frontiers | Frontiers in Sustainable Cities

TYPE Original Research
PUBLISHED 03 April 2024
DOI 10.3389/frsc.2024.1384945

OPEN ACCESS

EDITED BY
Ojonugwa Usman,
Istanbul Commerce University, Türkiye

REVIEWED BY
Ayodele Oluwafemi,
Obafemi Awolowo University, Nigeria
Elżbieta Macioszek,
Silesian University of Technology, Poland

*CORRESPONDENCE
Hilary I. Okagbue
✉ tobyhilly93@gmail.com

RECEIVED 11 February 2024
ACCEPTED 08 March 2024
PUBLISHED 03 April 2024

CITATION
Iroham CO, Okagbue HI, Ekanem IF, Peter NJ, Samuel OW, Nto SE, Isiaka S and Adedotun AF (2024) Three attributes determining land values in three selected housing estates in Uyo, Nigeria.
Front. Sustain. Cities 6:1384945.
doi: 10.3389/frsc.2024.1384945

Three attributes determining land values in three selected housing estates in Uyo, Nigeria

Chukwuemeka O. Iroham[1], Hilary I. Okagbue[2]*, Inimfon F. Ekanem[1], Nkolika J. Peter[3], Olugbemisola W. Samuel[2], Sunday E. Nto[2], Saheed Isiaka[2] and Adedayo F. Adedotun[4]

[1]Department of Estate Management, Covenant University, Ota, Ogun State, Nigeria, [2]Sydani Institute for Research and Innovation, Sydani Group, Abuja, Nigeria, [3]Department of Estate Management, Lagos State University, Epe, Lagos State, Nigeria, [4]Department of Mathematics, Covenant University, Ota, Ogun State, Nigeria

There is a knowledge gap regarding the specific attributes (location-specific, environmental, and neighborhood) that impact land value, the relationship among these attributes, and the degree of impact on the land values in residential estates in Uyo, Nigeria. The three factors all combine to create a unique picture of a place, impacting its desirability and ultimately, its land value. This study explores the relationship between various land value attributes within specific residential estates (Ewet Housing Estate, Shelter Afrique Estate, and Akwa-Ima Estate) in Uyo. A questionnaire was designed and used to solicit data from the respondents living in the three estates with the aid of the purposive sampling technique. The findings revealed the following: Closeness to school is the location-specific attribute that contributes the most to land value, and closeness to recreational centers contributes the least. The presence of security and police stations had the most significant contribution to land value, and the presence of noise in the neighborhood had the least significant contribution. Peace, quiet, and beauty had the most significant contribution to land value, and the presence of lakes and water bodies in the environment contributed the least to land value. The factor analysis yielded two major factors for location-specific attributes: 'transport' and 'place'. The factor analysis grouped the neighborhood attributes into two factors: 'easily controlled' and 'not easily controlled'. All three attributes of land values are positively correlated with one another. Implications for research and recommendations were made.

KEYWORDS

attribute, cities in the global south, environment, factor analysis, land value, location, neighborhood, statistics

1 Introduction

The value of land as space at a location, as conceptualized by urban rent theory, is distinct from the bundle of neighborhood, environmental qualities, and local public goods that the land incorporates (Cheshire and Sheppard, 1993). Hence, when conducting a comprehensive investigation into land values or prices, it is crucial to recognize that land is not a singular entity but rather a multifaceted combination of services or potential services that span across various dimensions.

Land encompasses several factors that combine to create collections of attributes that affect the usefulness and desirability of a property, which are valued by consumers. Since the mid-20th century, homeowners, investors, and users have faced challenges in identifying the core elements that influence the worth of residential properties in the worldwide housing market.

These attributes of land values were divided by Alonso (1964) into location factors and non-location variables. Location factors, such as proximity to the central business district (CBD), play a significant role in determining property value. On the other hand, non-location factors encompass various aspects like the size of the plot, the duration of land ownership, the age of the neighborhood, monthly income, zoning regulations, and the overall quality of the neighborhood.

Based on theories and prior research, Son et al. (2020) further classify these characteristics of land values as distance factors, socio-economic factors, and environmental aspects. The factors considered in terms of distance include the following: the proximity to the city center, the distance from the study area's land to the people's committee, the distance to the police station, the distance to schools, colleges, universities, and vocational schools, the distance to healthcare facilities, the distance to markets, supermarkets, and shopping malls, the distance to cultural centers, the distance to parks and recreational areas, the distance to kindergartens and public pre-schools, the distance to sources of pollution, the distance to points of noise pollution, the distance to nearby city centers, the distance to main roads, the distance to cemeteries, and the distance to public lakes and the slope of the terrain. Clean water availability, static traffic density, historic towns that need to be preserved, population density (people per square kilometer) of a specific land area, rate of natural increase, new urban areas, zoning, construction restrictions, security measures, total product *per capita*, and the added value of an entire ward are included in the socioeconomic factors. Environmental elements considered include soil, water, and air quality.

Few Nigerian studies have additionally investigated the influence and relationship between these attributes on land and residential property values. They are (Oloke et al., 2013) in Lagos; (Ajibola et al., 2014) in Port Harcourt; (Adegoke et al., 2017) in Ibadan Metropolis; and (Elenwo and Akujuru, 2018) in Port Harcourt Metropolis, among others. All of these investigations, though, were carried out in various cities and regions; Uyo (the studied area in this paper) was not included among them.

