The Effect of Telecommunication Base Station on Residential Housing Preference in Enugu Metropolis

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Abstract: - Considerable growth in the use of mobile phones has led to increasing demand for land to site telecommunication base stations and associated infrastructure. There are concerns about this trend of things, such as the intrusive nature of the structures and the fear of lowered property value, as well as health concerns associated with living in proximity to such stations. This paper outlines the results of a study carried out to show the effect of telecommunication base station on residential housing preferences in Enugu metropolis. In all 35 estate surveyors, 65 tenants and 30 landlords were selected within Enugu urban for the study. A total of 98 structured questionnaires based on the Linkert-5-Point scale of responses were administered to the occupants of residential property sited close to telecommunication masts out of which 90 were retrieved for analysis. Statistical Package for Social Sciences (SPSS version 21) was used for this study to determine the causal effect of telecommunication base stations on residential housing preference in the study area. The findings revealed that the location of global system for mobile communications (GSM) masts has impact on houses in close proximity to it as prospective tenants are repelled by negative perceptions associated with living in proximity to such structures. This research also reveals that the phenomenon negatively impacts property value in affected areas.

Key Words: ***Telecommunication, Base station, Residential, Rent, Property value.***

I. INTRODUCTION

Housing is defined as the total residential neighborhood/environment or micro district including the physical structure, all necessary services, facilities and apparatus of the total health and social well-being of the individual and family [1]. According to Abram [2], housing is not only a shelter but also part of the fabric of the neighborhood life and of the whole social milieu.

Housing touches upon many facets of economic activity and development. Thus, housing provides social contact, good image, a sense of belonging and an indicator of social status.

Economically, housing consumes a major portion of the family budget or that of an establishment, yet in the realm of private and public investment, the built environment represents a man's most tangible material asset [3].

A considerable proportion of Nigeria living in sub-standard unsanitary residential environments [4] even when housing is recognized as the setting for the formation of social relationships [5].

Since the launching of global system for mobile (GSM) communication in Nigeria in year 2001, there has been an increasing need for functional telecommunications infrastructure to sustain the connectivity required for signals generation and transmission.

A base station and its mast together support the antenna at a height where it can satisfactorily send and receive radio waves. The telecommunication base stations are normally erected close to residential buildings, business places or on rooftops to enhance communication services. This has led to proliferation of many GSM base stations around the city.

In spite of many perceived health-related problems claimed to be associated with electromagnetic emissions from telecommunications base stations (TBS), the proximity of the stations does not appear to influence the decision of many

Manuscript revised April 14, 2023; accepted April 15, 2023. Date of publication April 16, 2023.

This paper available online at www.ijprse.com

ISSN (Online): 2582-7898; SJIF: 5.59

individuals on where to reside. The possibility of prolonged contact with electromagnetic radiation would be expected to negatively affect the decision to rent property in close proximity to TBS. Other hazards may include noise pollution deriving from the operating of power generating sets, and the risk of contamination of soil and water from the frequent refueling activities. There is also a risk of the mast falling and therefore there is a need to ensure that there is sufficient setback between towers and properties.

While experimental and epidemiological studies focus on the adverse health effects of radiation from the use of cell phones and base stations, few studies have been conducted to ascertain the effects of base stations on property values [6]. Property valuers need to understand the valuation implications of sitting residential property in close proximity to telecommunication phone base stations [7].

The rent offered on an apartment is a reflection of the value and assurance of safety attached to the location by the prospective tenant. According to published reports [8, 6] there are several instances in Canada where the assessed value of residential property was negatively impacted due to purely aesthetic reasons. However, it has been reported that people who live close to telecommunication base stations perceive it less negatively than others [7], and hence the need to understand the general perception of this phenomenon Enugu Urban and its impact on property value.

