ISSN (Print): 2476-8316
ISSN (Online): 2635-3490
Dutse Journal of Pure and Applied Sciences (DUJOPAS), *Vol. 6 No. 2 June 2020*

Environmental Impact Assessment of Noise Pollution in Aba, Abia State, Nigeria

[1*]**Chukwu, M. N.,** [2]**Isreal, G. N.,** [3]**Okoli, C. G.**

[1]Department of Pure and Applied Sciences,
National Open University of Nigeria Head Quarters

[2]Department of Environmental Technology,
Federal University of Technology,
Owerri

[3]Department of Environmental Health,
National Open University of Nigeria Head Quarters

Email: mchukwu@noun.edu.ng

Abstract
Noise pollution level and its environmental impact in Aba were assessed. Physical measurement of noise levels was carried out at eight different locations. Each location was assessed three times at three consecutive periods (7.30-8.30a.m., 11.30a.m-12.30p.m. and 3.30-4.30p.m.). Thereafter, mean readings were calculated. Fifty respondents comprising adults who live and or operate in the roads were interviewed on the perceived environmental impact associated with noise pollution using structured and standard questionnaires. Data obtained showed that the computed mean noise level at the eight locations ranged from 90.0 dB - 99.9 dB in the morning hours and from 73.5dB - 94.9dB at mid-day. In late afternoon however, the mean noise level ranged from 84.0 dB - 105.5dB, all of which were significantly above the acceptable range of 25-35dB (P >0.05). The noise level was rated unsatisfactory in each case because they were all within levels that can cause discomforts and pains to man. Increased population, industrialization, heavy traffics, indiscriminate use of generators, setting up motor parks and market also contributed to the noise pollution. The need for greater commitment of the government and non-governmental organizations to reduce this serious environmental hazard by implementation of the City's master plan, improving the traffic situation in Aba, educating the residents on the dangers inherent in noise pollution and enforcing laws prohibiting noise pollution in Aba.

Keywords: Noise level, Physical measurement, Environment, Pollution, Aba

INTRODUCTION
Sound is a form of acoustic energy and sensory perception evoked by a physiological process in the auditory brain (Amadi, 2011). Noise on the other hand is defined as unwanted or extraneous sound which results from the activities of man. Noise can also be looked at as a non-harmonous or discordant sound wave often harsh, discomforting or unpleasant to the ear (Okereke, 2006). According to Anyakoha (2007) noise is due to vibration of irregular

*Author for Correspondence

frequency such as the ratting of a wheel on a rough road. Anomohanran *et al*., (2008) noted that noise is an environmental pollutant that is increasing very rapidly as a result of improvement in commercial, industrial and social activities. Due to over population, urbanization and automobile industries cause noise pollution all over the globe (Li, 2013).

Studies on noise pollution level have been done in few places in the country. Generator usage, motorcycles, recording houses and automobiles had been identified to account for most of the noise in Nigeria (Onuu, 2002; Anomohanran *et al*., 2004; Anomohanran and Osemeikhian, 2006). It had also been shown that noise from most points in cities in Nigeria are caused by big trucks and also by commercial activities (Anomohanran *et al*., 2008; Anomohanran, 2013).

Some people believed that noise pollution can induce stress-related health problems on those exposed to it, producing such non-auditory difficulties as hypertension and gastrointestinal maladies (WHO, 2005). Parks (2009) noted that damage to ear is a measurable problem with noise pollution, but annoyance which is not necessarily easily measured may be of equal concern. Alberola *et al.* (2005) observed that the road traffic is a major factor in noise pollution, the generated noise radiates into the buildings. Lebiedowska, (2005) and Olayinka and Abdullahi (2008) claimed that road traffic is the prominent and most generating source of noise in Nigeria. Anomohanran and Osemeikhia (2006) found that lack of public awareness and ignorance of the people caused most noise pollution in major towns in Delta State, Nigeria.

No such study has been carried out in a very busy and thickly populated Aba, thus the work is geared towards assessing the environmental impact of noise pollution in Aba, Abia State, Nigeria.

METHODOLOGY

Study Area

Aba is the commercial nerve centre of Abia State in the South-Eastern part of Nigeria and thus attracts an influx of people of all races from all over the globe. This led to a progressive increase in the population of Aba, urban consolidation and increased volume of road and air traffics.

