

Telecommunication Mast Location and It's Health Implication for Residents in Ogbomoso, Nigeria

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Abstract

Telecommunication is a major phenomenon in the socio-economic development of cities all over the world. Indeed, many cities in developing countries of the world are currently expanding their telecommunication infrastructure especially in the area of global system of mobile telecommunication (GSM) to take advantage of the benefits that telecommunication offers. It is against this background that this study evaluates the health implication of telecommunication mast on residents of Ogbomoso. 150 copies of questionnaire were randomly administered on residents within 50m service radius to the telecom mast, while 7 other copies were administered to telecommunication service providers with masts in the study area. Secondary sources of data include the register of number and locational pattern of each of the telecom masts as obtained from the respective service providers in Ibadan headquarter and Ogbomoso area offices. Likert's scale was used to assess the perceived psychological, physiological and environmental impacts of the mast on residents, one-sample t-test was used to compare the magnitude of such impacts with the 'test-value' of 3.00 (condition of no impact), linear regression analysis was used in testing the relationship between residents' health and distance to mast. The results, among others, show that: (1) while the psychological impact is not statistically significant, it is for physiological impact; (2) there is a significant relationship between residents' health and distance to mast.. It is also found out that generator used in powering the mast causes water pollution. The study recommends that government should through its appropriate enforcement agencies, enforce laws related to location of mast in the neighbourhood. Also, telecommunication operators should be involved in corporate social responsibility of providing social services and facilities in the vicinity of telecommunication mast.

Keywords: Telecommunication, Mast, Location, Health, implication

1. Introduction

Telecommunication is a major driver of socio-economic development of cities all over the world. Indeed, many cities in the developing countries of the world are currently expanding their telecommunication infrastructure especially in the area of Global System of Mobile Telecommunication (GSM). Installation of Telecommunication involves construction of mast by the telecomm operators. Alleman (1989) describes a mast to be a free standing structure which supports antennas at a height where they can transmit and receive wave.

Studies have however shown that there is a salient long term problem that may affect the residents' health (especially living very close to mast location). In united Kingdom, it was shown that a mobile phone company was asked to remove its telecom mast from a block of flats after seven clusters of cancer and other serious illnesses were discovered (santini et al, 2003). Report from Northern Ireland Statistics and Research Agency shows that in its Dunanon Local Government District, residents that are between 1-5km from masts have several cancer cases including lings, prostate, breast cancer, lungs cancer, leukaemia, lymphoma and haematopietic cancer (Abdel et al 2007). There have been issues related to the fact that some of the masts that are erected are not very strong and there have been stray cases of towers having fallen down which causes nuisance to the environment.

In Nigeria, researchers have shown that indiscriminate locations of mast have effect on the health of people. For example, Onifade et al (2011) in the study of Ibadan report that indiscriminate location of masts in Egbeda Local Government Area (LGA) of Oyo State causes partial deafness, affect television/radio reception even the diesel from generating set also pollute the underground water around the mast location which can as a result lead to typhoid, dysentery and diarrhoea among others. However, the extent to which the situation is true in Ogbomoso has not been ascertained. Therefore this paper intends to unravel the following:

- Do masts' locations have environmental implication for their host communities?
- Do the service providers observe all the necessary environmental standards and guidelines before location of mast?
- Do the service providers consider the health and safety measures of the adjoining neighbourhood before mast location?
- What are the necessary guidelines and measures that need be put in place to enhance sustainable mast location?

The issue of telecommunication mast location and its effect on health is very important due to the fact that past researchers have proven that sitting of this mast in residential area had effect on the health of host neighbourhood (National Radiological Protection Board Scotland 1995 Onifade et al 2011, Sewo 2006).

Although several researches have been made on the subject matter, such studies are rather unpopular in Ogbomoso North Local Government Area, and this has necessitated a research of this type. Therefore, the outcome of this study will help to establish the relationship between the location of telecommunication mast and its effect on health of residents.

2. Theoretical Framework and Literature Review

Central to this study is the theory of health and illness. This theory deals with the ideas people use to explain how to maintain a healthy state and why they become ill. Ideas about illness causation may include such ideas as soul loss, germs, weakening of the body immune system. Theory of illness causation was derived from the cognitive orientation of a cultural group and therapeutic practice usually follows the cultural logic (Helman, 1990)

Theory of illness is divided into personalistic and naturalistic categories. In a personalistic system, illness is believed to be caused by the intervention of sensate agent or human being. Naturalistic theory of disease causation views health as a state of harmony between human being and the environment; when this balance is upset, illness will result (Good, 1994). Pollution from environment can cause illness in man and microwave radiation also causes disease in human being. All these are naturalistic theory of disease.

