.8, No.3, pp. 13-32, October 2020
Published by ECRTD-UK
ISSN 2054-6351 (print), ISSN 2054-636X (online)

THE CONTRIBUTIONS OF URBAN INFRASTRUCTURE TO RESIDENTIAL REAL ESTATE INVESTMENT VALUE IN AWKA, ANAMBRA STATE

Onyejiaka, Joseph Chukwudi and Okpala, Chukwunonso Arinze
Department of Estate Management, Nnamdi Azikiwe University, Awka Nigeria

ABSTRACT: *The study analyzed the contributions of urban infrastructure to residential real estate investment value in Awka. The problem was deficit of information on the impact of urban infrastructure to residential property investment value which affects the planner, investor or real estate developer in taking decisions. The study area Awka was divided into four (4) residential zones namely the core, transitional zone, peripheral zone and public housing estates. Six (6) infrastructures were identified as peculiar to residential properties in Awka. They include: electricity, water, drainage channel, refuse disposal facility, access road and security facility. Tenants of residential properties and estate surveyors practicing in Awka made up the population of the study. Sampling technique adopted was stratified random sampling while the instrument for data collection was questionnaire. A total number of two hundred and fifty-six (256) questionnaires were used for the analysis. The study employed multiple regression model to determine the influence of infrastructure on rental values of residential properties in Awka while correlation co-efficient was used to determine the relationship between available infrastructures and rental values. It was found that annual rent increases when there is an increase in electricity supply, water supply and improvement on access roads. The study recommended that government should create an enabling environment for private sector participation in the development, management and improvement of infrastructure through policy formulation and establishment of a coordinating agency that will be involved in planning, development and maintenance of urban infrastructure in order to reduce existing deficiencies that affect residential real estate investment.*

KEYWORDS: Urban infrastructure, real estate investment, residential, value

INTRODUCTION

According to the Infrastructure Development Fund (IDF) (1991) report "In Post-Independent Nigeria, Urban Infrastructure Development and Management were characterized by inadequate adaptation of appropriate standard and legislation, poor and un-sustained maintenance of urban infrastructure, disjointed administrative framework and uncoordinated efforts". Over two decades, the situation has remained the same. According to Otegbulu (2012), majority of household rely on vended and well water for their daily use. This source of water is not so hygienic and hence remains unfit for consumption. In addition, poor road conditions constrain movement of both people and goods from one point to the other, while poor drainage systems have worsened the problem of flooding in various locations. The power sector is not left out as it is marked by low generating capacity relative to installed capacity.

People have become more frustrated than ever before staying in places where infrastructure gains little or no attention. Prospective tenants often times compare the level of infrastructure provided with the rental values of residential properties in the same area before making decisions on where to reside and where not to. This also goes on with a potential investor who therefore considers every factor that will likely affect his returns of which infrastructure provided in an area is one of those factors to consider. Facility decay would therefore mean a situation whereby the basic amenities are not functional or are in deplorable state.

However, individuals long for better and comfortable dwelling places with basic infrastructures and pleasing environment. Locations that offer a good supply of different combination of infrastructure are more sought after thereby attracting a number of potential residents. On the other hand, locations that are deficient in a good number of infrastructures become least attractive. This competition for locations with good urban infrastructure usually results in an increase in land and housing values, either sales or rentals (Harvey, 1993). The problem of deteriorated infrastructure is particularly pronounced in the old, indigenous core areas of the cities while the non-availability of infrastructure is peculiar to the outer spontaneous settlements that accommodate the low-income population. Access to a range of basic infrastructural services (e.g. water and sanitation) is often regarded as an indicator of well-being. With good infrastructure base, development is both easily attainable and sustainable.
In most developing countries such as ours, owing to the established pattern on provision, government has always been called upon to provide infrastructure.

Unfortunately, the level of deficiencies and the degree of deterioration of infrastructure in the urban areas have grossly affected investor's decisions on real estate development particularly residential properties. They consider infrastructure put in place in a particular location where they intend to develop. This is because of the likely influence urban infrastructures could have on property values among other factors such as location, quality of building, demand and supply rate and inflation rate. A substantial public investment in an area would attract investor's interest as well as the general public interest. However, some private developers go a long way in providing infrastructure by themselves in order to enhance the values of their properties thereby making them become marketable for use and occupation. Consequently, such actions result to increase in developmental cost. In effect, where urban infrastructure is adequately provided and efficiently managed, profitable land uses are usually attracted to such areas and vice versa.

Statement of the Problem

Deficit of urban infrastructure affects rental values. A significant proportion of houses in Nigerian cities lack access to good roads, electricity, water, decent waste disposal systems and drainage channels. The problem of deteriorated infrastructure is particularly pronounced in the old, indigenous core areas of the cities while absence of infrastructure is peculiar to the outer spontaneous settlements that accommodate the low-income population. As a matter of fact, infrastructure deficit in such areas inhibits residential properties from commanding their full rental values. Unfortunately, the extent of the effect or impact of infrastructure deficit is unknown. There is paucity of data on infrastructure deficit which affects residential properties property investment.

In summary therefore, there is a problem of deficit of information on the impact of urban infrastructure on residential property investment value which affects the planner, investor or real estate developer in making decisions.

