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The Journal of African Real Estate Research (JARER) is an official publication of the African Real Estate Society (AfRES) and the Royal Institution of Chartered Surveyors (RICS), and is published jointly by AfRES and RICS.

The journal aims to understand African real estate markets including their structure and workings; the nature and impacts of efforts that seek to reform them. In addition, the journal highlights the role and importance of real estate markets in Africa in contributing to:

• Poverty alleviation

• Growth and stability of the household

• Provision of affordable housing

• Efficient resource allocation

• Equitable land management

• Social cohesion

• Innovation in urban development

• Urban and national economies

• Financial sector development.

The paintings used on the front cover were created by Mr Itika David Mwangakala, from Tanzania. Itika is a self taught artist who, among other styles, does Tingatinga paintings. Tingatinga is a style named to honour its founder Mr. Edward Said Tingatinga who was from the southern region of Tanzania. Mr. Edward S. Tingatinga was mistakenly gunned down for a car robber by the police in 1972 in Dar es Salaam, at the age of 40. His painting style, Tingatinga has grown and become a popular form of art throughout East Africa. Traditional Tingatinga paintings are composed in a square format, and generally feature colourful animal motifs against a monochrome background. One of the most distinctive characteristics of the style is its use of undiluted and often unmixed enamel and high-gloss paints which give Tingatinga paintings their characteristic glossy appearance. For the front cover of this journal, Itika has re-interpreted the traditional subject matters of Tingatingas to reflect more urban concerns.

Mr. Itika David Mwangakala (BSc Land Management and Valuation, UCLAS, Tanzania; MSc. Urban Development Management, HIS, Netherlands) is a land economy surveyor. Currently he is working with the National Housing Corporation (NHC), the largest landlord in Tanzania, as an estate officer. Apart from that, Mr. Itika is also a founding member of Universal Real Estate Company and an active member of both the Tanzania Institution of Surveyors and Estate Agents (TIVEA) and the African Real Estate Society (AfRES).

Willingness to pay for better environmental services: evidence from the Nigerian real estate market

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Abstract

Real estate as a multi-dimensional package of goods and services extends beyond shelter. It includes environmental amenities such as waste disposal, water and electricity supplies, neighbourhood roads and other locational services. Consequently, real estate values are readily influenced by residents' willingness to pay for both the structural characteristics of the shelter as well as neighbourhood characteristics where the real estate is located. This study used a two-stage hedonic model to examine the willingness to pay for better environmental services by residents of two neighbourhoods in Akure, Nigeria. The study has identified households' income, distance away from waste dump site and regularity of electricity supply as the major significant factors that influence the households' willingness to pay for better environmental services. In this respect, the study has recommended the economic empowerment of the people, diligent consideration in the location of waste dump sites and the adoption of some form of Public-Private Initiative in the provision of public infrastructure.

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Introduction

Property values are subject to multitude of complicated influences. These influences are generally classified into those which are external and those that are internal to the property (Mackmin, 1985). External influences relate to the general state of the economy, population, employment, immigration, finance, location, transportation and neighbourhood amenities while the internal influences essentially constitute the specific details of the property such as size, accommodation, condition, design, layout, age, type and plot size (Adair et al; 1982).

These value determining factors can be attributed to the nature of real estate as a package of goods and services. Real estate extends beyond shelter to include social and neighbourhood characteristics. Consequently, the transaction prices and rental value of properties located in different areas will reflect the consumers' willingness to pay for both the different structural property characteristics as well as the characteristics of the neighbourhood where the property is located. In valuation practice, environmental characteristics are believed to determine the general levels of property values within an urban area. Unfortunately, their influences on value are difficult to assess using the conventional valuation method. This is more so in the Nigerian real property market considering the wide range of environmental negative and positive externalities that impact on the market.