3. Literature Review

Several studies have addressed the subject matter. For example, Abdel et al (2007) in their Northern Ireland studies observe that residents living in Dunanon Local Government districts within 1-5km service radius close to mast location do suffer several number of cancer cases including lings, prostate, breast and lungs cancer. Other forms of ailment caused by mast location as reported by Abdel et al 2007 are that of leukaemia, lymphoma and haematopoietic which damaged blood cells and causes death of residents. They also observe untimely death, fever, headache as a result of vibration and pollution of environment due to various activities of generators and mast installation. They (Abdel et al 2007) further observe that land retained for mast or uses converted to mast affect the overall land use summation in an area which has effect on other land uses. Other planning requirements, in terms of application, allocation, rejection or grant of planning permits for mast location in an area, are not studied by Abdel et al (2007) work. This study attempts to unravel this.

The study of Santini et al (2003) in the United Kingdom equally confirms further the effect of telecommunication mast on the health of people of United Kingdom in which they observe that mast operators around the Northern United Kingdom were asked by the residents and native authority to evacuate their telecommunication masts due to the negative impacts on the residents. Not only that Santini et al (2003) equally reports twenty seven (27) cases of fallen masts tower as a result of weather problem. He however recommends for strong and effective location of mast on a sound base to resist against tensile, weather, vibration and other gravitational forces.

In the same vein, Onifade et al (2011) identify various side effects of mast location like vibration arising from generator and mast working on a regular basis. Noise pollution from mast and generator location exhausts fumes from generator, which causes lucomia and other ailments. His findings show that there is a significant relationship between mast location and health of the residents. The other health implication of mast location is the release of ultraviolet rays and pollution of ground water as a result of oil spillage into the soil which pollutes the nearby well water. Although the health implication of mast location within residential neighbourhood are critically dealt with by Onifade et al (2011)'s work, however the study does not show the severity and nature of the problem as will be addressed by this study.

4. The Study Area

Ogbomoso is located in the South-West Geo-political zone of Nigeria. The town lies around latitude $8^{\circ} 10^1 N$ and longitude $4^{\circ} 10^1 E$ of the equator. A derived savannah, Ogbomoso is about 105km North-East of Ibadan, the capital of Oyo state, 58km North- West of Osogbo, the capital of Osun state, 53km South-West of Ilorin the capital of Kwara state and 57km North –East of Oyo town. The town is the gateway to the western part of Nigeria from the North. The Lagos- Ibadan- Ilorin express road under construction spans across it.

Ogbomoso Township does not deviate away from the general morphology of traditional Yoruba cities. This is evidenced through central location of Soun's palace, township mosque, Oba inlet as well as Ogun O'jalu shrine. Other indication includes such commercial nuclei as Takie, Ahoyaya, Caretaker, and Sabo, among others, all of which are accessible by routes of five major roads, which divide the city into five major districts and closely surrounded by the high density residential areas (Abodurin, 2004). Close to this zone is medium density residential area. These areas include Arowomole, Oke- Alapata, Olopemarun, Idi- Abebe, Adiatu, Apake, OkeAanu, Sabo, Kaara, Oke –Ado, Akintola, General, and Stadium e.t.c.

Ogbomoso region forms the part of the Western Nigeria, the larger part of this region lies between 300m and 600m above sea level. The main water shed is located approximately 20km North and only 10km East

of Ogbomoso. South- west of this water shed is the Oba River with its tributaries flowing Southwards of Ogbomoso. North and east wards of the water shed are the Moso and Asa rivers with their tributaries flowing Northwards through the heart of Ilorin to join the River Niger at Jebba. The longitudinal slope of the river valley lies within 0.2 & 0.5%. In the tributary of the river valleys, the slopes are often steeper than 1.0%. The general land scape/ slope of the study area favours construction of Mast and other Telecommunication Gadgets.

