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HVOTL Associated Risks and Real Estate Investment in Lagos Metropolis, Nigeria

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ABSTRACT: High Voltage Overhead Transmission Lines (HVOTLs) associated risks have been thought to foster potential risks elements capable of creating property value diminution when located within the built environment. This current attempt identifies and evaluates particular risk elements attributable to HVOTLs within a perpendicular distance of 200m in residential neighbourhoods within Alimosho and Surulere neigbourhoods in Lagos metropolis using survey method. Data retrieved from residents within a 200meters distance perpendicular to power lines in the study areas of Lagos metropolis were analyzed and interpreted using the relative importance index. The study established that within the study areas, all nine risk elements were found significant but within varing extents. The study suggests that ROWs in the state must be enforced and respected by the public while erring individuals be sanctioned and their buildings demolished by State and Federal governments actions. This is crucial in promoting the sustainability of real estate investments.

Keywords: Power Lines, Residential Property, Surulere, Alimosho, Rental Values and Risks

ORIGINAL ARTICLE

INTRODUCTION

The controversy as to whether pylon and power line installations foster devaluation of properties or their attributable risks elements creates the need to identify and evaluate the perculiar nature of power line associated risk elements within distinct localities as perceived by residents per unit distance of power lines.

The effect of power line risks on human lives cannot be over emphasised as history has in it several electrical accidents which have claimed lives. Worthy of note is the worrisome news confirmed by the BBC of the charring of at least ten people asides those electrocuted during a power line snap in Port Harcourt, Nigeria on the fateful thirteenth day of February, 2010 (BBC News, 2010). This incident fostered the need to understand power line associated risks elements vis-a-vis the rents of homes in power line characterised residential neighbourhoods which seems to attract population.

Relevant literature on power line risks and property values have mostly been opinion anchored based on perception as pioneered by Kinnard (1967). Kinnard (1967), amongst other researchers undertook a comprehensive study on the implications of power lines on residential property value. The study constituted a year-long survey of 17 subdivisions within nine suburban towns in Hartford Metropolis, Connecticut. These subdivisions were developed between 1954 and 1964 and were either intersected by or abutted to a tower line ROW (Thomas *et al.*, 2010). Questionnaires were administered to property owners, professionals and establishments presumed to influence residential property sales in a bid to determine their attitudes and opinions. These professionals / establishments consist of banks, builders, realtors, appraisers, and assessors of real estate. Majority of residential property owners testified that living near a tower line was not crucial to them. More than 85% opined that, if given another previledge, they would re-purchase their exact plots again in the same location. Infinitesimal diminution in the range of 0% - 2% were found on homes as obscuring of pylon and line from view via the landscape, to some extent, tended to noticeably shrivel negative responses by neighbouring homeowners. Owners of more expensive residences reacted a little more negatively to the propinquity of the tower line than the owners of low cost residential buildings. Overall, the attitudes of those perceived to influence the sales value of homes were more negative as regards the effects of a power line than the attitudes of residential property owners. Being one of the foremost studies, the question of how appropriate and thorough the use of public "opinion" and "perspective" as a determinant of the value of residences in proximity to power lines is brought to the fore by this current study as it employs analysis of regression in determining the impact of power lines on the passing rents of homes.

Morgan *et al.* (1985) surveyed 116 alumni members of Carnegie-Mellon University using questionnaires to investigate the risk opinion of 50/60 Hz electromagnetic fields from power lines vis-a-vis electric

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blankets. In the questionnaire's first section, respondents were required to appraise the risk of large power lines, electric blankets, and 14 other common daily hazards such as pollution from automobiles, pesticides, caffeine, and cigarette smoking. The respondents were then requested to rank the hazards from least to most risky, assigning each variable (risk hazard) a score based on how each one viewed the prominence of hazards. The second section of the questionnaire highlighted further information on electromagnetic fields (EMFs), their potential health impacts, and how fields emitted by HVOTLs compare in strength to other electromagnetic fields rated 60 Hz. Variety of questions were inquired of the respondents such as suitable regulatory responses to EMFs and readiness to pay for exposure control. In this study, the alumni respondents did not view either electric blankets or power lines principally risky. Both hazards were ranked among the least risky of the 16 hazards inquired of. Power lines were rated slightly more risky than electric blankets. Altogether, the respondents believed that only modest regulatory control is considered necessary for EMFs emitted by power lines. Information retrieved from participants showed a "modest but statistically significant change in perception in the direction of more anxiety about the attendant risks." Responses as to public policy tended towards an unassuming regulatory control of field exposure from transmission lines and little or no control on field exposure from house-hold appliances. The study, though comprehensive on risks, was again like Kinnard (1967), anchored only on the "opinion" and "perception" of risk and not on any more rigorous methodology. The current study utilises the regression model to cater for this notable lapse in methodology.

