

The State of Noise Levels in Major Motor Parks in Ilorin Metropolis, Kwara State, Nigeria

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Abstract: Noise pollution is a major threat that affects the well-being of man in urban areas. This study assessed the noise pollution levels at major motor parks in Ilorin Metropolis, Kwara State, Nigeria. A total of Five (5) major motor parks were selected within the Metropolis namely: Offa garage motor park, Soludero Motor Park, Maraba motor park, New-Shao garage motor park and Saw-mill garage motor park. Noise levels assessment in the motor parks were measured using a Benetech GM 1357 factory-calibrated sound level meter. Measurements were taken at three points in each motor parks, making a total of fifteen points in all. The assessment took place in the morning between the hours of (6.00am-8:00am), afternoon (12-2:00pm) and evening (4:00-6:00pm) three times weekly in alternate days for four weeks. No night time assessments were made. The results revealed that with the exception of Offa garage motor park with 69.94 dB(A) that was slightly lower and within the 70 dB(A) WHO standard, all other motor parks had levels that were above the WHO recommended limit. Results showed exceedance of 60 dB(A) National Environmental Standard and Regulation Enforcement Agency (NESREA) recommended permissible limit in all the motor parks. The motor park with highest noise levels is Saw-mill garage motor park with mean noise value of 74.45 dB(A) followed by New-Shao garage motor park with 72.24 dB(A) then Maraba motor park having 71.74 dB(A) while Soludero motor park had 71.48 dB(A) and the least noise level was recorded at Offa garage motor park with 69.94 dB(A). This study provides and creates awareness on the implications of noise in motor parks. The lead source of noise is vehicular activities as observed during the assessment. The findings of the study provide information on the state of noise pollution in the motor parks and likely impacts on those that engage in activities in the motor parks. The study recommended that for vehicular noise pollution, it is important for the management of the motor parks to enlighten the drivers and vehicle owners the need to repair and maintain their vehicles to reduce the noise at source. Also, there is need for sporadic monitoring and assessment of noise levels in motor parks so as to provide relevant data on the state of noise levels in motor parks in urban centres, this will bridge up the data gap challenges. In ensuring the health effects of noise is prevented, there is need for the Ministry of Environment and other environmental regulatory agencies to create awareness and sensitize the public on the dangers of noise pollution. Strict actions on noise pollution should be done by the Ministry of Environment to ensure strict compliance to noise. Lastly, the need for periodic auditory examination and screening of motor park users and workers should be carried out for individuals who use and perform activities in motor parks.

Keywords: Noise pollution, Noise assessment, Noise monitoring, Motor parks, Sound Level Meter

I. INTRODUCTION

As the Sustainable Development Goals (SDGs) begin to guide the development agenda, the health of the populace remains an area of urgent concern, especially in Nigeria. People in motor parks are exposed to noise pollution mostly from horns from vehicles, running automobile engine, use of generators, faulty exhaust pipes and from megaphone speakers used for soliciting commuters which pose a threat to those in the vicinity of the motor park directly or indirectly. Levels of environmental noise pollution is alarming over the years due to rapid increase in human activities such as urbanization, industrialization and transportation [32,14]. Few studies have been carried out to investigate and assess the health implications of noise levels of motor parks; this study might provide insight on this. The study will generate information that will contribute to knowledge for researchers and policy makers who would want to carry out noise monitoring of motor parks. The study will serve as reference and guideline for future planning and regulations on noise limit which may be implemented for urban area like Ilorin Metropolis. Measures to limit and control exposure to environmental noise are hence fundamental. The aim of this study was to assess the noise levels in Major motor parks in Ilorin Metropolis, Kwara State, Nigeria and compare it with recommended standard. This research provides information on the state of noise levels in motor parks whose activities mostly from sounds produced by horns of vehicles, motor cycles and tricycles, running engines from automobile, broken and faulty exhaust pipes of automobile and music from speakers have potentials to pollute the environment and the health of the people there. The effect that such high levels of noise can have on people in the motor park is something that needs to be assessed and monitored. It is within this view that this paper assessed the level of noise in major motor parks in Ilorin Metropolis, Kwara State, Nigeria.