Aim and objectives of the Study

The aim of the study is to analyze the contributions of urban Infrastructure to residential real estate investment value in Awka. In order to achieve the stated aim, the following objectives were pursued.

i) To ascertain the rental values of residential properties in Awka.
ii) To identify the available infrastructure peculiar to the residential properties.
iii) To investigate the influence of infrastructure on rental values.
iv) To determine the relationship between the available infrastructures in the residential properties and their rental values.

Research Questions

In the course of this investigation therefore, it became pertinent to provide answers to the following questions:

a) What is the trend of rental values of residential properties in Awka?
b) What is the state of infrastructures in Awka?
c) How has the available infrastructures influenced the rental value of the residential properties?
d) Is there any relationship between available infrastructures and rent passing on residential properties?

Statement of Hypothesis

Ho: Urban infrastructure deficit has no impact on residential real estate investment value in Awka, Anambra state, Nigeria.

Justification for the Study

Many factors interplay to give value to real properties. These factors could be economic, institutional or environmental. Factors that negatively affect the value of real property injure ownership motives and goals. They also damage the investor's interest and discourage subsequent investment. However, other factors could be harnessed to boost rental values of properties in our cities. Since infrastructure are regarded as booster to social well-being of city dwellers (Megbolugbe, 2007); hence the choice of infrastructure as a factor that may likely affect the rental values of residential properties in Nigeria cities is considered to be appropriate.

Awka, the study area, was chosen on the pragmatic basis that it offers access to richer data on residential properties than most towns in Anambra state because of its role as the state capital. This makes Awka the seat of most federal establishments in the state. The increased relative political

influence of Awka as a state capital is responsible for its vast expansion. This has created greater opportunities especially for residential property development, hence justifying the choice of Awka where samples of different classifications of residential properties could be drawn for investigation purposes.

The study therefore gives innovative ideas to all stakeholders involved in real estate development and performance such as property developers and investors, builders, estate surveyors and valuers and indeed all persons resident in Awka.
The work among other things creates awareness on the deteriorating state of infrastructure and its effects on rental values of residential properties.

LITERATURE REVIEW

Concept of Infrastructure

Urban infrastructure, apart from being a major pointer of environmental quality, is a critical agent for the socio-economic development of an urban area (Okusipe, 1999). It plays an important and indispensable role in the economic, social and environmental aspects of life of an urban setting.
According to United Nations (2002), the quality and coverage of infrastructure services have a major impact on living standards and economic growth, yet it is estimated that two billion of the world's poor people lack access to adequate sanitation, two billion lack access to electricity, one billion lack access to clean water.

Specifically, physical infrastructure can be regarded as man-made municipal services, structures, or facilities that are designed to aid and ease the functioning of economic, domestic and social activities in a region. Recently, the term has gone to include information technology systems such as internet services, telephone networks etc. Public infrastructure covers a wide range of services and facilities, namely electricity, passenger and cargo transportation services, water supply systems, roads, waste disposal, drainage, communication, primary health services, schools and housing. These services can be provided through private or public means but more often provided by the government.

Nubi (2003) describes infrastructure as the aggregate of all facilities that allows a city to function effectively. It is also seen as a wide range of economic and social facilities crucial to creating an enabling environment for economic growth and enhancing quality of life. They can be seen as comprising housing, electricity, pipe-borne water, drainage, waste disposal, roads, sewage, health, education, telecommunications and institutional structures like police station, fire fighting stations, banks and post office. In other words, infrastructure is the large scale public services or systems, services and facilities of a country or region that are necessary for economic activities, including power and water supplies, public transportation, telecommunications, roads and schools. Fox (1994) defines infrastructure as those services derived from a set of public works traditionally set up by the public sector to enhance the private sector production and allow for household consumption. It is the facilities with high fixed costs, long economic lives, strong links to economic development and a tradition of public sector involvement. The services provided forms the

underpinnings of the nation's defense, a strong economy, and health and safety of its populace. They include highways, street roads and bridges; airports and airways; public transit and transport services; water supply, waste water treatment and water resources; solid waste and hazardous waste services; recreational facilities and security services.

Determinants of Property Values

Real estate has no value if it has no utility, if it is not scarce and if it is not effectively demanded. Real estate has significance only as it satisfies man's needs and desires. It is this man's collective desire for property that gives rise to value (Olusegun, 2003). Thus, the ability of a property to satisfy man's needs and desires together with its degree of scarcity and utility compared with others makes man to ascribe value to it. Property value therefore, according to Millington (2005) is the money obtainable from a person(s) willing and able to purchase property when it is offered for sale by a willing seller, allowing for reasonable time for negotiation and with the full knowledge of the nature and uses which the property is capable of being put. Tse & Love (2000) identify four categories of attributes namely; Structural, physical, neighborhood and environmental, for measuring residential property values, using hedonic equation in Hong Kong. Similarly, Cloete & Chikafalimani (2001) on property industry in Malawi identified eight factors that affect property value to include architectural design, quality of finishing, maintenance condition of the property, size of property, security, condition of the street and location.

