

**ASSESSING THE LOCATION AND SPATIAL DISTRIBUTION
OF TELECOMMUNICATION BASE STATIONS AND ITS IMPLICATION
ON PLANNING AND DEVELOPMENT (A CASE STUDY OF ILARO TOWN)**

BY

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Abstract

The objectives of this study are to identify the existing base stations in the study area; assess the level of compliance of base stations sitting with planning standards; investigate the impacts associated with the base stations on the population in the study area. An inventory, which employed direct observation, was carried out in respect of all the base stations located within the geographical confines of Ilaro. The complementary community survey employed cluster sampling in delineating the study area into clusters, out of which representative sampling clusters, namely Gbogidi, Ipadeola, Pahayi, GRA, and Surulere, were randomly selected. However, in each of the five neighborhoods selected, total enumeration was done for all the buildings within the radius of 300 meters from the base stations. Altogether, a total of 240 questionnaires were administered. Chi square test done to determine the validity of the null hypothesis that 'proximity of base stations does not affect the value of land' reflected an asymptotic significance of 0.00, which was less than the level of significance at 0.05 and therefore served as the basis for rejection decision. The study, inter alia, recommends the need for telecommunication operators to adopt the idea of collocating base stations.

Keywords: Telecommunication, Base stations, Assessment, Environmental Impacts, Sustainability

1.0 INTRODUCTION

The advent of Global System for Mobile Communication (GSM) heralded the dawn of a new era of modern wireless telecommunication, which has changed the face of business in Nigeria (Olapeju, 2008). At independence in 1960, Nigeria only had 18,724 functional telephone lines for an estimated population of 45,000,000,000, which represents a tele-density ratio of 0.04 per 100 people. The liberalization of the telecommunication sector in 2001 marked a watershed that brought the GSM to limelight. From a tele-density ratio of between 0.36-0.4 in the late 90s, Nigeria now has a tele-density of 92.14% with a subscriber population of 171,000,000,000 (Adewale, 2014). This reflects the growth of the telecommunication sector of the economy, which has buoyed from 0.77% of the country's Gross Domestic Product (GDP) pre-2010 to 8.69% of the new rebased GDP (Nigerian Bureau of Statistics, 2014).

However, the rapid growth of telecommunication in Nigeria has relationship with the proliferation of base stations, which are frequently used to refer to installations comprising mast and antennae that are collectively strategic to the transmission and receipt of radio signals (Olapeju, 2008). In order to have optimal network coverage, telecommunication operators locate base stations proximately to target users. Majority of the base stations are sited indiscriminately without recourse to planning standards.

This study is aimed at assessing the location and spatial distribution of telecommunication base stations in Ilaro, with the view to proffering recommendations that will enable positive compromises between telecommunication operators' interests, public health and environmental sustainability. The objectives are to identify the existing base stations in the study area; assess the level of compliance of base stations sitting with planning standards; and investigate the impacts associated with the base stations on the population in the study area.

2.0 LITERATURE REVIEW

Man as a social being must interact and this is achieved by exploring every avenue that provides a cheap means among alternatives. Cell phones serve as tool for social connection and managing social relationships among people (Graham, 2002). However, there is considerable confusion over the health and safety issues relating to non-ionizing radiation emitted by telecoms base stations and handsets. There is conflicting information from the various scientific sources and environmental groups with respect to health hazards associated with telecom base stations. Wakely and Phe (2000) iterated that studies of the effects of exposure to electromagnetic field on population of wild birds can provide further insights into the potential impacts on animal and human health. According to Cherry (2000), cell sites are risk factors for cancer, specifically brain

tumors and leukemia, heart attack and heart disease, particularly arrhythmia, neurological effects including sleep disturbance learning effects including sleep disturbance, learning difficulties, miscarriage, viral and infectious diseases because of reduced immune system competency associated with reduced melatonin and altered calcium ion homeostasis. Olapeju (2008) examined the variation in the satisfaction of people living around GSM base stations with samples drawn from Akure, Nigeria. Using Crosstabs nominal by nominal measures, the study found that resident's satisfaction increases with distance away from the base station. When the effect of fear of health problems exhibited by the residents was introduced, the study found that the variation in the satisfaction level with distance was due to those who labored fear of health problem. Bond et al (2003), studied residents perceptions toward living near cell phone Base stations and how they evaluate the impacts of these structures. Two cases study areas in the city of Auckland, New Zealand were selected in order to understand how resident's perceptions impact on property values. The study revealed mixed responses from residents ranging from being prepared to pay the same to being prepared to pay more than twenty percent less for a property located near cell phone base station.

