HVOTL STRUCTURES AND RESIDENTIAL PROPERTY INVESTMENTS IN SUBURBAN LAGOS, NIGERIA

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Abstract

High Voltage Overhead Transmission Lines (HVOTLs) otherwise referred to as power-lines, have been ascertained to influence diminution in property value. This study epicenters on the impact of power-lines on the rent of residential properties in suburban Lagos. Questionnaires were distributed to registered Estate Surveying firms, residents within 200m of a 10km double tracked power-line in Alimosho, Lagos while an indepth interview of the manager and field officers of the Alimosho PHCN sub-station was conducted. Averagely, a response rate of 66.5% was achieved and collated data were analysed accordingly. Findings revealed that the rents payable for homes within 100m proximity to the power line did not suffer value diminution. Finally, the study recommended the PHCN to call to order, all residents breaching the 25m ROW in suburban Lagos, to foster environmental decorum and also retain the null effect of power-lines on rents in the neighbourhood as the suburb gradually merges into the metropolis.

Key Words: HVOTLs, Residential Property, Rental Value, Alimosho & Suburb

Introduction

In a bid to understand the effect of HVOTLs otherwise referred to as "power lines" on property values, this current study evaluates the impact of power lines on the rents of Alimosho residential neighbourhoods in suburban Lagos State. Nigerian history has it that power lines in Lagos state originated from the pre-colonial era of the British. The construction and commissioning of the first thermal electric power plant by Queen Elizabeth of England on Iddo Island in 1952 propagated the immense use of power lines in conveying electricity to consumers via sub stations on the immediate Island and other distant industrial and residential locations. These power lines were known to have traversed villages, remote settlements and lagoons within Lagos until rapid infrastructural development fostered by the economic growth of the mid seventies, transformed and amalgamated these villages into metropolitan Lagos by the mid eighties. Being the capital of the federation till the early ninties, extensive land reclamation (still on till date) was carried out to accomodate more development. These brought into the neighbourhoods, the power lines once resident on isolated waters and areas.

Furthermore, the interaction of man and these power lines been recently noticed to have climaxed into chaotic situations in the state and nation as a whole (BBC News, 2010). Following incessant tragedies associated with power lines, substations and other electric power equipments, the Power Holding Company of Nigeria (PHCN) was forced to embark on enlightenment campaigns via the electronic and print media about the hazards associated with power line and the need for people to observe the regulatory setbacks. These concerns have generated controversial discussions as to the safety of lives and property around electric power installations and have brought to the fore, the need to study power lines in all ramifications inclusive of its impact on residential property values in both urban and suburban residential neighbourhoods.

1.1 The Study Area

The history of Lagos state is traceable to 1472 when the Portuguese first visited the old Yoruba settlement then and still known as Eko and named it a port for ferrying both human and material cargo to Europe. By 1861, it was annexed by the British who at this time opposed slavery sternly and governed it as a crown colony. In 1914 Lagos became the capital of the Colony and Protectorate of Nigeria. In 1960 the city became the capital of independent Nigeria. As Nigeria's oil industry boomed in the early 1970s, Lagos began developing rapidly. Located between latitudes 6^0 21^1N and 6^0 34^1N and longitudes 3^0 01^1 E and 3^0 27^1E, Lagos state is located in the south western region of Nigeria and is bounded in the north and east by Ogun State, south by the Atlantic ocean, west by Cotonou in Benin Republic.

Representing 0.4% of Nigeria's territorial landmass (Esubiyi,1994), Lagos is located on a total landed area of 3,345 sq km (1,292 sq mi) on four principal islands and adjacent parts of the state's mainland, the islands are connected to each other and to the mainland by bridges and landfills. Major sections of the old city include Ebute-Metta, Yaba, Surulere, and Somolu, which now serve as the commercial district, on western Lagos Island; Ikoyi Island, situated just east of Lagos Island and joined to it by a landfill; Apapa, the chief port district, located on the mainland; residential Victoria Island; and industrialized Iddo Island. Importantly, mainland suburbs which formerly were part of the old western region were incorporated as part of the city in 1967. These areas included Agege, Ikeja, Alimosho, Alakuko etc (Microsoft Encarta, 2008).

