



# ASSESSMENT OF NOISE POLLUTION FROM GENERATING PLANTS AT BASE TRANSCEIVER STATION /BASE TRANSCEIVER CONTROLLER IN WUKARI, TARABA STATE NIGERIA

Aboche F.E<sup>1</sup>, Chagok N.M.D<sup>2</sup>, Yusuf S<sup>3</sup>

E-Mail Id: aboche.ef@fuwukari.edu.ng

<sup>1,3</sup>Pure & Applied Physics, Federal University Wukari, Taraba State, Nigeria

<sup>2</sup>Physics Department, University of Jos, Plateau State, Nigeria

**Abstract**-Even though human were born and lived in noisy environments, we should not be ignorant of the effect of noise population and its hazardous effect on us which includes; temporal and permanent hearing loss, sleeping disturbance to mention but a few. Lack of recorded data on noise level from base transceiver station (BTS)/base transceiver controller (BTC) in Wukari town inspired this study. This research measured the noise level from all BTS/BTC in Wukari town, during the day when the diesel generators are ON. The noise level recorded were compared to WHO 55dBA and NESREA 50 – 60 dBA during the day respectively. The noise levels recorded for the 22 BTS, shows that the noise level from all BTS/BTC when the diesel generator is ON, are all above the WHO/NESREA levels; for maximum level; location 22 at MDG Area Wukari have the highest average noise level of 79.7dBA. On the minimum level, location 8 Old B.B Area Wukari have the least mean noise level during the day with 47.7 dBA, which is below WHO/NESREA minimum level. Therefore, calculating the mean noise level from minimum and maximum for each location, it shows again location 22 has the highest mean of 71.9 dBA. The least mean value is location 8 with 56.8 dBA. Hence, prolong exposure by residents of Wukari around the BTS/BTC whose generators are ON during the day will lead to induced hearing loss, sleeping disturbances and other hazards associated to continuous exposure to noise pollution. On the other when compared to when the generators are OFF, the noise pollution level were within the standard set for noise level during the day. Telecoms operators should explore others sources of energy to power their BTS/BTC in Wukari which have little or no noise such as Solar so that the risk of noise pollution may be reduced.

**Keywords:** Noise Pollution, BTS, Wukari, Diesel Generator.

## 1. INTRODUCTION

Human beings have lived with noise for ages, works and sleep in it, but presently noise is considered hazardous to human health and it is the enemy of the environment as it pollutes the surrounding. The human ear is sensitive to waves in the frequency range from 20 Hz-20 KHz. When a wave enters the ear, it causes a vibration of the air particle in the ear drum (membrane) with definite frequency and amplitude, this vibration may be described in terms of the vibrations of air pressure at the same point, the air pressure rises above atmospheric pressure with simple harmonic motion. when the air molecule oscillates at a frequency  $f$ , and the noise (sound) travels at a velocity  $v$ , the wavelength of the sound  $\lambda$  is given by  $\lambda = v/f$  wavelength, in meters where  $v$  = velocity of sound in a given medium in m/s;  $f$  = frequency in cycles/second or Hz. Frequency and amplitude are two basic parameters that describe noise. Amplitude is expressed as noise level, NL. The challenges of electricity supply in Nigeria have become a way of life to all Nigerians, to cope with the deficit in the supply of electricity supply, houses, industries, schools private and government sectors use alternative means of power supply which basically include generators or solar. In a recent ranking by spectator index of world worst electricity supply in 2017, Nigeria ranked second. BTS and masts forms part of the infrastructures required for effective telecommunication system. In order to have maximum network coverage BTS are usually located in close proximity to the targeted users, the main reason telecomm operators site their BTS in residential neighborhood [1]. Following the increase in the number in subscriber base in Nigeria, the number of BTS have rapidly increased from less than 80 in 2001 to about 44,000 in May 2014 [2]. This growth has high demand for diesel generators to power BTS in order to provide network service. In the process of solving a problem, we intentionally or unintentionally create more problems [3]. It can be seen that telecommunication companies have been using diesel generators or solar to power their base transceiver station (BTS) or controller (BTC); in other to provide its millions subscribers with network services. For subscribers to have access to a good network at all time, this implies that the BTS/BTC must be powered ON at by diesel

