Residential Rental Value Determination and the Power Line Factor in Lagos, Nigeria

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Abstract: Power lines, being a man-made environmental contaminant in residential neighbourhoods, is via the regression model, incorporated into the environmental factor considered germane in rent determination within the metropolitan and suburban parts of Lagos. By the use of two different questionnaire surveys distributed to registered estate surveyors and valuers (in Lagos metropolis) and residents within powerline blighted neighbourhoods, the study unearthens the negligible effect of power lines in the determination of rental values within metropolitan as against a nill effect in suburban areas after collected data were subjected to regression analysis. The study recommends prompt need of the Federal and State governments in empowering the Power Holding Company of Nigeria (PHCN) in eliminating this negligible effect by observance of Right of Ways (ROWs).

1.0 Introduction

Conventionally, the hedonic model of valuation as developed by Gene Dilmore in 1920 embraces the use of a regression model in determining the value of properties (dependent factor) based on individual contributive factors (independent factors) such as the physical attributes, demand and supply , accessibility and environmental factors of a subject property. Anchoring on the hedonic precept, the current study aims at including the factor of power lines within context of neighbourhood factors and analysing its role in the determination of residential property value along the power lines axis of Lagos metropolis and suburban Alimosho in Lagos.

Studies on power lines as it affects the price of residential properties date back from Bigras (1964). Till date, the three major analytical tools used in analysing and explaining

the impact of power lines on residential property prices are: opinion/perception based studies, multiple regression analysis/analysis of covariance and sales / resales price analysis (Thomas and Jennifer, 2010).

Within the opinion based studies, screening power lines from direct view through landscaping reduced negative reactions by homeowners while the owners of higher priced or custom homes had a slightly more negative reaction to the lines in metropolitan Hartford (Kinnard, 1967). Eighty-four percent of appraisers indicated that the market value of residential property near a power lines is negatively affected, by an average estimate of 10% (Delaney and Timmons, 1992) while fifty percent of homeowners adjacent power lines in 2 neighbourhoods in Memphis and Shelby Counties, consider power lines an eyesore indicating the possibility of adverse effects on price (Kung and Seagle, 1992).

Using statistical analysis, findings have ranged from diminuition in property values in Decatur, Illinois (Colwell and Foley, 1979), increment in selling price at a decreasing rate as distance to a power lines increases (Colwell, 1990), a 6.3% loss in residential property value due to proximity and visual impact in metropolitan Vancouver, Canada (Hamilton and Schwann, 1995), a 9.6% loss (average) on mean house prices adjacent to a power lines easement and pylon in Brossard City, Greater Montreal area of Canada (Des Rosiers, 1998) to a mean loss of =N=786.00 ($US4.85) in rent in Lagos, Nigeria (Akinjare, 2012). In isolated cases, power lines proximity was found to have a statistically insignificant effect on price recreational property developments in Marquette County, Michigan (Rigdon, 1991) and on home prices in Connecticut and Massachusetts (Chalmers and Voorvardt, 2009). Most of the studies anchored on the third and last method of analysis-sales/resales analysis, have reported nill effects of power lines in the resale prices - Carll (1954), Bigras (1964), Kung and Seagle (1992) and Cowger *et al.* (1991) except for the discovery of an insignificant variance in sales price based on proximity to a power lines ROW (Kinnard, 1967).

This current study aims at ascertaining if power lines (within the environmental characteristics context) in the hedonic method of valuation is a contributive determinant of rent in powerline characterised neighbourhoods due to the presence of many homes within these neighbourhoods.

2.0 Study Setting and Data Analytical Method

For the purpose of this study, the research is limited to only two areas of metropolitan Lagos. These are: Surulere Local Government Council Area and Alimosho Axis of Lagos metropolis. The choice of

Surulere Local Government Council Area was borne out of its urbanized nature and high power lines density being home to the Akangba PHCN substation along the Masha / Adelabu axis. Being a major power lines hub, it habours an estimated 38km (60.3%) of the entire power lines in Surulere region (constituting the peripheries of Surulere Local Government Council Area, Ijora, Apapa, Ojo, and Mushin axis). The region constitutes a total of 63km (52.5%) of the total power lines length of 120km in Lagos metropolis (NEPA, 2005).