II. METHODOLOGY

2.1 Population of the Study

Thirty-five (35) estate practitioners (who are responsible for managing lands and properties on which TBS have been sited) 65 tenants and 30 property owners (landlords) were drafted for the study. They were a part of the stud area population of 3,267,837. A total 98 structured questionnaires were administered to the occupiers of the study area (Trans-Ekulu, Garki and New layout) out of which 84 were retrieved for analysis.

The study participants' information is presented in Table 1.

Table.1. Estimated Population of the Study

S/NO	CAREGORIES	ESTIMATED POPULATION	SAMPLE SIZE
1	Estate practitioners	35	32.2
2	Tenants	65	55.9
3	Property owners	30	27.9
	Total	**110**	**98.3**

2.2 Sources of Data

Primary sources of data included interviews, field observation and questionnaires while secondary data were sourced from review of relevant literature both published and unpublished information.

The questionnaire was structured in 5-point scale of response format, as follows:

- Strongly disagrees, weighted 1
- Disagrees, weighted 2
- Undesired, weighted 3
- Agrees, weighted 4
- Strongly agrees, weighted 5

2.3 Determination of sample size and sampling technique

Sample size is defined as limited number of elements of a population selected, which can be representative of the entire population bearing on the level of significance [9]. However, in order to get a representation of the population, the Taro-Yamane's formula was used

Taro Yamane's formula:

n= N/1+N (e)2

Where n = sample size

N = population size

e = significant of study

1 = constant figure

2.4 Data collection and analysis

Questionnaire was used for data collection, as mentioned above. The analysis was performed using IBM Statistical Package for Social Sciences (SPSS) version 21.

III. RESULTS AND DISCUSSION

A total of 98 questionnaires were distributed to occupants of residential properties close to masts in Trans-Ekulu, Garki and Abakpa out of which 90 were retrieved for analysis and 12 questionnaires were not returned.

Table.2. Neighborhoods with a preponderance of telecommunication network in Enugu Urban.

S/N	Site ID	Site Name	State	Promasys Coordinates		TOWER Type	TOWER Height
				Longitude	Latitude		
1	EN0244	TTC Road	Enugu	E007 21 7.99	N06 50 12.66	Water Tank	22m
2.	EN0283	Udenwezestreet	Enugu	E007 30 51.7	N06 27 26.3	Water Tank	22m
3.	EN0391	Umukwa Street	Enugu	E006 51 23.70	N06 07 31.40	Rooftop	35m
4.	EN0534	Anglican Girls Awkunanaw	Enugu	E007 03 25.20	N05 57 23.00	Greenfield	25m
5.	EN7034	Uvuru	Enugu	E006 54 25.30	N05 59 51.61	Greenfield	22m