DOI Number: 10.30780/IJTRS.V3.I8.2018.002

pg. 269

www.ijtrs.com

www.ijtrs.org

Paper Id: IJTRS-V3-I8-002

Volume 3 Issue VIII, September 2018

@2017, IJTRS All Right Reserved

generators or solar. Electricity generating plants are among the main source of noise pollution in Nigeria, Noise pollution is defined as a form of air pollution that is an audible unwanted sound that poses a threat to a person's health and wellbeing [4]. Noise pollution has been a subject of active investigation over the years [5,6,7,8]. Interest in Noise pollution have grown because of the perceived hazardous effect on human health [9,10,11,12]. W.H.O guideline for community noise were revised in 1999, it recommends a night time  $L_{eq}$  of 30 dBA and in general a peak of 40 dBA or more should be avoided, during the daytime noise recommended limit is 50 dBA  $LA_{eqt}$  [13]. The legal regime on noise pollution in Nigeria can be considered under two main headings; the common law and the policy and statutes. The policy and statues established agencies such as National Environmental Standard and Regulation Enforcement Agency (NESREA) establishment act 2007. The NESREA permissible noise regulation; gives a maximum permissible noise level emanating from any premises like residents, mixed-use residents and commercial properties, factories etc. for semi-residential, residential noise level to range from 50-60 dBA during the daytime [14]. According to Cherry [15], 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 difficulties, depression and suicide; reproductive effects, especially miscarriage and congenital malformation; viral and infectious diseases because of reduced immune system competency associated with reduced melatonin and altered calcium ion homeostasis. Existing evidence indicates that noise pollution may have negative impacts on human health, this has justified research in order to provide better understanding of noise pollution problems and control [16]. Also W.H.O research also confirmed the effect of noise pollution to include anxiety, irritability, decrease in self-esteem, lost productivity, social isolation, psycho social wellbeing and psychiatric disorder [17]. Most BTS/BTC in Wukari town are powered by diesel generators. Therefore, this generator generates sounds which when it's loud it becomes noise. Noise may not appear as a threat to Wukari residents around BTS and the global environment as deforestation and other environmental pollutants but if residents around BTS are exposed to continuous noise for years, it may become dangerous leading to hearing loss. Noise is known by its disturbing and annoying nature that can cause some harmful effect on the health of a person. Noise has non-auditory health impact which increase stress hormones, anomalies in cardiovascular system, hypertension and psychological effects marked by irritation, panic attack, anxiety disorder, intense nervousness, inattentiveness, memory loss and insomnia [18]. Hearing damage can occur gradually at much lower noise level, if there is enough exposure over a long period of time people should be aware that your ears are not able to get use to noise level, if a certain noise level is close and it do not bother you, much as it did before, this is not because your ears have toughened up to it, it is because you have lost some of your hearing, all the more critical to protect the hearing you have left [19]. There is a possibility that people residing around BTS whose generators are ON are relatively at risk of developing noise-induced hearing loss (NIHL) which could be either short or long term. Data on noise level for developing countries are scares but available evidence suggest that average noise level is well above the environmental and occupational level recommended in may developed nations. The average noise level in developing countries may be on the increase because industrialization is not always accompanied by protection. The lack of data on the noise level emanating from diesel generating plants at BTS in Wukari inspired this study, the data and result from this study can be used for reference. This study therefore, seek to measure the level of noise generated by the diesel generators used by telecommunication BTS/ BTC in Wukari town during the day from 6am-7pm and compare the values to the standard permissible noise level for daytime by NESREA and W.H.O. The most appropriate unit for measuring noise exposure is the A-weighted dB (A), which is measures the level as experienced by human calculated using a spectral sensitive factor A-filter that weights sound pressure level by frequency to correspond to sensitivity of the human ear. The generating plants generates noise which affects the environment in which it is located, most BTS do not comply with the setback distance set by either NCC or NESREA which is 5m or 10m as it is prescribed in their acts respectively [20].

