

STUDY OF ROAD TRAFFIC NOISE POLLUTION AND IMPACTS ON RESIDENTS OF IKEJA LOCAL GOVERNMENT AREA OF LAGOS STATE, NIGERIA

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Abstract- This investigation is on road traffic noise levels/pollution and impacts on the community residents of Ikeja Local Government area of Lagos State in the Federal Republic of Nigeria. The research work was carried out in two different stages. Stage one was physical measurements while stage two was the social surveys that involved the distribution of questionnaires and oral interviews of selected residents of Ikeja metropolis. A total of 520 questionnaires were distributed while 416 of the residents responded giving a response rate of 80%. Outdoor sound level measurements and social surveys were carried out at 32 different locations comprising nine (9) road network, 12 junction/round-about and 11 loading parks (garages) in Ikeja metropolis, the capital city of Lagos State. Noise levels such as those exceeded or equaled for 10%, 50% and 90% of the measurement time were respectively measured at the various points. Corresponding values of maximum A-weighted noise levels, L_{Amax}. Traffic noise index, TNI, Noise pollution level, LNP, and Day-Night levels, LDN as well as minimum and maximum noise levels (L_{Amin}. and L_{Amax}.) were also obtained. Average maximum values of these noise levels, indices and descriptors at the road junction/round about, busy roads, parks/garages in dB(A) are as follows: L₁₀(93, 84, 86.2), L₅₀(89, 79.3, 82.8), L₉₀(85, 74.5, 79.7), L_{Aeq}(90.5, 88.1, 88.8), TNI(90, 89.4, 76.6), LDN(103, 99.8, 103), L_{Amin}.(76.5, 76.5, 82.1), L_{Amax}.(82.5, 83.1, 85.6). Results further showed that 93.8% were bothered/disturbed by motorcycle noise, 97% were bothered/disturbed by car noise while noise of lorries/heavies and buses bothered/disturbed 75% of the residents. These and other results obtained in this investigation will be very useful to Lagos State and Ikeja Local Government Area in planning a noise-free environment.

INTRODUCTION

Environmental noise as defined by EU Directive 49/EC (2002), as „an unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity, to which humans are exposed in particular in built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals, and other noise sensitive buildings and areas“

.Leventhall (2003), in his review of published research work on low frequency noise and its effect asserted that noise is an undesired sound and that both noise and sound are similar acoustic waves carried on oscillating particles in the air. In a nut shell, noise is sound that is too loud or that is unpleasant or disturbs the listeners.

Noise is derived from the Latin word “nausea” implying „unwanted sound“ or „sound that is loud, unpleasant or unexpected“. Noise originates from human activities, especially the urbanization and the development of transport and industry. Though the urban population is much more affected by such pollution, however, small town/villages along side roads or industries are also victim of this problem. Noise is becoming an increasingly omnipresent, yet unnoticed form of pollution even in developed countries. According to Birgitta and Lindvall (1995), road traffic, jet planes, garbage trucks, construction equipment, manufacturing processes, and lawn mowers are

some of the major sources of these unwanted sounds that are routinely transmitted into the air. In the last several years, a lot of researches have been done regarding noise and its effect to human.

Environmental noise effect includes various impacts on mental and physical health and disturbance of daily activities which may affect sleep, conversation, lead to perception of annoyance, cause hearing loss, instigate cardiovascular problems as well as affect human judgment and performance (Langdon, 1976; Ouis, 1982). Noise pollution is by now recognized worldwide as a major problem for the quality of life in any urban area (Piccolo *et al*, 2005).

Some reports on environmental noise pollution studies are available in Nigeria. Menkiti, (1976), highlighted the fact that there were many deaf people in Nigeria caused by exposure to loud noise. The survey carried out by Menkiti (1989) on the factors that constitute road traffic noise in the Nigerian environment concluded that people were bothered more outside their home and that the awareness to pedestrian danger as a factor is very low. Onuu and Menkiti, (1996), have analyzed the spectra of road traffic noise for parts of south-eastern Nigeria and concluded that this type of noise dominates the low frequency range (500-800 Hz). Onuu (1999), observed that road traffic noise constitutes the largest proportion of environmental noise in urban areas. He therefore observed that any meaningful noise abatement programme must first and foremost be

directed towards road traffic noise which is a major subject of environmental acoustics. Anomohanranet *al.*, (2004), while studying noise level in Agbor observed that the noise situation in Agbor is caused by big trucks, luxurious buses and by commercial activities and they called on the government to restrict the sighting of schools and hospitals along the major express way because of the high noise values observed from this location .