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

Deductions from the result of the 2006 population census, indicates that Lagos state is believed to be the most populous state in Nigerian after Kano with a population of over 9 million people even though the result was refuted by the then Asiwaju Bola Ahmed Tinubu led Lagos State Government who conducted a separate census exercise for the state resulting to a population about 14 million people (Sandra, 2007).

1.2 Literature Review

Numerous early studies such as those of Kinnard (1967), Wertheimer (1979), Colwell *et al.,* (1979) and those of recent times such as Chalmers and Voorvaart (2009), have for long, sort to investigate both the impact of power lines on the property values and its probable effect on the health of residents within close range and have concluded with varying degrees of findings as would be noted below.

Hamilton and Carruthers (1993) analysed a six year property market data. They found a diminution value of 5% on property in close proximity to power lines by 120m. Hamilton and Schwann (1995) surveyed 12,907 residential dwellings within four neighbourhoods in Vancouver, British Colombia within a period of 6 years (1985-1991). The two academics' analysed results found a 6.3% diminution effect on properties located 100m to a 230Kv Power lines and a 1.1% diminution effect on properties 200 meters from another 500Kv Power lines. Complete removal of the pylon/power lines increased value by a 6.3% margin. Des Rosier (1998) agreed with the findings of Colwell (1990) which portrayed a diminution in property values as a result of the visual effects of pylons and power lines. After a survey carried out on 507 single family sales, analysis showed a lesser diminution value on a property physically closer to a HVOTL but with its glare shielded by a wood, unlike other less distant properties which had the direct glare of the power lines unshielded.

In Sims (1996), professionals in the real estate industry were subjected to a psychometric test anchored on assessing their perception regarding contaminated land. Results showed that overhead power cables were perceived to be low risked. This differed from the study outcome of Slovic (1992) which indicated a greater perception of risk in this regard. According to Sims (2001), these studies enhanced media exposure on the issue of power-lines as they affect property values.

Des Rosier (1998) studied the impact of high-voltage transmission lines on surrounding residential property values using a micro-spatial approach. The research was anchored on a sample of 507 single-family houses in the city of Brossard, Greater Montreal, Canada; 257 of these town cottages sold during the study period between February 1991 and November 1996. The study area comprised three distinct neighbourhoods (R, S, and T) with a 315 KV transmission power line traversing through the center. The data bank includes 25 residential property descriptors relating to physical, environmental, neighborhood, access, fiscal and sales time attributes, as well as a series of power line related descriptors. Standard and stepwise regression procedures were successively used in the analysis. The model showed that a residential property both adjacent to an HVTL easement and facing a pylon would experience a drop in value due to visual encumbrance by approximately 9.6% of the mean house price. Residences located 1 to 2 lots away from a pylon were found to usually benefit from a market premium due to increased visual clearance and privacy. This premium, on average is within the range of 7.4% and 9.2% of the mean house price. A property located directly beneath the power line would suffer a decrease in value because of low minimal clearance of the lines fostering visual obstruction. This decrease is lesser and averages about 4.7% of the mean home price. Residences with a moderate rear or side view on a power line structure but not adjacent to the easement usually experience a market premium of 2.8% to 3.8% due to the improved visual clearance these residential properties benefit from. The net visual encumbrance defined as the difference between proximity obstacles and advantages was found to reach its peak at about 50 to 100m away the easements' external boundary. It also diminished quickly and thereafter, entirely faded away 150m and beyond. Luxury home prices were also found to be more sensitive to the visual encumbrances of power line structures. However, the methodology of this in-depth study was based only on sales value and not the passing rent of residential properties. This current study initiates and facilitates the use of residential rental values in measuring power line effects.

Wolverton and Bottemiller (2003), an assenting study of an earlier research work by Cowger, Bottlemillar and James (1996). In this study, investigations were made as to whether the outcomes of the original study would hold while using more rigorous and analytical methodologies. Cowger's study used a paired sales analysis in determining observed differences in the sales price of properties adjoining transmission line ROWs in Portland, Vancouver, and

Seattle, and similar properties located in the same cities but out of the view of power lines. Though, the original study did not control differences between the subject properties and their comparables Wolverton and Bottemiller attempted to surmount that setback using regression analysis. Analysis of covariance (ANCOVA) was made use of to determine how adjoining power line short change sales price. The data provided by the models did not support any price effect on residential property from being located adjacent to any power line. This affirms the conclusions of the original study of Cowger, that sales prices of properties are not momentously affected by the presence of a power line. Also, the data showed no discrepancy in appreciation rates between residences beside power line ROW and residences situated further away from the power line. This study was thorough in using paired sales analysis in line with regression in determining the impact of power lines on residential properties but this current study will be streamlined to utilising the passing rents of various cadres of residential properties in determining the effect of power lines on residential properties.