Uyo, a city in Nigeria, has experienced rapid growth and has emerged as one of the fastest-growing cities in the country. Over the past few years, there has been a significant surge in population and migration to Uyo, resulting in notable changes to the city's structural layout. These changes and status upgrades in the area attracted development, leading to increased pressure on land and landed resources in the urban fringe areas, which are transitioning from rural to urban land uses, thereby causing an increased growth of built-up land. This pattern further constitutes urbanization. Essien and Cyrus (2019) claimed that Uyo's urbanization, which was previously centered in the area around the city center (Ibom Plaza), has expanded to the urban fringe of the city (Mbiabong Etoi, Afaha Oku, Ikot Oku Ubo, Osong Ama, Itam, Abak, and Mbierebe). Given that one of the land's main characteristics is scarcity, the central business district (CBD) is becoming rather congested, and high-income residents who want excellent, comfortable housing are being forced to live outside the CBD, which has led to the observed diverse land values in the study area.

It is most unfortunate that there is a lack of comprehensive research specifically focused on examining the relationship among attributes of land value in the current area under study, since all relevant research in Nigeria has been found in other geographical parts of the country. Secondly, studying a single city like Uyo, with a diverse range of housing estate neighborhoods and property types allows researchers to observe how different attributes impact land values across various contexts. This diversity enables them to isolate the specific effects of individual factors, while controlling for the influence of other variables. Abidoye et al. (2016) noted that the variables influencing land values are distinct from geography; hence, the study recommends segmenting the study of the property markets. Therefore, it is essential to examine the key factors luring land purchasers and boosting the land's sales value in these three selected estates in Uyo, Nigeria.

Relationships among the attributes of land value have been investigated in numerous studies to examine the factors that influence land prices and land values in various study locations, leading to a variety of results. Since the value of land is contingent upon its specific characteristics, it is not feasible to draw generalized conclusions. It is reasonable to assume that a comprehensive study is necessary for each market or location before any definitive findings can be drawn. It is within this context that the research examines the correlation between land value attributes in the three primary estates of Uyo, Nigeria.

Many earlier scholars on the subject of residential property value, including (Aluko, 2011), concentrated their emphasis on a variety of concrete location characteristics that serve as the basis for residential property value. According to a number of scholars, such as Perry (2019), land values decline the further they are from the core business district. In contrast, the land value pattern in Uyo is inversely correlated with the CBD distance. This means that the value of land far from the city center seems higher than that around the city center. Therefore, it might be that other factors, besides the distance factor, are the main attributes influencing land values in this study area.

In their analysis of the determinants influencing residential property values in Lagos State's Magodo Neighborhood, an available study found that areas with developing transit networks tend to see property and land values rise more quickly than areas without such advancements. A number of these estates with high land values in the Uyo perimeter lack an appropriate transportation network, other infrastructural services or improvements, and the presence of various other factors that affect their land value, as opposed to those with lower land values close to the CBD. With the observations made, one would feel compelled to jump to the conclusion that the high demand and socioeconomic class of the locals are to blame for the high value of land in these locations.

Hence, relying solely on assumptions makes it unfeasible to determine the validity of their assertion, and it is equally impractical to draw any substantial statistical conclusions from it without subjecting the variables related to land attributes to a thorough scientific and statistical examination. This research was necessary because there was no prior empirical study in the literature on the characteristics of land values in the study area.

There is a knowledge gap regarding the specific attributes that impact land value in the area, the relationship among these attributes, and the degree of impact on the land values in these study areas, given

the level of participation of investors and developers in the residential sector, the ongoing urbanization, and changes in land use patterns in the numerous residential estates in Uyo, Nigeria.

Consequently, the main objective of this paper is to explore the relationship between various land value attributes within specific residential estates in Uyo.

The aim of this study is to determine the relationship among locational, environmental, and neighborhood attributes that determine land values in three selected housing estates in Uyo, Nigeria. Location-specific attributes refer to the proximity of a property to specific features that contribute to its desirability and convenience (Macioszek and Ahac, 2023). It is the measure of accessibility. These include: closeness to schools, bus stations, rail stations, airports, places of worship, city centers, business districts, recreational centers, and workplaces. Neighborhood attributes encompass the overall character and quality of the surrounding area, impacting its livability and appeal (Macioszek, 2023). They include security/police station, crime rate, quality roads and transportation routes, infrastructure and amenities, sanitary waste disposal, electricity and water supply, nightlife, hawking and informal or street trading, access to public spaces, disturbance from political activities, and noise. Environmental attributes focus on the natural elements and the overall environmental quality of the location (Qiu et al., 2023). They include peace, quiet, and beauty; quality air; quality water; green space; and lakes and water bodies. In order to achieve the aforementioned aim, this study will pursue the following research objectives:

1 To identify the attributes of land values in the study area.
2 To assess the magnitude of the attributes that influence the value of properties in the designated study area.
3 To obtain the relationship among the three attributes on land value in the study area.

Furthermore, the paper aims to analyze the effects and influences of these attributes on the overall value of the land. The findings could be useful not just to local landowners and investors but also to real estate surveyors, valuers, and policymakers in terms of infrastructure development and urban expansion. All interested parties can better grasp the reasons for the discrepancy in the land values of residential land in the area since the influence of land features on housing rental value will be established. Estate surveyors and valuers can use this data to identify factors and create models that account for dwelling status and residential neighborhoods when determining the land prices of different residential property kinds in the study region.

The introduction section is followed by the methodology, result and the discussion sections.

2 Methodology

The research adopted a questionnaire to solicit data on the subject matter from the residences of the three estates. The total number of households in the sampled neighborhood is 1,960 housing units. The sample size for each housing estate was drawn from the 1,960 residential units that were selected in the sampled neighborhoods so as to avoid under-sampling or over-sampling of these housing estates. Establishing a trustworthy, sufficient, and precise sample size is the best way to accurately reflect the population. The peripheral residential neighborhoods chosen for the study include Akwa-Ima Estate, Ewet Housing Estate, and Shelter Afrique Estate, forming the sample area for the research. This study used Yamane's formula in determining the suitable sample size for this study, with an assumption of 95% confidence level, and this is presented in Table 1.