CONCEPTUAL AND THEORETICAL FRAMEWORK

Wakely and Phe (2000) observed that the existing models of residential location are facing difficulties in explaining new trends in urban development such as gentrification and abandonment. Hence, the mainstreams approach which stresses the access/space trade-off and seems to be at variance with the current reality of dispersal of both housing in modern cities was proposed. The idea is about emphasizing on the center and recognizing that the propensity to locating relatively at distance from it is a function of housing status and dwelling quality. In the opinion of Rutherford (2005), there appears to be substantial convergence in the type and extent of telecommunication networks being deployed in major European cities to serve increasing numbers of corporate clients. However, Graham (2002) posits that the diffusion of information and communication technology (ICTs) remains starkly uneven at all scales. The contemporary city displays this evenness most visibly. In cities, clusters and enclaves of "super connected" people, firms and institutions often mix with large numbers of people with non-access to communication technologies.

STUDY AREA

Ilaro, a predominantly Yoruba speaking settlement is the study's area of focus. Ilaro town town is about 50 km from Abeokuta, the capital Ogun state, and about 100km from Ikeja, the city of Lagos state. It is defined by co-ordinates 6.88333°N and 3.01667°E. Ilaro, the headquarter of Yewa South L.G, has an area of 629km² and a population of over 100,000 (Oyesile and Olapeju 2013) . With population growth and physical expansion occasioned by the establishment of

growth poles like the Federal Polytechnic Ilaro and Dangote cement Ibese ,which is within the study area's ecological footprints, tele-density, which is the number of phone per population, will also increase, and make the proliferation of base stations for optimal service delivery inevitable.

METHODOLOGY

The study employed both primary and secondary data. The primary data were obtained through reconnaissance survey, field observation, and questionnaire administration. An inventory, which employed direct observation, was carried out in respect of all the base stations located within the geographical confines of Ilaro. The complementary community survey employed cluster sampling in delineating the study area into clusters, out of which representative sampling clusters, namely Gbogidi, Ipadeola, Pahayi, GRA, and Surulere, were randomly selected. However, in each of the five neighborhoods selected, total enumeration was done for all the buildings within the radius of 300 meters from the base stations. Altogether, a total of 240 questionnaires were administered and all were retrieved.