6.	EN0436	Chief Ugwu Street Abakpa	Enugu	E006 46 37.31	N06 08 18.12	Water Tank	22m
7.	EN0420	Green Roof Estate Trans Ekulu	Enugu	E006 46 48.00	N06 07 57.81	Water Tank	22m
8.	EN0275	New GRA	Enugu	3°25'9.44"E	6°25'51.42"N	Water Tank	35m
9.	EN0358	Sediakwukerd	Enugu	3°12'30.60"E	6°30'2.56"N	Greenfield	25m
10.	EN0361	NwigweOkolo Down NkworAgu	Enugu	3°15'29.63"E	6°35'8.70"N	Greenfield	22m
11.	EN0367	Umuchimelueze Village	Enugu	E006 54 07.10	N05 58 55.60	Greenfield	22m
12.	EN0471	Umueze Bus Stop, Agbani	Enugu	E007 04 44.70	N05 24 58.80	Greenfield	22m
13.	EN0239	Igbariam Street	Enugu	E007 00 05.70	N05 33 14.81	Greenfield	22m
14.	EN0261	Garki way	Enugu	E006 53 32.61	N05 15 32.9	Greenfield	35m
15.	EN0395	Opi Close	Enugu	E006 55.32.50	N05 30.65.8	Greenfield	22m
16.	EN0407	Goshen Estate	Enugu	N06 55 37.9	E007 31 37.0	Greenfield	22m
17.	EN0408	Ezuth Street Emene	Enugu	N06 27 44.1	E007 29 48.1	Greenfield	35m
18.	EN0409	Standard Layout	Enugu	N06 28 02.9	E007 29 16.2	Greenfield	25m
19.	EN0470	Four Corners Junction	Enugu	N05 04 36.0	E007 22 44.8	Greenfield	22m
20	EN0473	Obuoffiah Village, Awkunano	Enugu	N05 05 02.3	E007 22 28.8	Greenfield	22m
21.	EN0475	Amaodo Village, Awkunanaw	Enugu	N05 05 33.3	E007 21 31.6	Greenfield	22m
22.	EN0476	Agbani Beside Gov. ChimarokesHouse	Enugu	N05 06 19.2	E007 21 42.5	Greenfield	35m
23.	EN0437	OnualaIbagwa Nike	Enugu	N05 06 18.7	E007 21 53.5	Greenfield	25m
24.	EN0438	Enugu East LG Second Gate	Enugu	N05 32 35.2	E007 50 39.4	Greenfield	22m
25.	EN0314	Edibo road	Enugu	N05 04 22.5	E007 20 11.9	Greenfield	22m
26.	EN0284	Bishop Onyeabo street	Enugu	N05 06 24.9	E007 22 10.9	Greenfield	22m
27.	EN0289	Gmelina Street	Enugu	N06 28 02.9	E007 29 16.2	Greenfield	22m
28.	EN0261	Garki way	Enugu	06° 23' 16.8" N	E007° 29' 37.4	Greenfield	35m
29.	N0394	Bricks House, Phase 1	Enugu	06° 25' 32.2" N	E007° 31' 47.7	Greenfield	25m
30.	EN0482	Ogidi Crescent	Enugu	06° 26' 30.5" N	E007° 28' 50.3		22m
31.	EN0253	N0 9 Ezebude Street Akpakpa	Enugu	N06 55 37.9	E007 31 37.0	Greenfield	22m
32.	EN0286	Lt Col Odionyemfe Close	Enugu	N06 27 44.1	E007 29 48.1	Greenfield	22m
33.	EN0366	Amaechi Primary School	Enugu	N06 28 02.9	E007 29 16.2	Greenfield	35m
34.	EN0419	71 SaniAbacha Phase 6(Agbor Rd)	Enugu	N05 04 36.0	E007 22 44.8	Greenfield	25m
35.	EN0434	Ugbo Emma Ugbene II	Enugu	N05 05 02.3	E007 22 28.8	Greenfield	22m
36.	EN0456	Esut Prelim, Edem Rd Nsukka	Enugu	N05 05 33.3	E007 21 31.6	Greenfield	22m
37.	EN0465	UmuezeioUgbaike Rd, Obollo	Enugu	N05 06 19.2	E007 21 42.5	Greenfield	22m
38.	EN0353	Liberty Estate	Enugu	N05 06 18.7	E007 21 53.5	Greenfield	35m
39	EN0371	IkirikeIdaw River	Enugu	N05 32 35.2	E007 50 39.4	Greenfield	25m
40	EN0409	Standard layout	Enugu	N05 04 22.5	E007 20 11.9	Greenfield	22m
41	EN0437	OnualaIbagwa Nike	Enugu	N05 06 24.9	E007 22 10.9	Greenfield	22m
42.	En0356	Amaugwurd by fly over	Enugu	N06° 06' 55.50	0E06° 47' 5.70	Greenfield	22m