According to Ochsner (2003), both the amount of noise and the length of time one is exposed to determine its ability to damage hearing. She said sounds that are louder than 85 dB are potentially hazardous. Hearing loss often occurs gradually, becoming worse over time. For this reason, many people do not become aware of their hearing loss until it is too late to avoid permanent damage. Most people in Nigeria with the inclusion of Ikeja Local Government Area, the study area would not recognize noise as an

Definition of terms and formulae's

Levels, Indices and Spectra

Noise levels: This is a measure of sound pressure level give the symbol L, Various subscripts define the nature of the measurement; most commonly being the following:

L_{10} : is the sound level exceeded 10% of the time peak level and peak level is the maximum instantaneous sound pressure level over a given duration measure in decibels

L_{50} : Sound level exceeded 50% of the time (average or mean level)

L_{90} : Sound level exceeded 90% of the time (ambient level)

L_{eq} : Equivalent energy level

L_{Ad12} : The L_{Aeq} calculated from 7 a.m to 7 p.m

L_{Ae} : The L_{Aeq} calculated in the evening 7 p.m to 10 p.m

L_{An} : The L_{Aeq} calculated in the night

L_{Ah} : The L_{Aeq} calculated for any one hour period

L_{Adn} : The 24-hours L_{Aeq} obtained after addition of 10dB to sound levels from 10 P.M to 7A.M

L_{Aex} : The level of the time integral of the squared, A weighted sound pressure over a stated time referenced to $1(s) \times (20\mu P_a)^2$

Noise pollution level (L_{NP}): this is a process of measuring noise recently introduced in the U.S in an attempt to relate various earlier studies of community noise. The measurement in conceived so that it combines degree of steadiness in time of the noise (assuming that the less steady it is, the more distracting and annoying it becomes) Therefore

$$L_{NP} = L_{eq} + K\sigma \quad (1.1)$$

where

K = constant which is provisionally given the value as 2.56

insidious pollutant or attribute it to any physiological impacts, though they may consider it as nuisance during the sleeping hours. Ikeja city is a large component of the Lagos State metropolis with a large social economy, large commercial centre in Lagos State and Lagos has been the formal capital of the country Nigeria, it is expected that the noise level of the city will increase noticeably. It is therefore important to determine the noise level with the view to ascertain if the noise levels in the city conform to international permissible standards or not. The study will further ascertain the causes of high noise level in this area if it's applicable and offer solutions that will lead to the control of noise in the area. In this research work, the environmental noise pollution and the impacts on the residents shall be discussed. The analysis of noise bother by survey method in Ikeja Local Government Area of Lagos State, Nigeria shall be carried out.

σ = the standard deviation of instantaneous level in time
 Therefore eqn. (1.1) can also be rewrite as

$$L_{NP} = L_{eq} + a (L_{10} + L_{90}) \quad (1.2)$$

where $a = 1.0$

Pollution noise level (L_{NP}) is used in traffic noise

Perceived noise level ($PNdB$) is used in aircraft noise

The Equivalent continuous Level (L_{Aeq}): This is a constant noise level over a given time period that produces the same amount of A-weighted energy as the fluctuating level over the same time frame. It is measured in (dBA).

Mathematically,

$$L_{Aeq} = 10 \log_{10} \left\{ \frac{1}{T} \int_0^T \frac{P(t)^2}{P(o)^2} dt \right\} \quad (1.3)$$

$$= 10 \log_{10} \left\{ \frac{1}{T} \int_0^T 10^{0.1Li} dt \right\} \quad (1.4)$$

where

T = time period over which L_{Aeq} is determined

$P(t)^2$ = the instantaneous A-weighted sound pressure

$P(o)^2$ = the reference sound pressure ($20\mu P_a$)

Li = the noise level in the i^{th} samples

(Kiely, 1998)

$$L_D = 10 \log \left[\frac{1}{2} \left(\text{antilog} \frac{L_{AeqM}}{10} + \text{antilog} \frac{L_{AeqA}}{10} \right) \right]$$

$$L_N = 10 \log \left[\frac{1}{2} \left(\text{antilog} \frac{L_{AeqE}}{10} + \text{antilog} \frac{L_{AeqN}}{10} \right) \right]$$

To calculate the day-night sound level L_{DN}

$$L_{DN} = 10 \log \left[\frac{1}{24} \left(15 \times \text{antilog} \frac{L_D}{10} + 9 \times \text{antilog} \frac{(L_N + 10)}{10} \right) \right] \quad (1.5)$$

Saadu *et al.*, (1998)

where

L_D and L_N are the energy-average noise levels during the day-time (0700-2200) and night- time (2200-0700) periods respectively. The equivalent (mean) energy level index (L_{eq}), which is widely used to calculate the value of L_{Aeq} hourly from the cumulative noise data obtained with the statistical analyzer using the formula

$$L_{eq} = 10 \log \left(\frac{1}{100} \sum_{i=1}^n f_i 10^{\frac{L_i}{10}} \right) \quad (1.6)$$

In eqn. (1.5) f_i is the dB (A) sound level corresponding to the point of class. The 24h average values for L_{eq} were obtained by averaging the hourly values logarithmically over the relevant time periods. Mean values of L_{10} dB (A) over a period of 1 h were calculated for each class interval for road traffic noise using the relation

$$L_{10}(1h) = 10 \log (q) + 33 \log (V + 40 + \frac{500}{V}) + 10 \log (1 + \frac{5p}{V}) - 27.6 \text{ dB (A)} \quad (1.7)$$

(Onnu 2000).