In the Nigerian context, the situation is not far different from the foreign studies. Olusegun (2003) identifies seven factors that affect property values. These factors are; population (increase or decrease), changes in fashion and taste, institutional factors (these are factors relating to people's culture, religious belief and government action), technological factors, economic factors, location and complementary uses. He also identifies these factors under three major groups as external factors, internal factors and economic factors. The external factors include location and accessibility; internal factors include the individual features of the property such as number of bedrooms, plot size, garage, number of toilet, and so on; economic factors include the individual's purchasing power, the level of interest and inflation rates in the country.

Kalu (2001) argues that major considerations for property value hinge on the property's ability to produce income, be in demand and have a good location relative to its use. He identifies other determinants of value to include scarcity, prospect of income growth, state of the economy, cost in use, government and political factors, physical attributes and taxation. Adebayo (2006) asserts that one of the determinants of property value is infrastructure, the presence of which leads to appreciation in property values. Its absence affects neighborhood properties adversely (Adebayo, 2006).

Urban Infrastructure and Property Value

Des Rosiers, Bolduc & Theriault (1999) in their study discovered that negative externalities linked to water supply/quality problems in a given neighborhood adversely affected property values within the study location. Des Rosiers et al adopted the hedonic pricing model in quantifying the economic influence of this externality in property values within their study area. Findings indicated

that water-related health hazards exert a detrimental and measurable impact on higher property values.

A study in Nigeria on land value determinants in medium density residential neighborhoods of metropolitan Lagos, Oduwaye (2004) found that access roads, good drainage, electricity, public water supply and telephone are essential and where facilities are adequately available, land values will be high. He observed that road network is one of the factors that influence property values and establish that improvement in transportation facilities especially roads brought about improved accessibility. Using the Spearman's correlation analysis, a correlation coefficient of 0.177 for transport improvement was observed at 0.01 level of significance. The study only showed the relationship between growth in transport development and improvements in accessibility. However, the study did not empirically determine degrees and levels of accessibility and connectivity of each nodal point within the studied network. In addition, it also did not consider the effects of demand, supply and location on residential property values. Odudu (2003) compared different neighborhoods in Lagos and noticed that housing values tend to peak in those areas that enjoyed one form of infrastructure or the other. Land uses out-compete less productive uses through better rent offers. Competition for locations with good urban infrastructure usually results in an increase in land and housing values, either sales or rentals (Adebayo, 2006). Adebayo (2006) also suggests that a residential user may be prepared to pay a high value for a property depending on his consideration for basic facilities such as accessibility, water and electricity. A few other empirical studies also reveal this correlation.

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Nature of Residential Properties

Residential properties are generally constructed to mean property primarily acquired for residence which has the attributes of giving shelter, security, comfort, privacy, investment and personal identity. According to Henderson & Loannides (1987), residential properties are both consumption and investment good. As consumption good, it is acquired for owner occupation while as an investment good, it is to maximize optimum return from outright sale or letting. In that sense, the price of the residential property becomes very important to the landlord and the occupants. Investment in this type of property is regarded as a considerable source of wealth for many individuals (Reed, 2001). The physical characteristics of the property such as number of bedroom, age, size, various amenities and services have been noted to help determine the rental price for landlords as they set rental prices for residential properties (YuZhou & Haurin, 2010). Serious investigation into the nature and behavior of residential property recognizes that property as a commodity is not a single good but a complex bundle of services or potential services which operate in many dimensions (Greaves, 1984).

According to Nneji (1998), residential properties in Nigeria are often available in forms of tenements, blocks of flat, semi detached houses, detached houses and bungalows. These forms identify the classes of people that occupy them. A low-income earner will find it difficult to afford the rent for flat and as such will settle for single tenement. On the other hand, a high-income earner can easily vacate the single tenement occupied prior to the enhancement of his position so as to among other things meet with the social demands of the society. Okeke (2004) went further to discuss the various forms of residential properties.

Relationship between Housing and Infrastructure

The house in which an individual lives expresses his status, a measure of achievement, societal acceptance, an expression of his personality, and is the barometer that seems to indicate the way and manner an individual is perceived in the society. It could also be viewed as a durable asset which accounts for a shelter on which households spend substantial part of their income.

The United Nations (1990) stressed that housing encompasses facilities that are vital to human well-being. Hence, the relationship between housing and infrastructure cannot be underestimated because of the level of satisfaction people derived from its usage in the society. In most of the Nigerian urban centres, the choice of the residential apartments from individual perception depends on the availability, adequacy and quality of the facilities in the house and its immediate neighborhood.

However, availability or otherwise of urban infrastructure in Nigerian cities determines the choice of rented apartment. Similarly, inadequacy and non-availability of these infrastructures could necessitate changing of residences by people living in a particular area. This is known as residential mobility. The provision and maintenance of these infrastructures in any residential property requires substantial sum of money, which constitute part of an investment in property development. This investment in turn generates return in form of rental values. Therefore, the concern of this study is to analyze the contribution of the following infrastructure – water, electricity, refuse disposal facility, access road, drainage channel, security services on the rental values of residential properties.