In this particular study, the purposive sampling technique was employed to select the sample area for the study, while random sampling was used to administer questionnaires to the residents of the selected neighborhoods. The purposive sampling technique is similar to the ones presented in Maepa (2021), and Li et al. (2023).

The questionnaire was designed using examples from previous studies that had similar research themes. Some of these studies that greatly influenced the design of the questionnaire are: Oloke et al. (2013), Binoy et al. (2020), and Das et al. (2021). The questionnaire was divided into four sections. The first section on demographic data asked respondents about:

1 Gender (male, female).
2 Age (18–20, 21–29, 30–39, 40–49, 50 years and above).
3 Level of Education (OND, HND, B.Sc., M.Sc., Ph.D).
4 Resident Estate (Ewet Housing Estate, Shelter Afrique Estate, Akwa-Ima Estate).
5 Duration of Residency (Less than 6 months, 6 months – 12 months, 13–24 months, Over 2 years).

The second section was questions about location attribute. The respondents were asked if six location attributes affects land values. The responses are in 5-point Likert scale namely: strongly disagree (SD), disagree (D), neutral (N), agree (A) and strongly agree (SA) are coded as 1, 2, 3, 4 and 5, respectively.

1 Closeness to schools.
2 Closeness to bus station or airport.
3 Closeness to place of worship.
4 Nearness to place of work.
5 Closeness to city center (Ibom Plaza).
6 Closeness to recreational center.

The third section was questions about neighborhood attribute. The respondents were asked if ten neighborhood attributes affects land values. The scale of responses is the same as location attribute.

1 Security/Police station.
2 Quality roads and transportation routes.
3 Infrastructure and amenities.
4 Sanitary waste disposal.
5 Electricity and water supply.
6 Night life.
7 Hawking and street trading.

TABLE 1 The sample size across the Sample frame.

Residents	Ewet housing estate	Shelter Afrique estate	Akwa-Ima estate
Sample frame	1,287	575	100
Sample size	92	85	49

TABLE 2 Demographic summary.

Parameters	Subdivision	Frequency	Percentage
Gender	Male	52	47.3
	Female	58	52.7
Age	18–20 years	5	4.5
	21–29 years	47	42.7
	30–39 years	10	9.1
	40–49 years	28	25.5
	50 years and above	20	18.2
Educational status	OND	7	6.4
	HND	6	5.5
	B.Sc.	65	59.1
	M.Sc.	23	20.9
	Ph.D.	9	8.2
Resident estate	Ewet Housing Estate	57	51.8
	Shelter Afrique Estate	29	25.4
	Akwa-Ima Estate	24	21.8
Duration of residency	Less than 6 months	13	11.8
	6–12 months	13	11.8
	13–24 months	24	21.8
	Over 2 years	60	54.5

TABLE 3 Summary of responses and mean ranking of location-specific attributes.

Attributes	SD	D	N	A	SA	Mean	Ranking
Closeness to schools	3	10	5	60	32	3.98	1st
Closeness to bus station or airport	2	15	7	59	27	3.85	2nd
Closeness to place of worship	2	19	3	63	23	3.78	3rd
Nearness to place of work	3	23	17	47	20	3.53	4th
Closeness to city center (Ibom Plaza)	17	35	4	35	19	3.04	5th
Closeness to recreational center	8	47	11	31	13	2.95	6th

8 Flooding.
9 Disturbance from political activities.
10 Noise.

The fourth section was questions about environment attribute. The respondents were asked if five environmental attributes affects land values. The scale of responses is the same as location and neighborhood attributes.

1 Peace, quiet and beauty.
2 Quality air.
3 Quality water.
4 Green space.
5 Lake and water bodies.

Out of two hundred and twenty-five questionnaires that were distributed, one hundred and ten were retrieved, resulting in a response rate of 48.89%. The questionnaires were coded, and the data were analyzed using SPSS version 24. The statistical methods employed included frequency analysis, mean ranking, and exploratory factor analysis (EFA). A significance level of 0.05 was adopted in this study unless otherwise stated.

3 Results

3.1 Demographic analysis

The demographic analysis is presented in Table 2, where 47.3% of the respondents are male and the remaining are female. A further demographic analysis showed that 51.8, 25.4, and 21.8% of the respondents reside in Ewet Housing, Shelter Afrique, and Akwa-Ima Estates, respectively. Other demographics are as presented in Table 2.

3.2 Ranking of factors considered in attributes (location, neighborhood and environmental)

In this section, the residents of the estates were asked to rate what they considered to be the major attributes in regards to the location, neighborhood, and environment of their resident estate. The responses are strongly disagree (SD), disagree (D), neutral (N), agree (A), and strongly agree (SA), which are assigned the values 1, 2, 3, 4, and 5, respectively. The means of the variables were calculated, ranked subsequently, and presented in Table 3 (location-specific), Table 4 (neighborhood), and Table 5 (environmental).

Closeness to schools, bus stations or airports, and places of worship are the top three location attributes, while proximity to places of work, city centers, and recreational centers are the last three.

Security, quality roads, infrastructure and amenities, waste disposal, and electricity and water supply are the top five neighborhood attributes, while nightlife, hawking and street trading, flooding, disturbance from political activities, and noise are the last five.

Peace, quiet, beauty, quality air, and quality water are the top three environmental attributes, while green space, lakes, and water bodies are the last two.

3.3 Exploratory factor analysis of the attributes

EFA was applied and the results were grouped based on the three attributes.

3.3.1 Location attribute

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy, which is 0.681, indicates that the sample size is acceptable for conducting the analysis. Additionally, Bartlett's Test of Sphericity yielded a significant

TABLE 4 Summary of responses and mean ranking of neighborhood-specific attributes.

