**IDENTIFICATION OF NOISE POLLUTION, POSSIBLE EFFECT AND ITS ALLEVIATION: CASE STUDY OF NEW WASO MARKET, NURUDEEN GRAMMAR SCHOOL AND ORA MOTOR PARK, OGBOMOSO, OYO STATE NIGERIA**

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# Certification

**T**his is to certify that all the activities in this report was performed by LAWAL Sodiq Abiola. (Matric no: 152677)of the department of Civil Engineering, Faculty of Engineering and Technology, Ladoke Akintola University of Technology, Ogbomoso, Oyo State for the 2020/2021 final year project

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# Dedication

**T**his report is dedicated to God Almighty, who was there for us through the duration of the training, the giver of all knowledge and understanding.

# Acknowledgement

My profound acknowledgement goes to my project supervisor for her motherly care and concerns towards the success of this project and the entire staff of the Department of Civil Engineering.

# Table of Contents

Title Page i

[Certification ii](#_Toc81338687)

[Dedication iii](#_Toc81338688)

[Acknowledgement iv](#_Toc81338689)

[Table of Contents v](#_Toc81338690)

[List of Tables vii](#_Toc81338691)

[List of Figures viii](#_Toc81338692)

[Summary ix](#_Toc81338693)

[CHAPTER ONE](#_Toc81338694)

[1.0 Introduction](#_Toc81338695)

[1.1 Background of Study 1](#_Toc81338696)

[1.2 Problem Statement 4](#_Toc81338697)

[1.3 Scope of Study 7](#_Toc81338698)

[1.4 Aim and Objectives of the Study 8](#_Toc81338699)

[1.5 Significance of Study 9](#_Toc81338700)

[CHAPTER TWO](#_Toc81338701)

[2.0 Literature Review](#_Toc81338702)

[2.1 Noise Pollution 10](#_Toc81338703)

[2.2 Causes of Increasing Noise Pollution in our Environment 11](#_Toc81338704)

[2.3 Effect of Noise Pollution 12](#_Toc81338705)

[2.4 Sources of Noise Pollution 14](#_Toc81338706)

[2.5 WHO and CPCB Statutory Guidelines 14](#_Toc81338707)

[CHAPTER THREE](#_Toc81338708)

[3.0 Materials and Method](#_Toc81338709)

[3.1 Brief Description of the Study Area 18](#_Toc81338710)

[3.2 Measuring Equipment 19](#_Toc81338711)

[3.3 Data Collection 21](#_Toc81338712)

[3.3.1. Questionnaire Survey 21](#_Toc81338713)

[3.3.2 Field Investigation 21](#_Toc81338714)

[3.3.3 Physical Transient Noise Level Measurement 21](#_Toc81338715)

[3.4. Base Map Production of the Study Areas and Sampling Points and Noise Mapping to indicate the extent of pollution in the study Areas 22](#_Toc81338716)

[3.5 Statistical Analysis of the Questionnaires 22](#_Toc81338717)

[3.6 Expected Contribution to Knowledge 22](#_Toc81338718)

[References](#_Toc81338719)

# List of Tables

Table page

2.1: Guideline Values for Community Noise in Specific Environments

(World Health Organization Noise Standard adapted from Guidelines for

Community Noise WHO. 1999). 16

2.2: Permissible Noise Levels by CPCB (2000) 17

# List of Figures

Figures page

3.1: SW- 524 LCD Digital Sound Level Meter 20

# Summary

The systematic pollution of our environment is one of the biggest hazards that humanity faces today. In developing countries like Nigeria, one of the greatest challenge confronting industrial noise regulatory effects is how to alleviate noise pollution level in our environment. The quest for industrialization and economic emancipation has made many developing countries in the world to embrace urbanization without proper assessment and investigative measures. This research work attempt to measures noise pollution levels generated at Ora motor park, New waso market and Nurudeen grammar school in Ogbomoso, Oyo State, Nigeria. The data obtained will be compared with the WHO standard for each specific environment.