Residential Property Investment in Awka

Investment in real property market is undertaken by various individuals or groups, each having its own peculiar requirement in terms of property and returns. Residential property which is the focus of this study is a multidimensional good differentiated into a bundle of attributes that vary in both quantity and quality (Can, 1990). It is often difficult to identify the appropriate variables that explain residential sale and rental values because each piece of property is unique. One approach that has been used by researchers to model residential property value evaluates properties according to their neighborhood characteristics (Tse & Love, 2000). Other research explained it on the basis of housing units physical characteristics which includes number of bedroom, number of toilet/bathrooms, age of the building and area of the building (Wyatt, 1996).

In whichever way the analysis is viewed, the residential property investment in Awka has turned in a sterling performance over the years. Rental values of residential properties have shown an upward growth pattern. This may be because Awka is a state capital and civil servant state experiencing the influx of people from all spheres of life in search of government jobs. Investors have diverted their funds into real property development because of the security of returns and the profitability of the market. In addition, because of the high competition in the residential property market, there has been expansion and improvement in the quality of residential properties provided by the investors to meet demand.

Data presentation and Analysis

Characteristics of Tenants of Residential Properties in Awka

This section examined the characteristics of the sampled tenants of residential properties in Awka. The characteristics include the income level and household size of the tenants. These two characteristics are very important to the choice and ability to pay rent for the residential properties, which prospective tenants intend to occupy.

Income Level of the Tenants

The income level of the tenants was shown in Table 1. The table revealed that 5 percent of the tenants in the entire zones earned less than N100,000 per annum. However, 8 percent of the sampled tenants earned between N101,000 and N250,000 per annum, of which 24 percent of the tenants in the transitional zone fall into this income bracket. In Awka 24 percent and 28 percent of the entire tenants in residential properties earned between N501,000 and N1million; and between N1.1M and N5Million per annum correspondingly. It is necessary to note that 48.1 percent of the tenants in the public housing earned between N1.1M and N5Million per annum. About 22 percent of the sampled tenants earned between N5.1M and above of which 38.5 percent of the tenants in the public housing zone earned within the bracket. This shows that the zone was mostly inhabited by high-income earners.

Table 1: Income of Tenants by Zones in Awka (% in Parenthesis)

Income Per Annum	Core	Transitional	Peripheral	Public Housing	Total
Less than N100,000	1 (2)	6 (10)	3 (5)	0 (0.0)	10 (5)
N101,000 – N250,000	3 (6)	13 (24)	1 (2)	0 (0.0)	17 (8)
N251,000 – N500,000	4 (8)	16 (29)	6 (10)	2 (3.8)	28 (13)
N501,000 – N1M	18 (34)	11 (20)	20 (35)	5 (9.6)	54 (24)
N1.1M – N5M	12 (22)	7 (13)	18 (31)	25 (48.1)	62 (28)
N5.1M and Above	15 (28)	2 (4)	10 (17)	20 (38.5)	47 (22)
TOTAL	53 (24)	55 (25)	58 (27)	52 (24)	218 (100)

Household-size of the Tenants

The educational status coupled with the level of income of household-heads, influence in no small measure the household-size, particularly in developing countries. The household-size of sampled tenants in residential properties in Awka was shown in Table 2. The table shows that 5 percent of tenants were one-person household. The highest household-size was between 2 and 5 persons which constituted 72 percent of the entire tenants. However, 87 percent of the tenants in the transitional zone had between 2 and 5 persons household-size. The tenants with over 10 persons per household constituted 3 percent. In the core zone, only 4 percent of the tenants in the zone fell in 10 persons' household-size while 6 percent of tenants in the public Housing zone fell into the category.

In spite of the high educational background and high income level of tenants in the public housing, the zone exhibited high household-size. This was in connection with increase in the number of service supporting assistants such as the driver, gardener and security guards.

Table 2Household-size of Tenants by zones (% in Parenthesis)

Persons Per H/H	Core	Transitional	Peripheral	Public Housing	Total
1 Person	5 (9)	2 (4)	2 (3)	3 (6)	12 (5)
2-5 Persons	39 (74)	48 (87)	37 (64)	32 (62)	156 (72)
6-10 Persons	7 (13)	4 (7)	18 (31)	14 (26)	43 (20)
Over 10 Persons	2 (4)	4 (7)	1 (2)	3 (6)	7 (3)
TOTAL	53 (24)	58 (2)	58 (27)	52 (24)	218 (100)

Table 3 Types of Residential Properties by Zones (% in Parenthesis)

	Zones				
Types	Core	Transitional	Peripheral	Public Housing	Total
Block of Flats	48 (90)	36 (65)	17 (29)	9 (17)	110 (50)
Detached House	2 (4)	11 (20)	18 (31)	22 (42)	53 (24)
Semi-Detached House	0 (0)	1 (2)	11 (19)	3 (6)	15 (7)
Detached Bungalow	2 (4)	5 (9)	8 (14)	17 (33)	32 (15)
Semi-detached bungalow	1 (2)	2 (4)	4 (7)	1 (2)	8 (4)
TOTAL	53 (24)	55 (25)	58 (27)	52 (24)	218 (100)

Table 3 shows that 50 percent of the sampled residential properties were block of flats. This type of residential property was very prominent in the core and transitional zones.
However, 24 percent of the entire residential properties were detached houses while 7 percent were semi-detached houses. About 15 percent and 4 percent of the entire sampled residential properties were detached bungalows and semi-detached bungalow respectively. The public housing zone had the highest percentage of detached house and detached bungalow of about 42 percent and 33 percent respectively while the peripheral zone had the highest percentage of semi-detached houses and semi-detached bungalows of about 19 percent and 7 percent respectively.