43.	EN0358	SediAkwuke Rd	Enugu	06° 00' 13.0" N	E006° 55' 21.8	Greenfield	22m
44.	EN0361	NwigweOkolo Down NkworAgu	Enugu	06° 01' 24.9" N	E006° 55' 28.4	Greenfield	35m
45.	EN0386	Monaq Ave, Off Express Way	Enugu	N06° 01' 13.30	E07° 00' 54.30	Greenfield	22m
46.	EN0288	3 Sylvester Close Abakpa	Enugu	N05° 14' 11.03	E07°11' 23.27	Greenfield	22m
47.	EN0275	New GRA	Enugu	N05° 28' 34 50	E007° 07' 12.9	Greenfield	35m
48.	EN0239	Igbariam Street	Enugu	N05° 32' 19.68	E005° 45' 38.6	Greenfield	25m
49.	EN0409	Standard layout	Enugu	N05° 34' 23.30	E005° 41' 55.6	Greenfield	22m
50.	EN0437	OnualaIbagwa Nike	Enugu	N06° 09' 06.4	E006° 48' 58.7	Greenfield	22m
51.	EN0415	Hsh Hotel	Enugu	N06° 06' 55.50	E06° 47' 55.70	Greenfield	22m
52.	EN0446	Amoka Village NruNsukka	Enugu	06° 00' 13.0" N	E006° 55' 21.8	Greenfield	35m
53.	EN0470	Four Corners Junction	Enugu	06° 01' 24.9" N	E006° 55' 28.4	Greenfield	25m
54.	EN0471	Umueze Bus Stop, Agbani	Enugu	N06° 01' 13.30	E007° 00 54.3	Greenfield	22m
55.	EN0473	Obuoffiah Village, Awkunano	Enugu	N05° 14' 11.03	E007° 11' 23.2	Greenfield	22m
56.	EN0475	Amaodo Village, Awkunanaw	Enugu	N05° 28' 34 50	E007° 07' 2.90	Greenfield	22m
57.	EN0476	Agbani Beside Gov. Chimarokes House	Enugu	N05° 32' 19.68	E005° 45' 38.6	Greenfield	22m
58.	EN0508	St Peter and Paul, Abakpa	Enugu	N05° 34' 23.30	E005° 41' 55.6	Greenfield	35m
59.	EN0523	Ugbene ii, abakpa	Enugu	N06 09 09.7	006 48 57.5E	Greenfield	22m
60.	EN0524	Dr. Udenta Str. Ugbene II	Enugu	N06 06 55.1	006 47 53.5E	Greenfield	35m
60.	EN0524	Dr. Udenta Str. Ugbene II	Enugu	N06 06 55.1	006 47 53.5E	Greenfield	35m
61.	EN0526	Aneke Str. Ifo Layout, Abakpa	Enugu	N06 00 13.3	006 55 19.6E	Greenfield	25m
62.	EN0531	Adibe Street Achalla Layout	Enugu	N06 01 29.8	006 55 31.1E	Greenfield	22m
63.	EN0532	Ikiriki Village, by Idaw River	Enugu	N06 01 23.6	007 00 50.1E	Greenfield	22m
64.	EN0273	Moses Ogbodo Extension	Enugu	N06 24 24.4	E007 29 45.5	Greenfield	22m
65.	EN0257	AkpuogaEmene	Enugu	N06 25 51.0	E007 30 57.6	Greenfield	35m
66.	EN0287	Behind Emenite	Enugu	N06 25 43.7	E007 29 6.28	Greenfield	25m
67.	EN0298	St John Nkwubo	Enugu	N06 25 54.3	E007 31 20.1	Greenfield	22m
68.	EN0353	Liberty Estate	Enugu	N06 27 53.3	E007 27 59.2	Greenfield	22m
69.	EN0262	Opp. Artisan By Ebeanor Tunnel	Enugu	N06 27 19.8	E007 30 13.0	Greenfield	22m
70.	EN0299	AmaechiAwkunanu Street	Enugu	N06 24 24.4	E007 29 45.5	Greenfield	22m
71.	EN0400	Federal Secretariat, Enugu	Enugu	N06 25 51.0	E007 30 57.6	Greenfield	35m
72.	EN0543	Agangwu Coal Camp	Enugu	N06 25 43.7	E007 29 6.28	Greenfield	25m
73.	EN0391	Umukwa Street	Enugu	N06 25 54.3	E007 31 20.1	Greenfield	25m
74.	EN0299	AmaechiAwkunanu street	Enugu	N06 24 24.4	E007 29 45.5	Greenfield	22m
75.	EN0321	Genesis Roof Top	Enugu	N06 24 24.4	E007 29 45.5	Rooftop	35m
76.	EN0514	Ojoto Str. Trans Ekulu	Enugu	N06 28 52.3	E007 29 59.4	Greenfield	25m
77.	EN0539	Conference Centre	Enugu	N06° 26' 31.46	E007° 31' 1.51	Greenfield	25m