Workers and residents’ views and perception on the presence of the market, school and the motor park in the location will be determined through questionnaires. Noise pollution level will be measured insitu at 3 selected different points within the market, school and motor park at an average height of 1.5 m and distance of 3 m from the sources was taken using Digital Sound Level Meter set.

# CHAPTER ONE

# 1.0 Introduction

# 1.1 Background of Study

The environment plays a major role in the developmental processes of man and any little distortion on the environment can lead to dangerous consequences that the world will find difficult to come out from. (Abah and Unah, 2016). One of these environmental problems which have to be looked into is noise pollution in urban and rural communities in developing countries such as Nigeria when one considers the adverse effects on the citizenry (Aniefiok, 2018). Atmospheric pollution is not the only type of contamination that is harming living beings on the planet. According to the World Health Organization (WHO), it is one of the most dangerous environmental threats to health. And according to the European Environment Agency (EEA), noise is responsible for 16,600 premature deaths and more than 72,000 hospitalizations every year in Europe alone. Noise pollution in and around buildings and communities in which people live and work has gradually and steadily increased in magnitude as industrialization and uncontrolled urban growth has advanced (Cavanaugh and Tocci, 1998) and is currently a major public health problem in many cities worldwide.

Noise is derived from the Latin word “nausea” implying “unwanted sound”, therefore, noise can be regarded as unwanted sound (Oluwaseun *et al*., 2015). Not all sound is considered noise pollution. The World Health Organization (WHO) defines noise above 65 decibels (dB) as noise pollution. To be precise, noise becomes harmful when it exceeds 75 decibels (dB) and is painful above 120 dB. As a consequence, it is recommended noise levels be kept below 65 dB during the day and indicates that restful sleep is impossible with nighttime ambient noise levels in excess of 30 dB. Noise is also defined as sound which is loud, harsh and cause disturbance to the environment around (Hyani *et al*., 2018). Leventhall, 2003, defined noise as undesired sound. 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 (Leventhall, 2003). Noise has nothing to do with the melody of the sound, it is any sound that is out of place. City noise levels can be investigated in three different ways as traffic and transportation; industrial activities; Sport, marketing and entertainment facilities (Dursun *et al*., 2006)

In Nigeria, air pollution has become a topic of intense debate at all levels because of the enhanced anthropogenic activities (Kafeelah *et al*., 2013). Urban air pollution in Nigeria has increased rapidly with population growth, numbers of motor vehicles, use of fuels with poor environmental performance, uneven distribution of industries, urbanization, badly maintained transportation systems and above all, ineffective environmental regulations (Olajire *et al*., 2011). Also, Over the years, Nigeria has experienced a major setback in the electricity generation sector as most residential homes and industries depend on the use of electricity generating plant twenty-four (24) hours as an alternative to power supply with its attendant noise pollution on the environment and human health*.* (Ijaiya, 2014).

Noise originates from human activities, especially the urbanization and the development of transport and industry (Oluwaseun *et al*., 2015). The major sources of environmental noise pollution include road, rail and air craft, construction and public works, and the neighborhood (Schomer, 2001). Dursun, *et al.,* (2006) grouped noise into three major groups based on their sources in our environment, which are industrial noise, traffic and transportation and community noise. Industrial noise is the noise from various industrial processes such as cutting, grinding, crushing, drilling etc. the traffic and transportation noise is generated by the engine exhaust and aerodynamic noise compression and friction in the air around the body during motion. Community noise is noise generated within the residential and commercial environment which may be action of electric blender, fan’s blade, home theatre set, football viewing centres, malls, television etc.

The commercial markets range from industrial market, government market, consumers market etc. Industrialization and urbanization have made people migrate to the developing areas of the communities thereby increasing human activities that have resulted in noise pollution. Periodic markets where buyers and vendors gather for their commercial, economic and social transactions are created in these communities and their activities as they gather result in noise pollution of the environment (Aniefiok, 2018).

Furthermore, the distribution of industries, siting of motor parks and commercial centres in developing countries especially Nigeria is not uniform as they are sited majorly in the urban centers even though the urban centre is characterized with various form of pollutions already (Sada, 2015). Major commercial centers in the country include Lagos, Port Harcourt, Ibadan, Kano and Kaduna.

