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Effects of Environmental Features and Qualities on Rental Values of Residential Properties in Kaduna Metropolis

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Abstract

Concerns have been expressed over the years regarding the negative impact of environmental externalities on property values. Environmental quality has potentially significant effects on environments and their populations, thus it is important to understand its drivers and how to measure them. The aim of this study is to develop a model for measuring the effects of environmental quality on rental values of residential properties in Kaduna Metropolis with a view to establish the most sustainable attributes that significantly contribute to change in rental values in order to guide in making the best real estate investment decisions. The study adopted quantitative research approaches and survey strategy because of the nature of the research questions with a sample size of 320. Structured questionnaires were distributed to the respondents. The data was analysed using mean ranking, frequency distribution tables and multiple regression analysis. The result revealed that, the average (Mean) rent paid in different types of rented residential properties in Ungwan Rimi, Kaduna metropolis, Nigeria, stands for flat ₦436,093, bungalow ₦547,043 and tenement ₦116,083. Meanwhile, the study found that the two independent variables (LPS and ECS) were statistically significant. The overall model performance showed an R-squared of approximately 64.26%, indicating that the independent variables collectively account for a proportion of the total variation observed in the (rent). The study concludes that property owners/developers should continue to prioritise regular maintenance and timely repairs of fundamental property elements, as this ensures tenant satisfaction, increases turnover, and protects property value over time. The study recommends that property owners/developers should continue to prioritize regular maintenance and timely repairs of fundamental property elements, as this ensures

tenant satisfaction, increases turnover, and protects property value over time and to strategically invest in upgrading and maintaining flooring and ceilings to enhance interior aesthetics, boost perceived quality, and increase the desirability and potential rental value of their properties.

Keywords: Environmental Features' Quality, Residential property, Rental Value.

Introduction

Environment is a generic term that encompasses totality of globe. Environment comprises of every living and non-living thing in a particular habitat to include land, air, water, plants and animals, buildings and other infrastructure, and all of the natural resources that provide basic needs and opportunities for social and economic development of man (Social Report, 2018).

Environmental quality is a key indicator of human development (Talen, 2020). Humans are increasingly modifying the environment to cater to their needs. Therefore, if the environmental quality of an area is lacking, it is often a result of anthropogenic influence**.** Environmental quality refers to several components of the physical environment and their impact on the surrounding populations. In addition to the natural environment, environmental quality also considers more urban and built-up environments. Many things can affect the environmental quality of a place. In turn, this means that there are many things to be considered when measuring the quality of an environment. The quality of an environment, in terms of pattern of development, structural attributes and neighbourhood infrastructural facilities have a long-term effect on the property value (Ajilowo, 2019).

Environmental quality is largely responsible for the value of the property. Man's attitude towards the surrounding environment is not neutral because humans search for locations that deliver a high quality of life. Those expectations particularly concern man's daily surroundings, including residential areas or recreational grounds. The quality of that environment largely affects the decisions made in the real estate market. This factor influences the value of the property, and its social popularity generates economic benefits (Cellmer, Senetra & Szczepanska, 2021).

Environmental quality is a combination of different functional and physical components such as neighbourhood, location, structure, aesthetics of the residential area, traffic safety, the safety of self and property, maintenance, noise, and air quality (Talen, 2020). Neighbourhood quality as an aspect of environmental quality is related to neighbourhood amenities such neighbourhood infrastructure which is a major pointer of value determination and it plays an important and indispensable role in the economic, social and environmental aspects of life of an urban setting and it has a manifest impact on the quality of life (Adebayo,2016). Structural quality is the physical characteristics which include number of bedroom, garage, fireplace, square footage, lot size, number of bathroom, number of rooms, the size of the house and

the building condition, have been measured and correlated with property value, therefore structural quality is significant to value determination (Leishman, 2018). Location has been recognised as important determinant of property investment value, therefore is described as the most influential due to its relative accessibility function and amenities, relative proximity. Location attributes includes topography, proximity and accessibility to various amenities which includes central business district, church, mosques, place of work, hospital, school, public parks (Samy, 2015). All these elements constitutes the supply side of the property market. Many things can influence environmental quality, due to its potentially significant effects on environments and their populations, it is important to understand its drivers and how to measure them. The information obtained through various measurement techniques makes it possible to manage threats and shortcomings of (lack of) environmental quality, which is necessary to improve and reduce, damage (Binoy & Naseer, 2020).
In view of that, this study will assess the impact of environmental feature's quality to the rental value of residential property in the Kaduna Metropolis.