Solum (1985), an opinion study of the impacts of transmission line easements on rural land in northwest Wisconsin presented questionnaires to landowners whose properties had been encumbered by a power line rated between 69 kV to 161 kV in voltage capacity. All 180 respondents within this Wisconsin jurisdiction owned encumbered properties in three distinct divisions: agricultural (127 responses), recreational (43 responses) and residential (10 responses). After inquiry into how the power line had affected their real estates, a greater part of the agricultural property owners opined that the power line had no effect on their property values but only posed a concern when areas surrounding pylon and directly beneath power lines were being cultivated. For recreational property owners, the primary concern was with the anticipated loss of future timber value from clearing the easement area, while residential landowners were more incensed on the potential aesthetic loss likely to affect the value of their real estate negatively in the future. Solum later investigated property market value and sales price via personal interviews with the sellers and eventual buyers of the encumbered properties. Proceedings of the interviews indicated that only one of the encumbered properties was sold at a market price similar to non-encumbered properties. Importantly, none of the buyers negotiated the sellers price before purchasing properties abutting power lines. In Solum's conclusion, "despite concerns and inconveniences, the resale value of all three real estate types were not reduced due to the easement of transmission line". Judging from the sample size of 180 real estate owners of which respondents who owned residential real estate plots amounted to merely 10 individuals, the effects of the power line on residential property values may not have being well captured. Also, no indepth research work would possibly make valid inferences from a miniature residential property respondent size of 5.56% of the sample size. Inclusively, a rural setting, where demand for residential housing is most insignificant, would also not capture diminutions. This current research work builds on these loop holes by assessing the rental values of 1,185 urban residences in close proximity to power lines in both study areas.

Investigations of Delaney and Timmons (1992), amongst appraisers, found the value of residential properties near power lines to be averagely 10% lower than the market value for similar properties not prone to power line influence. Initially, 500 questionnaires were mailed to randomly survey Residential Member (RM) designatories of the Appraisal Institute. A response rate of 43.8% was achieved with about 84% of respondents indicating a negative influence of abutting power lines on residential property market value averaged at 10%. Generally, the much thought reasons for this value diminution were foremostly, visual unattractiveness of power lines, possible health risks, disturbing humming and buzzing sounds and safety concerns. Most appraisers examined diminutions based on paired sales analysis to ascertain value declination due to power-line proximity. An estimated 10% of the appraisers surveyed opined that power-line usually have no significant impact on value, while another 6% indicated that power lines potentially increased the value of properties owed to larger yards and added privacy. Though the findings of this study was applauded, it only concentrated on appraisers and failed to incorporate other actively affected parties such as affected residents living in proximity to power lines. This study identifies and resolves this weakness by not only sampling appraisers but also residents whose residences are within a perpendicular distance of 200meters to power lines.

Kung and Seagle (1992) scrutinized perceptions vis-à-vis the spatial relationships sandwiched between power lines and residential property values in Memphis and Shelby Counties, Tennessee. In the study, neighborhoods abutted by power lines were recognised and residential properties under and adjacent these lines were assessed to establish the actual or superficial influences on the value and marketability of these realties. In response to a questionnaire developed to survey 80 homeowners living adjacent to the power lines in two adjacent neighborhoods, 47 responded to the survey. 50% of the respondents were of the opinion that they considered the power lines an eyesore, while another 47% opined that they do not. 72% of those who perceived the lines an eyesore opined the lines had no influence on purchase price. Evidence associating electromagnetic fields to health problems such as cancers over the years have been scanty with insignificant direct causal relationship discovered in most studies. Of the 47 residential property owners, none considered the abutting power lines as being a potential health hazard. Although, 87% asserted that if they had previous knowledge of potential health risks, they would have opted to pay less

for their homes or looked elsewhere for alternatives. This study was an eye opener on the perspective of residents living along power line routes but is deficient in thoroughness of methodology as mere perspectives of residents may not be the best way to assess power line effects on property values without the use of passing rents. Again, a response rate of 58.8% (47) of the study is considered too small to conclusively infer the non diminutory effect of power lines on residential property values. These identified lapses have been catered for in the current study by a sample size of 1,185 respondents and the use of a regression model.

Priestley and Evans (1996) studied a large sample of people living in the vicinity of a power line about 28 miles north of San Francisco using psychometric scales. The subject pylon had just been rebuilt to withstand more power and comprised three high-voltage routes ranging from 120 to 160 feet in height. 445 questionnaires were administered via mail to the residents of two adjacent suburban neighbourhoods located within 900 feet of the subject power line. Though a 60% response rate was obtained, the survey indicated that most of the residents abutting the power lines considered it a negative element in the neighborhood affecting general health and safety, property values, and aesthetics. Another 87% of respondents signified that power lines had an adverse effect on only neighborhood aesthetics. Older people and those with high paying jobs showed more negative perceptions while it was less for those who used the ROW for recreational intentions. Residents of the neighborhood before the power line upgrade strongly detested the power lines while physical factors such as actual distance from the power line and visual impairedness did not affect perceptions of residents.