The effect of noise on human is classified into physiological (auditory) and psychological (non-auditory) effect *(*Ugbebor *et al.,* 2017). Blood pressure increases, heart beat accelerations, appearance of muscle reflexes, sleeping disorders may be considered among the other physiological effects. The psychological effects of noise are more common compared to the physiological ones and they can be seen in the forms of annoyance, stress, anger and concentration disorders as well as difficulties in resting and perception (Yao *et, al*., 2000).

The environmental effects of transportation projects have come under close scrutiny in recent years. Over the years the general incidence of noise has been increasing, the development of the steam engine, the petrol engine, and technological machinery in industry, contributed to an increasingly noisy environment in the nineteenth century. This has been further exacerbated in the twentieth century by the diesel engines, the turbo prop and jet engine (Dhole and Kadu, 2018). Chauhan *et al*., (2010) made assessment of noise level of Haridwar city. They found that traffic noise was the significant contributor to the overall noise. The variation ranges of SPLmin and SPLmax was between 56.6 - 102.4 dB in residential zone; 56.7-108.9 dB in commercial zone; 52.4-65.8 dB in industrial zone; and 45-87.8 dB in silence zone. He suggested widening of narrow roads, diversion of traffic to reduce traffic volume, plantation of evergreen trees, restriction on entry of heavy buses and trucks, penalization on use of pressure horns, segregation of slow moving traffic by constructing dedicated lane among other measures (Chauhan *et al*., 2010).

Many studies have been carried out recently to show the relationship in noise level in some certain environment such as industrial, commercial, traffic and residential, however, this study aim to relate average noise generated in commercial environment, school and residential environment and also compare with the WHO Standard for each specific environment.

# 1.2 Problem Statement

Noise is an inevitable part of everyday life; Mild noise can be annoying, excessive noise can destroy a person’s hearing. The slightest unwanted sound can become very annoying if it continues for any length of time (Dhole and Kadu, 2018). Many pregnant women are exposed to noise in the workplace which may damage fetuses and newborns. Reducing noise levels can improve the physiologic stability of sick neonates and therefore enlarge the potential for infant brain development. The human cochlea and peripheral sensory end organs complete their normal development by twenty-four weeks of gestation (Owoseni *et al*., 2017).

The effects of noise pollution on human may include hypertension, annoyance, sleep disturbance, inattention, interference with speech communication, leisure, or relaxation, and, at very high levels which may occur at work or during certain noisy leisure activities, it may result in hearing loss by causing damage to the hair-cells in the cochlea in the inner ear (Oloruntoba *et al*., 2012). Rather than leading to significant adverse physiological responses, however, noise is more often a major problem in terms of quality of human life in specific localities (WHO, 1995).

International bodies like the WHO agree that awareness of noise pollution is essential to beat this invisible enemy. For example: avoid very noisy leisure activities, opt for alternatives means of transport such as bicycles or electric vehicles over taking the car, do your housework at recommended times, insulate homes with noise-absorbing materials, etc. Educating the younger generation is also an essential aspect of environmental education, however the implementation of all these suffers a great setback in most developing countries due to their level of technology.

A research work by Oloruntoba *et al*., 2012 shows the effect of noise pollution on the residents through a questionnaire survey. A total of 341 questionnaires were administered out of which 245 were successfully retrieved, from the responses of the people, Headache (30.2%), followed by lack of concentration (23.7%) and thereafter irritability (12.2%) were the major health effects the respondents in the study area claimed to experience as a result of noise exposure. Exposure to noise up to 90dB for a long duration according to occupational safety and health act (Osha) may leads to physical, physiological and even psychological problems. These problems may include permanent or temporary hearing loss, interference with speech clarity and intelligibility, reduced productivity, increase blood pressure and even lack of concentration (Osha 2006).