## 2. MATERIAL AND METHOD

The study area is located at 7° 51' N 9° 47' E and 7.850° N 9.783° E, the town is the base of the Wukari federation, a traditional state and it is the home of the great Jukun people. Wukari town is among the largest LGA in Taraba state NE Nigeria. This research covers all BTS/BTC in the town, with the of population of 314,000 and square area of 4,308 km<sup>2</sup>. A digital sound level meter was used with measuring range of 30-130 dBA accuracy of  $\pm 1.5$ dB, frequency response of 31.5 - 8KHz, digital and resolution of 4digits 0.1 dB; sampling rating time of two times per seconds, a 30-meter fiber glass tape, a two-meter baton to hold the device vertically. The sound from the generator were considered in four directions because the perimeter fence is square in nature, 2 to 3 directions were observed to be the loudest i.e. the position of the generator close to the perimeter fence. In this research, position 1 and 2 which are close to the generator have the highest noise values, because the generator is normally at one end within the fence. On each BTS/BTC site the generator type, network name and location name were noted, the measurements were taken at an interval of 2m away from the perimeter fence of each BTS/BTC with the tape, reading were taken

DOI Number: 10.30780/IJTRS.V3.I8.2018.002

pg. 270

[www.ijtrs.com](http://www.ijtrs.com)

[www.ijtrs.org](http://www.ijtrs.org)

Paper Id: IJTRS-V3-I8-002

Volume 3 Issue VIII, September 2018

@2017, IJTRS All Right Reserved

between 0-20 meters depending on the available space and the buildings around. At each point 2-3 readings for minimum /maximum level of noise were recorded and the mean were calculated; the network providers are MTN-NG, Airtel-NG, Globacom-NG and 9Mobile-NG. It is observed that for  $\leq 2m$  away from the fence of most BTS, there is a building or a plot of land for an individual in some cases a resident share fence with a BTS/BTC.

## RESULTS

**Table-1: Location Information, Network Name and Generator Type**

Location No.	Northings	Eastings	Elev.	Location name in Wukari	Network	Generator Type
Location 1	585907	867491	160m	Campo Area Wukari	MTN	ASCOT HYBRID
Location 2	586014	867728	159m	Karofi Lodge Wukari	GLOBACOM	MANTRAC
Location 3	586700	868883	169m	Mission Quarters Wukari	AIRTEL	ASCOT HYBRID
Location 4	587035	868788	177m	Takum Junction Area Wukari	MTN	ASCOT HYBRID
Location 5	585365	870596	199m	AVI Pwadzu Area Wukari	MTN	ASCOT HYBRID
Location 6	585938	871623	202m	Near GSS Staff Quarters Wukari	AIRTEL	MIKANO
Location 7	586252	871806	199m	G.R.A Area Wukari	MTN	ASCOT HYBRID
Location 8	584591	869899	194m	Old B.B Area Wukari	GLOBACOM	MANTRAC
Location 9	584110	869634	181m	Jantukpa Area Wukari	MTN	ASCOT HYBRID
Location 10	585212	870074	187m	Sundi Road Wukari	MTN	ASCOT HYBRID
Location 11	584992	869769	185m	T-Junction Area Wukari	MTN	ASCOT HYBRID
Location 12	585320	869856	185m	Along T-junction Road Wukari	AIRTEL	MIKANO
Location 13	586895	870549	190m	Opp. East Primary School Wukari	AIRTEL	JMG
Location 14	587328	871014	195m	Kinkiso Area Wukari	MTN	ASCOT HYBRID
Location 15	586452	870347	188m	OPP BB Bread Wukari	9MOBILE	ASCOT HYBRID
Location 16	586484	870233	185m	Behind BB Bread	GLOBACOM	MANTRAC
Location 17	589102	872041	196m	Opp. F.G.C Wukari	MTN(BTC)	MIKANO
Location 18	588563	871800	190m	Before F.G.C Along Jalingo Rd.	GLOBACOM	MIKANO
Location 19	7 52 14.9	9 47 02.2	178m	Rice Mill Road Wukari	MTN	ASCOT HYBRID
Location 20	586143	869662	179m	Angwan SISHI Wukari	MTN	ASCOT HYBRID
Location 21	586036	869182	172m	Opp. Marmara Primary School	MTN(BTC)	ASCOT HYBRID
Location 22	585390	868868	175m	MDG Area Wukari	MTN	ASCOT HYBRID