Chalmers and Voorvaart (2009) also addressed the issue of power line impacts on residential property values and prices using a multiple regression framework. The study is anchored on the sales of residential properties (between 1999 and 2007) abutting a 345 KV transmission lines in Connecticut and Massachusetts. The authors investigated the influence of actual distance proximity and encumbrance on sales price and found proximity to have an insignificant effect on sales price. They concluded that ‘‘the only variable that appears to have any kind of systematic effect is the encumbrance variable,’’ although its statistical significance varied and the effect was ‘‘generally small.’’ The authors also addressed potential effects due to the visibility of the transmission line structures and found no significant impacts on sales prices. Though no statistically significant effect was found to on residential properties using sales price, this current study aims at determining effects via the use of rental values instead.

Lastly, Akinjare, Oluwunmi and Iroham (2012) sampled the rents of 123 homes located in high-brow Surulere-Lagos. The study emcompassed residential properties located along and within a 200m perpendicular distance of power lines along four axis and ascertained that “residential property rents increased as distance from power-lines increased averagely by =N=5,000.00 ($30.86) and also, by a mean value of =N=786 ($4.85) on neighbourhood rental value via regression analysis”. 110 registered surveying and valuation firms within the Surulere neighbourhood also validated the negligible impact of power lines on residential rental values. In

conclusion, the study encouraged the use of buried armour cables instead of overhead power-lines in future and the strict enforcement of ROWs within Lagos metropolis where power-lines already exist, in a bid to abate the effect of power line on property investments. Notably, this study failed to ascertain the influence of power lines on the rents of residential properties located non-high brow areas.

This current attempt identifies the near absence of Nigerian literature on this subject and seeks to not only compliment existing studies internationally but also to investigate the impact of power lines on the rents of residential properties in Alimosho in suburban Lagos, Nigeria.

1. Research Methods

Primary data were collected through questionnaires distributed to residents within 200m to power lines in Alimosho area and registered Estate Surveying firms from which rental values for the period of 2005 to 2009 were obtained. The study sampled every other residential building along both sides of a 10km double tracked power line route and within a 200m perpendicular distance of the same power line.

Response rates of 53.47% (123 residences) and 76.19% (110 Estate Surveying firms) were achieved for Alimosho area and for the Estate Surveying firms respectively. In a bid to further understand powerlines, an in-depth interview with the manager and field officers of the Alimosho PHCN sub station was conducted for the purpose of this research. In all, the survey recorded an average response rate of 66.5% and collated data was analysed using the descriptive and analytical statistics.

Since the impact of power lines on the rents of nearby residential properties were not expected to be uniform as rents were presumed to increase with distance away from the power line, a four point distance range in the order of 0-50m, 51-100m, 101-150m and 151-200m was adopted as opined by Chalmers and Voorvaart (2009) in analysing the impact power line on the rents of residential properties.

2. Results and Discussion

The ANOVA multivariate analysis for determining the impact of HVOTLs on residential property is as contained in Table 1 below.

Table 1: Alimosho ANOVA Multivariate Analysis Results Using Distance Variables.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Annual Rent	4.747(a)	2.373	.928	.398	.015
	Erection of Pylon	.000(b)	.000	.	.	.
	Low Rent	3.031(c)	1.515	2.715	.070	.043
	Working Place Proximity	.236(d)	.118	.443	.643	.007
	Cheap Land Value	3.493(e)	1.747	3.447	.035	.054
	Power line affects Property Demand	1.311(f)	.656	1.177	.312	.019
	Radiation to Health	.694(g)	.347	.479	.621	.008
	Humming and Buzzing	.145(h)	.073	.108	.898	.002
	Difficulty in Sales of Properties	.495(i)	.247	.542	.583	.009
Proximity to HVOTLs	Annual Rent	4.747	2.373	.928	.398	.015
	Erection of Pylon	.000	.000	.	.	.
	Low Rent	3.031	1.515	2.715	.070	.043
	Working Place Proximity	.236	.118	.443	.643	.007
	Cheap Land Value	3.493	1.747	3.447	.035	.054
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	Difficulty in Sales of Properties	.495	.247	.542	.583	.009