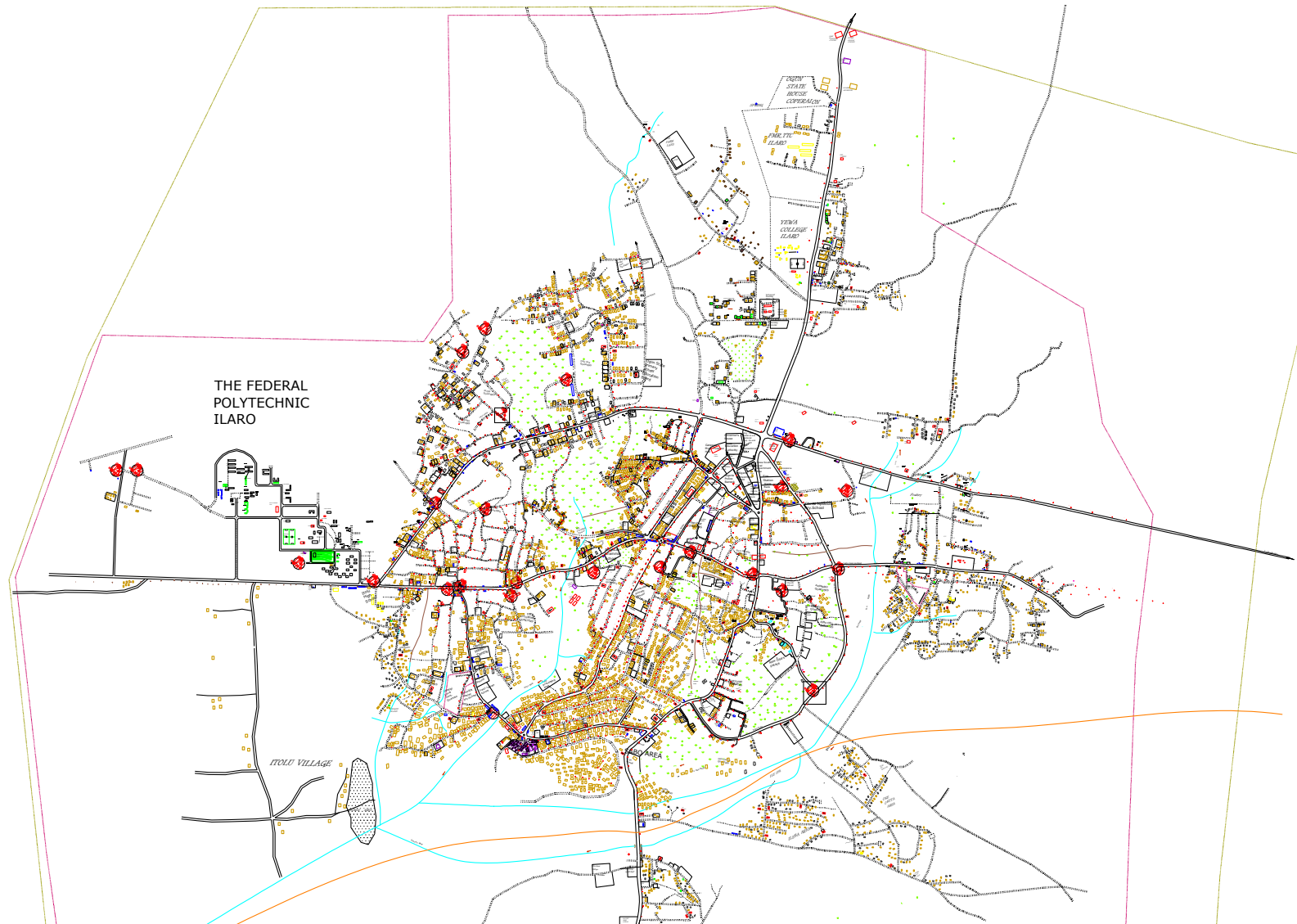
DISCUSSION OF FINDINGS

Compliance of Base Stations with Planning Standards

Field survey reveals that only 4(18%) of the 22 base stations identified in the study area comply with the setback regulations of 5 meters,10 meters, and between 5-10 meters provided by Nigerian Communication Commission (NCC), National Environmental Standards and Regulations Enforcement Agency(NESREA), and Ogun State Ministry of Urban and Physical Planning, respectively. They include the base stations located at Federal Polytechnic Ilaro East Campus with co-ordinates 6.8862307° N and 2.9851544° E ,owned by ETISALAT; the MTN base station located at Federal Polytechnic with co-ordinates 6.8702143° N and 2.731007° E ; GLOBACOM base station located at Federal Polytechnic Ilaro West Campus with co-ordinates 6.8702143° N and 2.731007° E; and the GLOBACOM base station at Sabo with co-ordinates 6.890117° N and 3.0291131° E, all of which observe above 10 meters setback.

Moreover, none of the base stations meets the guideline for base stations-to- base station spacing. The NCC guideline for base stations-to-base station is 1 kilometer (Ademola, 2012). All the base stations, apart from those located outside residential neighborhoods, have height above the recommended standard of 25 meters for residential area. As explicitly expressed in Olapeju (2008), telecommunication towers above 25 meters are not permitted in residential areas, with exception for when adequate fallback zones would be provided. This actually implies that telecommunication carriers in the study area do not comply with both NCC guidelines and Environmental Planning standards with respect to optimal base stations' sitting.

MAP SHOWING ALL THE TELECOMMUNICATION BASE STATIONS IN ILARO



Population Characteristics and Perception of Impacts Associated with Base Stations

From table 1, it is evident that the respondents are within age ranges that could offer the maturity and wisdom required for responses' validity. Majority of the respondents are literates. Those having above secondary education are about (62.45%), and the ones with primary education and no formal education are 25.4% and 12.0%, respectively. This has nexus with significant awareness that was expressed by 65% of respondents and the worry expressed by 77.1% of same, in respect of the negative implications of living contiguously to base stations. It is noteworthy to mention, however, that 68% of buildings surveyed were already constructed before the base stations were sited.