Also a published work by Saadu *et al*. (1998), Onuu and Menkiti (1993) and Ugwuanyi *et al*. (2004) shows that Nigerians are noisy people. In Nigeria, there is no public sensitization or any legal frame work upon which noise pollution can be abated. Federal Environmental Protection Agency (FEPA) in Nigeria only provided daily noise exposure limits for workers in industry (that is 90 dB(A) for 8 hours’ exposure) without monitoring the actual implementation of the standard. In short, the Nigerian Government and her citizenry appear not to be conscious of the present and future impacts of noise induced health hazards in their environment. Unless and until measures are taken to control the level of noise, the ongoing urbanization, industrialization and population explosion may complicate the problem so much that it becomes incurable

World Health Organization, (WHO, 2002) estimated that 4.6 million people die each year due to causes directly attributable to air pollution raises global concern as epidemiologic studies worldwide have provided enough insights into the association between exposure to gaseous and particulate pollutants and the occurrence of respiratory infections, cardiovascular diseases and cardiopulmonary mortality among the habitations [Gupta *et al*., 2004 & Koken *et al*., 2003].

The Nigerian Educational system constantly changes through consistent research and meaningful innovations. The concept and philosophy of the 6-3-3-4 is to cater for the “whole man” that is, to provide for the intellectual, social, material and spiritual needs of a student through its multi-purpose curriculum (Gbemisola and Vusy, 2016). However, these changes are very slow in term of technological advancement and implementation in teaching. Unlike before, every parents now want their wards to go to school and this had led to a great increase in the ratio of the teachers to the students and unfortunately, most schools especially government schools adopt no measure to curb the resulting noise pollution which is dangerous to health of the students and the nearby residents on a long term.

In contrast to many other environmental problems, noise pollution continues to grow and is accompanied by an increasing number of complaints from people exposed to the noise. The growth in noise pollution is unsustainable because it involves direct, as well as cumulative, adverse health effects. Due to the ignorance of Nigerians on the fact that there exists a close nexus between noise pollution and sustainable city, little or no attention is paid to the control of noise pollution in Nigeria (Oyedepo, 2013)

# 1.3 Scope of Study

Nurudeen Grammar School, New waso market and Ora motor park (popularly called Ora garage by the public) will be selected as the study area which are located in Ogbomoso north local government, Oyo State Nigeria, Ogbomoṣo is a city in [Oyo State](https://en.m.wikipedia.org/wiki/Oyo_State), south-western [Nigeria](https://en.m.wikipedia.org/wiki/Nigeria). Oja waso Titun (New waso Market) is a major market in Ogbomoso land serving more than 300,000 thousand population of students, indigene, lecturers and university professor. Remember, Ogbomoso is home to one of the prestigious university in western Nigeria called Ladoke Akintola University. In the like manner, Nurudeen grammar school is one of the prominent government secondary school in Ogbomoso established in 1979 and situated also very close to the second gate of Ladoke Akintola University of Technology. The school accommodated hundreds of students and up to about fifty staff working there. Ora motor park is one of the most efficient park in Ogbomoso due to the economic activities between Ogbomoso and towns in Osun State. This study attempt to measure noise generated from these three places and relate with the WHO Standards for each specific environment. The market, school and motor park were selected based on three major factors which are:

1. The market serving thousands of people including students and staff of Ladoke Akintola University of Technology,
2. Intensity of economic activities of the motor park,
3. Nurudeen Grammar School being one of the oldest, biggest and highly populated government secondary school in Ogbomoso, Oyo State, Nigeria.

# 1.4 Aim and Objectives of the Study

The aim of the project is to determine the extent of noise and its variation within New waso market, Nurudeen Grammar School and Ora motor park in Ogbomoso, Oyo State, Nigeria.

The specific objectives of this project include:

1. Determination of activities causing noise pollution, measurement of the noise level and distribution of questionnaires to households within the study areas
2. Statistical comparison of the noise level at new waso market, Nurudeen grammar school and Ora motor park and comparing with WHO Standard for each specific environment.
3. Orientation of the public and advise on the use of suitable noise control measures such as personal protective equipment, installation of barriers, enclosures and so on to alleviate the effect of high noise pollution level.
4. Production of noise mapping showing the extent and distribution of noise level in the study areas using GIS approach.