Urban Infrastructure available in Residential Properties in Awka

The infrastructure available includes electricity, water supply, access road, drainage channels, refuse disposal facilities and security facilities. The levels of provision of these facilities vary from building to building and from one zone to the other.

Electricity provision in Awka is quite stable with about 88.9 percent of residential properties connected with electricity. The entire residential properties in the public housing zone and peripheral zone were connected with electricity. Most buildings in these zones were provided with prepaid meter for its energy consumption thereby minimizing illegal connection issues, transformer overloading and issuance of estimated bills which were mainly the case in the core and transitional zones.

Water supply was not based on the public water provision or supply from Water Corporation. Functional water supply was either through hand-dug wells or boreholes. In this respect, 80.3 percent of the residential properties were provided with water from either hand-dug well or borehole. It is necessary to note that none of the zones experienced less than 76 percent of its residential properties provided with water. The location of the hand-dug well within the house compound determines the level of safety of such water particularly in the core area where most of the dug wells were located close to the septic field.

Every residential property is required to be provided with unhindered access road with a view to ensure easy and safe movement of both goods and humans. About 72 percent of residential properties in Awka were accessible by motorable roads. However, the residential properties in the core zone were mostly affected by inaccessibility, where only 54 percent were only accessible. This was followed by the peripheral zone where 76 percent of the residential properties were accessible. In the remaining two zones (transitional and public housing) not less than 88 percent of the residential properties were accessible by motorable roads.

About 69.3 percent of drainage channels in the residential properties in Awka were functional. The core area was least provided with functional drainage system having 52 percent followed by the transitional zone with 60 percent. The other two zones (peripheral and public housing) enjoy a fair share of structured drainage channels having 92 percent and 98 percent respectively. This was due to the fact that the core and transitional zones were mainly characterized by blocked drainage systems that lead to flooding during raining seasons.

Refuse disposal facilities in residential properties in Awka to a great extent was fair, with about 66.9 percent of residential properties provided with waste disposal bins, courtesy of ASWAMA (Anambra State Waste Management Agency).

Security facilities such as fencing wall and fencing wire, burglary proof and watch-night services were usually common in residential properties in Awka with about 72.9 percent of residential properties providing security facility and services to their properties. This is mostly seen in the public housing zone having about 96 percent of security facilities provided in the residential

properties followed by the peripheral zone with 84 percent and the core with least security facility of about 64 percent provided.

Table 4 Infrastructures Available in Residential Properties by Zones in Awka (% in Parenthesis)

	Zones				
Urban Infrastructure	Core	Transitional	Peripheral	Public Housing	Total
Electricity	46 (92)	48 (96)	50 (100)	50 (100)	194 (88.9)
Water supply	38 (76)	42 (84)	45 (90)	50 (100)	175 (80.3)
Access Road	27 (54)	48 (96)	38 (76)	44 (88)	157 (72.0)
Drainage Channel	26 (52)	30 (60)	46 (92)	49 (98)	151 (69.3)
Refuse Disposal facilities	30 (60)	28 (56)	43 (86)	45 (90)	146 (66.9)
Security facilities	32 (64)	37 (74)	42 (84)	48 (96)	159 (72.9)
Total	199 (398)	233 (466)	264 (528)	286 (572)	982 (450.3)

Table 5: Level of Satisfaction of tenants with urban infrastructures.

	Levels of Satisfaction			
Urban Infrastructure	Satisfied	Not Satisfied	Indifferent	Total
Electricity	158 (72.5)	47 (21.6)	13 (5.9)	218 (100)
Water supply	41 (18.8)	170 (77.9)	7 (3.3)	218 (100)
Access Road	63 (28.9)	128 (58.7)	27 (12.4)	218 (100)
Drainage Channel	58 (26.6)	135 (61.9)	25 (11.5)	218 (100)
Refuse Disposal Facility	120 (55.0)	87 (40.0)	11 (5.0)	218 (100)
Security Facility	102 (46.8)	110 (50.5)	6 (2.7)	218 (100)

From the result, it shows that majority was satisfied with electricity having a percentage of 72.5% and not satisfied with water supply with a percentage of 77.9%. Access road network and drainage channel were also the facilities that tenants in Awka were not satisfied with having a percentage of 58.7% and 61.9% respectively. 55% of tenants in Awka were satisfied with refuse disposal facility while 110% not satisfied with security facility.

Table 6: Duration of living in the residential buildings by the tenants in Awka (% in Parenthesis).