Statement of the Problem

Generally, concerns have been expressed over the years regarding the negative impact of environmental externalities on property values. An external cost is associated with manufacturing industries, the most prominent impacts being noise and gaseous emissions. Also, the deplorable condition of most physical or man-made amenities has been associated with the continued deterioration of physical infrastructures, different sources of income, inadequate land use regulation, lack of maintenance of public services, contested land tenure rights, uncoordinated conversion of farmland to housing, pollution, environmental problems, intensified resource exploitation, considerable economic dynamism and a severe lack of service provision. The extent of the contribution of the quality of man-made amenities or infrastructures to the rental values of properties requires careful investigation. It is on this basis that the study assesses the effect of three-dimensional elements of environmental quality on residential property rental value in Kaduna metropolis.

Urban Environmental Quality

Urban environmental quality is a complex and variable parameter used to describe the interaction between different factors that positively or negatively impact the quality of the environment (Faisal & Shaker, 2017). The environment is a unique resource that delivers an economically utilitarian function for society. The above approach defines the environment as a set of material (physical and biotic) and non-material elements –objects, forces and phenomena that create a mutually interconnected and dynamic system in a spatially limited territory. Environmental amenity refers to a view of the scenery of a portion whose eyes can comprehend it in a single view. It is a scene generated via observation, either on a natural or built environment, from one focal standpoint that provides inspiring vistas and a pleasing

environment while contributing to the economic value and comfortable enjoyment of real property (Popoola, Jinadu, Liman & Abdulrazack, 2015).

Environmental parameters refer to the quality of the neighbourhood and the quality of the location within the neighbourhood and are commonly measured by ordinal variables. Environmental quality is the specification and feature of the environment which affects humans and other organisms in general and locally. Environmental quality is an assessment of the environment in connection with one or more aspects of requirements or any human need or desire. Environmental quality can be define as a larger concept of "quality of life", combining basic qualities such as health and safety with aspects of welfare and grace (Malah, Bahi, Radoine, Maana& Mastouri, 2021).

The Influence of Neighbourhood Quality on Residential Property Values

Park and Burgess (2019), attributed that a neighbourhood can be distinct as an area with superlatively identifiable and recognizable characters with either natural or artificial boundaries such as streams, rivers, hills, culverts, drainages and fenced walls. The land use pattern and the urban growth can also influence the neighbourhood's look. Neighbourhoods may exhibit newness, growth, decay and renewal stages. Park and Burgess (2019), further revealed that some neighbourhoods are observed to be static in character while some are dynamic at various rates of speed. These different states make them gain public recognition and favour, especially from potential residents. Neighbourhood attributes are, therefore, many and varied depending on when they evolved and the extent of their dynamism. It ranges from physical, environmental, social, and economic to governmental or institutional. It includes parking availability, the size of the catchment area and transit accessibility. Similarly, coffee and bakery sites, parks, grocery stores, schools, restaurants, gas stations, and other features create attractiveness and serenity. McDonald and MacMillan (2007), explained neighbourhood characteristics on house value and identified two categories of neighbourhood variables which could positively or negatively influence house value. The positive neighbourhood variables outlined by MacDonald and MacMillan (2007), which are termed neighbourhood amenities, include Schools, playgrounds, hospitals and health centres, police stations, parks and recreational facilities, sporting facilities, shopping centres, community services and other environmental considerations like good drainages and waste disposal management tools. The negative neighbourhood variables termed as dis-amenities include industrial noise, neighbourhood crime rate, air pollution, heavy street traffic, and contaminated environment.