In Nigeria, the urban environment is characterized by a proliferation of squatter settlements, a breakdown of waste disposal arrangements, air and water pollution, inadequate water and power supply and squalid condition of environmental sanitation (Arimah, 1996). In addition, there is an increasing rate of urban crime. In urban centres in Nigeria, criminals are now graduating from predatory crimes to serious and heinous crimes of violence (Aluyor, 2005). On the other side are the positive externalities such as good roads, schools, shopping facilities and accessibility to good health care facilities. The immediate influence of environmental characteristics is manifested in the form of pull and push effects of the neighbourhood on the prospective house buyers. Under this situation, environmental

consideration in most cases outweigh other factors in the choice of where to live. The issue here is how the Nigerian real estate market is reflecting the significance of environmental factors as major determinants of property value. In this respect, the objective of this paper is to estimate the amount that residential property buyers are willing to pay for better environmental services such as regular supply of water and electricity, neighbourhood safety and environmental quality.

Interestingly, much work has been done on the relationship between residential property values and environmental variables in developed countries (Rosiers et al, 1999; Diamond, 1980). The different contextual and cultural settings (for example; variables of interests differ across cultural borders) as well as property market characteristics will obviously limit the direct application of these methodologies and their findings to Nigerian situation. However, not much has been done in Nigeria. The few existing studies in this area focused on the negative impacts of the environment on residential property value (Arimah, 1996; Arimah and Adinnu, 1995, Bello 2006). Therefore, in this study, an attempt is made to fill the void concerning the assessment of both the negative and positive influences that the environment may impact on residential property values and the willingness on the part of residential property buyers to pay for better environmental services.

The remainder of the paper is organized as follows. The next section deals with the theoretical model underlying the empirical work. Section three contains a brief description of Akure real estate market where the study's sample was taken, section four presents a detail description of the methodology adopted for the study, while section five focuses on empirical results. Concluding remarks and policy implication are contained in section six.

Theoretical model

The concept of willingness to pay is predicated on the principle that individuals (or households or firms) will maximize their welfare (utility) subject to a stated constraint (Okoko, 2003). In the context of this study,

households are assumed to consume a bundle of residential property attributes and other commodities. The objective function that is maximized in this situation is an economic basket of housing and non-housing goods and services which is subject to budget constraint. Formally stated, the consumption decision is:-

$$U = U(X_i, Z_i) \qquad (1)$$

And the household budget constraint is given as:

$$\gamma = P_x + P_z \qquad (2)$$

where

U = Household utility function

X_i = A row vector of other goods consumed by households

Z_i = A row vector of housing attributes

γ = Household total income

P_x and P_z = vector of prices

The two methodological approaches which are predominant in the literature for the estimation of household willingness to pay are contingent valuation analysis and hedonic models. They have been jointly or severally used in connection with issues such as pollution (Diamond, 1980, Brookshire et al., 1982; Palmquist, 1984, 1988, Graves et al., 1988; Murdooch and Thayer, 1988, Kask and Maani, 1982; Mendelsohn et al; 1992), effect of waste sites (Wise and Pfeifenberger (1994), water quality (Rosiers et al, 1999 Smith and Desvouges (1986); housing quality and housing prices (Okoko, 2003)

Contingent valuation analysis is a form of market buyer survey. In this method, households are confronted with possible changes in an environmental attribute and asked for valuation (Brookshire et al; 1982). In a contingent valuation method setting, a hypothetical market for goods X is set up, and respondents are invited to state what they would be willing to pay for the varying qualities of X. The public nature of X implies that no market exists for this service, hence the essence of the contingent valuation method is to obtain valuations that would have existed in the real market (Markandiya, 1992). The method is controversial, and presently there is no consensus as to the criticism that contingent valuation methods responses are influenced by a hypothetical bias (Carsons et al, 1996; Cumming et al, 1995; Frykblom, 1997; Neill et al, 1994; Boyle and Bergstrom, 1999; Hokby and Sodergist, 2001). Since it is based on individual perception or orientation, it will remain highly subjective and rarely allows for a reliable pricing of externalities (Kinnard et al, 1996) and hence was not used for this study.