The Table 2 above shows the different neighborhoods in Enugu Urban with the presence of telecommunication base stations. Trans-Ekulu, Garki and Abakpa were selected to represent the data analysis and discussion of findings.

A total of Ninety-eight (98) structured questionnaires were administered on the occupiers of these residential properties out of which 90 (91.0%) were retrieved for analysis and 8 (9.0%) were not returned

Table.3. Recovery of questionna**ire**

Neighborhood	**Questionnaires**	
	Distributed	**Returned**
Trans-Ekulu	32	30
Garki	29	25
Abakpa	37	35
Total	**98**	**90**

From the above analysis, a total of 90 (91.0%) out of the 98 questionnaires distributed were retrieved. 29 questionnaires were returned from Trans-Ekulu, 25 questionnaires were returned from Garki, 35 questionnaires were returned from Abakpa respectively. This shows that the research can be relied on because a reasonable number of the questionnaires distributed were duly filled and returned.

Table.4. Description of respondents by ownership status

VARIABLES	Trans-Ekulu		Garki		Abakpa	
	Frequency	Percentage (%)	Frequency	Percentage (%)	Frequency	Percentage (%)
Landlord	14	46.67	10	40.0	5	14.28
Tenant	16	53.33	15	60.0	30	85.71
Total	**30**	**100**	**25**	**100**	**35**	**100**

Table 4 above shows that, in Trans-Ekuku, 14 (48.27%) respondents were landlord while 15 (51.72%) were tenants; in Garki, 10 (40.0%) respondents were landlord while 15 (60.0%) were tenants; in Abakpa, 5 (14.28%) respondents were landlord while 30 (85.71%) were tenants. By implication, majority of the respondents were tenants which show that there were more tenants than landlords in the study areas.

Table: 5. Description of respondents by duration of residence in the neighborhood

RESPONSE	Trans-Ekulu		Garki		Abakpa	
	F	%	F	%	F	%
Less than 1 year	5	16.67	-	-	-	-
1 – 5 years	10	33.33	15	60.0	15	42.85
More than 5 years	15	50	10	40.0	20	57.14
Total	**30**	**100**	**25**	**100**	**35**	**100**

From the above table 5, in Trans-Ekulu, 5(16/67%) of the respondents had lived in the neighborhood for less than 1 year; 10(33.33%) respondents had lived in the neighborhood for 1 year to 5 years and 15(50.0%) had lived there for 5 years and above. In Garki, none of the respondents had lived in the neighborhood for less than 1 year; 15(60.0%) had lived in the neighborhood for 1 year to 5 years; 10(40.0%) respondents had lived in the neighborhood for
more than 5 years. In Abakpa none of the respondents had lived in the neighborhood for less than a year; 15(42.85%) respondents had lived in the neighborhood for 1 to 5 years and 20(57.14%) respondents had lived in the neighborhood for more than 5 years.