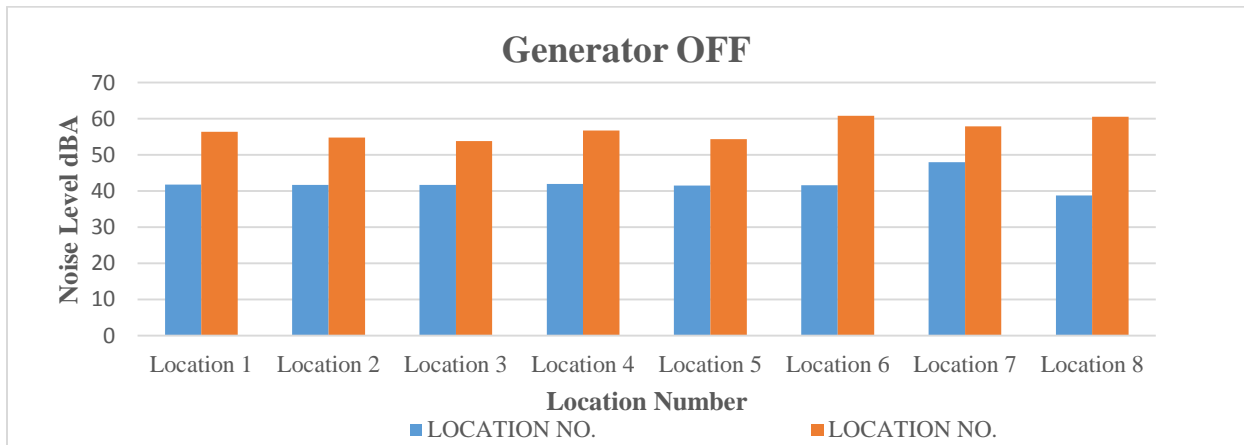
The results of the measurements are presented in the following tables, Table-1 above, which shows the location information where the BTS/BTC are sited while Table-2 below shows the Mean Minimum & Maximum Noise level for each BTS/BTC when the diesel generators are ON and Table-3 Mean Noise Level when diesel Generator are OFF.

**Table 2: Mean noise level when diesel generator is ON**

Location No.	Location Name	Network	Generator Type	Average noise Per BTS/BTC	
				Min(dBA)	Max(dBA)
Location 1	Campo Area Wukari	MTN	ASCOT HYBRID	57.5	69.10
Location 2	Karofi Lodge Wukari	Globacom	MANTRAC	50.8	70.90
Location 3	Mission Quarters Wukari	AIRTEL	ASCOT HYBRID	55.0	69.70
Location 4	Takum Junction Area Wuk.	MTN	ASCOT HYBRID	59.8	73.50
Location 5	AVI Pwadzu Area Wukari	MTN	ASCOT HYBRID	61.6	70.70
Location 6	Near G.S.S Staff Quarters wuk.	AIRTEL	MIKANO	50.3	65.30
Location 7	G.R.A Area Wukari	MTN	ASCOT HYBRID	54.9	66.70
Location 8	Old B.B Area Wukari	Globacom	MANTRAC	47.7	65.80
Location 9	Jantukpa Area Wukari	MTN	ASCOT HYBRID	56.2	66.50
Location 10	Sundi Road Wukari	MTN	ASCOT HYBRID	50.0	66.90
Location 11	At T-Junction Area Wukari	MTN	ASCOT HYBRID	59.82	71.62
Location 12	Along T-junction Road Wukari	AIRTEL	MIKANO	56.1	70.50
Location 13	Opp. East Primary School Wuk.	AIRTEL	JMG	53.0	64.50
Location 14	Kinkiso Area Wukari	MTN	ASCOT HYBRID	54.2	67.90
Location 15	Opp. BB Bread Wukari	9MOBILE	ASCOT HYBRID	54.0	64.60
Location 16	Behind BB Bread	Globacom	MANTRAC	51.5	66.10
Location 17	Opp. F.G.C Wukari	MTN(BTC)	MIKANO	55.1	68.90
Location 18	Before F.G.C Along Jalingo Rd	Globacom	MIKANO	56.8	68.80
Location 19	Rice Mill Road Wukari	MTN	ASCOT HYBRID	54.4	68.40
Location 20	Angwan Shishi Wukari	MTN	ASCOT HYBRID	59.6	66.90
Location 21	Opp. Marmara Primary School	MTN(BTC)	ASCOT HYBRID	58.5	72.30
Location 22	M.D.G Area Wukari	MTN	ASCOT HYBRID	64.1	79.70