# 1.5 Significance of Study

This study will help in monitoring noise pollution resulting from economic activities as well as serve as a guide in controlling noise pollution. The data obtained on the level and effects of noise pollution will form a baseline for noise pollution modeling in each area. Indiscriminate siting of motor park, school, commercial centres and residential building can be curbed. Regulatory agencies, State and Federal governments can use this valuable information on the promulgation of policies that will control the intensity of noise pollution. This will reduce the physiological and psychological effects of noise pollution on people.

# CHAPTER TWO

# 2.0 Literature Review

# 2.1 Noise Pollution

According to UK Essays (2018*)*, noise pollution is the unwanted sound dumped into environment without regard to the adverse effect it may have or any unwanted electromagnetic signal (sound) that produces displeasing effect and which interferes with human communication, comfort and health.

Noise is derived from the Latin word ‘nausea’ implying ‘unwanted sound’ or ‘sound that is loud, unpleasant or unexpected’. According to Garg, *et al.,* (2007*),* noise is transmitted usually through a medium such as air, when this noise reaches the ear, it may be perceived as desirable or undesirable. Okoro (2014) said it is the undesirable sound that is commonly referred to as noise. It is the only form of pollution that does not leave a residue. Noise pollution is also defined as the distressing noise that may harm the physical/mental activity of human being as well as animal life (Jhanwar, 2016)

Noise is an unwanted sound caused by human activities in our societies or simply defined as any loud sound. It becomes a pollutant when it is unpleasant, and could be disturbing to humans and the public(Evelyn, *et al*., 2012). Dasarathy (2015) also defined noise as audible sound that causes disturbance, impairment or health damage. Noise can be described as a loud, unpleasant or unexpected sound that can affect man’s quality of life (Narendra S. and Davar, 2004). Gorai and Pal (2006) considered noise as an unjustifiable interferences and imposition upon human health, comfort and qualitative human life. Sound intensity is measured in decibels (dB) that is the tenth part of the longest unit Bel. One dB is the faintest sound that a human ear can hear.

# 2.2 Causes of Increasing Noise Pollution in our Environment

Research work by Saadu *et al*. (1998), Onuu and Menkiti (1993) and Ugwuanyi *et al*. (2004) shows that Nigerians are noisy people. In Nigeria, there is no public sensitization or any legal frame work upon which noise pollution can be abated. Federal Environmental Protection Agency (FEPA) in Nigeria only provided daily noise exposure limits for workers in industry (that is 90 dB(A) for 8 hours’ exposure) without monitoring the actual implementation of the standard. In short, the Nigerian Government and her citizenry appear not to be conscious of the present and future impacts of noise induced health hazards in their environment. Unless and until measures are taken to control the level of noise, the ongoing urbanization, industrialization and population explosion may complicate the problem so much that it becomes incurable.

Assessment of noise quality in Bolpur- Santiniketan areas of India was made by Padhy and Padhi (2006). Noise is a prominent feature of the environment including noise from transport, industry and neighbors. An important part of noise assessment is the actual measurement of the noise levels. Continuous Leq measurement during day time (0600 – 2100 hr) was carried out in residential, commercial and silence zone location of Bolpur-Santiniketan areas during June-December, 2005. The results show that the noise pollution in the city is wide spread throughout most of its area. The noise in this area is composite in nature. Public participation, education, traffic management and structural designing play a major role in noise management.

# 2.3 Effect of Noise Pollution

Singh and Davar (2004) in their paper on Noise pollution - sources, effects and control describe the life of the people. Cross-section surveys of the population in Delhi State points out that main source of noise pollution are loudspeakers and automobiles. However, female population is affected by religious noise a little more than male population. Major effects of noise pollution include interference with communication, sleeplessness, and reduced efficiency. The extreme effects e.g., deafness and mental breakdown neither is ruled out. Generally, a request to reduce or stop the noise is made out by the aggrieved party. However, complaints to the administration and police have also been accepted as a way of solving this menace. Public education appears to be the best method as suggested by the respondents. However, government and NGOs can play a significant role in this process.