Effect telecommunication base stations has on housing preferences in Enugu metropolis

Table.6. Effects of telecommunication base stations

	SA (5)	A (4)	UN (3)	D (2)	SD (1)	M±SD
Are there environmental effects associated with living close to telecommunication mast?	41	32	10	7	0	4.19±0.92
Are there significant health hazards associated with living close to the base station?	31	27	12	11	9	3.67±1.33
Does telecommunication base station affects the demands of properties close to it?	18	25	10	20	17	3.07±1.44
Has the location of telecommunication base station in your neighborhood increase the security challenges in your area?	24	22	8	20	16	3.20±1.49
Is there variation in the rent of properties in neighborhood with telecommunication base station and those without?	5	17	28	23	17	2.67±1.15

n=90

Table 6 presents the effects of telecommunication base stations. The major effect telecommunication bases stations have on neighborhood are environmental effects (4.19±0.92), followed by health hazards to those living around the neighborhood (3.67±1.33).

Telecommunication base stations also increases the security challenges in the area (3.20±1.49) more than it affects the demands of properties close to it (3.07±1.44). A variation in rents is the least effect telecommunication mast has on a neighborhood (2.67±1.15).

Measures or standard should be checked or reached before installing of base station within residential areas

Table.7. Measures to be taken

	SA (5)	A (4)	UN (3)	D (2)	SD (1)	M±SD
Communal agreements are reached before the construction of telecommunication base station in the neighborhood?	28	35	18	9	0	3.91±0.96
Residents of properties close to a telecommunication base station benefit financially from its proceeds?	15	22	20	18	15	3.04±1.34
All the regulations outlined by environmental impacts assessment are obtained by the telecommunication company before siting mast.	15	17	32	16	10	3.12±1.22
There are certain benefits accruing to the residents in the neighborhood where mast is sited.	10	22	30	25	3	3.12±1.05

n=90

Table 7 presents the measures to be taken before building a telecommunication mast. The measures or standard was chiefly that communal agreements are reached before the construction of telecommunication base station in the neighborhood (3.91±0.96). Secondly, regulations outlined by environmental impacts assessments (3.12±1.22), and certain unspecified

benefits that accrues to the neighborhood (3.12±1.05). The least measures were financial benefits given to the people living in the neighborhood from the proceeds gotten from the telecommunication station (3.04±1.34).

The major physical problems of telecommunication masts

Table.8. Physical Effects of Telecommunication masts

	SA (5)	A (4)	UD (3)	D (2)	SD (1)	M±SD
Vibrations	44	34	8	2	2	4.29±0.89
Smoke	7	11	27	30	15	2.61±1.13
Water	24	19	13	26	8	3.27±1.36
Contamination	11	10	23	34	12	2.71±4.08
Sleep Disturbances	33	45	2	6	4	4.07±1.03

n=90

The major physical effects according to the residents is Vibration (4.29±0.89), followed by Sleep Disturbances (4.07±1.03). Also, water (3.27±1.36) has slight effect.

Fear of the telecommunication masts falling down

Table.9. Fear of masts falling

	SA (5)	A (4)	UD (3)	D (2)	SD (1)	M±SD
Fear of mask falling	34	23	11	14	8	3.68±1.36

n= 90

From the table slightly more than average numbers of the residents have the fear of the masts falling down (3.68±1.36).

IV. Conclusion

With the increase in the numbers of phone users in the foreseeable future, there will inevitable be increase in the numbers of base station sites. This will definitely lead to more agitations and public concerns for the possible impacts as awareness increases. Therefore, the community should always be involved in any decision to erect a base station in their neighborhoods. In this wise, they should be provided with unbiased factual information relating to the negative effects on health and other hazards associated with living in close proximity to a base station. This study has also examined the legal regulation of telecommunications installations within the Nigerian regulatory framework. The health and environmental implications of telecommunication installations are also articulated.

By way of recommendations, there should be regular or periodic review of relevant regulations and guidelines. Although the evolution of the telecommunications sector has been of a great benefit to everyone but even with the benefit derived there-from, care has to be taken against its health hazards. The work also makes a case for the need for telecommunications operators and installers to comply with relevant provisions of the Environmental Impact Assessment Act.

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