Understanding Noise Pollution

[18] Reported noise as an unwanted sound that is unpleasant or unexpected. Noise pollution is an environmental hazard which started long time ago since the beginning of civilization till today. Noise pollution has been linked with human activities and persistent human interaction with the environment. Noise pollution has gained increased attention over the past decades and studies have shown that noise pollution is one of the environmental hazards affecting

humans, the effects of which range from annoyance to sleeping difficulty, which later results to high blood pressure [8]. Noise constitutes a nuisance in many fast growing urban areas like Nigeria which impacts negatively on the social, physical and psychological well being of man [28]. It contributes to environmental degradation and poses a threat to human and terrestrial lives on earth. [17] and [41] reported environmental noise pollution as the third most hazardous form of pollution behind air and water pollution. Noise pollution is said to occur if the level is high beyond acceptable limit.

There are two types of noise pollution they are mainly from natural and man-made/ anthropogenic sources. Natural sources include; weather through thunderstorms, noise from insects and animals like bees, birds, crickets, birds and frogs. Anthropogenic sources are classified as Industrial and Non-industrial noise. Industrial noise sources are; noise from machines, welding operation, metal and fabrication works, forging, cutting and generator noise. Non-industrial noise are those noise that are not from industries or factories they include noise from transportation via road, air and rail, residential noise from homes through noise from washing and blending machines, Televisions and so on. Some of the sources of noise pollution are loud music, religious activities from mosques and churches, noise emitting generators [16], political rallies, road advertisement, traffic [29];[40], [3]. Noise could be from a mobile or stationary source. Mobile sources of environmental noise include noise from railway, construction activities, road, air traffic and neighbourhood activities while stationary sources are from power plant, generator, mills, factories, blending machines, televisions and so on. Noise level is measured in decibels (dB) and one decibel is the threshold at which one hears. [36] reported the noisy nature of motor parks in Nigerian towns was mainly due to increased vehicular and commercial activities in the vicinity. [11] in a study on noise levels in motor park in Kotokuraba commercial area of Cape Coast in Ghana reported transportation as the main cause of noise pollution. The noise in the motor parks arises mostly as a result of the practice in some parks of soliciting for vehicle travellers/passengers with the use of amplifiers and megaphones. Most major motor parks operate for over fourteen hours every day and the users; mostly people working in the environment of the motor parks, as distinct from vehicle commuters, travellers or passengers, are usually within the vicinity for the better part of the day. This setting exposes the users to appreciable noise and predisposes them to noise induce hearing loss over time [36].

Noise level Standards and Regulation

Noise management and control are crucial in developing criteria that permits safe noise exposure levels through assessment and monitoring which guides both the national and international noise regulation policies. The United Nation's Agenda 21 of RIO Earth summit supports a quite number of environmental management principles that formed the basis of government policies such as policies on noise management

like Environmental principles such as polluter pays principles and precautionary principle. Noise from any activities is expected to be reduced to the lowest acceptable levels as much as possible in any situation. If there is likelihood that noise could result in threat to the public, then urgent actions are required to arrest such possibility even in the absence of scientific proof. Action should be taken where applicable to reduce noise at the source, it is expected that those responsible for noise source should be made to pay for the costs that are connected to the noise pollution. Studies on noise pollution are very few as compared to other forms of pollution such as water, air and soil [23;5,22,30]. The reason is mainly due to the belief that noise pollution effects cannot be seen with naked eyes unlike that of water and air pollution, therefore this notion makes people not to take cognizance of the health effects that are associated with noise pollution unlike other forms of pollution that are pronounced.

The World Health Organization (WHO) issued guidelines on the maximum permissible levels of noise that is expected to be present in community noise for shopping and traffic area, industrial, commercial, indoor and outdoor environment as not exceeding 70 dB(A) day time [9]. In Nigeria the Agency in charge of regulating the environment is National Environmental Standard and Regulation Enforcement Agency (NESREA) who gave guidelines on noise pollution in Nigeria. NESREA provided a recommended permissible standard noise limit for Residential + industry or small scale production +commerce as not exceeding 60 dB(A) day time [20]. However, studies measuring environmental noise in Urban cities have reported noise values that exceeded the recommended standards. [6] (2006) in a study conducted on noise levels in Warri, Delta State, Nigeria reported noise levels that is above 90 dB(A). [24] reported noise levels between 86-106 dB(A) which exceeded the recommended limits. .