Chanhan and Pande (2010) deal with monitoring of noise pollution at different zones of Dehradun, Uttarakhand, India. Exposure to high level of noise may cause severe stress on the auditory and nervous system. Transportation and horn used in vehicles are the major sources of noise pollution in Dehradun City. Ambient noise level monitoring was carried out by Balashanmugam *et al* (2013), at various locations of the Chidambaram town of Tamil Nadu, India during September –November 2011. The data obtained was used to compute various noise parameters, namely, equivalent continuous level (Leq), Noise pollution level (Lnp), Noise climate

(NC), Percentile noise levels (L10, L50, L90). The comparison of the data shows that the noise levels at various locations of the Chidambaram town are more than the permissible limits. Vehicular traffic and air horns are found to be the main reasons for increasing noise pollution in the area.

Agbalagba *et al.,* (2013) conducted a survey on noise pollution levels in four selected sawmill factories in Delta State. The physical measurement assessed the noise level of different machines in the factories and the background noise levels were measured at 50 meters away from the factories. A mean level of machine noise pollution (and background noise level) of 103.77 ± 4.71 dBA (78.25 dBA), 96.55 ± 1.48 dBA (72.08 dBA), 99.02 ± 3.20 dBA (72.54 dBA), 99.97 ± 3.66 dBA (79.89 dBA) was recorded in Ozoro, Ughelli, Warri and Sapele, respectively. These recorded values show that the noise levels in the four factories investigated are well above the federal environmental protection agency (FEPA) recommended maximum permissible limits for an industrial environment. This may cause hearing impairment and some psychological effect like susceptibility to mistake, irritation, and sleeping and social discomfort among staff and resident living in close vicinity to these factories. This is further affirmed by the social survey which revealed the level of social discomfort and health menace caused by machines noise from the factories on the workers and those residing close to these factories. Recommendations were therefore made to control, and abate this health threatening pollution effects.

The study by Banihani and Jadaan (2012) provided an evaluation of road traffic noise pollution in the city of Amman and its effects on residents. Statistical noise index L10 (18 hours) was measured at nine different sites throughout the city of Amman. The British Calculation of Road Traffic Noise (CRTN) method was used to predict noise levels at the chosen sites. The results showed that Amman was environmentally noise polluted at the studied locations with noise levels ranging between 80.41 dBA and 83.71 dBA; thereby exceeding the maximum allowable limit of 63 dBA. The effectiveness of noise barrier walls in reducing noise levels was investigated. Noise barriers 5 m were found to be effective in reducing noise levels below the permissible limits at all sites. A social survey was carried out to evaluate the perceived noise impacts of road traffic noise on residents. The results of the survey revealed that road traffic noise was a major concern for the communities living in the vicinity of streets.

# 2.4 Sources of Noise Pollution

Sources of noise pollution into the environment as stated by Dasarathy (2015) are:

* Transportation systems are the main source of noise pollution in urban areas.
* Construction of buildings, highways, and roads cause a lot of noise, due to the usage of air compressors, bulldozers, loaders, dump trucks, and pavement breakers.
* Industrial noise also adds to the already unfavorable state of noise pollution.
* Loud speakers, plumbing, boilers, generators, air conditioners, fans, and vacuum cleaners add to the existing noise pollution as per environmental protection

# 2.5 WHO and CPCB Statutory Guidelines

Table 2.1 and 2.2 respectively show the WHO and CPCB guideline values arranged according to specific environments and critical health effects. The guideline values consider all identified adverse health effects for the specific environment. An adverse effect of noise refers to any temporary or long-term impairment of physical, psychological or social functioning that is associated with noise exposure. Specific noise limits have been set for each health effect, using the lowest noise level that produces an adverse health effect (i.e. the critical health effect).