A study conducted by Lee (2010), on the influence of leisure and sporting facilities on residential property values used the number of dwelling components such as the living area, number of rooms, building age, number of stories, and number of floors as explanatory variables for structural components and residential neighbourhood variables for sport and leisure facilities, revealed that sport and leisure facilities have a significant influence on residential properties with cross-level interaction at the same time. A different outcome was observed by applying the hedonic housing prices model by Kiel *et al.* (2010), who examined

the relationship between proximity to football stadiums and residential property values. Their findings clearly showed no relationship between residential property values and proximity to the football stadium. In a linked study, Haizan, Yan and Lin (2014), studied the influence of educational facilities on house values using data on housing values and educational facilities of 660 communities in Hangzhou, China. The hedonic pricing model and the spatial econometric model were adopted for the analysis of the influence of educational facilities on house prices. The result from findings revealed that educational facilities have a positive influence on house values. The findings showed that houses close to high-quality schools sell for higher values compared to houses located further away from the schools.

Olga (2011), assessed the influence of proximity to cell phone towers on residential property values in New Zealand. The traditional hedonic housing value model was used to analyze the data obtained for the study. Model testing of various proximity specifications across two populations of cell towers, including the residential-only all towers and the global all towers, was done. The result has shown no relationship between cell towers and house values. In another route, Iroham and Oloyede (2010), studied the influence of neighbourhood churches on residential property values in Ota, Ogun state, Nigeria, taking living faith church as a study reference. Sales data of residential property within the area before and after the situation of the church were gathered. A descriptive-analytical technique was used to analyze the data obtained. The average sales values of residential property in the area were compared before and after the church's situation. The study revealed that the location of a church in a neighbourhood might greatly influence surrounding residential property. The study, however, should have used inferential statistical tools like hedonic pricing model, which is well known to be more effective in analyzing the influence of property components on house values. Similarly, the use of average house sale values alone without considering other property characteristics that influence house values could render the findings unconvincing.

Residential Property Rental Value

The term residential property rent is regarded as the monthly payment made to a landlord and is also construed as payment for the use of the building (Ehwi, Asante & Morrison, 2020). Rent can be defined as a sum or amount agreed in the lease or tenancy agreement to be paid by the tenant to the landlord for exclusive possession of the property leased for the lease period (Kurtz & Noble-Allgire, 2018). It is apparent that rent involves some form of exchange between two parties. The said exchange is usually in monetary form and is based on the agreement reached between the parties. Due to the high demand for residential apartments, landlords may take undue advantage of tenants and increase rent without adhering to rent regulations (Adu-Gyamfi, Poku-Boansi & Cobbinah, 2020).

Wyatt (2013), also noted that rent is a periodic payment for the use of property. Rent is used mainly for land or land and improvement, but it could be used in respect of other chattels such as plants, machinery and equipment. Rents from property arise not from the considerations of investment, which operate on different sets of conditionality and parameters. In addition to the above definition, the word rent was derived from the Latin word "redditus" which means any

income or yield from an economic agent (Gray, 2017). However, several definitions have been given depending on the shade of opinion. For instance, the lawyer sees rent as a certain and periodic payment or service made or rendered by the tenant of a corporeal hereditament (Gray, 2017) or, more precisely, in present-day usage, a sum of money paid for the occupation of land. Economists see rent as that portion of the earth's produce that is paid to the landlord for the use of the original and indestructible powers of the soil. Classical economists see rent as the income derived from the portion of the earth's produce, which is paid to the landlord for the use of the original and indestructible power of the soil. Ball (2018), acknowledged that rent is the surplus produce arising from the use of an appropriate natural agent.

Based on the definition of rent described by various authors above, rent can either be a contract or economic rent. The contract rent refers to the actual payments tenants make for their use of the property for others. The landlord and tenant normally agree to the amount of these payments in advance within the period the property is in use and thus forms a mutual contractual arrangement, while economic rent is the payment made to a factor of production that is in excess of that which is needed to keep it employed in its current use or its transfer earning. This situation arises when demand for the factor increases, and the supply cannot fully respond to the increased demand. This type of economic rent arises because of scarcity in the supply of factors.