Most recently, Akinjare et al. (2013) in the quest to investigate power line disamenities hazards attribuatable to rental values in highbrow neighborhoods in Lagos metropolis, Nigeria identified and evaluated the various risk elements and hazards attributable to the power lines characterised residential neighbourhoods via interview. By interviewing executives and field officers of the Power Holding Company of Nigeria (PHCN) and sampling both residents within 200m to power lines in Surulere area of Lagos metropolis and Estate Surveyors and Valuers via questionnaires, the study established that both residents and Estate Surveyors and Valuers jointy identified "Fear of Falling Wires", "Buzzing and Humming", "Property Stimatization" and "Exposure to Electrical Radiation" from power lines as the four major risk elements identified as having outstanding impacts on the rental value of residential properties. The study suggests that locating all residential housing within the 25m Right of Ways in the state must be discouraged by the PHCN and further concludes that the State government organize and enforce the continuous demolition drive of illegal structures already occupying the ROW in Surulere to protect lives and enhance income from residential real estate investments.

Asides studies on the influence of power lines risks on property values, studies such as those of Chalmers and Voorvaart (2009), and in Nigeria, Akinjare *et al*. (2012) and Oluwunmi *et al.* (2012) have comprehensively studied the impact of power lines on both the capital values and monthly rents of residential property values and have identified diminutions in existence.

This current attempt seeks to foremostly compliment Nigerian literature on this subject and then present the Nigerian findings to the academic community internationally in further identifying the power line risks elements peculiar to influencing real estate investment along the peculiar power line corridors of Lagos metropolis.

STUDY SETTING AND DATA

For the purpose of this study, only two major areas of metropolitan Lagos were considered namely: Surulere and Alimosho Local Government Areas of Lagos metropolis. The choice of Surulere Local Government Council Area was borne out of its urbanized nature and high HVOTL density. It is home to a PHCN major electric power sub-station at Masha / Adelabu axis known as Akangba power substation (see appendix B(ii)). Being a major HVOTL hub, it habours an estimated 38km (60.3%) of the entire HVOTL in Surulere region (see Appendix B(iii)). Surulere region as described by Appendix B(ii) constitutes the peripheries of Surulere Local Government Council Area and it includes 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 (see appendix B(ii)).

On the other hand, Alimosho axis of Lagos region was chosen for its suburban nature (as compared to Surulere which is purely urban), presence of HVOTL and its highly dense residential nature. Alimosho axis is strictly a power line corridor (otherwise referred to as Alimosho HVOTLs axis in this study). Commencing from the PHCN Alimosho electric power 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.

Distance Coverage from HVOTLs

This study has been limited to residential properties within 200m from both outer ends of power line and pylons in each of the two study areas. This is because similar studies on other disamenities such as landfills (McCluskey and Rausser,2003; 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 nonlinear 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 analyzing the impact power line on the rents of residential properties.

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 the four power line routes totalling 31km in Surulere axis. These routes are namely: Akangba-Ojo (11km), Akangba-Isolo (7km), Akangba-Ijora (5km) and Akangba-Apapa (8km) routes. 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 gotten for registered Estate Surveying firms. In a bid to further understand powerlines, 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 the relative importance index (RII).

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

A detailed analysis of risk elements associated with HVOTLs conducted across the neighborhoods of the two HVOTL neighborhoods identified a number of risk element associated with HVOTLs varying from location to location. All nine risk elements were found to be significant only within the 0-50m distance range in Alimosho area due to the presence of a tarred road occupied the ROW. Also, in Surulere, all nine risk element were found to be most active within the distance ranges of 0-50m and 50-100m and was found to be due to the absence or near absence of a ROW.

DISCUSSION

Alimosho Axis

The relative important index (R.I.I) analysis for identifying risk elements associated with HVOTLs in Alimosho axis is as contained in Tables 1-7.

A quick glance at Table 1 reveals that risk associated with power lines are majorly experienced within the distance ranges of 0-50m and 51-100m. Further analysis of the Table also depicts that within the range of 0-50m, residents of tenemented properties attribute all nine risk elements as most significant from power lines. In order of priority, "Exposure to Radiation", "Possibility of Falling Wires", "Possibility of Electrocution", "EMF Interference with Daily Activities" and "Property Stigmatisation" all ranked highest. This was closely followed by all of "Humming and Buzzing", "Visual Unsightliness", "Electric Fire Hazards" and "Health Hazards".

Within the 51-100m distance range, "Electric Fire Hazard" was accounted to be most associated with power lines while the duo of "Humming and Buzzing", and "EMF Interference with other Daily Activities" were rated second. Lastly, the three other significant associated risks in order of significance are: "Possibility of Falling Wires", "Health Hazard" and "Possibility of Electrocution".

RESULTS

Table 1. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for Tenemented Properties.

Tenemented Properties										
	R.I.I for the Various Risks Elements Associated with HVOTLs.									
Unit Dist (m)	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interference	Property Stigmatization
0-50	35,000	2.7500*	2.7500*	3.0000*	3.0000*	3.0000*	2.7500*	2.7500*	3.0000*	3.0000*
51-100	54,000	2.5454*	1.6363	1.5454	2.4545*	2.0000*	2.6363*	2.2727*	2.5454*	1.7272
101-150	60,000	1.0000	1.4472	1.9231	1.0000	1.0000	1.0000	1.0000	1.4615	1.0000
151-200	60,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 2. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 1Bedroom Flat Properties

1 bedroom Flats										
	R.I.I for the Various Risks Elements Associated with HVOTLs.									
Unit Dist (m)	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interference	Property Stigmatization
0-50	48,000	1.0000	1.0000	1.0000	1.0000	2.0000*	2.0000*	1.0000	2.0000*	3.0000*
51-100	60,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	2.0000*	1.0000
101-150	70,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
151-200	80,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 2 reveals that risks associated with power lines are experienced within the distance ranges of 0-50m and 51-100m from the power line. Residents of 1bedroom flat properties within 0-50m region regard four of the nine risk elements as significant. "Property Stigmatisation" was found to be the most significant risk element associted with power lines.