Attributes	SD	D	N	A	SA	Mean	Ranking
Security/Police station	3	4	3	55	45	4.23	1st
Quality roads and transportation routes	0	6	2	67	35	4.19	2nd
Infrastructure and amenities	0	7	10	62	31	4.06	3rd
Sanitary waste disposal	2	9	5	65	29	4.00	4th
Electricity and water supply	1	13	7	54	35	3.99	5th
Night life	4	9	19	50	29	3.83	6th
Hawking and Street trading	14	29	3	48	16	3.21	7th
Flooding	17	41	11	27	14	2.82	8th
Disturbance from political activities	10	48	18	20	14	2.82	8th
Noise	29	59	7	12	3	2.10	10th

TABLE 5 Summary of responses and mean ranking of environment-specific attributes.

Attributes	SD	D	N	A	SA	Mean	Ranking
Peace, quiet and beauty	1	1	3	60	45	4.34	1st
Quality air	1	0	4	70	35	4.25	2nd
Quality water	1	5	3	66	35	4.17	3rd
Green space	0	9	12	54	35	4.05	4th
Lake and water bodies	24	43	14	11	18	2.6	5th

result (Chi-square = 172.88, $p = 0.000$), indicating that the correlation matrix is not an identity matrix and justifies the use of factor analysis in this study. The communalities were precipitated using the principal component analysis, and the extraction values are as follows: city center (0.73), schools (0.536), place of work (0.705), bus station or airport (0.77), recreational centers (0.575), and place of worship (0.579).

The model yielded six dimensions, but only two cumulatively explained 64.919 of the variation in the data. Dimensions 1 and 2 accounted for 45.376 and 19.543 of the cumulative variation. The remaining four dimensions accounted for the remaining 35.081 percent of the variation.

The component matrix yielded two major factors: transport factors and places, as presented in Table 6. The factors that determine location attributes are places and transport.

The first attribute (closeness to the city center) is maximally correlated with place (0.747), along with closeness to school (0.686), place of work (0.754), recreational centers (0.656), and the last attribute, place of worship (0.715). On the other hand, bus stations or airports (0.764) have accessibility to transport routes.

3.3.2 Neighborhood attribute

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy, which is 0.702, indicates that the sample size is acceptable for conducting the analysis. Additionally, Bartlett's Test of Sphericity yielded a significant result (Chi-square = 228.594, $p = 0.000$), indicating that the correlation matrix is not an identity matrix and justifies the use of factor analysis in this study. The communalities were precipitated using the principal component analysis, and the extraction values are as follows: infrastructure and amenities (0.390), flooding (0.600), security (0.338), noise (0.526), waste and drainages (0.356), roads and transportation (0.507), power and water supply (0.567), nightlife (0.413), nuisance from politics (0.439), and hawking and street trading (0.656).

The model yielded ten (10 dimensions), but only two cumulatively explained 47.914% of the variation in the data. Dimensions 1 and 2 accounted for 27.940 and 19.974 of the cumulative variation. The remaining eight dimensions accounted for the remaining 52.086 percent of the variation.

The component matrix yielded two major factors: easily controllable and not easily controllable, as presented in Table 7. The factors that influence neighborhood attributes are both easily and inconveniently controllable.

One factor that can easily be controlled and provided by the residences The residents can easily provide infrastructure and amenities (0.619), security (0.458), and the presence of quality waste disposal (0.588), controlled movement at night (0.637), disturbance from political activities (0.629), and street hawking (0.621). On the other hand, some factors cannot be easily controlled, which are flooding (0.682), noise (0.723), power and water supply (0.538), and the quality of roads and transportation (0.504).

3.3.3 Environmental attribute

Factor analysis was not applied because the factors are few.

3.4 Correlation among the attributes on land value

Pearson correlation as presented in Table 8 showed a significant positive correlation between the following pairs of attributes: location and neighborhood (Pearson = 0.399; $p < 0.05$), location and environmental (Pearson = 0.513; $p < 0.05$), and environmental and neighborhood (Pearson = 0.503; $p < 0.05$).

The positive correlation among the three attributes implies that an increase or decrease in one leads to an increase or decrease in another.

TABLE 6 Component matrix for location attribute model.

Location attribute	Factor	
	Places	Transport
City center	0.747	
Schools	0.684	
Place of work	0.754	
Bus station or airport		0.764
Recreational centers	0.656	
Place of worship	0.715	

TABLE 7 Component matrix for neighborhood attribute model.

Neighborhood attribute	Factor	
	Can easily be controlled	Not easily controlled
Infrastructure and amenities	0.619	
Flooding		0.682
Security	0.458	
Noise		0.723
Waste and drainages	0.588	
Roads and transportation		0.504
Power and water supply		0.538
Night life	0.637	
Nuisance from politics	0.629	
Hawking and street trading	0.621	

TABLE 8 Correlation among the attribute on Land value.

	Neighborhood	Environmental
Location	0.399*	0.513*
Neighborhood		0.503*

*$p < 0.05$.

3.5 Comparison of the mean rank of the attributes

The mean of the attributes were disaggregated into the three estates. This is targeted at determining the responses from the residents according to their estates, which helps to monitor the performance of the attributes that mostly influence land values across the estates. These are presented for the location attribute (Table 9), the neighborhood attribute (Table 10), and the environmental attribute (Table 11).

A look at Table 9 indicates that in Ewet housing estate, closeness to schools has the highest effect on the land value in this estate (4.25), followed by nearness to the place of work (3.88), closeness to the place of worship (3.72), closeness to transport, bus station, or airport (3.67), closeness to the city center (3.56), and closeness to the recreational center (2.93). In Shelter Afrique estate, closeness to transport, bus station, or airport has the highest effect on land values (4.17), followed by closeness to places of worship (4.03), closeness to schools (4.03), nearness to places of work (3.34), closeness to recreational centers (3.00), and least closeness to the city center (2.72). In Akwa-Ima estate, closeness to transport, bus station, or airport (3.92) influences land values in the area most, followed by closeness to places of worship (3.63), closeness to schools (3.29), nearness to places of work (2.92), closeness to recreational centers (2.92), and closeness to the city center (2.17).