Residential property rental value is the property's fair market value rented out in a lease (Schepotiev, 2020). More generally, it may be the consideration paid under a license to real property. In the science and arts of appraisal, it is the amount that would be paid for the rental of similar real property in the same condition and in the same area (Hussain, Abbas, Wei & Nurunnabi, 2019). There is a close relationship between rent and value. Rent can be distinct as the sum payable by a tenant to his landlord for the use of his property, usually annually (Owusu-Ansah, Ohemeng-Mensah, Abdulai & Obeng-Odoom, 2018). Soaita, Searle, McKee and Moore (2017), stated that the rental value of a property is the amount that a prospective tenant can afford to pay for its occupation. In the case of residential properties, occupation is a need and does not usually serve a profit-making function; the rental value of such a property will be determined by the level of demand and supply

Factors Affecting Residential Property Rental Value

The studies on residential property rental value generally identify four influential residential rental value factors: market forces, structural characteristics, neighbourhood characteristics and the economy (Feng & Humphreys, 2018). This is an indication that residential property rentals are determined by multiple factors, all contributing marginally to make up the rental value. This reflects the argument put forward by Darfo-Oduro (2020), that residential property as a composite commodity has several desirable and undesirable parts coming together to determine its rental value. It is therefore expected that, whereas desirable residential property enhances the value of a household, undesirable household will bring the rental value of residential property down. Thus, rental value rises when there is more desirable residential property, or the desirable households carry greater weight than undesirable residential property

and the opposite holds true. Thus, rental value changes depending on the net effect of the interaction between the desirable and undesirable attributes of a residential property (Craw, 2020).

Neighbourhood characteristics are the environmental characteristics or the exterior features of a property that affect or have the potential to affect a residential performance (Van Renterghem, 2019). The studies on the effect of neighbourhood characteristics on property rental values have presented several neighbourhood characteristics that have affected the value of the residential property. These factors include location factors, school quality, availability of wooded areas and distance to the workplace (d'Acci, 2019). It can be observed that neighbourhood characteristics are simply location, proximity to the centre of attraction and quality of the neighbourhood within which a property is located. Just as structural characteristics, neighbourhood characteristics are also a combination of desirable and undesirable factors that interact and exert their marginal effect to determine the prices of properties.

d'Acci (2019), wrote on urban location and housing value using a hedonic model, and the authors deviated from the monocentric measure of relative distance to the central business district as a measure of the importance or value of an estate or property. The authors argued that the central business district is not necessarily the centre of attraction. The authors, therefore, used both distance and travel time to measure the relative location of the house to the central business district and multiple employment centres. The authors revealed that the model that used central business as the only centre of attraction relative to the house's location other than multiple employment centres as the centre of attraction was inferior. The findings of Darfo-Oduro (2020), notwithstanding, several authors have used distance to the central business district as a neighbourhood characteristic in studies that attempt to determine house price factors.

From the studies review on factors influencing residential property value, it is clear that much of the existing studies have focused on the physical attributes such as neighbourhood, structural and locational attributes while little research has been dedicated to the study of the intangible factors influencing rental value which is also an important part of the urban environment and a critical determinant in the residents' choice of rental accommodation.

Determinants of Residential Property Value

In the real estate market, property value can be determined by various factors. These varying factors have made property value different from one market to another. For instance, Torquati, Giacchè and Tempesta (2020), identified three major factors affecting residential property values: location, position in terms of intrinsic characteristics, and physical characteristics of the property. Vandeviver and Bernasco (2020), also established that property location, structure and neighbourhood characteristics determine property value. This submission was in line with studies by (Roy, Dubé, Després, Freitas, and Légaré, 2018). Furthermore, Kgari (2017), submitted that factors determining property value are locational factors, structural

factors, neighbourhood factors, community characteristics, environmental factors and time-related factors.