	Zones				
Duration in Yrs	Core	Transitional	Peripheral	Public Housing	Total
Under 1 yr	7 (13.2)	4 (7)	6 (10.3)	6 (11.5)	23 (10.5)
Btw 1-2 yrs	7 (13.2)	5 (9)	15 (26)	15 (28.8)	42 (19.3)
Btw 3-5yrs	18 (34)	16 (29)	24 (41.3)	10 (19.3)	68 (31.2)
Over 5yrs	21 (39.6)	30 (55)	13 (22.4)	21 (40.4)	85 (39.0)
Total	53 (24)	55 (25)	58 (27)	52 (24)	218 (100)

Table 7 Annual rent paid by tenants in residential properties by zones in Awka (% in Parenthesis)

Annual Rent	Core	Transitional	Peripheral	Public Housing	Total
₦100,000 - ₦200,000	30 (56.6)	10 (21.8)	2 (3.4)	0 (0.0)	42 (19.3)
₦201,000 – ₦350,000	19 (35.8)	16 (29.1)	22 (37.9)	9 (17.3)	66 (30.3)
₦351,000 – ₦500,000	4 (7.5)	17 (30.9)	20 (34.5)	16 (30.8)	57 (26.1)
₦501,000 – ₦800,000	0 (0.0)	12 (21.8)	13 (22.4)	6 (11.5)	31 (14.2)
₦801,000 – ₦1M	0 (0.0)	0 (0.0)	1 (1.7)	14 (26.9)	15 (6.9)
₦1.1M and Above	0 (0.0)	0 (0.0)	0 (0.0)	7 (13.5)	7 (3.2)
Total	53 (24)	55 (25)	58 (27)	52 (24)	218 (100)

Table 8 Assessment of infrastructure in the four zones in Awka.

INFRASTRUCTURE	Core		Transitional		Peripheral		Public Housing	
	Freq	%	Freq	%	Freq	%	Freq	%
a)WATER SUPPLY								
Dug well	28	53	12	22	22	38	11	21
Borehole	8	15	19	34	24	41	39	75
Vendors	17	32	24	44	12	21	2	4
Total	53	100	55	100	58	100	52	100
b) ELECTRICITY								
Not Available	16	30	18	33	15	26	22	42
Available	25	47	22	40	24	41	24	46
Disconnected	12	23	15	27	19	33	6	12
Total	53	100	55	100	58	100	52	100
c) WASTE								
Refuse Bin	19	36	48	87	58	100	52	100
Burning	27	51	5	9	0	0	0	0
Dug Pit	7	13	2	4	0	0	0	0
Total	53	100	55	100	58	100	52	100
d) DRAINAGES								
Poor	50	94	47	85	40	69	11	21
Fair	3	6	8	15	17	29	38	73
Good	0	0	0	0	1	2	3	6
Total	53	100	55	100	58	100	52	100
e) ROADS								
Poor	50	94	47	85	40	69	11	21
Fair	3	6	8	15	17	29	38	73
Good	0	0	0	0	1	2	3	6
Total	53	100	55	100	58	100	52	100
f) SECURITY								
Not available	50	94	45	82	15	26	2	4
Available	3	6	10	18	43	74	50	96
Total	53	100	55	100	58	100	52	100

Table 9: Rental values in the four zones in Awka.

Accommodation Type	ZONES Rent per Annum (₦)			
	Core	Transitional	Peripheral	Public Housing
2 bedroom flat	120,000	150,000	200,000	250,000
3 bedroom flat	250,000	280,000	300,000	350,000
3 bedroom Bungalow	280,000	350,000	500,000	600,000
Detached House	500,000	800,000	1,000,000	1,200,000

Table 10: Zone with the highest rental value in Awka

Zones	Frequency	% of Total
Public Housing	6	60.0
Peripheral	2	20.0
Transitional	1	10.0
Core	1	10.0
Total	10	100.0

Besides the data gathered on the rental values of residential properties from tenants in Awka, efforts were made to gather information on the rental values of the residential properties from practicing estate surveyors and valuers based in Awka. This was done in order to get their rich professional background and in-depth knowledge of the property market of Awka and its environs. Estate surveyors and valuers confirmed that the residential properties in the public housing zone attract the highest rental value. The reasons for this among others include the high level of infrastructural provision, the aesthetics, finishing quality and the housing environment. They also confirmed that land in the core zone attracted very high rental value particularly for the purpose of commercial uses or activities but not essentially for residential purposes.

Table 11 consideration of infrastructure by tenants

	Frequency	Percentage (100%)
YES	32	84
NO	6	16
TOTAL	38	100

Table 11 shows that 84 percent of tenants consider infrastructures provided before choosing to live there. It shows that the level infrastructure facilities in a given area influences prospective tenant's decision.

Table 12: Reaction of tenants to rent increment when there is improvement on facility provided?

	Frequency	Percentage (100 %)
Positively and willing to comply	28	74
Negatively and unwilling to comply	10	26
Total	38	100

In table 12, it shows that most tenants react positively to rent increment when they see improvement on infrastructures. About 74 percent of estate surveyors and valuers confirmed that tenants are willing to comply by paying increased rent when there are improved facilities.

Table 13: Causes of urban infrastructure deficiency

	Frequency	Percentage (100%)
High cost of provision of urban infrastructure	5	13
Negligence by public sector	13	34
Lack of Fund	8	21
Poor Planning	12	32
Total	38	100

From the table, the cause of urban infrastructure deficiency was seen to be negligence by the public sector with 34 percent, followed by poor planning with 32 percent. Lack of fund and high cost scored the least with 21 percent and 13 percent respectively.