Adverse health effects of noise

The health effects of noise pollution cannot be underestimated. The effects of noise on human health depend on the duration of the noise, distance from source of noise and the volume of emitted noise. Noise pollution has direct and indirect cumulative effects. Noise pollution is said to occur when the noise exceeds the recommended set standards [39]. Noise as an environmental pollutant has both auditory and non-auditory effects. Some of the health impacts of noise include:

Hearing loss

Hearing loss and tinnitus are direct physical consequence of loud noise and as such are auditory effects. At higher noise levels, the ear finds it difficult to filter such loud noise and the effect of this is unhealthy to our health by damaging and impairing the hearing abilities. In a study done by [21], noise pollution was reported to impair hearing and cause irritation. Man-made noise such as horns and machinery when loud can be unhealthy for our hearing. Frequent exposure to loud levels

of noise can easily result in the damage of our ear drums and loss of hearing [7]. Noise-induced hearing impairment, the most common effect of noise pollution can occur at noise levels above 70dB [13].

Annoyance

Further than its effects on the auditory system, noise has been reported to cause annoyance, aggressive behaviour and stress [19,35].

Cardiovascular disease

Studies [42, 19] have linked noise with cardiovascular disease and high blood pressure levels. Noise at high levels is a known cause of increased blood pressure which causes irregular heartbeats by interfering with the normal flow of blood.

Mental health deterioration

[12] And [31] reported noise effect on mental health, people in noisy area perceived their mental health being affected since they have no control over the noise, and this can affect their emotional balance. Depression can set in due to high noise .

Low productivity: Noise causes reduction in productivity or quality of work due to sleep disturbance [37].

Sleeping disorders: Loud noise or noise above 45dB can indeed hamper sleeping pattern and may lead to irritation and uncomfortable situations. Without a good night sleep, it may lead to problems related to fatigue and your performance may reduce at home or in office [33, 10].

Accidents: Noise can cause accident due to inability to hear warning signals, this can lead to death.

Communication difficulties/interference: Noise affects communication, high decibel can lead to difficulty in communicating between two people, and this may lead to misunderstanding.

Effect on fetal development: The effect of prolonged exposure to noise above 85 dB(A) has been reported to reduce fetal growth and development with evidence on reduced birth weight [34].

The vulnerable groups are most at risk of the dangers of noise pollution.

II. MATERIALS AND METHODS

Description of the Study Area

The study was conducted in Kwara State, Nigeria. Ilorin, the Kwara State capital is located between latitude 8° 36' N and 8° 50' N of the equator, and longitude 04° 33' E of the Greenwich Meridian. Ilorin is found in the North central part of the Federal Republic of Nigeria with a population of more than one million people according to 2006 population census. Ilorin has diverse ethnic groups of mainly Yoruba, Fulani, Gobir, Hausa and Nupe, that constituted it. Ilorin is located in the transitional zone between the deciduous woodland of the South and dry savannah of North Nigeria [1]. Ilorin has three

Local Government Areas (LGAs) namely; Ilorin West LGA, Ilorin South LGA and Ilorin East LGA. It covers about 100 km². The landscape ranges in elevation in the western part from 273 m to 333 m and in the eastern part from 273 m to 364 m. Ilorin has both dry and wet season with rainy season beginning from May through October while the dry season starts in November and ends in April. [2] reported Ilorin with temperature ranges of between 33°C-35°C from November to January and between 34-37°C from February to April. Ilorin has a relative humidity of between 75% to 88% around May to October and about 35% to 80% during the dry season period of November to April. The dominant landform with highest point in the city is Sobi hill which is about 394m above the sea level [1].

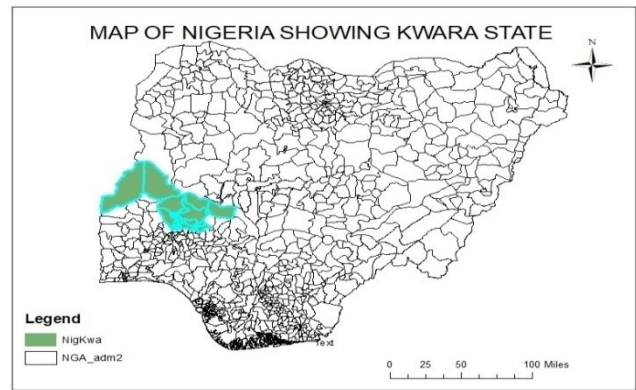


Figure 1: Map of Nigeria showing Kwara State

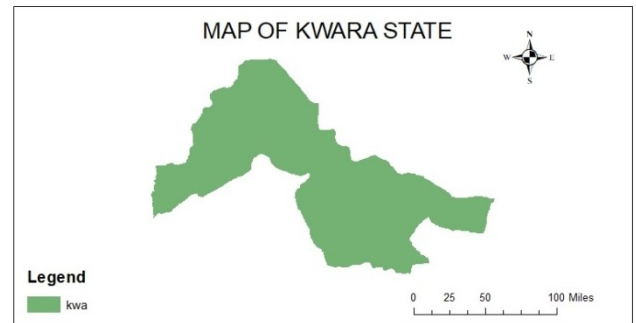


Figure 2: Map of Kwara State, Nigeria.