It is located approximately between latitudes 6° 28′ and 6° 32′ N and longitude 7° 00′ and 7° 05′ E of the Equator. Its land mass is 32.88 km^2 with a plain terrain of 25.34km^2 and wet land 7.54km^2. The vegetation is tropical rain forest although some parts consist of Guinea Savanna forest. Its mean annual rainfall is between 2,250 mm and 2,500 mm, while the mean temperature is between 25°C and 27°C. The relative humidity is around 80%.

Physical Measurement of Noise Level

Eight roads were randomly selected from the major roads as representatives of the area. These include Aba-Owerri road, Asa road, Opobo road, Eziukwu road, Port-Harcourt road, Ngwa road, Okigwe road and Faulks road. Three locations were also selected on each road for noise level measurement using simple random sampling. The measurement was done at three different periods (7.30-8.30a.m, 11.30a.m.-12.30p.m. and 3.30p.m-4.30p.m.) in a day at each location using Digital Sound Level Meter of 30dB – 130dB. Three readings were taken for three consecutive minutes and the mean recorded. At the end of the physical noise level

measurement, the results were compared with the standard acceptable noise levels/ranges following the description made by Anomoharan (2013) (Table 1)

Table 1: Noise Quality Description for Daytime

Noise level (dB)	Noise Quality Description
0-20	Excellent
21-40	Very good
41-60	Good
61-80	Satisfactory
81-100	Unsatisfactory (Painful)
101-120	Hazardous
>120	Not allowed

Source: Anomoharan (2013)

Survey

Fifty respondents were randomly selected from the adult residents and operators in Aba city using cluster sampling technique according to Rastogi (2006), Mahajan (2005) and Banerjee (2011). These were interviewed using structured questionnaire titled "Noise Pollution Questionnaire". The questionnaire was divided into two sections; A and B. Section A was for bio data while section B had questions related to noise pollution. The questionnaire was validated by experts before administration. Data collected were coded in the coding sheet and analyzed using frequency counts and percentages while Chi-square test was used to identify significant difference at 5% level of significance.

RESULTS AND DISCUSSION

Table 2 showed that the noise levels in all the eight locations were above their acceptable ranges when compared with the standards from Anomoharan (2013) (Table 1). Noise level was not steady in any of the eight locations during the period of study. In each location, noise level reached its peak in the morning hours (7.30-8.30a.m.), deceased at mid-day (11.30a.m-12.30pm) and increased again late in the afternoon (3.30-4.30p.m.) (Table 2). This is in agreement with the findings of Schomer (2001) and Ozer *et al.* (2009) that noise levels in the city increase during the morning and evening rush hours due to the gathering of people and work activities. Increased traffic contributed to the noise generation at these periods (WHO, 1999; Alterola, 2005 and Lebieowska, 2005).

Table 2: Physical Measurement of Noise Levels (dB) in Aba

Sampling location	Noise level in dB			Mean	Acceptable Range (dB)	Assessment/ Description
	7.30-830a.m	11.30 a.m-12.30pm	3.30-4.30p.m.			
Port-Harcourt road	95.5	84.7	99.2	93.1	30-40	Unsatisfactory
Opobo road	99.5	80.3	92.5	90.8	65-70	Unsatisfactory
Asa road	99.9	74.2	93.7	89.3	25-40	Unsatisfactory
Okigwe road	99.7	74.7	84.0	86.7	61-75	Unsatisfactory
Aba Owerri road	99.0	83.3	85.8	89.4	61-75	Unsatisfactory
Faulks road	99.3	73.5	99.9	90.9	25-40	Unsatisfactory
Eziukwu road	90.0	77.8	95.9	87.9	61-75	Unsatisfactory
Ngwa road	95.5	94.9	105.5	98.6	61-75	Unsatisfactory

Table 2 showed the variations in the mean noise level at different locations and periods. The mean noise level in the morning hours (7.30-8.30a.m.) ranged from 90.0 dB recorded at Aba Owerri road to 99.9 dB recorded at Asa road. At mid-day (11.30 a.m.-12.30p.m.) the mean noise level ranged from 73.5dB recorded at Faulks road to 94.9dB recorded at Ngwa road. In late afternoon (3.30-4.30p.m.) however, the mean noise level ranged from 84.0 dB recorded

at Okigwe to 105.5dB recorded at Ngwa road (Table 2). Generally, high mean noise levels were recorded in the morning and late afternoon hours with the least recorded in mid-day at all locations.