From Table 1, the independent variable of Cheap Land Value was found to have been significant with a value of 0.035 (less then 0.05) resulting in a 5.4% impact. All other eight variables had insignificant impacts in relation to proximity to power lines in the Alimosho power axis indicating the existence of other features and characteristics other than the other eight variables affecting residential properties abutting HVOTLs. Enquiry from residents, residing directly adjacent to power lines within the 51-100m, attested to the cheap price of land parcels directly adjacent the power-lines largely because of the intrusive nature of the pylons and also, the fear of government acquisition of portions of such parcels in the nearest future for road expansion projects.

From Table 2, the SPSS results of multivariate tests showed Wilks' Lambda signified F = 1.271, P = 0.083. The significance level was measured at 0.217 which is far higher than the

standard measure of 0.05 significance level. This indicates that there was no variable significantly affected by proximity of residences in Alimosho to the power line. As against the result of Table 1, the significance of only one variable creates a ratio of 1:9 (5.4% impact) between the nine independent variables and failed to portray an overall significance in impact.

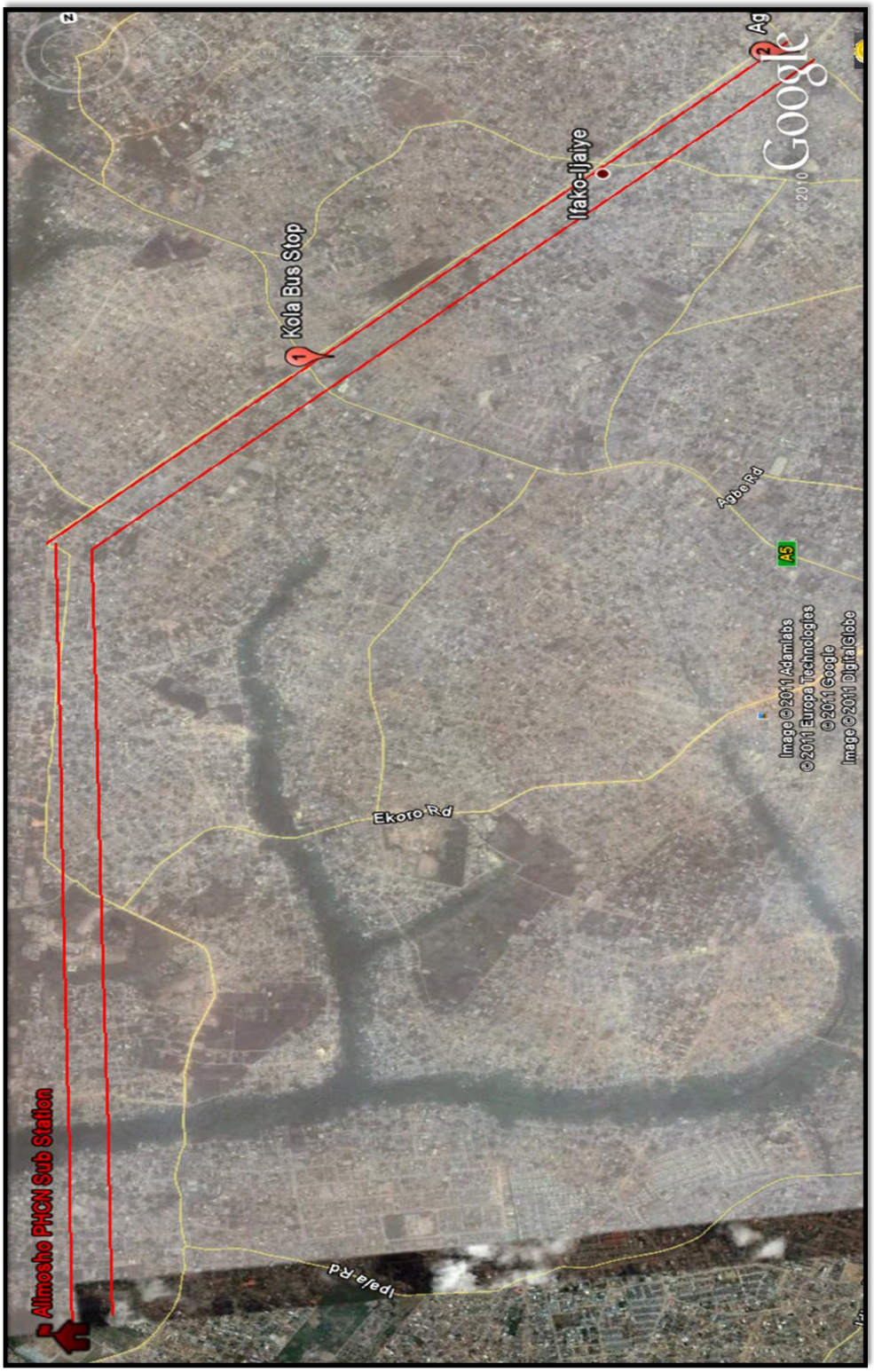
Table 2: Multivariate Tests Result of No Significance.