Where q is the number of vehicles per hour during the recording time, p is the ratio of the number of heavy vehicles to the total number of vehicles and V is the speed in $\frac{km}{h}$.

Traffic noise index (TNI): this is an attempt to develop acceptability criteria for traffic noise from roads in residential areas (I.D Griffith and F.J Langdon 1963), produced a unit for rating traffic noise, the traffic noise index

$$TNI = 4(L_{10} - L_{90}) + (L_{90} + 30) \quad (1.8)$$

(Dhananjay *et al*, 2007)

Noise climate:

Noise (NC) is the range over which the sound levels are fluctuating in the interval of time and is given by the relation

$$NC = (L_{10} - L_{90}) \quad (1.9)$$

(Dhananjay *et al*, 2007)

Materials and Methods

Materials

Sound level meter:

This is the instrument used for the field measurement of noise level at selected area of Ikeja Local Government Area of Lagos state. The Sound Level Meter(SLM) model Extech 407750, it has electronic circuit and readout display. The electrets microphone detects the small air pressure associated with sound and changes them into electrical signals, these signals are then processed by electronic circuitry of the instrument in which the readout displays the sound levels in decibels. The sound level meter (SLM)

measures the sound pressure level (SPL) at on instance in each particular location. The measurements were taken setting the sound level meter to A-weighted network in all the sampling locations. .

Questionnaires:

The questionnaires were used for subjective assessment of the impacts of environmental noise on the residents of Ikeja Local Government Area and their attitude towards the former. Part I, is the personal data while part II is a response section which describes the different noise sources within the Ikeja Local Government Area and also the degree of bother. Part III describes people’s complaint, Action or Reaction towards environmental noise pollution. The questions were similar to those used by Onnu in his survey (Onnu 2000). A total of 520 questionnaires were distributed to and 480 were collected, giving a response rate of 92.3%.

METHOD

Physical measurements:

At a selected area, noise survey was conducted to identify measurements of noise at a locations and points. Measurements of environmental noise levels were recorded by using sound level meter (SLM) Extech 407750 .all the instruments comply with IEC standard the measurements were recorded/taken at busy streets, Junctions, Roads and Passenger loading park. During the noise level measurements the sound level meter (SLM) was held in such a way that the microphone was at 1meter from any reflecting surface and 1.2meter from the ground corresponding to the hear level of an average person. Measurements were recorded at interval of 30 second for a period of 30 minutes given 60 minutes per sampling location. This procedure was carried out for Morning (7:30am – 8:30am), Afternoon (12:30pm – 1:30pm). Evening (3:30pm – 4:30pm and Night 8:30pm – 9:30pm) measurements, from these readings, commonly used community noise assessment quantities like the exceeding percentiles, L_{10}, L_{50}, L_{90} A-weighted equivalent continues sound pressure level L_{Aeq} , the daytime average sound level L_d , the nighttime average sound level L_n , the Day and Night average sound level L_{dn} , the Noise Pollution Level L_{np} , the Noise Climate NC, and the Traffic Noise Index TNI were computed these noise measures has already be defined in introductory part of this paper work. In this research work, noise level measurements were made at selected areas within Ikeja local Government Area, traffic noise measurements were normally taken when the road surface was dry; this is because wet road surface would give increase noise levels. While noise variations were also taken within the interval of one minutes for ten minutes at selected areas using sound level meter.

Results and Discussions

Physical measurements:

Table 1.1

Mean values for traffic noise levels at junctions/Roundabout and busy street in Ikeja.

SITES	NOISE LEVEL AT DESCRIPTORS IN dB(A)											
	L_{Aeq}	L_{10}	L_{50}	L_{90}	TNI	L_{NP}	L_D	L_N	L_{DN}	L_{Min}	L_{Max}	NC
AARA	89.7	85	78.3	71.6	89.8	101	95.9	94	103	74.6	82.5	13.7
AJLO-J	70.6	69	65.8	61.8	61.3	80	71.2	77	85.9	66.5	69.7	7.37
ORA	77.5	75	71.5	67.9	66.1	84.4	76.8	79	87.8	66	72.3	7.1
LJ/AC-J	72	72	69.2	66.3	60.1	80.1	78.5	71	79.9	71.4	77.8	5.97
LJ/HB-J	70.5	69	65.6	62.1	61.3	78.4	74.3	75	83.3	72	76.1	7.3
AS-J	85.4	82	75.8	69.5	90	96.4	89.3	84	92.3	75.6	77.8	12.6
CIPE-J	69.5	67	62.7	58.4	61.1	76.3	81.3	69	77.3	65.5	68.3	8.17
UBCOMP.V	90.5	93	89	85	85.2	103	97.4	95	103	76.5	80.1	7.5
RJ-R	82.9	80	73.9	67.7	88.5	94.8	83.8	89	98	73.5	74.8	12.7
AMRD	67.5	79	74.8	70.6	75.6	91.2	94.2	87	95.8	66.4	68	8.8
HRAOB	78.1	77	73.2	69.4	68.3	85.2	77.2	81	90	65.7	70.5	7.23
AJRA-J	82.5	81	76	71	81.7	94.2	90.2	86	94.9	73.5	75.6	10.1