This was followed by "Possibility of Electrocution", "Electric Fire Hazard" "EMF Interference with daily Activities", all having the same rating. Within the

51-100m region, only one of the nine risk variables (EMF Interference with Daily Activities) was found to be associated with power lines.

Table 3. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 2Bedroom Flat Properties

2 Bedroom Flats										
Unit Dist (m)	R.I.I for the Various Risks Elements Associated with HVOTLs.									
	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interference	Property Stigmatization
0-50	90,000	2.1923*	2.3462*	2.0385*	2.4231*	2.1923*	1.8846	2.0385*	2.5000*	2.7308*
51-100	95,000	1.8077	2.1538*	1.8077	1.2308	1.2308	1.3462	1.4231	2.3462*	1.6923
101-150	115,000	1.0000	1.5769	1.0000	1.1154	1.0000	1.0000	1.0000	1.6538	1.0000
151-200	125,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.2692	1.0000

Analysis of Table 3 affirms again that risks associated with power lines are only experienced within the distance ranges of 0-50m and 51-100m of power lines as residents of 2 bedroom flats within the critical region of 0-50m reveal the significance of eight of the nine risks elements associated power lines. In order of significance, the risk elements are as follows: "Property Stigmatisation", "EMF Interference with Daily Activities", "Possibility of Falling Wires", "Visual Unsightliness", "Humming and Buzzing" in par with "Possibility of Electrocution" and lastly, "Exposure to Radiation" also at par with "Health Hazards".

Within the 51-100m range, residents of 2 bedroom properties observed the existence of two of the nine risk elements associated with power lines. In order of relevance, the risk elements consist of "EMF Interference with Daily Activities" and "Visual Unsightliness".

Table 4. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 3 Bedroom Flat Properties

3 Bedroom Flats										
Unit Dist (m)	R.I.I for the Various Risks Elements Associated with HVOTLs.									
	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of Electro-cution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	105,000	2.1923*	2.3462*	2.0385*	2.4231*	2.1923*	1.8846	2.0385*	2.5000*	2.7308*
51-100	120,000	1.8077	2.1538*	1.8077	1.2308	1.2308	1.3462	1.4231	2.3462*	1.6923
101-150	150,000	1.0000	1.5769	1.0000	1.1154	1.0000	1.0000	1.0000	1.6538	1.0000
151-200	150,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.2692	1.0000

Table 4 reveals that of the four different distance ranges, the effects associated with power lines can only be experienced within the ranges of 0-50m and 51-100m. Residents of 3 bedroom flats within 0-50m of the power line identified eight of the nine risk elements as associable with their locality. "Property Stigmatisation" was identified as the most significant risk element followed by "EMF Interference with Daily Activities". In order of significance, the others as identified are: "Possibility of Falling Wires", "Visual Unsightliness", "Humming and Buzzing" at par with "Possibility of Electrocution" and lastly "Exposure to Radiation" in par with "Health Hazards".

Furthermore, residents of 3 bedroom flats within the 51-100m range identified only two of the nine risk elements as being associable with their locality. Most prominent of the two risk elements was "EMF Interference with Daily Activities" which was followed by "Visual Unsightliness".

Table 5. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 2Bedroom Bungalow Properties

2 Bedroom Bungalow (B/Q)										
Unit Dist (m)	R.I.I for the Various Risks Elements Associated with HVOTLs.									
	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of Electro-cution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	96,000	2.4286*	2.0714*	1.8571	2.5000*	2.2857*	1.9286	2.0714*	2.2143*	2.4286*
51-100	107,000	1.5000	1.6429	1.4286	1.4286	1.1429	1.7857	1.1429	2.0714*	1.6429
101-150	125,000	1.0000	1.0000	1.1429	1.0000	1.0000	1.0000	1.0000	1.9286	1.4286
151-200	130,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.2143	1.0000

Analysis of Table 5 provides a more vivid picture illustrating that risks associated with power lines are only experienced within the distance ranges of 0-50m and 51-100m of power lines as residents of 2 bedroom bungalows within the region of 0-50m reveal the significance of **seven** of the nine risks elements associated power lines. In

order of significance, the risk elements are as follows: "Possibility of Falling Wires", "Humming and Buzzing" at par with "Property Stigmatisation", "Possibility of Electrocution", "EMF Interference with Daily Activities" and "Visual Unsightliness" in par with "Health Hazards".

Within the 51-100m range, residents of 2bedroom bungalow properties observed the existence of only "EMF Interference with Daily Activities" as the only risk elements associated with power lines.