From Table 10, security/police station (4.51) has the highest effect on land values in Ewet housing estate, followed by quality roads and transportation routes (4.30), power and water supply (4.21), infrastructure and amenities (4.03), wastes and drainages (3.88), nightlife (3.77), hawking and street trading (3.02), disturbance from political activities (2.93), flooding (2.35), and noise (2.02). In Shelter Afrique estate, quality roads and transportation routes (4.21) have the most effect on land values in this area, followed by wastes and drainages (4.17), power and water supply (4.14), infrastructure and amenities (4.03), nightlife (3.90), security/police station (3.66), flooding (3.21), hawking and street trading (3.00), disturbance from political activities (2.72), and noise (2.03). In Akwa-Ima estate, security/police station (4.25) has the most effect on land values, followed by infrastructure and amenities (4.08), wastes and drainages (4.08), quality roads and transportation routes (3.92), hawking and street trading (3.92), nightlife (3.88), flooding (3.46), power and water supply (3.29), disturbance from political activities (2.67), and noise (2.38).

A look at Table 11 indicates that in the Ewet housing estate, peace, quiet, and beauty (4.35) contribute most to the land value, followed by quality air (4.23), quality water (4.12), green space (4.09), lakes, and water bodies (2.42). In the Shelter Afrique estate, peace, quiet, and beauty (4.38) have the highest effect on land values in the neighborhood, followed by quality water (4.31), quality air (4.28), green space (4.10), and the least significant lake and water bodies (2.76). In Akwa-Ima estate, the environmental attributes with the most significant effect on its land value are quality air (4.29), followed by peace, quiet, and beauty (4.25), quality water (4.13), green space (3.88), and lakes and water bodies (2.83).

4 Discussion and conclusions

Globally, the value of land is intimately linked to its location, neighborhood, and environmental attributes. These three factors combine in different aspects to influence land values in various ways. Location attributes, such as proximity to essential facilities like schools, hospitals, workplaces, transportation hubs, and recreational centers, are pivotal in determining land values. Properties located closer to these amenities often command higher prices due to increased accessibility and convenience. An example is the effect of railway networks on land venues in southwest Tokyo, Japan (Arum and Fukuda, 2020). Additionally, being near city centers, business centers, or major economic centers can significantly inflate land values, reflecting the demand for prime locations (Amarrohman et al., 2023). Neighborhood attributes also play a crucial role in shaping land values. Infrastructure quality, access to services like public healthcare and education, and security measures such as the presence of police stations all impact the desirability of a neighborhood and, consequently, its land values. Cities that embark on large-scale urban projects, as recently witnessed in Dubai and Doha, are likely to see a huge positive change in land values (Almeida et al., 2021). Factors like flooding risk, noise pollution, waste management, and the quality of roads and transportation routes can

TABLE 9 Mean rank of the location specific variables across the resident estates.

Location-specific variables		Ewet housing		Shelter Afrique		Akwa-Ima	
		Mean	Rank	Mean	Rank	Mean	Rank
1	Closeness to city center (Ibom Plaza)	3.56	5	2.72	6	2.17	6
2	Closeness to Schools	4.25	1	4.03	2.5	3.29	3
3	Nearness to place of work	3.88	2	3.34	4	2.92	4.5
4	Closeness to transport or bus station or airport	3.67	4	4.17	1	3.92	1
5	Closeness to recreational center	2.93	6	3.00	5	2.92	4.5
6	Closeness to place of worship	3.72	3	4.03	2.5	3.63	2

TABLE 10 Mean rank of the neighborhood specific variables across the resident estates.

Neighborhood-specific variables		Ewet housing		Shelter Afrique		Akwa-Ima	
		Mean	Rank	Mean	Rank	Mean	Rank
1	Infrastructure and amenities	4.07	4	4.03	4	4.08	2.5
2	Flooding	2.35	9	3.21	7	3.46	7
3	Security/Police station	4.51	1	3.66	6	4.25	1
4	Noise	2.02	10	2.03	10	2.38	10
5	Wastes and drainages	3.88	5	4.17	2	4.08	2.5
6	Quality roads and transportation routes	4.30	2	4.21	1	3.92	4.5
7	Power and water supply	4.21	3	4.14	3	3.29	8
8	Night life	3.77	6	3.90	5	3.88	6
9	Disturbance from political activities	2.93	8	2.72	9	2.67	9
10	Hawking and Street trading	3.02	7	3.00	8	3.92	4.5

either accentuate or attenuate the attractiveness of an area, directly affecting land prices (Aziz et al., 2021). Environmental attributes further contribute to the valuation of land. The quality of air and water, the presence of green spaces, and the overall aesthetic appeal of an environment can significantly influence land values (Nguyen et al., 2021). Additionally, areas with peace and quiet, as well as proximity to lakes or other water bodies, may command premium prices due to their perceived value for recreation and quality of life.

To optimize land values, especially in resource-constrained settings, policymakers and urban planners should consider integrated approaches that address all three dimensions: location, neighborhood, and environmental attributes. Investing in infrastructure development to improve accessibility and connectivity can enhance the value of land in underserved areas, which can encourage investment in land development (Prus and Sikora, 2021). Implementing flood mitigation measures, waste management systems, and enhancing security can make neighborhoods more attractive, thereby boosting land values and encouraging optimum land use (Radonic et al., 2020). Furthermore, prioritizing environmental conservation efforts, such as maintaining green spaces and improving air and water quality, can enhance the overall livability and attractiveness of an area, positively impacting land values. However, investment in improving the attributes should not be the basis for the indiscriminate conversion of residential buildings to commercial ones (Jamil and Gulzar, 2022), as default rent payments are often manifestations of constant conversions (Ankeli, 2022). Collaborative efforts between government agencies, private developers, and local communities are essential to implementing sustainable urban development strategies that optimize land values (Alkhani, 2020) while ensuring social equity and environmental resilience.