Research Methodology

The research adopted the quantitative research approaches and survey research design. It also employs the use of questionnaires and existing databases. This research involved gathering information on targeted population from a sample and analyzed sample to the entire population of 1895 household heads and sample size of 320 was drawn using Krejcie and Mogan (1970). The data collected from the field were analysis using mean ranking and multiple regression.

Data Presentation and Analysis

The findings from the data analysis are presented and discussed in this section of the study. The 320 sets of questionnaires were administered to the household heads of rented residential properties in the selected study area (Ungwan Rimi). A total number of 271 questionnaires with 84.69% approximate response rate were retrieved from the study area were used in the analyses after removing invalid ones and data screening for outliers.

Environmental Features' Qualities Provided in Rented Residential Properties in Ungwan Rimi, Kaduna Metropolis

Descriptive statistics based on mean ranking was carried out to explore the environmental features and qualities provided in rented residential properties in Ungwan Rimi, Kaduna metropolis, Nigeria. The environmental features have two themes: Location (proximities) and Neighbourhood (attributes).

Location (Proximities)

Descriptive statistics based on mean ranking were carried out to explore the location (proximities) features of rented residential properties in Ungwan Rimi, Kaduna metropolis, Nigeria. The results showed the mean, standard deviation and mean ranking for each item, as presented in Table 1.

Table 1: Location (Proximities)

	Mean	Std. Deviation	Ranking	Remarks
Proximity to Place of worship	4.25	0.013	1	Very high
Proximity to School	4.13	0.997	2	High
Proximity to Local shops	4.11	0.009	3	High
Proximity to Hospital	4.09	0.994	4	High
Proximity to Public Transportation	4.06	1.049	5	High
Proximity to a Police station	4.06	1.072	6	High
Proximity to Market	4.04	1.03	7	High
Proximity to Local and city centre	4.01	1.063	8	High
Proximity to Waste disposal centres	3.4	1.041	9	Moderate

	Mean	Std. Deviation	Ranking	Remarks
Proximity to Recreational centres	3.31	1.048	10	Moderate
Proximity to a Fire station	3.1	1.099	11	Moderate
Location (proximities)	**3.56**	**1.037**		**Good**

Table 1 presents the Location (proximities)features of rented residential properties in Ungwan Rimi, Kaduna metropolis, where the result indicated highest ranked mean and rated very high proximity to mosque/church (M=4.25, SD= 0.013). This was followed by means rated high proximity to school (M=4.22, SD=0.997), and proximity to local shops (M=4.22, SD= 0.009). The least ranked means but rated high consist of proximity to waste disposal centres (M=3.40, SD=1.041), proximity to recreational centres (M=3.31, SD=1.048), and proximity to a fire station (M=3.10 SD=1.099). The overall result for location (proximities) features of rented residential properties in Ungwan Rimi, Kaduna metropolis indicates a good (close) proximity to essential services.

Neighbourhood Attributes

Descriptive statistics based on mean ranking was carried out to explore the neighbourhood attributes provided in rented residential properties in Ungwan Rimi, Kaduna metropolis, Nigeria. The results showed the mean, standard deviation and mean ranking for each item as presented in Table 2.

Table 2: Neighbourhood Attributes

	Mean	Std. Deviation	Ranking	Remarks
Electricity supply	4.34	0.982	1	Very good
Greening	4.33	0.984	2	Very good
Security	4.33	1.01	3	Very good
Recreational centres	4.32	1.006	4	Very good
Conditions in dry season	4.32	1.018	5	Very good
Layout condition (topography)	4.2	1.026	6	Good
Conditions in wet season	4.18	1.046	7	Good
Traffic noise from outside	4.1	1.068	8	Good
Pollution	4	1.074	9	Good
Location of building	3.9	1.028	10	Good
Human noise from outside	3.7	1.063	11	Good
Parking spaces	3.4	1.083	12	Moderate
Circulation space	3.2	1.109	13	Moderate
Drainage condition	3.12	1.058	14	Moderate
Water supply	3.05	1.07	15	Moderate
Trees and shrubs	3	1.126	16	Moderate
Sanitation	2.85	1.057	17	Moderate
Neighbourhood attributes	**3.78**	**1.047**		**Good**