The alternative approach is the hedonic model. The hedonic approach is based on the theoretical writings of Rossen (1974) and Freeman (1979). It is a statistical technique used to isolate the effect and contribution of various housing attributes to real estate prices (Rosen, 1974), hence its growing popularity among urban economists and property appraisers (Rosiers et al, 1999). This technique assumes that when consumers purchase or rent marketed goods, they are implicitly also buying some environmental goods, which by their nature are non-marketed. Therefore, by regressing the characteristics of the purchased goods (including the environment characteristics) on the observed price of the purchased good, one can extract the contribution of the environmental good to the price of the marketed good.

In employing the hedonic model, a two-stage approach was adopted. In the first stage, the residential property value function is specified. In this stage, value is regarded as function of attribute X_1 to X_n with coefficient α_1 to α_n to be estimated, that is:

$$P = \alpha_0 + \alpha_1 X1 + \alpha_2 X_2 + \ldots\ldots\ldots + \alpha_n X_n \quad (3)$$

The second stage involves using the marginal implicit price of characteristics in the estimation of willingness to pay. In this respect, the willingness to pay for better environmental services can be specified as:-

$$WTP = f(Y, ES, SE, C) \quad (4)$$

Where

Y = income

ES = environmental quality

SE = a row vector of social economic characteristics

C = a vector of other demander shifters.

The two-stage Hedonic Model (predictive and logistic) developed for the study is presented in equations 5 and 6.

The predictive model is:

$$Val = b_0 + b_1 \text{ Wallmat} + b_2 \text{ Ceiling} + b_3 \text{ Roof} + b_4 \text{ Window} + b_5 \text{ Roomsize} + b_6 \text{ Kitchen} + b_7 \text{ Toilet} + b_8 \text{ Fence} + b_9 \text{ Access} + b_{10} \text{ Electric} + b_{11} \text{ Drainage} + b_{12} \text{ Water} + b_{13} \text{ Crimes} + b_{14} \text{ Privschl} + b_{15} \text{ Pubschl} + b_{16} \text{ Distance} + \mu \quad (5)$$

Where Val = property value

$b_0 \ldots b_{13}$ = regression coefficients

μ = error term

Other variables are defined in table 1.

With the logistic modeling, all variables with the exception of those in binary scale (for obvious mathematical reasoning), are in logarithm. This transformation is necessary in order to enable the coefficients to be interpreted as elasticity estimates. The model is a measure of the Willingness To Pay (WTP) and is specified as follows:-

$$WTP = b_0 + b_1 \text{ Ln PUBSCHL} + b_2 \text{ Ln EDUCATION} + b_3 \text{ Ln ROOMSIZE} + b_4 \text{ Ln DEPENDANTS} + b_5 \text{ Ln ELECTRIC} + b_6 \text{ Ln CRIME} + b_7 \text{ Ln AGE} + b_8 \text{ Ln DISTANCE} + b_9 \text{ Ln INCOME} + \mu \quad (6)$$

Although the two-stage hedonic model has been criticized for its simultaneity bias (Arimah, 1996), this notwithstanding, this specification has continued to gain popularity among researchers. The beauty of the two stage model is that the estimated regression coefficients from the first stage model tells us the impact of the housing attributes on the property value while the implicit price estimated in the second model is a measure of the household willingness to pay.

Akure real estate market

Akure, the Ondo State Capital, is one of the prominent cities in western Nigeria. It is situated in the heart of Ondo State with easy access to both towns and cities within and outside the state. The 1963 census gave the population of the city as 71,106 and according to 1991 census the population figure has risen to 239,124. The local economy is based on agriculture, commerce, government employment and light manufacturing. Presently, the attention being given to bitumen exploitation is expected to change the economic landscape.