**Table- 3: Mean Noise Level When Diesel Generator ARE OFF**

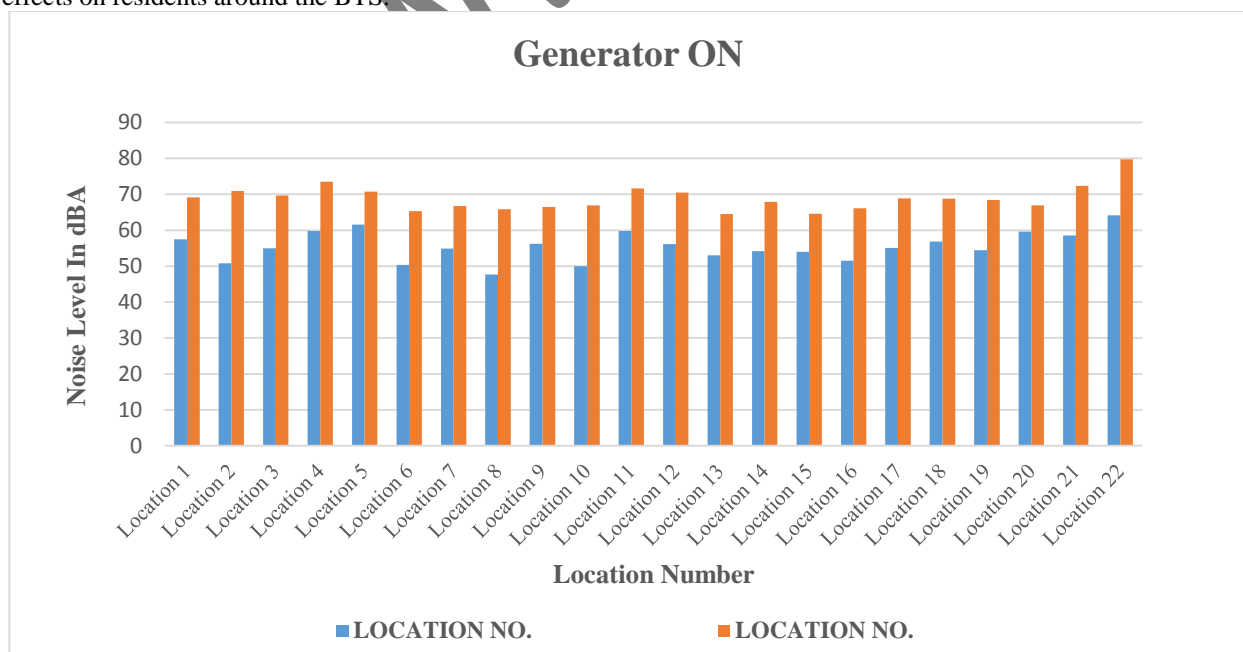
Location NO.	Location Name	Network	Generator Type	Average Per BTS/BTC	
				Min(dBA)	Max(dBA)
Location 1	Angwan SISHI Wukari	MTN	ASCOT HYBRID	41.8	56.4
Location 2	Rice Mill Road Wukari	MTN	ASCOT HYBRID	41.7	54.8
Location 3	Kinkiso Area Wukari	MTN	ASCOT HYBRID	41.7	53.8
Location 4	MDG Area Wukari	MTN	ASCOT HYBRID	42.0	56.8
Location 5	Takum Junction Area Wukari	MTN	ASCOT HYBRID	41.5	54.4
Location 6	AVI Pwadzu Area Wukari	MTN	ASCOT HYBRID	41.6	60.8
Location 7	Near GSS Staff Quarters wuk.	AIRTEL	MIKANO	48.0	57.9
Location 8	Sundi Road Wukari	MTN	ASCOT HYBRID	38.8	60.6