Effect		Value	F	Hypothesis Df	Error Df	Sig.	Partial Eta Squared
Proximity to HVOTLs	Pillai's Trace	.162	1.256	16.000	228.000	.227	.081
	Wilks' Lambda	.842	1.271(a)	16.000	226.000	.217	.083
	Hotelling's Trace	.184	1.285	16.000	224.000	.208	.084
	Roy's Largest Root	.155	2.206(b)	8.000	114.000	.032	.134

a. Exact statistic b. The statistic is an upper bound on F that yields a lower bound on the significance level.

In line with the no significance of Wilks' Lambda, the multiple comparisons of the Post Hoc tests of distance of residences from the power line proves the null significance of all nine independent variables. The insignificance of all nine variables is traceable to the nature of the Alimosho residential housing market which largely differs in nature from that obtainable in core Lagos. The power line axis of Alimosho is concentrated in the suburban region of Lagos State with approximately 2km proximity with the border town of Sango-Otta in Ogun State. Housing characteristics differ alot as most of the properties within this corridor are inferior to those of core Lagos in modern architecture, layout e.t.c thus defining the class of residents of this areas. Asides the dual carriage Lagos-Abeokuta expressway, accessibility within this axis cannot be compared with that obtainable in core Lagos, all others to include the Ray Power/ African Independent Television (AIT) road linking Kola Bus stop to the lateritic road of Amikanle along which the power line deviates en route to Alimosho transmitting sub station and the Kola Bus stop-Agbado rail crossing which both occupy the ROWs are all single laned.

Figure 2. Aerial View of Alimosho HVOTLs Route Within Suburban Lagos.



Source: Google Online Maps

3.1 Findings

Results of the ANOVA analysis from the responses from residents established that there was no ascertained impact on rents payable in on residential properties in Alimosho as caused by power lines.

3.2 Recommendations

The study recommends that the Federal Government of Nigeria utilise more creative alternative channels of bulk electric energy transfer as suburban Alimosho gradually merges into Lagos metropolis. Sub-surface mode of electricity transfer should be encouraged as it obtains in the petroleum industry where buried pipelines are employed in transfering oil products from on part of the country to the other.

Furthermore, insulation of future overhead cables could further reduce electrical accidents should cables snap off the hanger and where insulation is absent. The use of trouble shooters in all electric power sub stations, capable of stopping the flow of current into snapped cables must be utilised in order to abate the possible electrocution of nearby residents and pedestrians as have been recorded in the country. Also, the emforcement of the 25m ROWs throughout the State must be implemented forcefully especially where they have been breached to foster environmental and developmental decorum.

3. Conclusions

This study has documented the impact of HVOTLs in Alimosho Lagos and has established the existence of a null impact of HVOTL on the rental values of residential properties within suburban areas.

Finally, it is hoped that the findings contained in this research work will be of particular interest to the academic community, Power Holding Company of Nigeria (PHCN), Estate Surveyors and Valuers and potential investors in the Nigerian real estate market residing in the diaspora.

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