DISAMENITY RISKS AND PROPERTY INVESTMENTS IN LAGOS, NIGERIA.

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Abstract
Disamenities such as High Voltage Overhead Transmission Lines (HVOTLs) otherwise refered to as power-lines, have greatly facilitated property value diminution. This study tries to capture the impact of power-lines on residential property values within Lagos metropolis. Questionnaires were distributed to 139 registered Estate Surveying firms and 605 persons residing along and within a 200m perpendicular distance to power-lines in Surulere and Alimosho Local Government Council Areas of Lagos Metropolis. Interviews with the managers and field officers of PHCN sub-stations in the study area were also conducted while data were analysed using analytical statistics. The study revealed that power-lines and its associated risks were found to affect rental values of residential properties within high brow Surulere while no effect was recorded for residential properties in suburban Alimosho. The study recommends the use of buried armour cables as alternative to power lines and the strict enforcement of the right-of-ways where power-lines exist within the Lagos metropolis and generally across the nation.

Keywords: *HVOTLs, Risk elements, Residential property, Rental value, Estate Surveyors*

1. Introduction

The attendant risks synonymous with power lines disamenities have been known to have devastated man in time past due to his unending quest for more land to house developmental activities. This unending quest for land has increased his activities along and within power line "infested" areas leading to unpleasant incidences of electrocutions as reported by both the international and local news media in Nigeria. On the 13th of February, 2010 in Port Harcourt, Southern Nigeria, the BBC online news confirmed that at least ten people were charred beyond recognition while many other passengers were electrocuted when a power line cable snapped off a pylon hanger and fell on a commuter bus (BBC News, 2010). More recently, in July 2012, several people inclusive of a pregnant woman and a nursing mother where electrocuted to death when a powerline snapped off the its hanger, falling into a vegetable market in Apata area of Ibadan, Western Nigeria. The article brings to fore, previous incidences of power line falling on houses, buses, schools, flooded streets and even on petrol tankers, triggering catastrophic explosions (Princewill, 2012). A closer look at the locations of these happenings reveal their highly dense residential characteristic as a result of cheaper rents (Akinjare, 2012), spurring the need to attempt understanding how powerline risks influence property rents.

2. Previous Studies

Though literature on the particular subject of power line risks and property values is near absent, studies on powerline risks and health related matters exist significantly.
Researches such as those of Morgan, *et al*. (1985), Hayes (1990), Shulman (1990), Florig (1992), Gorman (1992), Hopwood (1996), Pierobon (1993) and Toburen (1996) have been conducted to ascertain the association between health effects and continuous EMF contact. These studies, having utilised different methodologies and approaches, have ended up with largely inconclusive findings.
Thomas *et al*., (2010) notes that the U.S. Congress commissioned the Electric and Magnetic Fields Research and Public Information Dissemination Program (EMF-RAPID) in 1992 for a six-year ''program of research and analysis. The sole aim was to offer scientific evidence to substantially elucidate the possible health risks arising from exposure to extremely low frequency of electric and magnetic fields (ELF-EMF)''. Concluding this project in 1999, the National Institute of Environmental Health Sciences (NIEHS) notified the Congress of a weak link between EMF exposure and health risks. Generally, studies on epidemiological EMF signify a small trend in increased risk of cancers - childhood leukemia and chronic lymphocytic leukemia in adults with job-related EMF exposure. Nevertheless, laboratory researches have fallen short of providing reliable evidence in validating this relationship. As ascertained by the NIEHS, exposure to EMF cannot be considered entirely safe as available scientific evidence of health risks is ''insufficient to warrant aggressive regulatory concern.'' In view of negligible indications of any genuine health consequences from EMFs, any implied power line effect on real estate values may arise due to other factors such as visual pollution, humming and buzzing sounds, electrical fire hazards and the intrusion into power lines ROWs. This is thus, the crux of this current study.

3. Methodology

For the purpose of this study, the research is limited to 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 HVOTL density, being home to the Akangba PHCN substation along the Masha / Adelabu axis. Being a major HVOTL hub, it habours an estimated 38km (60.3%) of the entire HVOTL 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 HVOTL 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 HVOTL and its highly dense residential nature. For the purpose of this study, Alimosho axis is strictly a HVOTL corridor. Commencing from the PHCN Alimosho PHCN substation, 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).

3.1 Distance Coverage from HVOTLs

This study has been limited to residential properties within 200m from both outer ends of HVOTL 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 *et al*. (2009) in analysing the impact HVOTL on the rents of residential properties.