Although the guideline values refer to sound levels impacting the most exposed receiver at the listed environments, they are applicable to the general population. The time base for the **equivalent continuous sound level in (**LAeq) for “daytime” and “night-time” is 12–16 hours and 8 hours, respectively. No time base is given for evenings, but typically, the guideline value should be 5–10 dB lower than in the daytime. Other time bases are recommended for schools, preschools and playgrounds, depending on activity (WHO, 1999).

It is not enough to characterize the noise environment in terms of noise measures or indices based only on energy summation (e.g., maximum level of a noise source **(**LAmax), because different critical health effects require different descriptions. It is equally important to display the maximum values of the noise fluctuations, preferably combined with a measure of the number of noise events. A separate characterization of night time noise exposures is also necessary. For indoor environments, reverberation time is also an important factor for things such as speech intelligibility. If the noise includes a large proportion of low-frequency components, still lower guideline values should be applied. Supplementary to the guideline values given in Tables 2.1 and 2.2, precautions should be taken for vulnerable groups and for noise of certain character (e.g. low-frequency components, low background noise).

Table 2.1: Guideline Values for Community Noise in Specific Environments

|  |  |  |  |
| --- | --- | --- | --- |
| Specific Environment | LAeq  (dB) | Time Base  (Hours) | LAmax Fast  (dB) |
| Outdoor living area | 55 | 16 | - |
| Dwelling, indoors  Inside bedrooms | 35  30 | 16  8 | -  45 |
| Outside bedrooms | 45 | 8 | 60 |
| School class rooms & pre-schools, indoors | 35 | During class | - |
| Pre-school bedrooms, indoor | 30 | Sleeping time | 45 |
| School, playground outdoor | 55 | During play | - |
| Hospital, ward rooms, indoors | 30  30 | 8  16 | 40  - |
| Industrial, commercial shopping and traffic areas, indoors and outdoors | 70 | 24 | 110 |

Source: (WHO, 1999)

**Table 2.2:** **Permissible Noise Levels by CPCB (2000)**

|  |  |  |  |
| --- | --- | --- | --- |
| S/N | Zone | Noise Level (dBA  Day Night | |
| 1 | Industrial | 75 | 70 |
| 2 | Commercial | 65 | 55 |
| 3 | Residential | 55 | 45 |
| 4 | Silence | 50 | 40 |

Source: (NEP as amended in 2000)

# CHAPTER THREE

## 3.0 Materials and Method

# 3.1 Brief Description of the Study Area

Ogbomoṣo is a city in [Oyo State](https://en.m.wikipedia.org/wiki/Oyo_State), south-western [Nigeria](https://en.m.wikipedia.org/wiki/Nigeria). It was founded in the mid-17th century. The population was approximately 245,000 in 2006 [census.](https://en.m.wikipedia.org/wiki/Census-designated_place) The majority of the people are members of the [Yoruba](https://en.m.wikipedia.org/wiki/Yoruba_people) ethnic group. [Yams](https://en.m.wikipedia.org/wiki/Yam_(vegetable)), [cassava](https://en.m.wikipedia.org/wiki/Cassava), cashew, mango, [maize](https://en.m.wikipedia.org/wiki/Maize), and [tobacco](https://en.m.wikipedia.org/wiki/Tobacco) are some of the notable agricultural products of the region.

Oja waso Titun (New waso Market) is a major market in Ogbomoso land serving more than 300,000 thousand population of students, indigene, lecturers and university professor. Remember, ogbomoso is home to one of the prestigious university in western Nigeria called Ladoke Akintola University. The market is situated close to the institution. There is also old waso market for clarity sake. Products are brought as far as from northern Nigeria to Oja waso titun. Such product include yam, beans, pepper, onion, tomatoes, gari, elubo, meat, fish, plastics, provisions, gift items and so on.

Nurudeen grammar school was established in 1979 by religious bodies with the ultimate aim of aiding the difficult task of evangelization in their respective denominations. At Nurudeen Grammar School the teaching morals in form Islamic studies are inevitable till today; since it is areligious school (Gbemisola and Vusy, 2016).