The high mean noise level in the morning hours was probably because people rushed to works and their businesses, parents take their wards to school thus the gatherings of people in most public places; all these increase noise level. At mid-day, people had settled in their work and business places, there was decrease in traffic and this led to reduction in noise generation. In the late afternoons however, people were going home, parents rushing to pick their wards from schools, Christians attending evening services coupled with the heated environment. These no doubt increase noise generation. The fact that noise generation was found to be higher in some places than others in Aba agreed with the findings of Anomoharan (2013) that different places in Abuja, Nigeria had different noise levels; some higher than the acceptable ranges. There was however, no significant differences in the mean noise levels between and within locations ($P<0.05$).

From the socio-demographic view point locality, gender, average monthly income and level of education were suggested as factors influencing noise generation in Aba. A good number of the respondents (46%) were peasants earning an average monthly income of N10,000-N20,000. This no doubt would make them lack the capacity to live and operate in decent, separate and noise-free environments (Table 3). Majority of the respondents (40%) were between 21 and 30 years while only 20% were above 50 years. Most of the respondents (68%) were males and females(32%).The respondents opined that gender influenced noise generation which is in line with the findings of Rains *et al.* (2003) that illiterate women and illiterate young adult males generate noise more than their literate counterparts and they might not be knowledgeable enough on the dangers inherent in noise pollution. Majority of the respondents (40%) were secondary school certificate holders while only 18 were graduates of tertiary institutions (Table 3).

Majority of the respondents opined that locality influences noise pollution most, 14% attributed it to gender, 12% to average monthly income, 6% to level of education while 12% believe that none of the factors was responsible. Chi-square testing showed statistical significance (Table 4).

Table 3: Socio-Demographic Characteristics of the Respondents

Variables		Frequency	Percentage (%)
Age	21-30	20	40
	31-40	11	22
	41-50	9	18
	51 and above	10	20
Gender	Male	34	68
	Female	16	32
Marital status	Single	29	58
	Married	17	34
	Divorced	1	2
	Others	3	6
Average Monthly Income (N)	10,000-20,000	23	46
	21,000-30,000	11	22
	31,000-40,000	6	12
	41,000 and above	10	20
Employment status	Students	2	4
	Unemployed	3	6
	Employees/Companies workers	5	10
	Traders/Hawkers	18	36
	Civil/Public Servants	7	14
	Artisans	15	30
Highest Educational Qualification	No Formal Education	8	16
	Primary	13	26
	Secondary	20	40
	Tertiary	9	18

Majority of the respondents opined that locality influences noise pollution most, 14% attributed it to gender, 12% to average monthly income, 6% to level of education while 12% believe that none of the factors was responsible. Chi-square testing showed statistical significance. (Table 4).

Few of the respondents (18%) opined that there was continuous education on laws prohibiting noise generation, but 78% said that there was none (Table 5a). Majority (84%) of the respondents blamed noise pollution in the city on lack of enforcement of the laws prohibiting noise generation. This was in agreement with the findings of Park (2009) and WHO (2005) that lack of legislation and enforcement of laws prohibiting noise pollution is a major cause of noise pollution in the third world countries. Chi-square testing showed statistical significance (Table 5b).

Table 4: Responses of the respondents to socio-demographic factors influencing noise pollution in Aba

Variable	Frequency (%)		Total	P value	Chi-square values
	Gender				
	Males	Females			
Age	10 (20)	10 (20)	20 (40)	P < 0.05	1422.487
Locality	26 (52)	7 (14)	33 (66)		
Gender	2 (4)	5 (10)	7 (14)		
Average monthly income	3 (6)	3 (6)	6 (12)		
Level of Education	2 (4)	1 (2)	3 (6)		
None of the above	1 (2)	0 (0)	1 (2)		

Tabulated X^2 =11.07, df = 5

Table 5a: Responses of the respondents on continuous education on environmental risks of noise pollution in Aba

Variable	Frequency (%)		Total	P value	Chi-square values
	Gender				
	Males	Females			
There is continuous education of the residents on the associated environmental risks of noise pollution				P < 0.05	557.247
Yes	6 (12)	3 (6)	9 (18)		
No	27(54)	12 (24)	39 (78)		
Undecided	1 (2)	1 (2)	2 (4)		

Tabulated X^2 = 5.991, df = 2

Table 5b: Responses of the respondents on enforcement of Laws prohibiting noise pollution in Aba

Variable	Frequency (%)		Total	P value	Chi-square values
	Gender				
	Males	Females			
Noise pollution is due to lack of enforcement of Laws prohibiting noise pollution				P < 0.05	336.247
Yes	33 (66)	9 (18)	42 (84)		
No	1 (2)	5 (10)	6 (12)		
Undecided	1 (2)	1 (2)	2 (4)		

Tabulated X^2 =2.991, df = 2

Observations showed that there was indiscriminate setting of motor parks (loading bays),use of generators and other sound systems and people live in sound prone buildings. There were also markets and street hawking activities; all contributing to the noise pollution.