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

Primary data were collected through questionnaires distributed to 436 residents within 200m to power-lines in Surulere and Alimosho areas, 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 line routes and within a 200m perpendicular distance from power line routes totalling 31km in Surulere axis. Within the Alimosho power line axis, residential sampling was accomplished along and within a 200m perpendicular distance to the 10km Alimosho double pylon track.

Response rates of 56.8% and 53.5% were achieved for Surulere and Alimosho areas respectively while a 76.2% response rate was achieved for registered estate surveying firms. Furthermore, an in-depth interview with the managers and field officers of the Akangba and 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 stepwise regression analysis.

4. Results

4.1 Alimosho Axis.

The linear regression analysis on the influence of the risk elements on rental property values is as follows:

Table 1: Alimosho Linear Regression Result.

Variables		Unstandardized Beta	Part Correlation	Sig	R^2	F
Dependent	Independent					
Rental Value					0.235	5.608
	Humming & Buzzing	0.535	0.535	0.033		
	Visual Unsightliness	0.193	0.228	0.413		
	Exposure to Radiation	0.397	0.469	0.078		
	Possibility of falling wires	0.244	0.267	0.335		
	Possibility of electrocution	-0.415	-0.464	0.082		
	Electrical Fire Hazards	-0.183	-0.192	0.493		
	Possible Health Hazards	0.042	0.049	0.863		
	EMF Interference with other Daily Activities	-0.254	-0.301	0.276		
	Property Stigmatization	0.003	0.004	0.989		

Of the nine variables which consist of risk elements affecting rental value, only the “Humming & Buzzing” variable (F=5.608, P<0.03) was found to significantly affect rental values in Alimosho axis accounting for 3.3% of the change in property values. All other eight variables were found to be insignificant in influencing rental values. Recalling equation 1 as earlier stated, the influence of the “Humming & Buzzing” variable on Alimosho rental values can be summarized mathematically by the regression formula:

$$Rv = 0.17+0.535_{HB}+0.193_{VU}+0.397_{ER}+0.244_{PFW}-0.415_{FE}-0.183_{EFH}+0.042_{PHH} -0.254_{EM}+0.003_{PS} \quad \text{... Eqn. 1}$$

Rv = Rental Value
α = 0.17
β_1 = 0.535
HB =“Humming & Buzzing” variable.
β_2 = 0.193
VU = Coefficient of “Visual Unsightliness”.
β_3 = 0.397
ER = Coefficient of “Exposure to Radiation”
β_4 = 0.244
PFW = Coefficient of “Possibility of Falling Wires”
β_5 = -0.415
EFH = Coefficient of “Electric Fire Hazards”
β_6 = -0.183
PHH = Coefficient of “Possible Health Hazards”
β_7 = 0.042
EMF = Coefficient of “Electromagnetic Interference with other Day to Day Activities”
β_8 = -0.254
PS = Coefficient of “Property Stigmatisation”
β_9 = 0.003

4.2 Surulere Axis.

The linear regression analysis on the influence of the risk elements on rental property values is as follows:

Table 2. Surulere Linear Regression Result.

Dependent	**Independent**	**Unstandardized Beta**			
		Step 1	**Step 2**	**Step 3**	**Step 4**
Rental Value					
	Buzzing & Humming	-0.885**	-0.746**	-1.107**	-1.177**
	Visual Unsightliness		-0.286*	-0.281*	-0.366*
	Exposure to Radiation			0.42*	0.504*
	Possibility of falling wires				0.230*
	R^2	0.783	0.846	0.894	0.937
	R^2 Change		0.062	0.048	0.044
		78.3%	6.2%	4.8%	4.4%

Significant at 0.00 (**), Significant at < 0.05 (*)

From Table 2, four of the nine risk variables are identified to significantly influence rental values. These variables are: Humming & Buzzing, Visual Unsightliness, Exposure to Radiation and Possibility of falling wires. Using the stepwise method of regression, Humming & Buzzing was found to be most significant of all four risk variables (F= -0.885, P<0.00**)**. This is reflective in the first step analysis and an R^2 value of 0.783 depicting a 78.3% influence on overall diminutions caused by powerlines. In line with the regression equation 1, a new equation 2 is deduceable for this step as follows:

$$Rv = 9.903 - 0.885_{HB} \quad \text{... Eqn. 2}$$

Where:

Rv = Rental Value

α = 9.903

β_1 = -0.885

$_{HB}$ = Coefficient of "Humming & Buzzing".