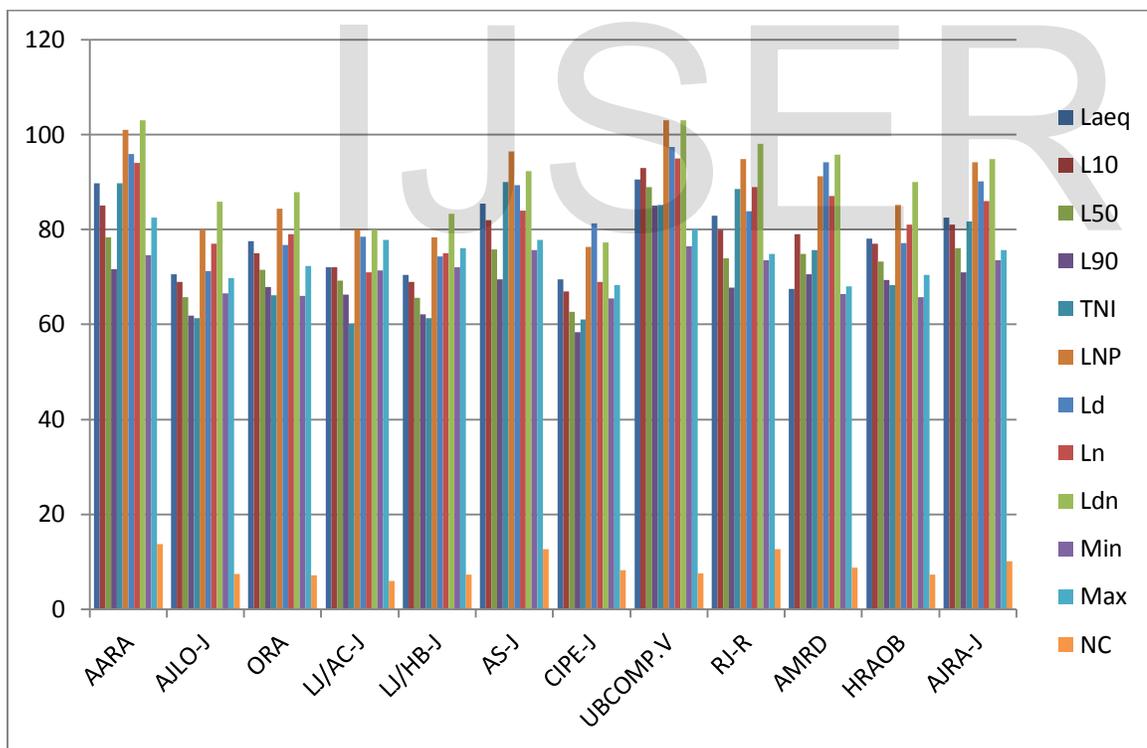


Figure 1.1: The graph of traffic noise levels at junctions/Roundabout and busy street in Ikeja

Table 1.2

Mean values for traffic noise levels at roads in Ikeja.

SITES	NOISE LEVEL AT DESCRIPTORS IN dB(A)											
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	L_{Aeq}	L_{10}	L_{50}	L_{90}	TNI	L_{NP}	L_D	L_N	L_{DN}	L_{Min}	L_{Max}	NC
AAAR	87.3	84	79	73.9	82.7	94.8	92.2	89	98	74.1	79.6	9.7
AAR	79	76	72.8	69.6	66.9	83.9	83.2	77	85.8	72.4	74.7	6.83
AA-RD	74	69	65.4	61.7	61.5	77.9	83.4	72	82.2	73.5	75.6	7.47
AJAR	79.3	75	72.5	69.9	61.4	82.1	85.4	88	96.8	66.4	68	5.37
AP-R	69.5	67	62.9	58.8	59.8	77	68.9	72	80.9	60.8	68.6	7.73
LJR/EKO.FM	73.5	74	70.9	67.7	62.2	84	80.8	82	90.9	62.2	64.8	6.13
NAC R	88.1	84	79.3	74.5	82.1	96.1	91.2	91	99.8	72.2	75.3	9.4
OA-R	85.6	82	75.7	69.4	89.4	96.6	88.7	90	99	69.8	83.1	12.5
SAWCV	82.5	82	76.8	71.6	81.9	94.9	85.4	87	95.8	76.5	80.3	10.1