Table 14: Problems Emanating from lack of adequate facilities (% in parenthesis)

S/N	Problems	Strongly Agree	Strongly Disagree	Agree	Disagree	Total Score	Rank
1	High Crime rate	7 (18)	12 (32)	9 (24)	10 (26)	38 (100)	4th
2	Overstretched Available facilities	9 (24)	7 (18)	10 (26)	12 (32)	38 (100)	3rd
3	Dissatisfaction of Users	10 (26)	10 (26)	10 (26)	8 (22)	38 (100)	2nd
4	Low demand for Properties	12 (31)	9 (24)	9 (24)	8 (21)	38 (100)	1st

From table 14, low demand for properties was ranked first amongst other problems. This shows that the demand for residential properties tends to be low where urban infrastructures are lacking. Ranking second was dissatisfaction of users while overstretched available facilities and high crime rate were ranked third and fourth respectively. It therefore shows that tenants are dissatisfied staying in properties where infrastructures are not adequate.

Table 15: Solution to the problems (% in Parenthesis)

S/N	Solutions	Strongly Agree	Strongly Disagree	Agree	Disagree	Total Score	Rank
1	Good Planning	13 (34)	12 (31)	7 (18)	6 (17)	38 (100)	1st
2	Effective Maintenance Policy	10 (26)	12 (32)	9 (24)	7 (18)	38 (100)	2nd
3	Provision of More Facilities	6 (16)	3 (8)	12 (32)	17 (44)	38 (100)	4th
4	Management of facilities by Public-private sectors	9 (24)	11 (29)	10 (26)	8 (21)	38 (100)	3rd

From the table, all the solutions to remedy the problems emanating from urban infrastructure deficiency were very important. Good planning was ranked first, followed by effective maintenance policy as second. The third was management of facilities by public-private sectors and provision of more facilities ranking fourth.

TESTING OF HYPOTHESIS

Hypothesis

H_0: Urban infrastructure deficit has no impact on residential real estate investment value in Awka, Anambra state.

H_1: Urban infrastructure deficit has impact on residential real estate investment value in Awka, Anambra state.

Table 16: A Zero-Order Matrix of Pearson's Correlation Coefficient of Key Rental Value Variables.

	Annual rent	Elect	Water	Access road	Drainage	Refuse disposal	Security
Annual rent	1						
Elect	0.953* 0.047	1					
Water	0.785 0.215	0.912 0.088	1				
Access road	0.370 0.630	0.600 0.400	0.600 0.400	1			
Drainage	0.933 0.067	0.951* 0.049	0.932 0.068	0.380 0.620	1		
Refuse disposal	0.886 0.114	0.857 0.143	0.856 0.144	0.156 0.844	0.972* 0.028	1	
Security	0.817 0.183	0.928 0.072	0.998 0.002**	0.571 0.429	0.952* 0.048	0.883 0.117	1

Cell Contents: Pearson correlation
P-Value

**Correlation significant at 0.01 or 1% level

*Correlation significant at 0.05 or 5% level

This section examines the relationships among the infrastructural variables. Table 16 is the Zero-order Pearson Product Correlation Matrix of 7 variables.

Correlation was used in the determination of nature and strength of relationship between variables of interest. If the correlation coefficient is negative, it implies inverse relationship and positive value is an indication of direct relationship. Correlation value greater than 0.5 is tagged strong and the correlation value less than 0.5 is referred to as weak relationship. In the above correlation matrix, the diagonal entries are 1 which is the correlation between a variable and itself. Correlation value of 1 is tagged perfect correlation or relationship. In the correlation between the variables in pair, the correlation values between the variables are all positive which implies the variables have positive impact on one another, that is, an increase in one would lead to increase in the other variable. The p-value was used to determine the level at which the correlation value is significant as the p-value less than 0.01 is an indication of significant correlation value at 1% and p-value greater than 0.01 but less than 0.05 implies significance of the correlation value at 5% level of significance.

In the correlation matrix, among the independent variables considered, electricity has the highest correlation value with Annual rent as the value of 0.953 is the highest correlation value among all values computed, closely followed by the correlation value of drainage channel. This can be interpreted thus; availability of electricity is the most important variable that determines the rent value among other variables to be considered.

Regression Model of the Variables

In the regression model, annual rent serves as the dependent variable and electricity, water, access road, drainage channel, refuse disposal and security as independent variables. The regression output is as follows:

Regression Analysis: Annual rent versus Electricity, Water, ...

* Drainage is highly correlated with other X variables
* Drainage was removed from the equation.

* Refuse disposal is highly correlated with other X variables
* Refuse disposal was removed from the equation.

* Security is highly correlated with other X variables
* Security was removed from the equation.