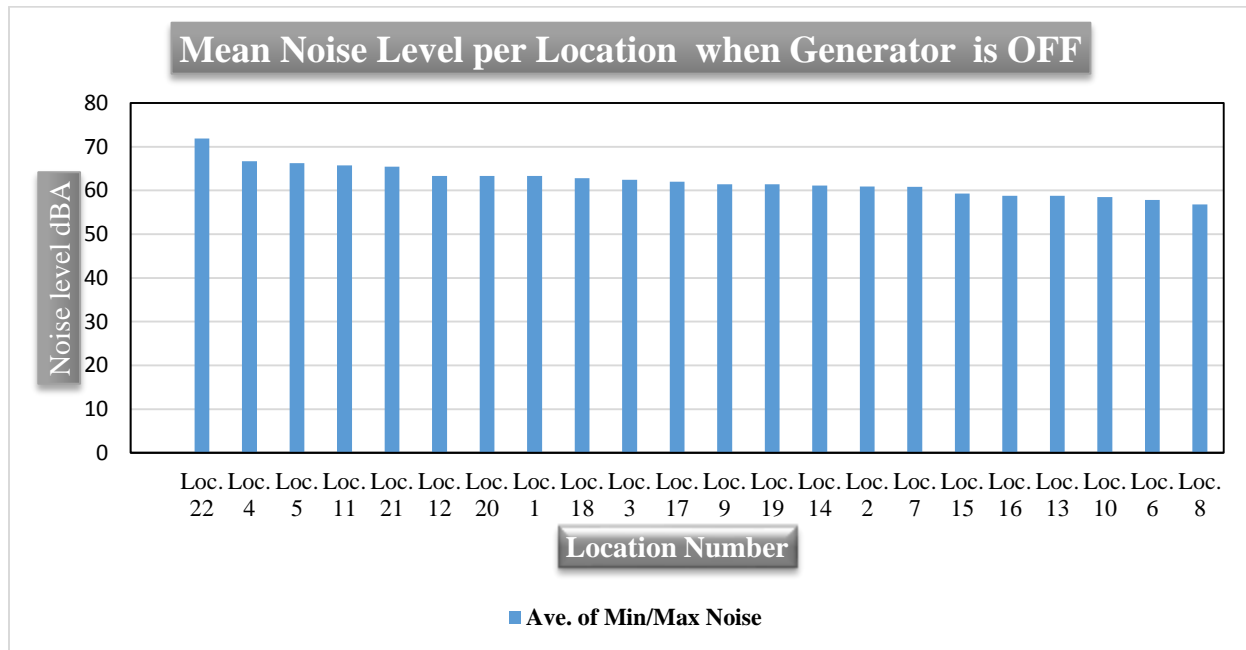
**Fig.1: Chart of Noise Level When Generators ARE OFF**

## CONCLUSION/DISCUSSION

There are 22 BTS/BTC within the town all of which do not comply with the setback distance set by NCC/NESREA of 5m and 10m respectively. Table 2 above, shows the mean Noise level generated by diesel generator when its ON at each location, comparing these Noise level to WHO of 55 dBA and NESREA 50-60 dBA per day time, the result of this study shows that the values are above the Noise level thresholds of WHO/NEREA, it also shows that location 22, has the Maximum Noise level with the Mean of 79.7 dBA, follow by location 4; 21 and 11; with 73.5; 72.5 and 71.5 dBA respectively which are higher than the standard Noise level per day time. In the minimum noise range the location with the lowest is location 8 with 47.7 dBA which is lower than the 50 dBA of NESREA. The result when the generator is ON, shows that most BTS/BTC Noise level are all within the minimum and maximum noise range of 50 – 60 dBA by NESREA. Calculating the mean Noise level from minimum and maximum of each location as in figure 1, shows location 22 has the highest value of 71.9 dBA, followed by location 4, 5 and 11 with 66.7, 66.2 and 65.7 dBA. The least value is location 8 with 56.8 dBA. Figure 1; shows a chart for the maximum and minimum noise per location and figure 2; the mean level for each BTS in descending order. In conclusion, the mean values of Noise pollution from all location are above the recommended Noise level since all the location values are above 50 dBA; hence prolong exposure to this Noise level will lead to some or all the health effects associated to induced hearing loss e.g. insomnia, headache etc. Telecom company should seek alternative means of powering their generator such solar or well sound proof generators because Noise Level from this generator have effects on residents around the BTS.