Table 2 presents the neighbourhood attributes qualities provided in rented residential properties in Ungwan Rimi, Kaduna metropolis. The result shows that the major neighbourhood attributes with means ranked highest and rated with very good qualities are electricity supply M = 4.34, SD = 0.982), greening (M = 4.33, SD = 0.984), security (M = 4.33, SD=1.010), recreational centres (M = 4.32 SD= 1.006), conditions in dry season (M= 4.32, SD= 1.018), and layout condition (topography) (M= 4.32, SD=1.026). The neighbourhood attributes ranked least, but rated good are drainage condition (M= 3.12, SD= 1.058), water supply (M= 3.05, SD= 1.070), trees and shrubs (M=3.00, SD=1.126), and sanitation (M=2.85, SD=1.057). The overall neighbourhood attributes quality provided in rented residential properties in Ungwan Rimi, Kaduna metropolis were rated good.

Table 3: Descriptive Analysis of Rental Values of Residential Properties in Ungwan Rimi

	Ungwan Rimi		
Descriptive	**Flat**	**Bungalow**	**Tenement**
Mean	888624	751375	210966.5
Standard Error	2802.46	5802.89	1076.208
Median	900000	750000	200000
Mode	900000	800000	200000
Standard Deviation	45971.3	95174.5	17651.13
Sample Variance	2.11E+11	9.06E+11	3.12E+08
Kurtosis	1.348009	1.540764	0.600445
Skewness	0.483697	1.203641	0.760579
Range	200000	400000	100000
Minimum	800000	600000	150000
Maximum	1000000	1000000	250000
Sum	2.39E+09	2.02E+09	56750000
Count	271	271	271

Source: Computed From Appendix A and B

The result of descriptive analysis of rental value of residential property types in Ungwan Rimi is presented in table 3. The average rental value of Residential flat in Ungwan Rimi is ₦888,624. The average rental value of residential Bungalow in Ungwan Rimi is ₦751,375 while the average rental value of residential tenement is ₦210,966 Ungwan Rimi.

Table 4: Analysis of Variance in Rental Values of Residential property Types Across the Study Areas

Market	SS	Sum of Squares	Df	Mean Square	F	Sig.
Flat	Between Groups	22079800567092268	5	4415960113418453	13350.038	.000
	Within Groups	509735974830166	1541	330782592362		
	Total	22589536541922436	1546			
Bungalow	Between Groups	30566898411509704.000	5	6113379682301941	31863.801	.000
	Within Groups	295655813525843.750	1541	191859710269.853		
	Total	30862554225035548.000	1546			

Market	SS	Sum of Squares	Df	Mean Square	F	Sig.
Tenement	Between Groups	1507188438593767.500	5	301437687718753.5	33772.652	.000
	Within Groups	13754190197764.816	1541	8925496559.224		
	Total	1520942628791532.200	1546			

Source: Computed from Appendix A-F

Table 5: Ordinary Least Square (OLS) Regression Model for Ungwan Rimi Property Residential Market

Variable	Coefficient	Std. Error	t-Statistic	Prob.	R-sq	DW
LPS	0.872721	0.043361	20.12674	0.0000	0.799	2.056
ECS	0.259518	0.053181	4.880084	0.0096		
C	4.160224	0.379913	10.950849	0.0025		

HCPS: Housing physical condition; HNPS: Housing Non-Physical Condition; LPS: Environmental Location Proximity; ECS: Environmental Neighbourhood Quality Condition. All variables are significant at 0.05.