CONCLUSION

The study had established that there is a very high noise pollution level in Aba city of Abia State, Nigeria. The morning, mid-day and late afternoon measurements were all above the approved range and unsatisfactory thus posing severe health and environmental risk. It is recommended that the government should fast track the implementation of the City's

master plan, improve the traffic situation in Aba, educate the residents on the dangers inherent in noise pollution and enforce laws prohibiting noise pollution in Aba.

ACKNOWLEDGEMENT

I wish to appreciate Mr. Alex Chukwu for his prayers and financial support. Special thanks to Prof. C. G.Okoli for her guidance throughout the period of study.

REFERENCES

Alberola, J., Flindell, H. and Bullmore, J. (2005). Variability in road traffic noise level. European

Commission Environmental Noise Directive 2002/49/ECOFF J. European Communalities L. 189, 12-25.

Amadi, A. N. (2011). ABC of Environmental Health. Owerri Readon Publishers,pp. 391-405.

Anomohanran, O., Iwegbue, C. M. A., Oghenerhoro, O. and Egbai, J. C. (2008). Investigation of Environmental Noise Pollution level in Abraka in Delta State, Nigeria. *Trends in Applied Sciences Research*, 3 (4): 292-297.

Anomohanran, O. and Osemeikhian, J. E. A.(2006). Day and Night Noise Pollution Study in some major towns in Delta State, Nigeria. *Ghana Journal of Science*, 46: 47-54.

Anomohanran, O. (2013). Evaluation of Environmental Noise pollution in Abuja, Nigeria. International Journal of Research and Review in Applied Siences, 14 (2): 24.

Anyakoha, M. W.(2007). New School Physics for Secondary Schools. African First Publishers, Onitsha,pp. 332-333.

Banerjee, P. K. (2011). Introduction to Biostatistics (A Textbook for Biometry) New Delhi: Nirja Publishers and Printers Pvt. Ltd. pp. 252-253.

Lebieowska, B. (2005). Acoustic Background and transport noise in urbanized areas: A note on the relative classification of the city soundscape. Trans. Resi. Part D: transport and environment, 10 (4): 341-345.

Li, M. F. (2013). Air Pollution: A case of suspended Air particulate matter at Amanperdana, Klang, Selengor, Malasia. *Greener Journal of Science, Engineering and Technology Research*, 3 (6): 186 – 194.

Mahajan, B. K.(2005). Methods in Biostatistics for Medial Students and Research Workers (6th Ed.). New Delhi: Jaypec Brothers Medical Publishers, pp. 99-120.

Okereke, C. D. (2006). Environmental Pollution Control. Owerri: Bentoz Publication Inc., pp.239-274.

Olayinka, O. S. and Abdullahi, S. A.(2008). A Statistical Analysis of the Day Time and Night Time Noise levels in Ilorin Metropolis, Nigeria. *Trends in Applied Sciences Research*, 3 (3): 253-266.

Onuu, M. U., Menkiti, A. I. an Essien, J. O. 2002. Spectral Analysis of Industrial noise in Calabar, Nigeria. *Global Journal of Pure and AppliedSciences*, 2 (2)" 1-9.

Ozer, S., Irmak, M. A. and Hasan, Y. 2008. Determination of roadside noise reduction effectiveness of Pinus Sylvester L. and Populus nigra L. in Erzurum. Turkey: *Environment Monitoring Assessment*, 144:191-197.

Park, K.(2009). Park's textbook of preventive and social medicine (20th Ed), Jabalpur, India M/S Banarside Bhanot,pp. 648-650.

Rains, J., Alba, J. Garcia, D. and Hernandoz, F. (2003). Noise effects of reducing traffic flow through an environmental measure. Spanish City, Spain.*Appl. Acoust*. 64 (3): 343-364.

Rastogi, V. B.(2006). Fundamentals of biostatistics. India: Ane Book, pp. 30-39.

Schomer, P.(2001). A White Paper Assessment of Noise, Annoyance, Schomer and Associate Inc. Campaign. II 61821

WHO. (2005). Occupational and Community Noise. WHO Publication, WHO-OHS

WHO. (2011). Noise and Nuisance Policy, A publication of the Department of Environment, Food and Rural Affairs. London.