On the other hand, Alimosho axis of Lagos region was chosen for its suburban nature, presence of power lines and its highly dense residential nature. For the purpose of this study, Alimosho axis is strictly a power lines corridor. Commencing from the PHCN Alimosho sub station, the corridor consists of two 10km separate pylon routes travelling side by side via Kola and Ifako-Ijaiye (Agbado Crossing) to Ogba within the Lagos region (NEPA, 2005).

2.1 Distance Coverage from Power lines

This study has been limited to residential properties within 200m from both outer ends of power lines and pylons in each of the two study areas. This is because similar studies on other disamenities such as landfills {McCluskey and Rausser (2003) and Ihlanfeldt and Taylor, (2004)} contend that choosing a distance bracket either too big or extending too far could compromise the integrity of the model results. Wisinger (2006) also opined that while more points are better, the maximum number of points needed to get an idea of a mathematical relationship is either three or four. According to his postulations, two points will give a better idea of the relationship if it is non-linear and four if it is linear. For this study, the four point distance range used in studying the variable relationship were; 0-50m, 51-100m, 101-150m and 151-200m as opined by Chalmers and Voorvardt, (2009) in analysing the impact power lines on the rents of residential properties.

Figure 1: Map of Metropolitan Lagos.
Source: Lagos State Ministry of Information

Primary data was collected through questionnaires distributed to 436 residents within 200m to power lines in Alimosho area, 139 registered Estate Surveying firms in Lagos State to obtain data on rents between the period of 2005-2009. The study sampled every other residential building along power lines routes and within a 200m perpendicular distance from the power lines routes totalling 10km in Aimosho axis.

A response rate of 53.5% was achieved for Alimosho area while a 76.2% response rate was retrieved from registered Estate Surveying firms. In a bid to further understand power lines, an in-depth interview with the manager and 3 field officers of the Alimosho PHCN sub station was conducted. In all, the survey recorded an average response rate of 66.5% and collated data was analysed using the regression model summmarised as:

$$\mathbf{RV = V(P_{X1} + N_{X2} + A_{X3} + E_{X4})} \quad \textbf{... Eqn. 1}$$

Where;
RV = Rental Value of Residential property
V= Value
$\mathbf{P_{X1}}$= Coefficient of Property characteristics
$\mathbf{N_{X2}}$ = Coefficient of Demand and Supply
$\mathbf{A_{X3}}$ = Coefficient of Accessibility characteristics
$\mathbf{E_{X4}}$ = Coefficient of Environmental characteristics.

3.0 Discussion.

3.1 The Power lines Factor on Residential Rental Values per unit Distance

3.1.1 Alimosho Axis

In determining the impact of power lines on the rental values of residential properties in Alimosho Local Government Area, it was paramount to view the power lines factor vis-a-vis other major factors found to influence rental value of all properties generally in the study area. Going by the result of a pilot study, four major factors perculiar to the study area were found to influence residential rental values. These factors were: “Cheap Land Value”, “Demand and Supply”, “Accessibility” and the “power lines” factor. The regression formula was thus appropriated in determining the individual coefficients of the four identified factors as tabularised in Table 1.

Table 1. Alimosho Linear Regression Presentation.