The regression equation thus;

Annual rent = - 175 + 5.29 Elect + 0.550 Water + 0.208 Access Rd

Interpretation of the model

The regression model shows the most important variables in the model that interplay with one another to determine annual rent in the zones. Other independent variables such as drainage channel, refuse disposal and security were removed to prevent multi-co-linearity in the model. In multiple regression, when independent variables are highly correlated, it is referred to as multi-co-

linearity which could lead to spurious regression model. The highly correlated independent variables were removed to prevent multi-co-linearity in the model.
The model can be interpreted thus; annual rent increases by 5.29unit when there is increase in electricity supply. Also, it increases to 0.55 and 0.208 units when there is steady water supply and more accessible roads.
From the empirical results of the multiple regression model, it shows that electricity, access road and water provision are the most determining variables of rental value.

3.5.2 Variance of Inflation Factor

Table 17 variance of inflation factor (VIF)

Predictor	**Coef**	**SE Coef**	**T**	**P**	**VIF**
Constant	-174.591	0.000	1.003	0.0216	
Electricity	5.28523	0.00000	2.437	0.0032	6.102
Water	0.550336	0.000000	2.354	0.0310	6.105
Access road	0.208054	0.000000	1.762	1.762	1.604

Variance Inflation Factor shows the presence of multi-co-linearity in a model and it is said to be present when the value of VIF is greater than 10.0.

In the table 17, the VIF values are less than 10.0 which implies, model formulated was free from multi-co-linearity and could be used for decision making. The p-values of the t-test which was used for the significance of the parameters in the model were all less than 0.05 which implies the parameters were significant and necessary in the model formulated.

From the empirical result of variance of inflation factor presented in Table 17, only three (3) of the six (6) infrastructure are very crucial for the determination of rental values by tenants of residential properties in Awka. The most crucial is electricity with regression coefficient of 5.29 and the second most important is water with 0.55 and access road with 0.208. The infrastructure put together contributed 93 percent in the determination of rental values. It can be concluded that tenants valued electricity, water and access roads in residential properties very much that they are willing and ready to offer and increased rent for apartments where these three infrastructure are available. On a general note, these three infrastructures are mostly available in the residential properties in the public housing zone. Findings under section 3.5.2 equally confirmed that residential properties in the zone attracted the highest rental values.

3.5.3 Analysis of Variance (ANOVA)

Table 18 ANOVA Result

Model	**DF**	**SS**	**MS**	**F**	**P**
Regression	3	274.000	91.333	91333	0.000
Residual Error	4	0.021	0.001		
Total	7	274.000			

The p-value of 0.00 implies the model is significant at 1%.
R^2 = 0.928 R^2 (adj) = 0.93

The regression of rental value of residential properties on the available infrastructure is positively correlated with $R^2 = 0.928$ and R^2 adjusted is 0.93. This implies that 93 percent of the decisions on rental value of residential properties are accounted for by available infrastructure provided in the building while its deficiencies result to low rental value. Findings under section 3.5.3 also confirmed that residential properties in the core and transitional zones attracted the lowest rental values.

The result from the ANOVA table shows that F-ratio is 91333; the degree of freedom is 3 between sum of square and 274 within sum of square. Since the computed F-ratio of 91333 is significant at 0.1 level; Ho is rejected and H1 is accepted. This shows that urban infrastructure deficit has impact on residential real estate investment value in Awka, Anambra state.

FINDINGS AND CONCLUSION

Findings

The summary of major findings in the study area includes:

a) Public housing estates command high rental values because they are characterized with high accessibility, connectivity index and adequate functional facilities.

b) There is a high demand for residential properties in public housing estates. This is due to the fact that the zone enjoys high quality of housing environment and better infrastructures when compared with other zones.

c) The core zone is the zone with the residential properties that attracted the lowest rental value. This is because the zone is characterized with poor and decaying infrastructure.

d) Electricity, water and access roads were the major infrastructures in residential properties that tenants mostly value. They are willing and ready to offer or pay increased rent for housing accommodations where these three infrastructures are available.

e) The capital intensive characteristics of urban infrastructure provision make it to be left in the hands of the government for its development. Funding the provisions of electricity for instance, will require a lot of capital. With our low income per capita, only a limited number of persons or organizations may venture into the provision of such services as the generation and distribution of electricity.

Conclusion

Deficit of urban infrastructure make residential properties inaccessible and as well, unavailable. A property which is inaccessible is untenantable and as a result performs below expectation. In the four (4) zones of residential properties studied, it was observed that there are inadequacies of urban infrastructure though the public housing zone has a slight advantage over other zones. The study also revealed that paucity of data on infrastructure significantly affects returns of investors or real estate developers. In addition, it found that the closer a residential property is to new infrastructural projects, the higher the increase in its values while the reverse relationship is true. Therefore, falling infrastructural investment is closely related to falling property values. There is a connection between public investment and financial values of housing. This suggests that people are willing to pay more for a house if they know there is, or was, substantial public investment. In effect, it

points to the fact that investors are willing to invest where there is government interest. This situation is not different in other parts of the country and Awka in particular shares in the similitude.

However, adequate advance planning for infrastructure provision and maintenance is inevitable if all operational stakeholders would be properly coordinated. The public sector should join hands with the private sector in adopting the public private partnership (PPP) as a means of providing efficient, cost effective infrastructure and as well manage same in such a way that it would attract investors.

Furthermore, government on its part should provide new estates with adequate urban infrastructure before they are opened for habitation.

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