In the second step, "Buzzing and Humming" alongside "Visual Unsightliness" were found to be significant risk elements impeding rental values with the former having a significance of (F= -0.746, P<0.00**)** and the later (F= -0.286, P<0.00). The R^2 in this step was found to have increased from 0.783 to 0.846 with a marginal increase of 0.062 noted as R change. The R change depicts the significance of "Visual Unsightliness" as 6.2% of all diminutions caused by power lines in the study area. In line with the regression Equation 1, a new Equation 3 is deduceable for this step with two different risk variables as follows:

$$Rv = 10.891 - 0.074_{HB} - 0.286_{VU} \quad \text{... Equ. 3}$$

Where:

Rv = Rental Value

α = 10.891

β_1 = -0.074

$_{HB}$ = Coefficient of "Humming & Buzzing"

β_2 = - 0.286

$_{VU}$ = Coefficient of "Visual Unsightliness".

Step three shows the significance of a third risk variable (Exposure to Radiation) along with the aforementioned two. Here, Humming and Buzzing is significant by (F= -1.107, P<0.00), Visual Unsightliness by (F= -0.281, P<0.00) and Exposure to Radiation by (F=0.42, P<0.05). R^2 in this step is found to have increased to 0.894 from 0.846 by a marginal R change of 0.048. This depicts that "Exposure to Radiation" has an influence of 4.8% on the overall diminution created by power lines in the study area. This step also climaxes with the formation of a regression equation 4 as follows:

$$Rv = 10.938 – 1.107_{HB} - 0.281_{VU} + 0.420_{ER} \quad \text{... Eqn. 4}$$

Where:

Rv = Rental Value

α = 10.938

β_1 = -1.107

$_{HB}$ = Coefficient of "Humming & Buzzing"

β_2 = - 0.281

$_{VU}$ = Coefficient of "Visual Unsightliness"

β_3 = 0.42

$_{ER}$ = Coefficient of "Exposure to Radiation"

Lastly, step four indicates yet a forth significant variable "Possibility of Falling Wires". In this step, the "Humming and Buzzing" variable is significant by (F= -1.177, P< 0.00), "Visual Unsightliness" by (F= -0.366, P<0.00), "Exposure To Radiation" by (F= 0.504, P<0.05) and lastly, "Possibility of Falling Wires" by (F=0.230, P<0.05). A change in R^2 from 0.894 to 0.937 depicts an increment by a 0.044 margin. This indicates that the fourth variable is significant in the total diminution caused by power lines by a fraction of 4.4%. The lead model represented by equation 5 is finally formulated to comprise all four significant variables as follows:

$$Rv = 10.720 – 1.177_{HB} - 0.366_{VU} + 0.504_{ER} + 0.230_{FFW} \quad ... \text{Eqn. 5}$$

Where:

Rv = Rental Value

$\alpha = 10.720$

$\beta_1 = -1.177$

$_{HB} =$ Coefficient of “Humming & Buzzing”

$\beta_{2} =$ - 0.366

$_{VU}$ = Coefficient of “Visual Unsightliness”

$\beta_3 = 0.504$

$_{ER}$ = Coefficient of “Exposure to Radiation”

$\beta_4 = 0.230$

$_{FFW}$ = Coefficient of “Possibility of Falling Wires”

5. Discussion

The detailed regression analysis of risk elements identified to influence rental value around HVOTLs neighbourhoods showed that the influence of risk elements associated with HVOTL on rents significantly varies from locality to locality. Also, different risk elements associated with HVOTLs were found to influence residential rental value negatively along both axis. In Alimosho, only the “Humming & Buzzing” variable was identified to influence residential property rental value negatively while in Surulere, four variables were identified as rental value depressants. In the order of significance, these are: “Humming and Buzzing”, “Visual Unsightliness”, “Exposure to Radiation” and lastly, the “Possibility of Falling Wires”.

6. Conclusion and Recommendation

Conclusively, the study revealed that risk elements associated with power lines diminute rentage of properties in high brow residential communities. Recommendations were put forward for consideration by government and other stakeholders.

In a bid to curb the excesses of Lagosians, the State Governments is encouraged to empower the PHCN in continually weeding off developmental works termed illegal off ROWs and also directly beneath HVOTLs. As no citizenry is above the law, all HVOTL corridors in the State should of necessity be sanitised of all intrusions in order to safe guard lives and property. Relocation of persons residing within the approved 25m ROW should be conceived in order to abate related health hazards and risks. The PHCN should enlighten the public as to the importance of ROWs and the need to adhere to stipulated building lines for developments abutting power lines. The dangers of living too close to power lines should be emphasised with the attendant risks associated with power line re-iterated via the mass media in order to entrench the dangers of power lines into the heart of the public. Lastly, 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. The Nigerian Institution of Estate Surveyors and Valuers (NIESV) needs brings to the fore, the need for valuers to consider diminutions fostered by disamenties like HVOTLs when valuing abutting properties.

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