Figure 3: Map of Ilorin West LG showing the locations of the motor parks

Data Collection Method

Assessment was limited to noise level assessment in five Major motor parks namely; Offa garage motor park, Soludero motor park, Maraba motor park, New- Shao garage motor park and Sawmill garage motor park. The sound level meter is an instrument used for measuring sound pressure level and is mostly used in noise pollution assessment and monitoring [15]. In situ (on-the-site) measurements of noise levels were performed using a Factory calibrated sound level meter with model Benetech GM 1357. The device is a precision-grade sound-level meter (designed according to IEC651 TYPE2 & ANSI S1.4 TYPE2 class standard) with one 1/2-in. condenser microphone and .33-octave filter with frequency range of 31.5 Hz–8 kHz and measuring level range of 30–130 dB. It has two equivalent weighted sound pressure levels, A and C feature with Fast & Slow dynamic characteristic modes. The instrument was held with hand and pointed the microphone to the direction of noise source by ensuring it was at a distance above 1m away from any reflecting object. Measurements were taken by setting the device to slow response at A-weighted mode. Measurement in A-weighted dB dB(A) measures loudness and compensate for the human ear’s lower sensitivity to lower frequency and very high-frequency sounds [4], minimum and maximum reading were taken at different distances in three sampling points (front, middle and back) within the vicinity of each motor park and this was triplicate in order to have a representative values at each point of the motor park. The assessment of noise levels took place during weekdays alternately (Monday, Wednesday and Friday) at daytime between 6.00am and 6.00pm. Measurement was taken three times daily; morning (6-8am), afternoon (12-2pm) and evening (4-6pm) for a period of four (4) weeks from 24th September, 2019 through 20th of October 2019. Night time assessment was not performed. The average values for repeated readings at each sampling point were computed. The coordinates of the locations were taken using a handheld digital Global Positioning System (GPS) Garmin Dakota 20 model to extract the coordinates and points of each location where noise level assessment were taken within the study area. The data obtained was used to produce a digital map through the use of Arc GIS 10.5 software.

Data Management

Data obtained from the assessment were presented in the forms of tables, figures and column charts .Mean, range and standard deviation were computed for each of noise data obtained and compared the values with both National (NESREA) and International (WHO) recommended standard limits.

III. RESULT AND DISCUSSION

Noise level at the selected motor parks

Table 1. Comparison of average mean noise value of the selected motor parks with that of NESREA and WHO Standards

Motor Parks	Mean Noise dB(A) LAeq	Range	S.D	NESR EA limit (dBA) LAeq	WHO limit (dBA) LAeq
Offa garage	69.94	66.77-71.83	2.76	60	70
Soludero	71.48	67.15-75.47	6.47	60	70
Maraba	71.74	68.17-73.68	3.10	60	70
New-Shao garage	72.24	69.66-73.85	2.26	60	70
Saw-mill garage	74.45	69.69-79.80	5.08	60	70

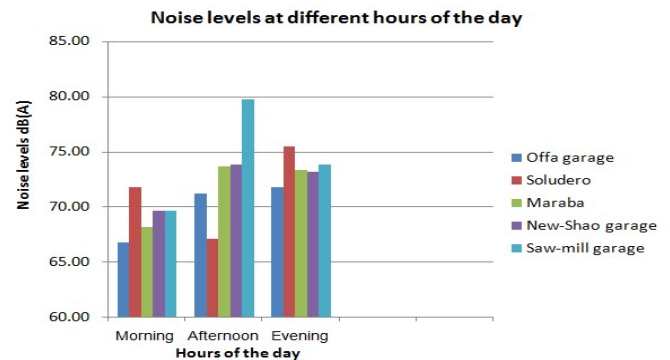


Figure 4: Showing noise levels in the motor parks at different hours of the day

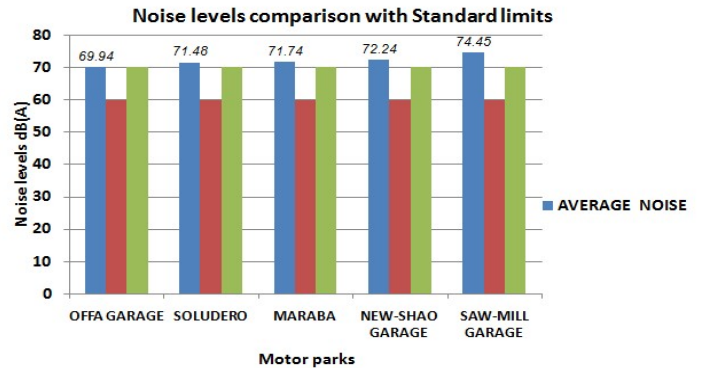


Figure 5: Comparison of Average Noise levels in the selected Motor Parks with NESREA and WHO Standards