5. Methodology

The study utilized both primary and secondary data. Primary data were collected with the aid of reconnaissance survey, personal interview and questionnaire administration. Having discovered that mast in the study area were provided by 7 service providers- MTN, GLO, AIRTEL, MULTILINKS, STARCOMS, ETISALAT and GOTV with distribution ratio of 15:7:3:6:3:2:1 respectively as depicted in Table 1. Radius of 500m was delineated and questionnaires were administered to respondents within the defined area of each mast. Thus, a total of 150 questionnaires were administered in all the (7) selected masts' locations. Secondary data were sourced from published journals relating to the subject matter. In measuring the perceived psychological, physiological and other environmental impacts, Likhert's scale was used (i.e. 5, 4, 3, 2, and 1 for very high, fairly high/moderate, indifferent or no impact, low and very low respectively). Data obtained were subjected to: (1) tabulation, (2) one-sample t-test to compare the magnitudes of the psychological, physiological and other environmental impacts with a test-value of 3.00 (which is a condition of no impact or neutrality), (3) linear regression to determine the relationship between distance of the mast and health implications for residents.

For this analysis, five dependent variables that best represent residents health are: inability to concentrate, inability to speak, fear/shock, sleeping disruption, irritation that leads to anger, emotional instability, headache, loss of hearing, stomach pain, eating disorder, loss of memory, fatigue, visual perturbation, dizziness, cholera, rashes, diarrhoea and vomiting. All these variables are summarized into one variable and it is called outbreak of disease (residents' health). This analysis gives a detailed and accurate fact of the rate of change of one variable as the others increase or decrease at a given rate. The health condition variables are then added together as dependent variable while, mast distance is the independent variable.

The numbers of houses selected within the radius are described as follows:

Table 1: Number of Houses Selected within the Radius

No	Mast Name	Distance/Radius 500m	No of Questionnaire
1	MTN	10	10
2	MTN	9	9
3	MTN	10	10
4	MTN	8	8
5	MTN	9	9
6	MTN	7	7
7	MTN	10	10
8	GLO	8	8
9	GLO	10	10
10	Airtel	12	12
11	Airtel	6	6
12	Etisalat	9	9
13	Etisalat	7	7
14	Etisalat	9	9
15	Go Tv	7	7
16	Starcom	6	6
17	Starcom	5	5
18	Multilinks	8	8
Total			150

Source Field Survey, 2015

6. Findings and Discussion

6.1 Numbers and Spatial Location of Mast

Table 2 shows telecommunication service providers. It is indicated that MTN has 15 masts, GLO has 7, AIRTEL has 3, STARCOM 3, MULTILINKS 3 and ETISALAT 6, while GOTV has 1 mast in the study area. It can be seen that MTN has erected more masts in the area than other network service providers which may be as a result of long period of operation and need to improve quality of services. Research has shown that MTN and GLO masts emit electromagnetic wave, RF radiation and infrared with a height above 15m. This therefore implies that residents living near their masts are at the risk of these waves which might have adverse effect on the people's health after a long period of time.

Table 3 reveals that MTN has the highest number of masts erected especially within the residential area, follows by ETISALAT. According to survey, most of the MTN masts are erected very close to residential area without the minimum standard setback of 500m as specified by the National Communication Committee and National Environment Standard Regulation Agency (NESREA). It is observed that GOTV and MULTILINKS has the lowest number of masts in the study area. It is also observed that most GLO masts emit electromagnetic wave and are more than 15meters in height while MTN mast emits both electromagnetic and RF radiation and are more than 15meters in height.

This implies that people living around these masts, particularly those of MTN, are at risk of diseases emanating from these waves which are nausea, diarrhoea, skin burn (short term effect) and leukaemia, various type of cancer (long term effect) as stated by radiologists, this finding also corroborates the study of Onifade et al (2011) on the notion that electromagnetic wave results from mast causes different types of cancer and other health problems.

Table 2: Spatial/Location of mast and their numbers

Service Provider	Numbers	Location
MTN	15	Police Station Owode, Pakiotan Compound Okelerin/Sekoni, Go Yard Takie, Stadium Area, Behind Nurudeen Grammar School, Iwagba Near Miracle Hospital, Iwagba Near EGC Fence, Papa Adeyemo along Yaku Road, Papa Olomi Area, Papa Olomi Area, Gen. Post Office, Kinnira Area off Ikoyi Road., Bolanta Area, Adeniran House, Olukoko Area.
GLO	7	Alapa Compound IsaleOra, Okelerin Bapt. Church Mission House, Sabo (Waso Market), Lautech Area, Beside Ologbon Hotel Off Ikoyi Road, Papa Olomi Area, Girls High School Area.
AIRTEL	3	Olukoko Area, Lautech Main Gate, Isale-OraJokodolu Compound.
STARCOM	3	OkeOwode Near Police Station, Agboin, Royal Crown Hotel.
MULTILINKS	3	OkeOwodeAgbowo Area, Ultra Modern Mkt. Ilorin Road,
ETISALAT	6	Takie, Agboin, Sabo Baptist Church, Stadium Area, Off Lautech Road, Papa Olomi Area.
GO TV	1	Aare Alasa L/out okeorogun off IkirunRoad .
TOTAL	37	