Table 6. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 3bedroom Bungalow Properties

3 Bedroom Bungalow										
Unit Dist (m)	R.I.I for the Various Risks Elements Associated with HVOTLs.									
	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	120,000	2.6923*	2.6154*	2.0000*	2.0769*	2.6154*	1.6923	1.9231	2.5385*	2.5385*
51-100	136,000	2.0000*	1.2308	1.7692	1.9231	1.5385	1.4615	1.7692	2.2308*	1.9231
101-150	160,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
151-200	160,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 6 reveals that risks associated with power lines are experienced within the distance bungalows within 0-50m region regard seven of the nine risk elements as significant. "Humming and Buzzing" was found to be the most significant risk element associted with power lines. This was followed by "Visual Unsightliness" at par with "Possibility of Electrocution", "EMF interference with Daily Activities" at par with "Property Stigmatisation", "Possibility of Falling Wires" and lastly, "Exposure to Radiation" in order of significance.

Within the 51-100m region, two of the nine risk variables ("EMF Interference with Daily Activities" and "Humming and Buzzing") were found to be significantly associated with power lines in Alimosho area.

Table 7. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 3Bedroom Duplex Properties

3 Bedroom Duplex										
Unit Dist. (m)	R.I.I for the Various Risks Elements Associated with HVOTLs.									
	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	180,000	2.2500*	2.7500*	2.2500*	2.2500*	2.0000*	1.7500	2.2500*	2.7500*	2.2500*
51-100	190,000	2.0000*	1.2308	1.7500	2.0000	1.5000	1.5000	1.7500	2.2500*	1.7500
101-150	200,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
151-200	200,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 7 reveals that risks associated with power lines are experienced within the distance ranges of 0-50m and 51-100m from the power line. Residents of 3 bedroom duplexes within 0-50m region regard eight of the nine risk elements as significant. "Visual Unsightliness and EMF Interference with Daily Activities" were found to be the most significant risk elements associated with power lines as both risks were at par with each other. This was followed by "Humming and Buzzing", "Exposure to Radiation", "Possibility of Falling Wires", "Health Hazards" and "Property Stigmatisation" which were all at par with each other. The eighth and last in order of significance among the risk elements was "Possibility of Electrocution".

Within the 51-100m region, two of the nine risk variables ("EMF Interference with Daily Activities" and "Humming and Buzzing") were found to also be significantly associated with power lines in Alimosho area.

Surulere Axis.

The relative importance index for the various cadres of property per unit distance of HVOTLs in Surulere axis is as contained in Tables 8-14:

Table 8. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for Tenemented Properties

Tenemented Properties										
Unit Dist (m)	R.I.I for the Various Risks Elements Associated with HVOTLs.									
	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	46,000	2.1923*	2.5000*	2.3846*	2.5128*	2.4872*	2.4487*	2.6538*	2.6026*	2.8205*
51-100	70,000	2.1410*	2.2179*	2.0128*	2.0513*	1.8205	2.2692*	2.3974*	2.4744*	1.8077
101-150	94,000	1.1923	1.3590	1.0385	1.0000	1.0128	1.0128	1.1795	1.8462	1.4103
151-200	96,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.3718	1.0000

Table 8 clearly shows the presence of active risk elements in the distance ranges of 0-50m and 51-100m as depicted by residents of tenemented properties within Surulere area of Lagos State. Within the 0-50m range of distance, all nine risk elements were noted to be significantly associated with power lines. "Property Stigmatisation" was most associated with properties within 0-50m proximity to power lines. In order of

importance, other eight risk elements consist of: "Health Hazards","EMF interference with Daily Activities", "Possibility of Falling Wires", "Visual Unsightliness", "Possibility of Electrocution", "Electric Fire Hazard", "Exposure to Radiation" and "Humming and Buzzing".

Within the 51-100m range, seven of the nine risk elements were found to be significantly associated with power lines. Rated highest of the seven identified risk elements is "EMF Interference with Daily Activities" followed by "Health Hazards", "Electric fire hazards", "Visual Unsightliness", "Humming and Buzzing", "Possibility of Falling Wires" and "Exposure to Radiation" in order of significance.

Table 9. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 1bedroom Flat Properties

1 Bedroom Flat Properties										
	R.I.I for the Various Risks Elements Associated with HVOTLs.									
Unit Dist (m)	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	152,000	2.6400*	2.8800*	2.6400*	2.8800*	2.8400*	2.5600*	2.4800*	2.9200*	2.8400*
51-100	176,000	2.3200*	2.9600*	2.2800*	2.0800*	2.3200*	2.0000*	2.2800*	2.3200*	1.6000
101-150	250,000	1.0000	1.2800	1.0000	1.0000	1.0000	1.0000	1.0000	1.2000	1.0000
151-200	250,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.1200	1.0000

Table 9 clearly shows the significance of various risk elements in the distance ranges of 0-50m and 51-100m as depicted by residents of 1bedroom flat properties within Surulere area of Lagos State. Within the 0-50m range of distance, all nine risk elements were noted to be significantly associated with power lines. "EMF Interference with Daily Activities" was most associated with properties within 0-50m proximity to power lines. The duo of "Visual Unsightliness" and "Possibility of Falling Wires" were secondly rated most associated with power lines. Also, the duo of "Possibility of Electrocution" and "Property Stigmatization" were rated third most significant risk elements. In the same vein, the duo of "Exposure to Radiation" and "Humming and Buzzing" were rated fourth in significance while "Electric Fire Hazard" and "Health Hazards" were individually rated fifth and sixth in significance levels as associated with power lines.