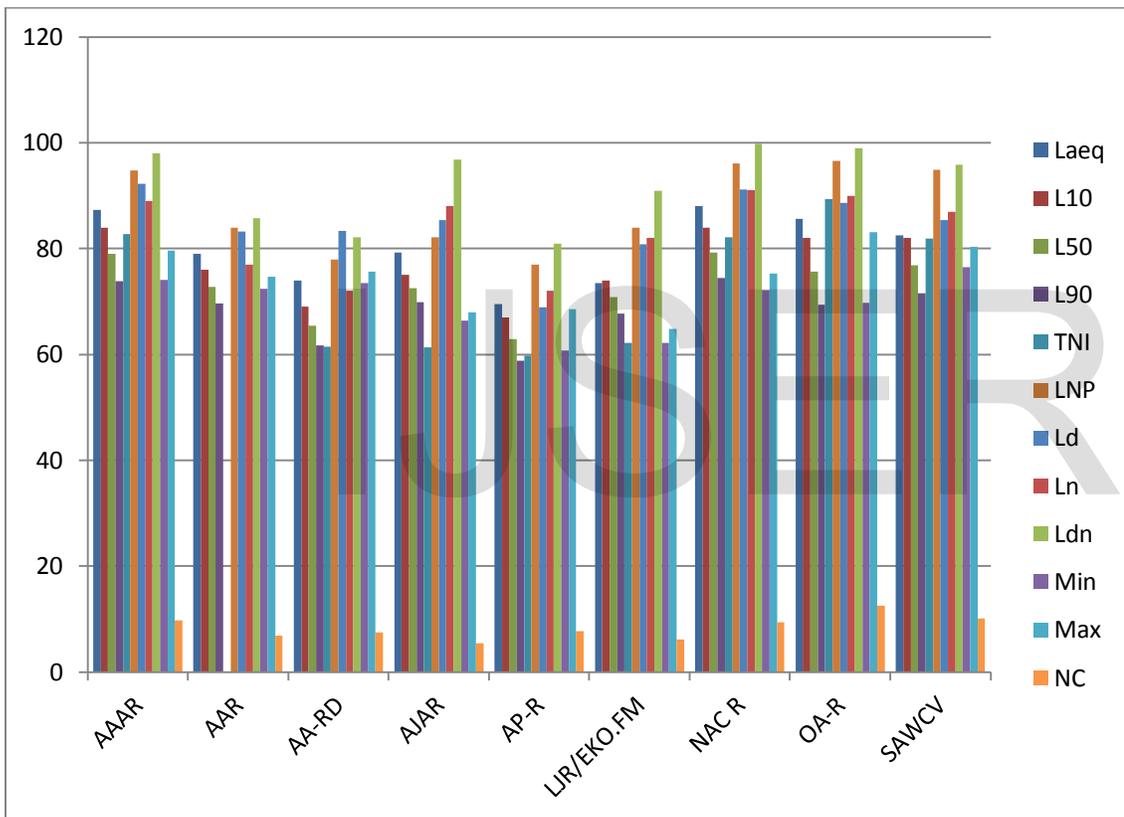


Figure 1.2: graph of traffic noise levels at roads in Ikeja

Table 1.3;

Mean values of noise levels at loading parks (garage) in Ikeja.

SITE	NOISE LEVEL AT DESCRIPTORS IN dB(A)											
	L_{Aeq}	L_{10}	L_{50}	L_{90}	TNI	L_{NP}	L_D	L_N	L_{DN}	L_{Min}	L_{Max}	NC
	AKAW-B	86.7	84.3	82	79.7	68.2	91.4	95	91	100	74	75.7
EAS-B	80.3	77.9	75	72.1	65.1	86	86	84	92	67.7	80.5	5.8
ICTA-B	85.9	83.4	80.3	77.1	72.4	92.3	87	89	98	82.1	85.6	6.3
LTV-B	75.7	73.4	70.3	67.2	62	81.8	79	66	85	65.5	71.4	6.2
M-B	84.4	82.1	79.5	76.8	68	89.7	84	91	100	75.8	80	5.3
MPAW-B	81.5	79.2	75.9	72.5	69.4	88.2	85	83	91	68	72.3	6.7
NGAR	81.7	79.4	75.1	70.7	75.5	90.4	81	89	97	65.6	67.5	9.4
APKA-W	88.7	86.2	82.8	79.4	76.6	95.5	93	89	97	74.5	76.2	6.8
RLP/AMD	82.4	79.5	76.4	73.2	68.8	88.8	95	80	94	72	74.5	6.4
SAI-B	84.8	82.3	80.1	77.9	65.6	89.3	91	94	103	75.6	77.5	5.3
UBCV-B	85.9	84.1	81.8	78.9	69.7	91.1	86	91	100	72	78.5	5.2