**Fig. 2: Chart Showing The Max And Min Noise Level When Generator is ON**



**Fig.3: Mean Noise Level Per Location in Descending Order**

## REFERENCE

- [1] Michael A.O., Nnaemeka B.E., Matthew T.O. (2013); Locational Effect of GSM Mast on Neighboring Residential Properties' Rental Values in Akure, Nigeria, *Academic Journal of Interdisciplinary Studies* MCSER Publishing, Rome-Italy; Vol. 2 No 3, E-ISSN 2281-4612 ISSN 2281-3993.
- [2] Nigerian Communications Commissions (NCC) 2014; industrial information retrieved from <http://www.ncc.gov.ng/index.php>, (20/1/18,13:23).
- [3] Aderoju O.M., Ibrahim M., Onuoha H.U, Adebowale R.K, Oke A.B.;(2013), Assessment of the Level of Noise from Base Transceivers' Station Using Geospatial Techniques: In Abuja Municipal Area; *IOSR Journal of Environmental Science, Toxicology and Food Technology*, e-ISSN: 2319-2402, p-ISSN:2319-2399. Volume7, Issue, PP30-39.
- [4] Goines, L. and Hagler, L. (2007) Noise Pollution: A Modern Plague. *Southern Medical Journal*;100(3): 287-293.
- [5] Koushki, P., Chandrasekhar, B., Ali, A. and Al-Sarawi, M. (2002). Exposure to noise inside Transit buses in Kuwait: Measurement and passenger attitudes. *Journal of Transport Reviews*, 22: 295- 308. DOI: 10.1080/01441640110103914.
- [6] Thangadurai N, Ravichandran C, Meena K (2005). Environmental noise pollution in Salem, Tamil Nadu, India. *Journal of Industrial Pollution Control*; 21(2) 347–354.
- [7] Pachpande, B. G., Patel, V. S., Patil, R. D., Girase, M. R. and Ingle, S. T. (2005). Assessment of hearing loss in school teachers and students exposed to highway traffic noise pollution. *Journal of Ecophysiology and Occupational Health*; 5(1&2): 123–126.
- [8] Banerjee, D. and Chakraborty, S. K. (2006) Monthly variation in night time noise levels residential areas of Asansol city (India). *Journal of Environmental Science and Engineering*, 48(1): 39-44.
- [9] Rabinowitz, P. (2000) Noise-Induced Hearing Loss. *American Family Physician*. May 2000; 61:2749-2756, 2759-2760.
- [10] Rosenlund, M., Berglund, N., Jarup, L. and Bluhm, G. (2001) Increased Prevalence of Hypertension in a Population Exposed to Aircraft Noise. *Occupational and Environmental Medicine*; 58:769-773.
- [11] McBride, D. (2004) Noise-induced Hearing Loss and Hearing Conservation in Mining Occupational Medicine; 54:290-296.
- [12] NIDCD (2007) Fact Sheet: Noise-Induced Hearing Loss. NIH Publication No. 97-4233. Update April 2007. [www.nidcd.nih.gov](http://www.nidcd.nih.gov)(20/1/18, 13:23).
- [13] World Health Organization (WHO) (1999). *Guidelines for Community Noise*, Geneva, Switzerland.
- [14] National Environmental (Standards for Telecommunications and Broadcast Facilities) Regulations 2007 (NESREA Regulations 2011) s.5 (4) (20/1/18, 13:23).



- [15] Cherry, N. (2000), "Probable Health Effects Associated with Mobil Base Stations in Communities: The Need for Health Studies," Lincoln University, counterbury, New-zeeland.
- [16] Georgiadou, E., Kourtidis, K. and Ziomas, I.: 2004, "Exploratory traffic noise measurement at five main streets of Thessaloniki, Greece", Global Nestle International Journal 6 (1), 53-61.
- [17] W.H.O 2004 Occupational Noise: Assessing the burden of disease from work related hearing Impairment at National & Local.
- [18] Arndt V, Rothenbacher D, Brenner H, Fraisse E, Zschenderlein B, Daniel U, Schuberth S, Flidner TM (1996). Older workers in the construction industry: results of a routine health examination and a five-year follow up. Occupational and Environmental Medicine, 53(10):686-691.
- [19] NIOSH 1998 CRITERIA for a recommended standard: Occupational Noise Exposure. Reviewed criterion 1998 Cincinnati, OH, national institute for occupational safety and Health (<http://www.cdc.gov/niosh/98-126.html>).
- [20] Nigerian Communications Commissions Act 2003 (NCCA 2003), s3 (1) (20/1/18, 13:23).

WWW.IJTRS.COM