The paper has shown a positive correlation among location, environmental, and neighborhood attributes, which are measures of land value, especially in developing countries. The work extends the neighborhood factors in Aliu (2023) beyond security, which means that other factors apart from security have tendencies to negatively affect residential property values and create unscheduled and unintended residential mobility. Moreover, this work and others surveyed are unanimous that security determines the land value, property value, or rent, as seen in Olajide and Lizam (2016), Nigeria (Bamiteko and Adebiyi, 2020), and South Africa (Odubiyi et al., 2019). However, it appears that natural disasters like flooding can attenuate the land value, despite the three attributes considered in his paper. The effect of flooding was clearly highlighted in Ajibola et al. (2012) and Ayedun et al. (2018). Moreover, the approach used in this research can be modified to include the current price of land and hedonic models applied for prediction (Abidoye and Chan, 2017). Fortunately, the attributes can interact among themselves to lower or increase the actual prices of land because price is not the major determinant of land value but rent, lease, and other aspects of land use. Proximity to the place of work was not the top choice in this paper, largely because the study area was mostly residential. The result would have been different if the estate had a business district (Ilechukwu, 2018) or areas of commercial activity (Otty et al., 2021), particularly if the business district is located in a central area easily accessible from all parts of the city (Sridhar and Sathyanathan, 2022).

TABLE 11 Mean rank of the environmental specific variables across the resident estates.

Environment-specific variables		Ewet housing		Shelter Afrique		Akwa-Ima	
		Mean	Rank	Mean	Rank	Mean	Rank
1	Quality air	4.23	2	4.28	3	4.29	1
2	Quality water	4.12	3	4.31	2	4.13	3
3	Peace, quiet and beauty	4.35	1	4.38	1	4.25	2
4	Green space	4.09	4	4.10	4	3.88	4
5	Lake and water bodies	2.42	5	2.76	5	2.83	5

Another aspect of this work is the clear definition of attributes, which is a form of creating order, as there appears to be confusion in the definition of attributes. An instance is when neighborhood attributes were defined as environmental attributes or vice versa (Agheyisi and Aghedo, 2021). Another instance is where environmental attributes are merged with location (Ayeni et al., 2022), where location and neighborhood are combined with accessibility and topography (Thiwanka and Wickramaarachchi, 2022), and where the three attributes presented in this paper are combined with developers' brand (Lie et al., 2021). It is also worthy to note that the attributes can be correlated with other factors not considered in this paper, such as geography and location (Shuaibu, 2022), income level (Chigwenya and Dube, 2019), and housing-related attributes such as color, spacing, number of bedrooms, fencing, presence of swimming pools, and so on (Chiwuzie et al., 2020). Lastly, speculators sell property without taking into account the attributes that determine land values (Oloke et al., 2017), the existing pricing models or attributes notwithstanding, which creates some level of entropy in the determination of land values. The paper thus recommends that more geographically tailored attribute factors that can feed hedonic models are urgently needed to model land, property value, or rent in Nigeria. Adopting the recommendation will create order, reduce perceived disparities (Oloke et al., 2021), infill (Peter et al., 2020), obsolescence (Olajide and Ijagbemi, 2019), and interference from speculative or exploitative investors, and create an enabling business climate that will enable genuine investors to benefit optimally from their investment in land or property and the sustainable transformation of rural areas in Nigeria (Akinjare et al., 2022). The study recommends that property investors should consider these attributes in the investment decision-making process, and policymakers should consider these attributes for development planning, sustainability, and optimum utilization of land resources.

Examining land value determinants in low- and middle-income countries' cities is essential for crafting effective urban policies. This knowledge informs decisions on improving neighborhoods, promoting affordable housing, and environmental conservation, ultimately leading to sustainable and equitable urban development. The outcome of this research could inform policymakers to determine the extent of which the three factors could be assessed, measured and controlled to ensure sustainable cities and consequently improving the wellbeing of citizens.

The subjectivity of the attributes is the major limitation of this paper. Also, the variables that make up the attributes may differ from one city to another. This perceived subjectivity can make it challenging to accurately quantify the impact of each attribute on land value, potentially leading to context or population or condition-specific results. As such, caution should be exercised in the adoption of the research findings in this paper. Adaption is recommended.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval were not required for the study on human participants in accordance with the institutional requirements. Written informed consent from the participants was not required to participate in this study. The data is completely anonymized and cannot be traced back to the respondents.

Author contributions

CI: Writing – original draft, Writing – review & editing. HO: Writing – original draft, Writing – review & editing. IE: Writing – original draft, Writing – review & editing. NP: Writing – original draft, Writing – review & editing. OS: Writing – review & editing. SN: Writing – review & editing. SI: Writing – review & editing. AA: Writing – review & editing.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. Sydani Group paid the publication fees.

Acknowledgments

The authors would like to thank Covenant University and Sydani Group for their support of this study.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

References

Abidoye, R. B., and Chan, A. P. (2017). Critical review of hedonic pricing model application in property price appraisal: a case of Nigeria. *Int. J. Sustain. Built Environ.* 6, 250–259. doi: 10.1016/j.ijsbe.2017.02.007

Abidoye, R., Chan, A., and Oshodi, O. (2016). Factors that Influence Real Estate Project Investment: Professionals Standpoint. In 9th CIBD Postgraduate Conference (pp. 229–239).

Adegoke, O. J., Aluko, B. T., and Adegoke, B. F. (2017). Determinants of market value of residential properties in Ibadan Metropolis, Nigeria. *J. Econ. Sustain. Dev.* 8, 178–188.

Agheyisi, J. E., and Aghedo, I. (2021). Neighborhood vulnerability to security threats in Benin City: the role of informal housing and the built environment. *Africa Stud. Q.* 20, 20–40.