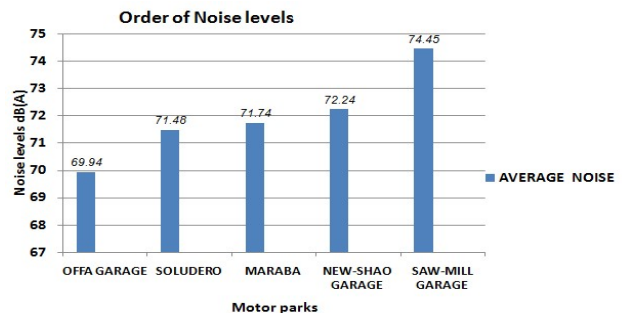


Figure 6: Order of noise in the selected motor parks

IV. DISCUSSION

Comparison of average mean noise value of the selected motor parks with that of NESREA and WHO Standards

Table 1 compared the mean value of the selected motor parks with that of NESREA and WHO Standards. The noise levels varied in each motor park over the periods of study. The noise level in Offa garage motor park ranges from 66.77-71.83 dB(A) with a mean value of 69.94 dB(A) which exceeded the 60 dB(A) Standard limit of NESREA for Residential + industry or small scale production +commerce but slightly below and within the WHO limits 70dB(A) for community noise for shopping and traffic area, industrial, commercial, indoor and outdoor environment. For Soludero motor park, noise level ranges between 67.15-75.47 dB(A) with a mean noise of 71.48 dB(A) which exceeded the limits set by NESREA 60 dB(A) and WHO 70 dB(A). Maraba motor park had a noise range between 68.17-73.68 dB(A) with a mean noise value of 71.74 dB(A) which is higher than the NESREA and WHO recommended limits. The motor park in New-Shao garage had a noise value ranging between 69.66-73.85 dB(A) with a mean value of 72.24 dB(A) which did not obey the set limits of NESREA and WHO. Saw-mill motor park had a noise range value between 69.69-79.80 dB(A) and a mean value of 74.80 dB(A) which is above the NESREA and WHO standards.

Noise levels in the motor parks at different hours of the day

Figure 1 reveals the noise levels in the selected motor parks at different hours of the day. For the morning hours (6:00am-8:00am) assessment, all the motor parks had noise values that were above the NESREA set limit of 60 dB(A) but below and within the 70 dB(A) WHO limits except Soludero motor park that exceeded 70 dB(A) recommended limits of WHO. The exceedance in the NESREA and WHO standard were due to increased vehicular movements/activities as observed during the assessment as it was rush hour time. For the afternoon hour (12:00-2:00pm) assessment, all the motor parks had noise values that were above the NESREA and WHO limits except Soludero motor park with a noise level of 67.15 dB(A) which was below and within the 70 dB(A) WHO recommended limit. This low noise level was due to reduced vehicular activities in the motor park. However, Saw-mill garage had the highest noise level of 79.79 dB(A) in the afternoon which exceeded the 70 dB(A) WHO limits. The exceedance in the WHO limit was due to increased vehicular activities in the motor park. For the evening hour (4:00pm-6:00pm) assessment, all the motor parks had noise levels that were higher than the NESREA and WHO recommended limits of 60 dB(A) and 70 dB(A) respectively with the highest noise levels recorded at Soludero motor park with 75.47 dB(A) followed by Saw-mill garage motor park with 73.88 dB(A) and the least noise level of 71.83 dB(A) was reported at Offa garage motor park. The low noise level was attributed to reduced activities in the motor park as observed during the assessment.