The creation of Ondo State in 1976 had resulted into the influx of civil servants and other public officers hitherto working in other parts of the country which has led to an upsurge in the demand for houses in Akure, the state capital. The resulting industrial and commercial growth, coupled with increasing population and rising rate of family formation have since then continued to put greater pressure on demand for housing.

Presently, various attempts have been made and are being made by Government and her agencies to increase the stock of houses either through direct construction or the provision of housing loans. These are grossly inadequate. The total units constructed by government is a very insignificant contribution to the housing market. As a result of the above, a considerable proportion of the people working in Akure now live in neighbouring towns and villages like Oba-Ile, Ijare and Ilara Mokin. The true picture of the prospect of residential estate investment in this town is shown by the cost of rental apartments.

The Akure real estate market is dominated by residential property. This is stratified into three categories which are tenement buildings, block of flats, and detached houses/duplex for low, medium and high income earners respectively. The data for this study was drawn from a sample of tenement buildings and block of flats together with their occupiers. The detached houses were left out of the study because of the following reasons. First, they constitute a small proportion in the study area, less than 3% (5 out of 200). Detached houses and duplexes are mainly concentrated in

Government reservation areas and private residential estates in prime locations. Secondly, since they are owned by high income earners, they hardly depend on the public for electricity, water and have their own private security arrangements. Because of the aforementioned reasons, the exclusion of the detached house/duplexes from the analysis will have no effect on the result of the study.

The methodology

 The two communities which were targeted for this study were Araromi-Isolo and Igoba. The former is located within the core area of Akure. In this area, 'most of the houses available to renters have deficiencies like lack of water, kitchen, toilet and sewage disposal facilities. Most of the buildings' rooms and renters are thus exposed to incessant cases of pilfering, assault and other social problems like loss of privacy' (Okoko, 2000). The other targeted community is located at sub–urban fringe along Akure-Ado Ekiti road. This is characterized by new developments

of high density, with most of the houses partly completed but inhabited. Within each community, a random selection of 100 houses was made. In each of the selected houses, a questionnaire was administered to elicit information on both the structural and environmental characteristics of the house as well as socioeconomic characteristics of the head of the household. In a case of multi-tenanted house, the socioeconomic data of the 'chief tenant' was considered for analysis. Table 1 shows the variables considered for the study.

The annual rent paid by the household has been used as the property value. In valuation theory and practice, the relationship between rental and capital values has been well established (David et al, 1971; Geho, 2002). This is expressed as:

$$C V = YP (RV) \qquad (7)$$

Where

C V = Capital Value

YP = Years Purchase

RV = Rental Value

Based on this relationship, any one of these can be used as a proxy for the other. The variables contained in table 1 can be broadly classified into three categories as follows:

1. Property characteristic (variables 2 – 9)

2. Environmental characteristics (variables 10 – 17) and

3. Household characteristics (variables 18 – 22)

In this study however, the variables of primary interest are the environmental variables.

Empirical results and discussion

The results of the two stage hedonic models are presented as follows:-

(a) predictive modeling of property values as a function of housing attributes, and

(b) logistic modeling of willingness to pay.

Predictive modelling of housing attributes

Table 2 and 3 show the Analysis of Variance and parameters estimate of the Hedonic Multiple Regression.

Table 1: Variable list and description

S/NO	Variable	Description
1	Val	Property value in Naira (₦)
2	Wallmat	Wall materials; 1 if Sand Crete block, 0 otherwise
3	Ceiling	Ceiling materials ; 1 if asbestos sheet/wooden*, 0 otherwise
4	Roof	Roofing materials; 1 if corrugated asbestos / iron sheet*, 0 otherwise
5	Window	Window materials; 1 if louver /glazed aluminum*, 0 otherwise
6	Roomsize	Size of room in m^2
7	Kitchen	Availability of kitchen; 1 if available, 0 otherwise
8	Toilet	Availability of toilet; 1 if available, 0 otherwise
9	Fence	Availability of fence; 1 if available, 0 otherwise
10	Access	Condition of the access road; 1 if motorable, 0 otherwise
11	Electric	Regularity of electricity supply (hours of supply / day)
12	Drainage	Condition of the drainage, 1 if satisfactory, 0 otherwise
13	Water	Regularity of public water supply (hours of supply /day)
14	Crimes	Reported crime rate (no of reported cases per month)
15	Privschl	Number of government approved private school
16	Pubschl	Number of public school
17	Distance	Distance away from offensive refuse dump (km)
8	Income	Income of the head of household in ₦ /annum
19	Dependants	Number of dependants
20	Education	No of years spent on formal education
21	Gender	Sex of the head of household 1if male, 0 otherwise
22	Period	Length of stay in the present dwelling