Ajibola, M. O., Ebikefe, A. V., and Awodiran, O. O. (2014). Militant activities and property values in Port Harcourt, Rivers state. *Am. Int. J. Soc. Sci.* 3, 118–129.

Ajibola, M. O., Izunwanne, E. M., and Ogungbemi, A. O. (2012). Assessing the effects of flooding on residential property values in Lekki phase I, Lagos, Nigeria. *Int. J. Asian Soc. Sci.* 2, 271–282.

Akinjare, O. A., Akinjare, V. A., Ayedun, C. A., Oluwatobi, A. O., and Alexander, M. N. (2022). Value pertinence for residential property Investments in Christian Mission Estates: an investigation of Canaan City in Ogun state, Nigeria. *J. Civil Eng. Urban.* 12, 61–69. doi: 10.54203/jceu.2022.9

Aliu, I. R. (2023). Urban property markets and security risk: explaining how neighborhood security shapes housing rental prices in Ojo Lagos, Nigeria. *Prop. Manag.* 41, 404–430. doi: 10.1108/PM-09-2022-0070

Alkhani, R. (2020). Understanding private-sector engagement in sustainable urban development and delivering the climate agenda in northwestern Europe—a case study of London and Copenhagen. *Sustain. For.* 12:8431. doi: 10.3390/su12208431

Almeida, R., Brandão, M., Torres, R., Patrício, P., and Amaral, P. (2021). An assessment of the impacts of large-scale urban projects on land values: the case of Belo Horizonte, Brazil. *Pap. Reg. Sci.* 100, 517–560. doi: 10.1111/pirs.12572

Alonso, W. (1964). *Location and Land Use. Toward a General Theory of Land Rent*. Cambridge: Harward University Press.

Aluko, O. (2011). The effects of location and neighborhood attributes on housing values in metropolitan Lagos. *Ethiop. J. Environ. Stud. Manag.* 4, 69–82. doi: 10.4314/ejesm.v4i2.8

Amarrohman, F. J., Wahyuddin, Y., and Patricia, E. (2023). Analysis of land value in the area surrounding the central Business District (CBD) of Simpang Lima, Semarang City using geographically weighted regression (GWR). *J. Appl. Geospat. Inf.* 7, 919–926. doi: 10.30871/jagi.v7i2.6361

Ankeli, A. I. (2022). Influencing factors of property use conversion and residential properties rental value trend in Ikeja, Nigeria. *Int. J. Real Estate Stud.* 16, 118–128. doi: 10.11113/intrest.v16n2.218

Arum, S. P., and Fukuda, D. (2020). The impact of railway networks on residential land values within transit-oriented development areas. *Asian Transp. Stud.* 6:100009. doi: 10.1016/j.eastsj.2020.100009

Ayedun, C. A., Durodola, D. O., Oni, S. A., Oluwatobi, A. O., and Ikotun, O. T. (2018). The flooding effect on residential property values: a case study of Shogunro residential estate, Agege; Lagos state Nigeria. *Int. J. Civil Eng. Technol.* 9, 489–496.

Ayeni, O. F., Kemiki, O. A., Popoola, N. I., and Musa, H. D. (2022). Assessment of the contribution of environmental attributes to residential property rental value in Abuja. *Environ. Technol. Sci. J.* 13, 17–27. doi: 10.4314/etsj.v13i2.2

Aziz, A., Anwar, M. M., and Dawood, M. (2021). The impact of neighborhood services on land values: an estimation through the hedonic pricing model. *GeoJournal* 86, 1915–1925. doi: 10.1007/s10708-019-10127-w

Bamiteko, O. D., and Adebiyi, O. O. (2020). Neighborhood security and housing price in Amuwo-Odofin local government area of Lagos state. *J. Bus. Econ. Dev.* 5, 214–218. doi: 10.11648/j.jbed.20200504.13

Binoy, B. V., Naseer, M. A., and Anil Kumar, P. P. (2020). A methodology for identifying critical factors influencing land value in urban areas: a case study of Kerala, India. *Prop. Manag.* 38, 665–681. doi: 10.1108/PM-01-2020-0004

Cheshire, P. C., and Sheppard, S. (1993). Evaluating the Impact of Neighborhood Effects on House Prices and Land Rents: Results From an Extended Model. Department of Economics, Faculty of Urban and Regional Studies. London: London School of Economics.

Chigwenya, A., and Dube, D. (2019). Infrastructure development and property values in low income residential properties in Bulawayo. *Int. J. Built Environ. Sci. Res.* 2, 131–140. doi: 10.24853/ijbesr.2.2.131-140

Chiwuzie, A., Dabara, D., Prince, E., Ajiboye, B., and Olawuyi, S. (2020). Housing-related attributes and the changing structure of preferences. *Afr. J. Built Environ. Res.* 4, 37–58. doi: 10.33796/ajober.4.1.03

Das, G., Chandio, I. A., Talpur, M. A. H., Memon, I. A., and Shaikh, F. A. (2021). Factors affecting residential land values: a case study of Tando Allahyar City. *Eng. Sci. Technol. Int. Res. J.* 5, 82–87.

Elenwo, E., and Akujuru, V. A. (2018). The expert Valuers views on the critical variables influencing residential property values in Port Harcourt Metropolis. *Int. J. Hum. Soc. Sci.* 7, 193–204.

Essien, E., and Cyrus, S. (2019). Detection of urban development in Uyo (Nigeria) using remote sensing. *Land* 8:102. doi: 10.3390/land8060102

Ilechukwu, V. U. (2018). A paradigm shift in urban economic theories: the re-examination of land and housing values determinants in African cities. *J. Sustain. Dev. Afr.* 20, 1–24.

Jamil, F., and Gulzar, S. (2022). Impact of land use change on built environment of planned neighborhoods of Lahore: a case study of Wapda town. *Pak. J. Eng. Appl. Sci.* 31, 94–108.