Majority of respondents (36.1%) perceived vibrations from the base stations were the most significant negative impact they felt worried about. This is followed by 35.0% who perceived radio-frequency radiations being emitted by base stations could have linkages with health effects such as cancer, and 28.9% who were most worried about the fear of accidental fall of masts in the base stations, considering their limited fall back spaces. Table 2 shows the Chi square test done to determine the validity of the null hypothesis that proximity of base stations does not affect the value of land. With the asymptotic significance of 0.00, which is less than the level of significance at 0.05, the null hypothesis was rejected. The implication of this is that the awareness of the health implications of living closely to base stations, concerns about vibrations from the base stations, diesel spills from generators, and fear of accidental falls accounts for why base stations are deemed contaminatory, and prospective buyers of land that are close to base stations may not be willing to pay the normal prices that similar land sizes in normal sites command.

Table 1 Population Characteristics and Perception of Impacts Associated with Base Stations

Parameters	N	%
Age		
21-40	109	45.4
41-60	122	50.8
61 and above	9	3.8
Total	240	100
Educational Background of Respondents		
No formal education	61	25.4
Primary education	29	12.0
Secondary education	81	33.7
Tertiary education	69	28.75
Total	240	100
Awareness of the Respondents to the Possible Negative Impacts of Base Stations		
Yes	156	65
No	84	35
Total	240	100
Extent of Respondents Worry with respect to the Possible Negative Impacts of Base Stations		

Very worried	185	77.1
A little worried	48	20
Not worried	7	2.9
	240	100
Period of Respondents' Buildings Construction with respect to When Base Station was sited		
Pre- Base Station siting	163	68%
Post –Base Station siting	77	32%
Total	240	100
Negative Impacts of Base stations that Worry Respondents the Most		
Health Impact	84	35.0
Vibrations from the base stations	87	36.1
Fear of Accidental Fall	69	28.9
Total	240	100
How Respondents will Pay for a Land or a House near a base station		
Pay less price	105	43.8
Pay normal price	111	46.3
Indifferent	24	10
Total	240	100

Table 2: Chi squared Test Statistics Result on Proximity of base stations does not Affect the Value of Land

Proximity of Base Stations does not affect the Value of Land	
Chi- Square	59.025
Df	2
Asymptotic Significance	0.000
Level of Significance	0.05

CONCLUSION AND RECCOMENDATIONS

The study has examined the location of telecommunication base stations in Ilaro, and revealed that the level of compliance of base stations' siting to standards is very low. It equally profiled the population of the neighborhoods where base stations proximately locate, and revealed their perception with respect to concerns about vibrations from the base stations, diesel spills from generators, and fear of accidental falls of base stations. Beyond the perception of the respondents, the sitting of base stations without recourse to standards does not only have a blotting effects on landscapes, the controversies with respect to their impacts on health make them come across as contaminants, and essentially inform precautionary disposition of prospective buyers or renters of spaces or apartments such that they pay less on sites where they closely locate. In addressing the foregoing, the study recommends the following:

- There is need for telecommunication operators in Nigeria to adopt the idea of collocating, and sharing same base stations facilities. This has the advantage of mitigating visual

effects borne out of over concentration of towers, obviating the cost of land purchase, and essentially sparing other parts of the environment where proliferating towers could contaminate.

- Telecommunication operators should enhance and apply the products of researches that culminate in network technologies with less environmental impacts and visual presence like the optic fibre
- There is need for the NCC to expand its influence of control by expanding its zonal offices from the present ones in Lagos, Kano, Enugu, Port Harcourt, and Ibadan to all the states in Nigeria
- There is need for the Ministry of Urban and Physical Planning in Ogun State, which is empowered by the Urban and Regional Planning law of 1992(amended 1999) not only to enforce the preparation of Environmental Impact Assessment (EIA) as a prerequisite for granting permit to base stations development proposal, but to also ensure Environmental Impact Auditing is carried out periodically for existing base stations.
- Integration of telecommunication infrastructure in the utilities component of master plans should be considered for future development plans of the settlement.

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