Source: Field survey, 2015

6.2 Age of Telecommunication Mast in Ogbomoso North LGA

Table 3 reveals that most MTN masts have been in existence in Ogbomoso for 5-10years. Most GLO masts have been erected within 5years, most Airtel mast have been erected in the study area for less than 5years, while STARCOMS and MULTILINKS masts are the oldest masts in the study area. This implies that people have been living around the area before the erection of the masts. This is a pointer to the fact that no serious development control measures are being enforced to protect the health and life of the people in the study area and it is a serious concern.

Table 3: Service Provider Location and Ages

No	Service Provider	Location	Age
1	MTN	Lautech	5-10yrs
2	MTN	Olukoko	<5 yrs
3	MTN	Iwagba	5-10yrs
4	MTN	Papa Olomi	5-10yrs
5	MTN	Iwagba	<5yrs
6	MTN	Papa Olomi	5-10yrs
7	MTN	OkeOwode	<5yrs
8	GLO	Papa Olomi	<5yrs
9	GLO	Lautech	<5yrs
10	Airtel	Olukoko	<5yrs
11	Airtel	Lautech	<5yrs
12	Etisalat	Lautech	5-10yrs
13	Etisalat	Agboin	<5yrs
14	Etisalat	Papa Olomi	<5yrs
15	Go Tv	Aare Alasa	<5yrs
16	Starcom	Owode area	5-10yrs
17	Starcom	Agboin	5-10yrs
18	Multilinks	Owode	5-10yrs
Total			

Source: Field Survey, 2015

6.3 Perceived Impacts of Telecommunication Mast on Residents' Health

This section analyses perceived impact of telecommunication mast on psychological and physiological wellbeing of the residents. The psychological well being discussed here is centred on inability to concentrate, inability to speak in low tones, fear/shock, sleeping disorder etc. Physiological wellbeing includes; loss of memory, fatigue dizziness, eating disorder among others.

Table 4 shows that inability to speak in low tones has the highest impact value of 3.44. This is followed in decreasing order by emotional instability (3.43), fear/shock (3.40), inability to concentrate (3.39) and sleeping disorder (3.29), why irritation that leads to anger has the least value of 2.54. What is important here is the fact that, with a score higher than the average of 3.0, five out of the six psychological variables examined can be said to be impacted upon. Such impact is, however, observed to be statistically insignificant with the t-value (one-sample t-test) of 1.73 and p-value of 0.14 (i.e higher than the alpha level of 0.05)

Also from Table 4, it is observed that loss of memory has the highest impact value of 3.65. This is followed in descending order by visual perturbation (3.62), stomach pain (3.616) dizziness (3.611), eating disorder (3.52), fatigue (3.10) and headache (3.08). Also of importance is the fact that none of the physiological variables has an average score less than 3.00, which is the state of 'no impact' or neutrality. And with an average impact value of 3.46, t-value (one-sample t-test) of 4.76 and p-value of 0.003 (i.e. far less than the alpha-level of 0.05), it is observed that the telecommunication mast has a significant physiological impact on the residents.

Table 4: Perceived Psychological and Physiological Impacts of Mast

Health Conditions	Ranking					NR (f)	AWV	AWV/NR(f)	\bar{X}
	5	4	3	2	1				
PSYCHOLOGICAL EFFECTS									
Inability to concentrate	16	43	17	22	6	104	353	3.3942	3.2472
Inability to speak in low tones	21	29	23	17	6	96	330	3.4375	
Fear/shock	19	31	22	17	7	96	326	3.3958	
Sleeping disorder	18	26	29	28	2	103	339	3.2913	
Irritation that leads to anger	20	28	21	23	8	100	254	2.5400	
Emotional instability	22	31	28	20	5	106	363	3.4245	
Total								19.4833	
PHYSIOLOGICAL EFFECTS									
Headache	16	32	17	31	12	108	333	3.0833	3.4407
Stomach Pain	29	30	19	15	6	99	358	3.6162	
Eating disorder	26	28	30	12	7	103	363	3.5243	
Loss of memory	23	35	21	18	0	97	354	3.6495	
Fatigue	21	31	27	21	20	120	372	3.1000	
Visual perturbation	23	44	20	19	2	108	391	3.6204	
Dizziness	19	39	21	13	3	95	343	3.6105	
Total								27.5253	