Li, Y., Bhutto, M. Y., Sun, C., and Mehdi, S. M. (2023). Do information publicity and moral norms trigger waste-sorting intention among households? A sequential mediation analysis. *Front. Psychol.* 14:1193411. doi: 10.3389/fpsyg.2023.1193411

Lie, K. B., Fachrudin, K. A., and Fachrudin, H. T. (2021). Analysis of the effect of location, design, housing facilities, environmental characteristics and developer brands on land value of housing properties in Medan Sunggal. *J. Econ. Fin. Account. Stud.* 3, 169–179. doi: 10.32996/jefas.2021.3.2.17

Macioszek, E. (2023). Analysis of the rail cargo transport volume in Poland in 2010-2021. *J. Silesian Univ. Technol. Ser. Transp.* 119, 125–140. doi: 10.20858/sjsutst.2023.119.7

Macioszek, E., and Ahac, S. (2023). Analysis of the transport volume of passengers and cargo on the example of the Warsaw-Okęcie international airport (Poland). *Zeszyty Naukowe. Transport/Politechnika Śląska* 120, 151–164. doi: 10.20858/sjsutst.2023.120.10

Maepa, M. P. (2021). Self-esteem and resilience differences among street children compared to non-street children in Limpopo Province of South Africa: a baseline study. *Front. Public Health* 9:542778. doi: 10.3389/fpubh.2021.542778

Nguyen, P. Y., Astell-Burt, T., Rahimi-Ardabili, H., and Feng, X. (2021). Green space quality and health: a systematic review. *Int. J. Environ. Res. Public Health* 18:11028. doi: 10.3390/ijerph182111028

Odubiyi, T. B., Oguntona, O. A., Oshodi, O. S., Aigbavboa, C. O., and Thwala, W. D. (2019). Impact of security on rental price of residential properties: evidence from South Africa. *IOP Conf. Ser. Mater. Sci. Eng.* 640:012001. doi: 10.1088/1757-899X/640/1/012001

Olajide, S. E., and Ijagbemi, C. O. (2019). Review of the impact of obsolescence on residential property values. *Int. J. Multidisc. Res. Dev.* 6, 92–99.

Olajide, S., and Lizam, M. (2016). Determining the impact of residential Neighbourhood crime on housing investment using logistic regression. *Traektoriâ Nauki* 2:6.8. doi: 10.22178/pos.17-13

Oloke, O. C., Ezema, I., Fayomi, O. S. I., Emetere, M. E., Omeje, M., and Jesusegun, D. (2021). A comparative study of rental value of residential properties at border communities of Lagos and Ogun states, Nigeria. *IOP Conf. Se. Earth Environ. Sci.* 665:012050. doi: 10.1088/1755-1315/665/1/012050

Oloke, O. C., Olawale, Y. A., and Oni, A. S. (2017). Price determination for residential properties in Lagos state, Nigeria: the principal-agent dilemma. *Int. J. Econ. Manag. Soc. Sci.* 6, 28–32.

Oloke, O. C., Simon, F. R., and Adesulu, A. F. (2013). An examination of the factors affecting residential property values in Magodo neighborhood, Lagos state. *Int. J. Econ. Manag. Soc. Sci.* 2, 639–643.

Otty, E. U., Nwosu, C. C., and Okoro, A. C. (2021). Analysis of impact of property management on commercial property values in Awka, Anambra state, Nigeria. *Int. J. Adv. Eng. Manag.* 3, 537–543. doi: 10.35629/5252-0309537543

Perry, L. (2019). *The Value of Farmland: Mapping Assessor Data to Understand Land Use Change Masters' dissertation.* Logan, Utah: Utah State University.

Peter, N. J., Fateye, T. B., Okagbue, H. I., Abonta, G., and Ibisola, A. S. (2020). Infill development and its attendant consequences on Neighbourhood property value: evidence from Gwarinpa, Abuja, Nigeria. *Int. J. Mech. Prod. Eng. Res. Dev.* 10, 2203–2218. doi: 10.24247/ijmperdjun2020206

Prus, P., and Sikora, M. (2021). The impact of transport infrastructure on the sustainable development of the region—case study. *Agriculture* 11:279. doi: 10.3390/agriculture11040279

Qiu, W., Li, W., Liu, X., Zhang, Z., Li, X., and Huang, X. (2023). Subjective and objective measures of streetscape perceptions: relationships with property value in Shanghai. *Cities* 132:104037. doi: 10.1016/j.cities.2022.104037

Radonic, L., Cooper, L. T., and Omans, M. (2020). At the crossroads of flood mitigation and urban revitalization: residents' perspectives of shifting floodplain governance in the United States rust belt. *Hum. Organ.* 79, 117–129. doi: 10.17730/1938-3525.79.2.117

Shuaibu, M. N. (2022). *The Impact of Neighbourhood Characteristics on Rental Values of Residential Properties in Minna, Nigeria (Doctoral Dissertation)*. Federal University of Technology, Minna, Nigeria.

Son, N. P., Van Manh, L., Thuy, N. T., Vu, T. N., and Hanh, N. T. (2020). Factors that affect land values and the development of land value maps for strengthening policy making in Vietnam: the case study of non-agricultural land in Quang Ninh province, Vietnam. *EQA Int. J. Environ. Qual.* 36, 23–35. doi: 10.6092/issn.2281-4485/9771

Sridhar, M. B., and Sathyanathan, R. (2022). Assessment of factors affecting residential land values in the urban fringes of Chennai city, India. *Adv. Eng. Sci.* 54, 1887–1901.

Thiwanka, A. M. D., and Wickramaarachchi, N. C. (2022). Critical determinants of residential land values in a suburban area: a perception analysis. *Sri Lanka J. Real Estate* 19, 61–81. doi: 10.31357/sljre.v19i1.6024