The result of effect of environmental quality and property features on rental value was conducted using OLS regression analysis and the result is presented in Table 5. The result revealed that 79.9% variation in aggregated rental values of residential property types is significantly influenced by two environmental variables (LPS & ECS). The result of t-statistics presented in the tables suggested that there is statistically significant relationship between environmental quality features and rental values in Ungwan Rimi residential market as the p-values of t-statistics are found below 0.05 level of precision. The effect of the relationship was determined using coefficient determination are 87.27% and 25.95% positive effects for LPS & ECS respectively as presented in the table. In other word, result further indicates that any change in LPS of any property type, will significantly amount to 87.27% positive change in rental values and finally, any improvement in ECS will significantly result in 25.95% positive change in rental values of residential property types. The result of Durbin Watson statistics at 2.056 indicates that there is no problem of autocorrelation in the residuals that might cause a serious distortion in the model.

Aggregated Rent = 0.872721*LPS + 0.259518*ECS+ 4.160224

Table 6: Test of Significance of Model and Reliability of the Model in Ungwan Rimi Residential Property Market

Test of Significance of Model

R-squared	0.799995	Mean dependent var	7.188192
Adjusted R-squared	0.796987	S.D. dependent var	1.536473
S.E. of regression	0.692288	Akaike info criterion	2.120649
Sum squared resid	127.4839	Schwarz criterion	2.187109
Log likelihood	-282.3479	Hannan-Quinn criterion.	2.147333
F-statistic	265.9909	Durbin-Watson stat	2.056741

Prob(F-statistic)	0.000000

Ungwan Rimi residential property market model developed was tested to ascertain the level of fit-ness of the model for future use and reliability of the model for accurate prediction. The result of the test featured F-statistics that measures significance and fit-ness of the model for the future use and the result revealed that the f-test at 265.9909 is found statistically significant as the p-value (prob) at 0.000 is less than 0.05 level precision. By implication, the model is found fit and can be used for purpose of prediction of rental value in Ungwan Rimi residential market. Also, the residual of the model was tested and examined using Durbin Watson statistic. The Durbin Watson was used to test the presence of serial autocorrelation in the residuals and the result revealed that Durbin Watson statistics at 2.056 is found within the reasonable range of 2.00 (not significantly < 2 and not significantly greater > 2). This therefore implies that none of the variable included in the model is correlated with itself and linear assumption OLS was not violated.

Table 7: OLS Regression Analysis with Rent as Dependent Variable

Variable	Coefficient	Std. Error	t-statistics	Probability
C	9.593826	0.126101	76.08075	0
Log (ECS)	1.031368	0.239948	4.29829	0
Log (LPS)	0.490871	0.17457	2.811892	0.0052

Table 52 presents OLS regression between dependent variables and independent variables. The model employs a log transformation form, where both the dependent variable, log(rent), and all independent variables (ECS and LPS) are transformed using natural logarithms. This specific transformation is particularly useful when the underlying relationship between variables is non-linear in its original parameters, as the logarithm transformation can linearize the model, aligning it with one of the core assumptions of OLS. The practical advantage of this approach is that the coefficients derived from such a model can be directly interpreted as elasticity's. This implies that the model aims to capture how a percentage change in an independent variable corresponds to a percentage change in the dependent variable, which is often more economically meaningful than absolute unit changes. The choice of a log-log model suggests an underlying economic hypothesis that the proportional change in rent is consistently related to the proportional changes in its determinants, rather than absolute unit changes. The dataset used for this analysis comprises 400 observations.

In a log-log regression model, the estimated coefficient for an independent variable represents the elasticity of the dependent variable concerning that independent variable. This means that for a 1% change in an independent variable, the dependent variable, Log (Rent), is expected to change by the magnitude of its coefficient in percentage terms, assuming all other variables are held constant. The coefficient for the constant term is 9.593826, with a p-value of 0.0000. This indicates that the constant is highly statistically significant. In a log-log model, the

constant represents the expected value of log(rent) when the natural logarithm of all independent variables is zero (i.e. when the original independent variables are equal to one). While statistically significant, its direct economic interpretation is often limited as it primarily serves to adjust the overall level of the regression line.