Within the 51-100m range, eight of the nine risk elements were found to be significantly associated with power lines. Rated highest of the seven identified risk elements was "Visual Unsightliness". This was followed by the trio of "Humming and Buzzing", "Possibility of Electrocution" and "EMF Interference with Daily Activities". Afterwards, the duo of "Exposure to Radiation" and "Health Hazards" were rated third significant. "Possibility of Electrocution" was rated fourth while "Electric fire hazard" was rated fifth in significance as associated with power lines.

Table 10 illustrates that within the distance cadres of 0-50m and 51-100m, various risk elements are associated with power lines. Within the 0-50m distance range, all nine risk elements were found significant with "EMF Interference with Daily Activities" and "Property Stigmatization" being rated most associated with power lines in Surulere.

This was followed by "Exposure to Radiation", "Humming and Buzzing", "Health Hazards", "Visual Unsightliness", "Possibility of Falling Wires", "Possibility of Electrocution" and lastly, "Electric Fire Hazard".

Within the 51-100m distance range, six prominent risk elements were identified by residents. Of most importance was "EMF Interference with Daily Activities" while "Visual Unsightliness" and "Exposure to Radiation" were rated second and third most important risk elements. In order of importance, the other three risk elements are: "Possibility of Falling Wires", "Humming and Buzzing" and lastly, "Electric fire hazard".

Table 10. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 2Bedroom Flat Properties

2 Bedroom Flats										
	R.I.I for the Various Risks Elements Associated with HVOTLs.									
Unit Dist (m)	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	230,000	2.8627*	2.7255*	2.9216*	2.6275*	2.4314*	2.2941*	2.7451*	3.0000*	3.0000*
51-100	254,000	2.0980*	2.6863*	2.6275*	2.1765*	1.9608	2.0000*	1.9021	2.7059*	1.8235
101-150	276,000	1.0000	1.1765	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
151-200	280,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 11. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 3Bedroom Flat Properties

3 Bedroom Flats										
	R.I.I for the Various Risks Elements Associated with HVOTLs.									
Unit Dist (m)	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	270,000	2.7391*	2.8261*	2.5000*	2.8478*	2.2174*	2.1522*	2.4565*	3.0000*	3.0000*
51-100	290,000	2.4130*	2.7391*	2.5000*	1.7174	2.1087*	1.3043	1.4565	2.1957*	1.6087
101-150	330,000	1.2174	1.6522	1.0000	1.0000	1.0000	1.0000	1.0000	2.0217	1.0000
151-200	335,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Analysis of Table 11 clearly indicate that risk elements associated with power lines are only experienced within the distance ranges of 0-50m and 51-100m of proximity to power lines in Surulere. Residents within the distance range of 0-50m of power lines in the study area indicate the existence of all nine risk elements associated with power lines with "EMF Interference with Daily Activities" and "Property Stigmatisation" being the most highly rated. This is then followed by "Possibility of Falling Wires", "Visual Unsightliness", "Humming and Buzzing", "Exposure to Radiation", "Health Hazards", "Possibility of Electrocution" and lastly, "Electric Fire Hazard" in the order of significance.

Also, within the distance range of 51-100m, **five** of the nine risk variables are noted to be significantly associated with power lines of which "Visual Unsightliness" ranks first. In order of importance, the other variables are: "Exposure to Radiation", "Humming and Buzzing" and "EMF Interference with Daily Activities" while "Possibility of Electrocution" was rated the least significant of the five identified risk variables.

Table 12. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 2Bedroom Bungalow Properties

2 Bedroom Bungalow (B/Q)										
Unit Dist (m)	R.I.I for the Various Risks Elements Associated with HVOTLs.									
	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	200,000	2.5714*	2.7143*	2.4286*	2.0000*	2.8571*	2.7143*	2.4286*	3.0000*	3.0000*
51-100	215,000	2.1429*	2.4286*	1.8571	2.0000*	2.0000*	1.5714	2.1429*	2.5714*	2.2857*
101-150	240,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
151-200	240,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Analysis of Table 12 indicates the existence of risk elements associated with power lines within only the distance ranges of 0-50m and 51-100m of power lines in Surulere. Residents within the distance range of 0-50m of power lines in the study area indicate the existence of all nine risk elements associated with power lines with "EMF Interference with Daily Activities" and "Property Stigmatisation" being the most highly rated. This is then followed by "Possibility of Electrocution" which ranks second. Visual Unsightliness" and "Electric Fire Hazard" were both rated third most significant. "Humming and Buzzing" was ranked fourth most important while the duo of "Exposure to Radiation" and "Health Hazards" were rated fifth. Lastly, "Possibility of Falling Wires" ranked least in order of significance.