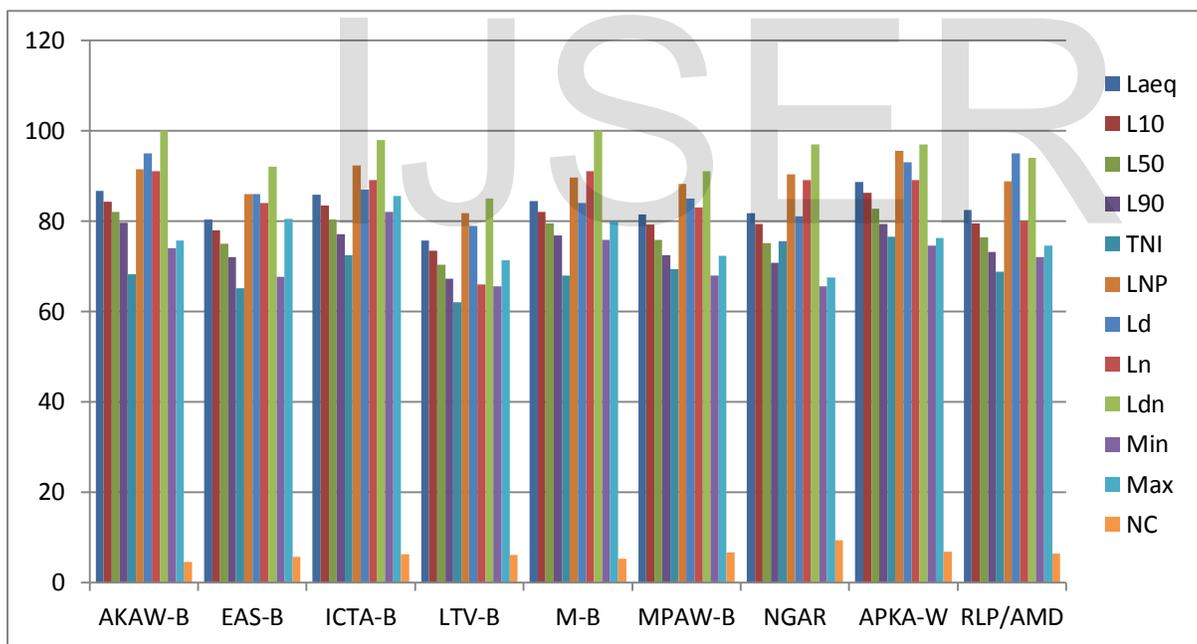


figure 1.3: the graph of traffic noise levels at parks (garage) in Ikeja

Table 1.1-1.3 and figure 1.1-1.3, is the bar chart, show the variations of noise levels descriptors at selected junctions/round-about, roads and loading parks (garages), the average noise descriptors measured were; at junctions/round-about and busy streets ranges as, L_{Aeq} 67.5dB(A)-89.7dB(A), L_D 71.2dB(A) - 97.4dB(A), L_N 69dB(A) – 95dB(A) , L_{DN} (calculated) is 79.9dB(A) – 103dB(A), L_{NP}

76.3dB(A) – 103dB(A) TNI 61.3dB(A) – 90dB(A), L_{MAX} 82.5dB(A) and L_{MIN} 74.5dB(A), for roads traffic noise ranges between L_{Aeq} 69.5dB(A) – 87.3dB(A), L_D 68.9dB(A) – 92.2db(A), L_N 72dB(A) – 95dB(A), L_{ND} (calc.) 80.9dB(A) – 99.8dB(A), L_{NP} 77dB(A) –96.6dB(A), TNI 59.5dB(A) – 89.4dB(A), L_{MAX} 83.1dB(A) and L_{MIN} 76.5dB(A), traffic noise at the loading parks (garages) ranges from L_{Aeq} 75.7dB(A) –

88.7dB(A), L_D 79dB(A) – 95dB(A), L_N 66dB(A)-94dB(A), L_{ND} 85dB(A)- 103dB(A), L_{NP} 81.8dB(A) -9.5dB(A), TNI 62dB(A)- 76.6dB(A), L_{MAX} 85.6dB(A) and L_{MIN} 75.6dB(A). The traffic noise in Ikeja is higher than the standard stated by (WHO) ranges between 45dB(A) – 65dB(A) (EPA, 1986) amended in (2002). This high noise variation occurs as a result of densely population, abuse of vehicle horns, commercial centre, and CD sellers within the area. Comparing with others investigators around the globe, in the city of Kerman, Iran, L_{Aeq} varies between 66dB(A) to 79.5dB(A), Mohammadi, (2009). In India intermediate city, L_{Aeq} 73.2dB(A). Dhananjay and Prashant, (2007). South – East, Nigeria L_{Aeq} 68.0dB (A) to 84.6dB(A). Onuu, (2000). In Ilorin, Nigeria 75dB(A) and L_{DNIS} 83dB(A). Olayinka *et al.* (2010).