The results indicated that Log(ECS) and Log(LPS) demonstrated statistical significance results at the 5% confidence level with corresponding p-values of 0.0096, 0.000, 0.0052 respectively. The varying levels of significance and magnitudes across the independent variables highlight that not all factors contribute equally to explaining rental price variations. Log(ECS) with p-value 0.0000 stands out as the most significant and impactful variable, suggesting it is a primary driver of rental price changes.

Table 8: Overall Model Performance

Model Performance	
R-square	0.699122
Adjusted R-square	0.595011
S.E. of Regression	0.481873
Sum squared resid	90.55844
Log likelihood	-269.585
F-statistics	145.7163
Prob (F-statistics)	0

From the result, the R-squared value for this model is 0.699122, an R-squared of approximately 69.91% indicates that the independent variables collectively account for a very high proportion of the total variation observed in log(rent). This suggests the strong explanatory power of the model. The Adjusted R-squared is 0.695011. Unlike R-squared, the Adjusted R-squared accounts for the number of predictors in the model and penalizes the inclusion of unnecessary variables. While R-squared tends to increase with the addition of more variables, even if they do not meaningfully improve the model, Adjusted R-squared will decrease if additional variables do not contribute significantly to the model's explanatory power. The minimal difference between the R-squared and Adjusted R-squared values (0.699122 vs. 0.695011) suggests that the independent variables included in the model are generally contributing meaningfully to its explanatory power. This confirms the strong explanatory power of the model while also considering its complexity.

Summary of Findings

The study found that only two independent variables Environmental Neighbourhood Quality Condition ECS) and Environmental Locational Proximity (LPS) were statistically insignificant. The overall model performance showed an R-squared of approximately 64.26%,

indicating that the independent variables collectively account for a proportion of the total variation observed in the (rent).

The Adjusted R-squared was 63.59%, indicating that 63.59% of the variability in the dependent variable (rent) is explained by the independent variables. The minimal difference between the R-squared and Adjusted R-squared values (0.642646 vs. 0.635904) suggests that the independent variables are generally contributing meaningfully to the model's explanatory power.

This confirms the strong explanatory power of the model despite its complexity when the variables are transformed into log form to select the model with the most appropriate result.

The study found that Log (ECS) Environmental Neighbourhood quality Condition, and Log (LPS) Environmental Locational Proximity all showed statistical significance at the 5% confidence level, indicating that not all factors contribute equally to explaining rental price variations. Log (ECS) Environmental Neighbourhood quality Condition was the most significant and impactful variable.

The result also revealed that average rental values of residential property types revealed that Ungwan Rimi is good rental markets; it is higher and steady over and above other market. Furthermore, analysis of rental variance confirmed that Ungwan Rimi rental market constitute bulk of variance in rental values of residential property investment in Kaduna.

Conclusion

The result found that there is a statistically significance relationship between rental values and environmental quality attributes. The two environmental features (LPS & ECS) maintained between 68% and 85% significant influence on rental variance across the study areas. The effect of the relationship was estimated and result indicated that there are positive effects of LPS & ECS on rental values of residential property types across the study areas most especially LPS maintained the highest significant effect on rental changes. By implication, a prudent investor should focused more on LPS variables because it highest significant effect in determining the values of residential investment in Kaduna.

Recommendations

i. Property owners/developers should continue to prioritize regular maintenance and timely repairs of fundamental property elements, as this ensures tenant satisfaction, increases turnover, and protects property value over time.
ii. Property owners should strategically invest in upgrading and maintaining flooring and ceilings to enhance interior aesthetics, boost perceived quality, and increase the desirability and potential rental value of their properties
iii. Local government should prioritize projects to improve and expand drainage infrastructure, especially in areas prone to flooding, to ensure better sanitation, prevent property damage, and enhance resident safety, particularly during the rainy season.
iv. Encouraging the planting of more trees and shrubs can improve air quality, provide shade, enhance aesthetic appeal, and contribute to a more pleasant living environment.

v. Focus investments on improving environmental quality, particularly ventilation and natural lighting, as these are primary drivers of rental price increases.

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