Ora motor park is located at isale ora, Ogbomoso, Oyo State, Nigeria. The park has different destinations but two common destinations are Osogbo and Ile-Ife. The economic activities between Oyo and Osun State is the reason the vehicles at Ora motor park load faster than any other motor park in Ogbomoso.

# 3.2 Measuring Equipment

The noise level measurement will be done using SW-524 LCD Digital Sound Level Meter, which consists of a 6mm polarization capacitance microphone, electronic circuits, a readout display and Power Supply (3 pieces AAA battery). The microphone detects the small air pressure variations associated with sound and changes them into electrical signals. These signals are then processed by the electronic circuitry of the instrument. The readout displays the sound level in decibels. The Sound Level Meter takes the sound pressure level at one instant in a particular location. It satisfies the International Committee IEC 651 Type 2 and American International Standard ANSI 1.4 Type 2 specifications for laboratory grade meters. The noise meter measures noise levels in the range of 30 – 130 dBA with accuracy up to ±1.5dB is shown in Figure 3.1.



Figure 3.1: SW- 524 LCD Digital Sound Level Meter

# 3.3 Data Collection

Data Collection will be Achieved by the Following means

1. Field investigation
2. Field measurement which involve physical transient noise level measurement
3. Questionnaire Survey

## 3.3.1. **Questionnaire Survey**

Questionnaires will be distributed to the residents and workers of the study areas. This will be done to have an in-depth knowledge about the operations and activities performed in the area. The data to be collected includes the age range, job identification, average hour spent in the market/park per day and condition, resident perception and business of residents within the vicinity of the market, school or motor park location.

## 3.3.2 Field Investigation

This will be done to actually verify the responses in the questionnaire in a bid to know if the residents or workers are biased or not. The responses and field investigation will be compare together. This method is reliable and convenient but time consuming.

## 3.3.3 Physical Transient Noise Level Measurement

There was no record of any previous noise pollution study of the study area, thus a preliminary field survey became necessary. The preliminary survey will involve sites visitation, initiation of noise measurement modalities and interaction/interview of officers and workers in the study areas. The noise levels will measure in-situ at the different locations inside the market, school and the motor pack at the height of about 1.5 m above the ground and distance of about 3 meters from the sources, using a SW-524 LCD digital sound level meter set. During measurement, the meter microphone was directed towards the noise sources and the meter held away from the body. Five readings will be taken at each spot when the machine was in operation and the average value recorded. This will be repeated at the different measuring spot in the market, school and the motor park.

# 3.4. Base Map Production of the Study Areas and Sampling Points and Noise Mapping to indicate the extent of pollution in the study Areas

Base map coordinates showing the three locations of the research work and the sampling points and noise mapping showing the extent of noise pollution will be produced using GIS approach

# 3.5 Statistical Analysis of the Questionnaires

The questionnaires will be processed and descriptive statistics will be determined using SPSS software and excel spreadsheet. This will also serve as one of the basis of discussion in chapter four.

# 3.6 Expected Contribution to Knowledge

1. To improve the understanding of human perception of noise pollution studies and effects and as a result will lead to the decrease noise level and efficient management of exposure time by improving the orientation of the issue and motivating the residents and workers of the endangered areas to take actions that will reduce the negative effects of noise pollution
2. Identification of areas prone to high noise level due to the effect of the motor park or market and sensitize the people on the need to maintain the clear-off standards specified by the government agencies.
3. The likely activities that generate noise from the proposed study areas are to be identified and the likely exposure time of a worker at a noise generating source is to be assessed.
4. The data obtained on the level and effects of noise pollution will form a baseline for noise pollution modeling in the area. Regulatory agencies, State and Federal governments can use this valuable information on the promulgation of policies that will control the intensity of noise pollution through proper planning such as the location, minimum distance from the residents, kinds of goods (being sold in the market) should be considered and enforced before siting them.
5. The workspace environment noise levels are to be checked with WHO standard. If the noise exposure levels are higher, suitable noise control measures like personal protective equipment, installation of barriers, enclosures etc., will be suggested to the people to alleviate the noise level in the area

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