*Tenants or buyers are indifferent in the choice between these materials
Source: Compiled by the Author, 2006

Table 2: Analysis of variance of predictive model

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1056044425400.630	16	66002776587.539	14.908	.000
Residual	770374407897.799	174	4427439125.849		
Total	1826418833298.429	190			

Table 3: Parameters of the predictive model

Unstandardised	Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-12079.494	44094.446		-.274	.784
WALLMAT	-4613.507	10490.735	-.024	-.440	.661
CEILING	-1418.726	6072.532	-.013	-.234	.816
ROOF	9141.855	34571.530	.013	.264	.792
WINDOW	11618.528	11758.280	.053	.988	.324
RMSIZE	4836.931	1636.245	.191	2.956	.004
ACCESS	63457.814	14231.609	.324	4.459	.000
ELECTRIC	129962.648	18432.055	.388	7.051	.000
DRAINAGE	-34315.409	16545.238	-.287	-2.074	.040
WATER	2007.928	3015.634	.038	.666	.506
CRIME	830.502	8842.143	.005	.094	.925
PRIVSCHL	-10356.705	8483.902	-.103	-1.221	.224
PUBSCHL	1204.554	3310.832	.020	.364	.716
FENCE	368.417	529.255	.038	.696	.487
TOILET	14372.592	14482.913	.072	.992	.322
KITCHEN	-13504.191	6259.213	-.121	-2.157	.032
DISTANCE	30359.367	7410.802	.609	4.097	.000
R^2	0.58				
STD ERROR	66539.00455				

Source: Analysis of surveyed data, 2006

The performance of this model is good as indicated by R^2 statistic (0.58). This shows that 58% of the sample variation in residential property value is attributable to the independent variables. The computed F statistic (F= 14.908) falls in the rejection region, signifying that at least one of the model coefficients is non-zero. Therefore the model appears to be useful for predicting residential property. However, the study is not limited to the predictive ability of this model. The focus here is on the environmental variables.

The relationship between property value and three out of the eight environmental variables (i.e. distance, electric and access) are statistically significant as against one (i.e. roomsize) out of eight property attributes. The relative importance of the environmental variables could be seen from the Zero-order, Part and Partial correlations between property values and the independent variables (Table 4).

The Pearson Coefficient of correlation shows that three out of the eight environmental variables rank among the top five. These relatively higher values indicate a relatively stronger linear relationship between property value and the environmental variables. Two environmental variables that are of particular interest to this study are distance and crime. The distance variable is positively correlated to the residential property value. This confirms the expected relationship between property value and distance away from a waste dump site, that is each meter one locates away from waste dump site adds more value to the property (Arimah, 1996; Bello, 2006). Since the crime variable is negatively correlated with the property value, this indicates that any increase in crime rate may lead to a corresponding decrease in property value.