Comparison of Average Noise levels in the selected Motor Parks with NESREA and WHO Standards

The result from Figure 5 shows that all the motor parks had mean noise levels that were above the 60 dB(A) standards of NESREA for Residential + industry or small scale production +commerce[20]. However, with the exception of Offa garage motor park with noise level of 69.94 dB(A) which was slightly lower and within the recommended WHO limits of 70dB(A) for community noise for shopping and traffic area, industrial, commercial, indoor and outdoor environment [9], other motor parks had noise levels that exceeded the 70 dB(A) set limit of WHO. The motor park with the least noise level measured was Offa garage with 69.94 dB(A) followed by Soludero motor park with 71.48 dB(A) while Maraba motor park had a mean noise level of 71.74 dB(A) and the second motor park with high noise level was New-Shao garage motor park with 72.24 dB(A) and the motor park with the highest noise level was Sawmill garage motor park.

Order of noise in the selected motor parks

Figure 6 shows the increasing order of noise levels in the motor parks. The motor park with the least noise level is Offa garage motor park with 69.94 dB(A), followed by Soludero motor park having noise level of 71.48 dB(A), this was followed by Maraba motor park with average noise level of 71.74 dB(A) and the second motor park with high noise level is New-Shao garage motor park with 72.24 dB(A) while the motor park with the highest noise level is Saw-mill garage motor park with 74.45dB(A).

The noise assessment revealed that Saw-mill garage motor park environment is noisy with a noise level of 74.45 dB(A). This is attributed to the fact that the motor park is located near the road. This value is lower than the reported values of 87.9 dB(A) in a study done by [27] in Passengers loading parks in the same Ilorin Metropolis, Kwara State, Nigeria. This value is less than 84.1 dB(A) that was reported by [36] in Sagamu, Nigeria but higher than the reported value of 67 dB(A) in a study by [38] in Brazil. The results of this study is lower than that of [26] who reported noise level as high as 115dB in Ado-Ekiti and 120dB at Iwo road bus stop in Ibadan. The result of this study is in agreement with the study done by [25] who reported road traffic noise as the lead source of noise in Urban centres.

V. CONCLUSION

The result revealed that the average noise pollution levels in the selected major motor parks in Ilorin Metropolis ranges from 66.94 dB(A) to 74.45 dB(A). The motor park with the highest noise value recorded was Saw-mill garage motor park with 74.45 dB(A) followed by New-Shao garage motor park with 72.24 dB(A) while Maraba motor park follows with 71.74 dB(A) then followed by Soludero motor park having 71.48 dB(A) and the least noise value was recorded at Offa garage motor park with 69.94 dB(A). The result hence indicated that all the selected major motor parks in Ilorin

Metropolis, Kwara State, Nigeria had noise levels that were above the 60 dB(A) NESREA (National) recommended standard and 70 dB(A) WHO (International) recommended standard with the exception of Offa garage motor park with noise level that was slightly lower and within the WHO set limit. The result differs from that of [29] who reported noise level of 87.8 dB(A) in passengers loading park of Ilorin Metropolis, Kwara State, Nigeria. The result is lower than the reported value of 84.1 dB(A) in a study by [36] in Sagamu, Nigeria. The sources of the noise as observed were mostly from vehicular activities and to some extent commercial activities in the motor parks. This result is in agreement with the studies of [40, 3] who reported vehicular transportation as one of the lead contributors of noise in urban centres. The health implications of noise status in motor parks as revealed in this study could contribute to psychological effects such as annoyance, hearing impairment, insomnia, increased high blood pressure and loss of concentration and communication interference if actions are not taken to reduce the noise in the area. The sensitive and vulnerable groups such as people with underlying health conditions, children and adults are highly at risk of the effect of noise that exceeds recommended permissible limits.

VI. RECOMMENDATIONS

The study recommended that for vehicular noise pollution, it is important for the management of the motor parks to enlighten the drivers and vehicle owners the need to repair and maintain their vehicles to reduce the noise at source. Also, there is need for sporadic monitoring and assessment of noise levels in motor parks so as to provide relevant data on the state of noise levels in motor parks in urban centres, this will bridge up the data gap challenges. In ensuring the health effects of noise is prevented, there is need for the Ministry of Environment and other environmental regulatory agencies to create awareness and sensitize the public on the dangers of noise pollution. Environmental Regulatory Agency and Ministry of Environment should update the existing noise standard limit and ensure strict compliance to noise. Town planners and other relevant professionals should consider noise in building plan before siting and approving of motor parks in the area, this will check the menace of unapproved illegal motor parks in the Metropolis. Lastly, the need for periodic auditory examination and screening of motor park users and workers should be carried out for individuals who use and perform activities in motor park.

ACKNOWLEDGMENT

We acknowledge and appreciate the cooperation we received from the Heads of the National Union of Road Transport Workers (NURTW) and Road Transport Employers Association of Nigeria (RTEAN) in the motor parks.

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