Variables		Unstandardized Beta	Part Correlation	Sig	R^2	F
Dependent	**Independent**					
Rental Value					0.090	2.924
	Cheap Land Value	0.283	0.042	0.934		
	Demand and Supply	-0.007		0.002*		
	Accessibility	-0.087		0.141		
	Power lines (Environmental Characteristics)	-0.131		0.332		

From Table 1, the only variable that significantly influenced property values abuting power lines was "Demand and Supply " at 0.05 significance level. The notable impact of only Demand and Supply on residential rental values must have been triggered by the huge discrepancy in the demand for and supply of housing generally in Nigeria. Also, the landlords confirmed that most plots abutting the power lines were bought at a premium during a brief discussion at their monthly Community Development Association (CDA) meeting. In line with equation 1, the influence of the aforementioned notable factors on the residential property values of Alimosho can be summarized mathematically by the regression formula:

$$RV = 4.644 + 0.283_{C.L} - 0.007_{D.S} - 0.087_{A} - 0.131_{P.L.} \quad \text{... Eqn. 2}$$

Where:
RV = Rental Value
$\alpha = 4.644$
$_{C.L}$ = "Cheap Land" variable
$\beta_1 = 0.283$
$_{D.S}$ = "Demand and Supply " variable
$\beta_2 = - 0.007$
$_{A}$= "Accessibility" variable
$\beta_3 = - 0.087$
$_{P.L}$= "Power lines" variable.
$\beta_4 = - 0.131$

3.1.2 Surulere Area.

In line with property value investigations in the study area, the four peculiar determinants of residential rental values namely: "Cheap Land", "Demand and Supply", "Accessibility" and the power lines variable being investigated into were utilised in ascertaining their individual impact on the rents of residential properties in close proximity of power lines in Surulere axis. The analysis of the aforementioned factors as each individually determines rental value is further tabularised to give a vivid illustration of findings.

Table 2. Surulere Linear Regression Result.

Variables		Unstandardized Beta	Part Correlation	Sig	R^2	F
Dependent	**Independent**					
Rental Value					0.032	0.969
	Cheap Land Value	0.038	0.04	0.679		
	Demand and Supply	0.019	0.042	0.835		
	Accessibility	-0.066	-0.34	0.483		
	Power lines (Environmental Characteristic)	0.170	0.159	0.072		

From Table 2, only "power lines" were noticed to slightly influence residential rental values. This must have been due to the fact that most surveyed buildings abutting the power lines were barely between 2-10 meters away from it. In a very severe case, the rear perimeter wall of a building was found to be merely a meter from the power lines. The influence of the four peculiar factors on the study area can be summarized mathematically by the regression formula:

$$RV = 4.104 + 0.038_{C.L} + 0.019_{L.R} - 0.066_{A} + 0.17_{P.L.}$$

... Eqn. 3

Where:

RV = Rental Value

$\alpha = 4.104$

$_{C.L}$ = "Cheap Land" variable

$\beta_1 = 0.038$

$_{D.S}$ = "Demand and Supply " variable

$\beta_2 = 0.019$

$_{A}$= "Accessibility" variable

$\beta_3 = - 0.066$

$_{P.L}$= "Power lines" variable.

$\beta_4 = 0.17$

4.0 Research findings

A detailed regression analysis of factors identified to influence rental value around power lines neighbourhoods showed three notable findings. First, power lines have negligible impact on the rent of residential properties in high-brow areas. Second, power lines have no impact on the rent of residential properties in suburban areas and third, residencial properties closest to power lines suffer negligible diminution in value.

The stated findings have proven the existence of a power lines impact (though negligible) on the rents of residential properties in high brow areas. To promote value sustainance, government must emphasis the existence and adherence of stipulated ROWs, by continually weeding off developments within power lines

ROWs especially in high brow areas.

5.0 Conclusion and Recommendations

Based on the findings from this research, the study recommends that the Lagos State Government empowers the PHCN in continually weeding off developments off ROWs and beneath power lines. As no citizenry is above the law, all power lines corridors in the state should of necessity, be sanitised of all intrusions in order to eliminate the negligible effects of power lines thereby sustaining improved rental values. Via mass enlightenment, the PHCN should teach the importance of ROWs and the need to adhere to stipulated building setbacks for developments abutting power lines. Also, the PHCN at the upper and lower cadres need to work in hand with both the Federal and State governments in a bid to effectively implement sanctions on erring developers and landlords in the state.

Lastly, the Nigerian Institution of Estate Surveyors and Valuers (NIESV) should bring to the fore, the need for valuers to consider power lines when valuing abutting properties.

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