Social Survey

The results of the survey shows that 450 respondents were exposed to motorcycles noise and 445 people were bothered which show 93.8% respondents and 92.7% were bothered, motorcycles noise is the second in the list of bothered and the second in the list of Hear. While 475 exposed to cars noise and 470 people were bothered shows that 99% exposed to and 97.9% bothered, cars noise is the first in both list of Hear and bothered. Lorrie's noise had 362 respondents exposure and 360 people were bothered show 75.4% heard and 75% were bothered.

The degree of bothers

Using A,B,C,D,E and F respectively and referring to mean, the degree of bothered/disturbed and the percentages, for motorcycles, the degree of bothered are (A) 5, 1%, (B) 7, 1.5%, (C) 47, 9.8% (D) 350, 72.9%, (E) 16, 3.3%, (F) 25, 5.2% and (G) 0, 0%. For cars noise (A) 5, 1%, (B) 20, 4.2% (C) 67, 14% (D) 300, 62.5% (E) 55, 11.5% (F) 28, 5.8%, (G) 0, 0%, while for Lorrie's are (A) 2, 0.6%, (B) 0, 0% (C) 0, 0% (D) 50, 10.4% (E) 204, 42.4% (F) 100, 20.8% (G) 6, 1.2%.

Where A = Not at all, B = Very Slightly, C = Slightly, D = Moderately, E = More Moderately, F = Severe and G = More Severe.

Conclusion

The following conclusions can be derived after performing the analysis data of both physical surveys (measurement) noise level data and social surveys (questionnaires) in Ikeja Local Government Area of Lagos States.

(i) It was observed at all the selected study locations that, car noise (97.9%) were found to be the most dominant noise that bothered the residents of Ikeja, followed by motorcycles (92.7%), and Lorries (75%).

(ii) The mean noise levels descriptors (dBA) were evaluated at difference sources of noise which ranges between, L_{Max} 63.6 to 98.3 dB(A), L_{Min} 59.5 to 96 dB(A), L_{10} 68 to 100.3 dB(A), L_{50} 65.6 to 88.9 dB(A), L_{90} 62.3 to 77.4 dB(A), L_{Aeq} 70.6 to 103 dB(A), L_{NP} ,75.4 to 103 dB(A), TNI 59.8 to 90 dB(A), L_D , 68.9 to 92.3dB(A), L_N 66 to 95 dB(A) L_{DN} 80.9to 103 dB(A) and NC 4.8 to 22.9 dB(A).

(iii) From the social surveys (questionnaires), it was found that, 72.9% were moderately bothered by motorcycles, cars 62.5% were moderately bothered also, 42.2% were more moderately and 20.8% were severe bothered by Lorries.

(iv) Form the physical surveys (measurements) it was found that the L_{Aeq} observed was between 67.5 to 89.7 at all the selected locations which higher than the World Health Organisation (WHO) safety level. Therefore the effects of noise on residents of Ikeja Local Government ranges from sleeping disturbance, hearing damage, speech interference, annoyance, interference with conversation to disturbances in mental health(such as emotional instability, anxiety, nausea, stress, headache, argumentativeness, and changes in mood, increase in social conflict, neurosis, psychosis and hysteria).

Recommendations

It can be recommended based on the information from this study and the effects (impacts) of noise on the environment and analysed the noise bothered in Ikeja Local Government Area of Lagos State that:

- (1) Lagos State Government with the collaboration of the Federal Environmental Protection agency (FEPA) should organise seminars and workshops to enlighten the residents of Ikeja on the hazards of noise pollution.
- (2) The Lagos State Government should pass laws that will check mate excess of high noise level within the Ikeja
- (3) Lagos State Government and FEDA should also establish good network among environmental professional such as architects, environmental engineers and town planners to put into consideration the problems of environmental noise pollution in mind when constructing new roads, building new schools, shopping complex centres, hospital and commercial residential houses in Ikeja Local Government Area.
- (4) Suitable protection accessories should be provided for the workers who will work in noisy environment and they should be trained on regular usage of such accessories, also employers and workers should be trained on noise and its effects on human health.