Within the distance range of 51-100m, seven of the nine risk variables were noted to be significantly associated with power lines of which "EMF Interference with Daily Activities" ranked first while "Visual Unsightliness" ranked second. In order of importance, the other variables were: "Stigmatisation of Property", the duo of "Humming and Buzzing" and "Health Hazards" were equally marched. In the same vein, the duo of "Possibility of Falling Wires" and "Possibility of Electrocution" were rated least important.

Table 13. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 3Bedroom Bungalow Properties

3 Bedroom Bungalow										
Unit Dist (m)	R.I.I for the Various Risks Elements Associated with HVOTLs.									
	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electrocution	Electric Fire Hazard	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	714,000	3.0000*	3.0000*	2.6667*	2.6667*	2.6667*	2.6667*	3.0000*	3.0000*	3.0000*
51-100	712,000	2.6667*	2.6667*	2.3333*	2.6667*	2.6667*	2.3333*	2.3333*	3.0000*	2.6667*
101-150	770,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.8571	1.0000
151-200	970,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 13 indicates the existence of risk elements associated with power lines within only the distance ranges of 0-50m and 51-100m of power lines in Surulere. Residents of 3 bedroom bungalows within the distance range of 0-50m of power lines in the study area indicate the existence of all nine risk elements associated with power lines with five risk elements namely "Humming and Buzzing", "Visual Unsightliness", "Health Hazards", "EMF Interference with Daily Activities" and "Property Stigmatisation" being rated first. This is then followed by all of "Exposure to Radiation", "Possibility of Falling Wires", "Possibility of Electrocution" and "Electric Fire Hazard" being ranked second.

Within the distance range of 51-100m, all nine risk variables were noted to be significantly associated with power lines of which "EMF Interference with Daily Activities" ranked first while five variables namely: "Humming and Buzzing", "Visual Unsightliness" "Possibility of Falling Wires", "Possibility of Electrocution" and "Property Stigmatisation" all ranked second. The last set of variables which were least ranked together were: "Exposure to Radiation", "Electric Fire Hazard" and "Health Hazards".

Table 14. Relative Importance Index of the Nine Risk Elements Associated with HVOTLs for 3Bedroom Duplex Properties

Unit Dist. (m)	3 Bedroom Duplex									
	R.I.I for the Various Risks Elements Associated with HVOTLs.									
	R.V per Unit Dist. (=N=)	Humming and Buzzing	Visual Unsight-liness	Exposure to Radiation	Possibility of falling wires	Possibility of electroc-ution	Electric Fire Hazards	Health Hazards	EMF Interfe-rence	Property Stigma-tisation.
0-50	884,000	3.0000*	3.0000*	3.0000*	3.0000*	3.0000*	3.0000*	3.0000*	3.0000*	3.0000*
51-100	912,000	2.6667*	3.0000*	2.6667*	2.3333*	2.6667*	2.3333*	2.3333*	3.0000*	2.3333*
101-150	970,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
151-200	1,000,000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 14 gives a vivid picture of the presence of risks elements associated with power lines only within the distance ranges of 0-50m and 51-100m. Residents of 3bedroom duplexes within the 0-50m distance range ranked all nine risks elements as strongly associated with power lines within the Surulere area while their counterparts within the 51-100m zone though identified all nine risk variables as existent in their locality, rated "Visual Unsightliness" and "EMF Interference with Daily Activities" as most dominant risk variables associated with power lines. Afterwards, the trio of "Humming and Buzzing", "Exposure to Radiation" and "Possibility of Electrocution" were ranked second most significant while "Possibility of falling wires, "Electric Fire Hazard", "Health Hazards" and "Property Stigmatisation" were ranked least significant.

CONCLUSION AND RECOMMENDATIONS

Based on the findings from this research, power lines are generally associated with one or more risk elements and also, risk elements associated with power lines do diminute rental property values in high brow residential communities. Therefore the various tiers of government should help curb the excesses of Lagosians by continually weeding off developmental works termed illegal within and along ROWs in order to ensure the sustainability of property values. The ROWs as conceived would abate related health hazards and risks attendant to property devaluation. The Power Holding Holding Company of Nigeria (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.

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APPENDIX A.

The individual high tension overhead transmission line axis in the lagos region and their corresponding length in km.