Source: Field survey, 2015

6.4 Relationship between Telecommunication Mast and Residents' Health

Linear regression was used to examine relationship between telecom mast and residents' health. All the health hazards associated with the health of people living beside a telecomm mast such as sleeplessness, headache, fatigue, inability to speak in a low tones, ear problem, among others where added up. The residents' health is dependent variable and mast location (i.e. distance from the resident's house) is independent variable. The regression result is contained in Table 5, Table 6 and Table 7

Table 5: Regression Model Summary

Model	*R	**R Square	Adjusted R Square	Std. Error of the Estimate
1	.633(a)	.400	.325	12.83306

Source: Field survey, 2015

*Linear correlation coefficient

**coefficient of linear determination.

Predictors: (Constant), mast location distance

Table 6: Test of Significance of Regression Model.

Model	Sum of Squares	Df	Mean Square	F	P value
Regression	879.271	1	879.271	5.339	.050(a)
Residual	1317.499	8	164.687		
Total	2196.770	9			

Source: Field survey, 2015

a. Predictors: (Constant), Mast location distance

b. Dependent Variable: Residents' health

Table 7: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	124.647	27.708		4.499	.002
	Mast location distance	-21.816	9.442	-.633	-2.311	.050

Source: Field survey, 2015

In this model, $y = -0.633x$, i.e the regression coefficient $b = -0.633$. This implies that for a unit change in distance of mast from residence, health condition will change by 0.633. But the relationship is inverse, that is the farther the residents from the mast the less the impact on health and vice-versa. With the F value of 5.339 and P value of .050, it is observed that the relationship between telecomm mast and residents health is significant at $p =$

0.05. Also, with a multiple correlation coefficient R of 0.633 and coefficient of determination R^2 of 0.400, one observes that about 40% of variability in the residents' health (measured via their experiences of different types of ailments) might be attributed to the effect of telecomm mast location or length of stay in the area with telecommunication mast. The remaining 60% as observed here might be due to other factors not covered in this model. This calls for the concern of the relevant development control to wake up from slumber and do something about control of erection of masts in the town, and the need for a more comprehensive study to unravel the factors accounting for the remaining sixty percent.

7. Conclusion and Recommendation

This study has shown the spatial distribution and concentrations of telecommunication masts of different providers, as well as the psychological and physiological impacts of same. It also provides an insight into the effect of distance from (and by implication proximity to) telecommunication masts in the study area. It is interesting to note that the perceived impacts, particularly the physiological one is observed to be considerable and statistically significant. Yet people still cluster around such telecommunication facility as if everything is normal. This though may not be unconnected to the fact that there is ineffective physical development control in the study area, it also is a pointer to the problem of poverty, which prevents people from looking for alternative housing accommodation, either for residential or other purposes. It is also an indication of the fact that the service providers themselves are not alive to their social responsibility to the community where they operate, as it is observed from the study that that was no measure in place to cushion any likely effects of the mast location on the residents. What was noted in the course of the study is that once the providers acquire the plots of land for the masts, particularly through lease, they and the land 'owners' or dealers are only concerned about the amount to be paid for the acquisition of the land and nothing about the environmental impact of the operation of the facility.

Against the above background, it is hereby recommended that:

1. The residents of Ogbomosho through their respective landlord associations should resist any act of over-concentration of different masts in their area.
2. The standard of 50m setback radius to residential houses should be observed by all operators of telecommunication in sitting the mast.
3. Also the telecommunication operators should collaborate among themselves in installing their network service on a single mast instead of proliferation of different masts that defaces the urban built environment.
4. The physical development control agencies of the Oyo State Ministry of Physical Planning, Oyo State Urban and Regional Planning board and the Local planning Authority should be adequately funded, staffed and equipped to monitor all illegal mast construction, illegal development so as to promote a virile urban and sustainable urban development. They should as a matter of obligation ensure preparation and effective implementation of physical development plans that incorporate sitting of masts to prevent indiscriminate springing up of telecommunication masts.
5. Research efforts should also be directed at unravelling the other factors affecting residents' health, which may also be related to mast location in residential and other land use environment.

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