REFERENCE

- Anomohanran, O, Iserhien-Emekeme and O.L.Emekeme,(2004). Environmental noise assessment study of agbor metropolis in Delta State, *Adv. Nat. Applied Sci. Res*, 2;167- 174.
- Birgitta, Berglund and Lindrall, Homas. (1995). A draft document of community Noise. WHO environmental Health Criteria 12, World Health Organization, Genera.
- Dhananjay, K.P and Prashant, B.N; (2007). Assessment and ANN modelling of noise levels at major Road intersections in an Indian Intermediate City, *Journal of Research in Science Computing and Engineering*, 4:3; pp. 39-49.
- EPA (1974) Railroad noise: Proposed emission standards. 39 Fed. Reg., 24580.
- EU Directive 2002/49/EC. (2002). Directive of the European parliament and of the council of 25 June 2002 relating to the assessment and management of environmental noise. *Official Journal of the European community's* L189:12-25, (2002).
- Guasch, O., Magram, F.X Hales Swift (2002). Partner project 19: Review of the literature related to potential health effects of aircraft noise. Report No. COE. 2010-003.
- Leventhall, G, (2003). A review of published research on low frequency noise and its effect. British Department of environment, food and Rural Affairs DEFRA publication, London.
- Mahammadi Gh. (2009). An investigation of community response to urban traffic noise, *Iran. J. Environ. Health Sci. Eng.* Vol. 6, No. 2, pp. 137-142.
- Menkiti, A.I. (1976). Combating the menace of Noise. *Daily Times of Nigeria*, Nigeria.
- Menkiti, A.I.(1986). Analysis of Noise-bother by survey method. *J. west Afr. Sci Assoc.* 32, 37-44.
- Ochsner, G, (2003). Community and Environmental Noise. IEA publication, Atlanta.
- Olayinkan, S. Oyedepo and Abdullahi, A. Saadu, (2010). Evaluation and noise analysis of noise levels in Ilorin metropolis, *Nigeria. Environ. Monit. Assess.* 160: 563-577
- Onuu, M. U, Menkiti, A. I and Essien, J. O. (1996). Special analysis of industrial noise in Calabar, Nigeria. *Global J of pure and applied sciences.* 2:239-247.
- Onuu, M. U. (1999). Environmental noise control. Review and assessment of theories and models. *Nig. J. Phys.*, 11:91-96.
- Onuu, M. U. (2000). Road traffic noise in Nigeria: Measurements, analysis and Evaluation of nuisance. *Journal of Sound and Vibration*, 233(3), 391-405.
- Piccolo, A. D. Plutino, G. Cannistraro, (2005). "Evaluation and analysis of environmental noise of Messina, Italy" *Applied acoustics* 66, pp. 447-465.
- Saadu, A. A., Onyeonwu, R. O., Ayorinde, E. O., & Ogisi, F. O. (1998). Road traffic noise survey and analysis in some major urban centers in Nigeria. *Noise Control Engineering Journal*, 46(4), 146-158.
- Sadan, A.A, Onyeonwu, Ayoride, E.o, Ogisi, F.O.(1986). "Community attitudinal noise survey and analysis of eight Nigeria cities" *Applied Accoustics*, 49, pp.49-69.
- Schultz, T.J,(1978). "Synthesis of Surveys on Noise annoyance" *J Acoust Soc. Am* 64, pp377- 465.
- Stansfeld, S.A, Sharp, D.S, Gallacher, J, Babishw,(1983). "Road traffic noise". *Noise Sensitivity and Psychological Disorder Psychological Medicine*, 23pp. 977-85.

ABBREVIATIONS MEANING

AAAR:	Awolowo-Allen Avenue Road
AA-R;	Aromire Avenue Road
AARA	Awolowo –Avenue Round About
AJA-R:	AdeniyiJone Avenue Road
AJAR-J:	Adeniyi Jones Avenue-Aromire Avenue Junction
AJLO-J:	Adeniyi Jones Ave-Ladipo O Junction
AKAWB:	Alausa B/stop KudiratAbiola Way
AMDR:	Agege Motor Drive Road
A-RD:	Akran Road
AS-M:	Ajakaye Street Mangoro.
CIPE-A-J:	CIPE Avenue Junction
EAS-B:	Elephant Alausa Secretarial B/stop
HRAOA:	Hospital round-about, Oba Akuobi way
ICTARD-B:	Ikeja Central Terminal Awolowo Road B/stops
LJR-EKO FM:	LateefJakande Road-Eko FM

LJR-EKO FM:	LateefJakande Road-Eko FM
LJR-HBS-J:	LateefJakande Road-HakeenBalogun Street Junction
LTV-B:	Lagos State Television B/stop
MB:	Magoro B/stop
MPABWB:	Mobolaji Park Anthony way Ikeja B/stop
NAC-R:	Nigeria Army Cantonment Ikeja Road
NGA RD:	New Garage Awolowo Road
OA-R:	Oba Akran Road
ORA:	Opebi round-about
RLP/AMD:	Railway Line Park/ Agege Motor Drive
RLP/AMD:	Railway Line Park/ Agege Motor Drive
SAI-B:	Secretarial Alausa B/stop Ikeja
SAI-B:	Secretarial Alausa B/stop Ikeja
UB-COMP-V:	Under Bridge Computer Village
UBCVB:	Under Bridge B/stop Computer Village

IJSER