S/N	Description	330KV and 132KV Transmission Lines			
		Thermal Rating (Amps)	Conductor Size (mm^2)	Type	Lenght (Km)
	LAGOS REGION				
1	Ayede-Ikeja West (2nos SC 330KV)	1360	2 ×350	Bison	137
2	Ikeja West - Akangba (2nos SC 330KV)	1360	2 ×350	Bison	18
3	Ikeja West - Egbin DC 330KV	1360	2 ×350	Bison	62
4	Egbin-Aja DC 330KV	1360	2 ×350	Bison	14
5	Aja-Alagbon DC 330KV	1100	2 ×250	Panther	26
6	Ikeja West - Ejigbo DC 132KV	550	250	Bear	10
7	Ejigbo - Itire DC 132KV	550	250	Bear	3
8	Itire - Akangba DC 132KV	550	250	Bear	3
9	Ikeja West - Abesan DC 132KV	550	250	Bear	6
10	Abesan - Isheri DC 132KV	550	250	Bear	12
11	Akangba - Ijora DC 132KV	400	150	Wolf	5
12	Ijora - Alagbon SC 132KV	400	150	Wolf	79
13	Isheri - Erunkan DC 132KV	550	250	Bear	9
14	Erunkan - Oworonshoki (DC 132KV)	550	250	Bear	6
15	Oworonshoki - Akoka (DC 132KV)	550	250	Bear	4
16	Akoka - Yaba (DC 132KV)	550	250	Bear	3
17	Yaba - Alagbon SC 132KV	550	250	Bear	8
18	Yaba - Ijora SC 132KV	550	250	Bear	4
19	Akangba - Isolo DC 132KV	400	150	Wolf	7
20	Isolo - Ilupeju SC 132KV	550	250	Bear	21
21	Ilupeju - Maryland DC 132KV	400	150	Wolf	2
22	Maryland – Ikorodu DC 132KV	550	250	Bear	19
23	Ikorodu - Shagamu SC 132KV	400	150	Wolf	42
24	Ikorodu - Egbin DC 132KV	550	250	Bear	18
25	Ikeja West - Agbara DC 132KV	550	250	Bear	22
26	Agbara - Ojo DC 132KV	550	250	Bear	16
27	Ojo - Amuwo Odofin DC 132KV	550	250	Bear	6
28	Amuwo Odofin – Akangba (DC 132KV)	550	250	Bear	5
29	Akangba - Apapa Road DC 132KV	400	150	Wolf	8
30	Ikeja West - Alimosho DC 132KV	550	250	Bear	4
31	Alimosho - Ogba DC 132KV	550	250	Bear	10
32	Ogba – Alahusa DC 132KV	550	250	Bear	2
33	Ikeja West - Otta DC 132KV	550	250	Bear	10
34	Otta - Papalanto SC 132KV	400	150	Wolf	10
35	Papalanto – Abeokuta SC 132KV	400	150	Wolf	35
36	Akangba - Isolo DC 132KV	400	150	Wolf	6
37	Egbin - Epe DC 132KV	550	250	Bear	-
38	Ayede - Jericho DC 132KV	400	150	Wolf	2
39	Ayede - Shagamu SC 132KV	400	150	Wolf	67
40	Shagamu T.S - Shagamu CEM SC 132KV	400	150	Wolf	9
41	Ayede - Ibadan North SC 132KV	400	150	*	*
42	Shagamu - Ikorodu SC 132KV	400	150	Wolf	42
43	Shagamu - Ijebu Ode SC 132KV	400	150	Wolf	41
44	Jericho - Iwo SC 132KV	400	150	Wolf	*
45	Iwo - Iseyin SC 132 KV	400	150	Wolf	85

SOURCE: phcn akangba electric power substation, surulere, lagos state.

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APPENDIX B.

(EXTRACTIONS FROM APPENDIX A)

B(i). **Lagos Metropolis**.

S/No	Axis	Voltage Rating (KV)	Length in Km	S/No on PHCN Document.
1.	Ikeja West – Akangba	330	18	02
2.	Ikeja West – Ejigbo	132	10	06
3.	Itire – Akangba	132	3	08
4.	Akangba – Ijora	132	5	11
5.	Oworonshoki – Akoka	132	4	15
6.	Akoka – Yaba	132	3	16
7.	Yaba – Alagbon	132	8	17
8.	Yaba – Ijora	132	4	18
9.	Akangba – Isolo	132	7	19
10.	Isolo – Ilupeju	132	21	20
11.	Ilupeju – Maryland	132	2	21
12.	Amuwo Odofin – Akangba	132	5	28
13.	Akangba – Apapa Road	132	8	29
14.	Ikeja West - Alimosho	132	4	30
15.	Alimosho – Ogba	132	10	31
16.	Ogba – Alausa	132	2	32
17.	Akangba – Isolo Road	132	6	36
	Total	--	120	--

SOURCE: extractions from appendix a.

B(ii). Surulere Region.

S/No	Axis	Voltage Rating (KV)	Length in Km	S/No on PHCN Document.
1.	Ikeja .W – Akangba	330	18	2
2.	Itire – Akangba	132	3	9
3.	Akangba – Ijora	132	5	11
4.	Akangba – Isolo	132	7	19
5.	Akangba – Isolo	132	6	36
6.	Akangba – Apapa Road	132	8	20
7.	Amuwo Odofin – Akangba	132	5	28
8.	Akangba – Ojo	132	11	--
	Total	---	63	--

SOURCE: extractions from appendix a(i).

(iii). SURULERE AREA.

S/No	Axis	Voltage Rating. (KV)	Length in Km	S/No on PHCN Document.
1.	Ikeja .W – Akangba	330	18	2
2.	Itire – Akangba	132	3	9
3.	Akangba – Ijora	132	5	11
4.	Akangba – Isolo	132	7	19
5.	Amuwo Odofin – Akangba	132	5	28
	Total	--	38	--

SOURCE: extractions from appendix a(i).