Table 4: Zero-order, part and partial correlations

	Zero-order	Partial	Part
(Constant)			
WALLMAT	.236	-.033	-.022
CEILING	.140	-.018	-.012
ROOF	-.040	.020	.013
WINDOW	.258	.075	.049
ROOMSIZE	.424	.219	.146
ACCESS	.597	.320	.220
ELECTRIC	.350	.471	.347
DRAINAGE	.380	-.155	-.102
WATER	.194	.050	.033
CRIME	-.189	.007	.005
PRIVSCHL	.292	-.092	-.060
PUBSCHL	.202	.028	.018
FENCE	.150	.053	.034
TOILET	.437	.075	.049
KITCHEN	.123	-.161	-.106
DISTANCE	.441	.297	.202

Source: Analysis of surveyed data, 2006

Logistic modeling of willingness to pay

The logistic modeling was done in order to express the regression coefficients as elasticity estimates. The double log form was used because this will not only reduce the occurrence of heteroskedasticity but also allows for declining marginal prices and interdependence among variables (Arimah, 1996). Table 5 and 6 show the result of the logistic model.

Table 5: analysis of variance of the logistic model

	Sum of Squares	df	Mean Square	F	Sig.
Regression	69.948	9	7.772	187.943	.000
Residual	7.485	181	.041		
Total	77.433	190			

Source: Analysis of surveyed data, 2006

Table 6: Parameters of logistic modeling of willingness to pay

	Unstandardised Coefficients	Standard error	Standardized Coefficients	T	Sig.
(CONSTANT)	1.080	.641		.845	.399
Ln PUBSCHL	.112	.104	.025	1.073	.285
EDUCATION	7.127E-02	.035	.050	2.046	.042
Ln ROOMSIZE	.152	.047	.109	3.240	.001
Ln DEPENDANTS	-.106	.063	-.084	-1.683	.094
Ln ELECTRIC	.253	.055	.116	4.599	.000
Ln CRIME	-2.556E-02	.027	-.024	-.958	.339
Ln AGE	-3.227e-02	.019	-.044	-1.692	.092
Ln DISTANCE	.198	.030	.188	6.491	.000
Ln INCOME	.542	.072	.831	14.957	.000
R^2	0.903				
STD ERROR	0.20335				

Source: Analysis of surveyed data, 2006

The performance of this model is very good as indicated by R^2 statistic (0.903) and F value (187.943). Table 6 shows that for a 100% increase in income, willingness to pay (WTP) will increase by 54%. With an empirical mean WTP value of ₦1, 387, the residents are willing to pay an increase of ₦748.98 for better environmental services. Other variables such as room size (15.2 %), regularity of electricity (25.3%), education (7.1%) and distance from refuse dump (19.8%) exert positive influences on households' WTP. Three variables, number of dependants (10.6%), crime rates (2.5%) and age (3.23%) exert negative influences on households' WTP.

Policy implications and conclusion

The study has identified a number of major factors that influence the households' willingness to pay for better environmental services. The significant ones among these factors that would be of interest to policy makers are (i) income (ii) distance, and (iii) electricity supply.

The study revealed that the willingness to pay for better environmental services increases with households' income. The implication here is that there is the need to economically empower the people. In this respect, governments in the past have introduced several programmes like Better Life and Peoples Bank projects, which have not yielded the desired results. This notwithstanding, the continued implementation of the present government socioeconomic reforms such as Poverty Eradication Programme (PEP) and Poverty Alleviation Programme (PAP) will go a long way in increasing the economic well being of the populace. And when the populace is comfortable economically, individual accessibility to better environmental services will be greatly enhanced.

The disamenities of residing close to a waste dump site is one of the study's findings that should attract the attention of the policy makers. Since the households are willing to pay for each kilometer away from waste dump site, governments at all levels should endeavour to provide waste dump site at a location far away from residential areas. And where a waste dump site is located, adequate buffer zones should be provided to shield the adjoining neighbourhood from its hazardous effects.

The deficient quality and quantity of infrastructure in the neighbourhood is revealed by the willingness of the people to pay for a regular supply of electricity. This is a true reflection of the pathetic nature of public infrastructure in most of our cities. Government should, through a Public–Private Initiative, endeavour to address this issue. The remarkable improvement in the telecommunication sector achieved through this approach should be a pointer to the government to explore this method in the provision of other infrastructure in our cities.

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