Original Research Article

'For the Love of the Environment' Reflections on Professional Music Practice and Climate Change in Nigeria

ABSTRACT

The study is on the issues of noise pollution through professional music practice and its sociological impact on the environment in Nigeria. The study examines noise pollution through excessive sound pressure levels of music production by way of music merchandising, products promotion and live performances in indoor and outdoor venues in Nigeria. Data for this paper were gathered through observation of music production at social events and public places, interviews with music professionals and audiences using a Virtual Instrument; a Sound Pressure Level mobile application installed on a mobile phone for sound production measurement. The equivalent noise level using A-weighting was taken every fifteen minutes in each location between 6:00 am and 12:00 pm and the LAeq, T, of each research's case study center, was calculated. Maximum LAeq, 6h of 105.40 dB was obtained in all the centers visited between 6:00 am and 12:00 pm while the minimum value of LAeq, 6h obtained for a residential area in the same period is 69.51 dBA. The findings of this paper reflect that the residents are exposed to average noise levels of 75 - 98 dB (A) or more every day which is higher than the recommended value of 60 dBA by World Health Organization (WHO).The paper concludes that the acoustic treatment of performance venues, training of music professionalism centers as well as appropriate legislation on awareness creation by the government are some significant ways to check noise pollution generated from professional music practice in order to make the acoustic environment more ecologically-friendly. This paper recommends that acceptable optimal standards for sound production either in enclosures or in open spaces should be established for effective sound control. More importantly, a lot of awareness and advocacy should be carried out in order to sensitize the citizenry on the dangers of very loud music which most times translate to noise.

Keywords: music and sound, environmental degradation, sound and climate change

Department of Music, Obafemi Awolowo University, Ile-Ife, Nigeria

Introduction

In about 2004, the departmental band of music, Obafemi Awolowo University was contracted to play at a dinner organized by the *Otolaryngological Society of Nigeria* (an association for Ear, Nose and Throat doctors (ENT). As usual, the band wanted to impress the audience not just with the quality of our music but, also in terms of volume or amplitude of our musical equipment. As the band struck the first chord, somebody walked up and asked us to reduce the volume of the music which we did. As the band continued to play, there were yet, more calls for a reduction of the sound pressure and volume levels until the performance practically turned to singing and playing in soft whispers before being allowed to continue the performance. Afterward, the doctors took the time to educate us and the band on the dangers of loud music, especially as regards auditory perception and gradual loss of hearing. The complaints about the high volume of the sound made very little sense to the band then especially considering our acquired behavior of professional practice where the core lesson is '*the louder the better'*, our instrument for creating audience awareness and domination of the musical atmosphere.

Several years later as a teacher of sound acoustics and electronics to undergraduate students, it became clearer to understand terms like '*threshold of pain* 'which occurs when Sound Pressure Level (SPL) becomes unbearable for a human listener {1}, '*listeners' fatigue* 'which is a feeling of tiredness or an unconscious switch to tuning the audio out or to passive listening {2}., '*frequency bias'* which expresses the value in megawatts per 0.1 Hertz (MW/0.1 Hz) {3} The term "*frequency bias"* could also be described *as a* subconscious or subliminal human subjective judgment on sound frequency perception, sound frequency considered too high to one might be considered too low to another. , *grating*', which describes the nature of sound as harsh and unpleasant {4}, 'sympathetic *vibration*, which

was described as a vibration produced in one body by the vibrations of exactly the same period in a neighboring body, 'the decibel scale' which is used to measure sound level etc, all of which represent '*danger signs'* as regards loud music {5}. It was at this point in my academic and professional practice that the appreciation of the lessons learned about the dangers of loud sound on human health from the Ear, Nose, and Throat (ENT) doctors. The consensus opinion in many areas of environmental research is that the climate is changing and that the change is due mainly to human activities and the impacts on the environment. Climate change caused by human activities or anthropogenic factors have given birth to a new climatic terminology referred to generally as *global warming,* the term used to describe a gradual increase in the average temperature of the Earth's atmosphere and its oceans, a change that is believed to be permanently changing the Earth's climate {6}. While many physical phenomena like bush burning, gas flaring, gaseous emissions from vehicles, industries and deforestation among others, have been held accountable for climate change in various parts of the world, the impact of very loud sounds on the environment as it relates to issues in global warming and climate change have been largely ignored until very recently when it has become to be a global concern. There are many different problems that are leading to climate change in Nigeria due to natural events and human musical activity. Considering the relationship between musical activity and climate change, Ochuko {7} wrote that reliance upon a relatively new approach to understanding "*ecomusicolgy"* which studies the relationship between natures, culture and music are required. In a more broadly understanding, the relationship between musical and sonic issues, both textual and performative, related to ecology and the environment.

Anomohanran {8} commented that Nigeria is experiencing adverse climate conditions with negative impacts on the welfare of millions of people. The practices of popular musicians in Nigeria are in a way provides connections between diverse worlds of music and the complex

realms of global warming and climate change. A great variety of Nigerian musical styles and genres engage with environmental issues, the connections with climate change are usually through the lyrical content of music more than the specific sound produced. For example, Jimi Solanke's (a Nigerian folk musician) sang on 1982 flooded Ogunpa River, King Sunny Ade sang on Harmattan occurrence in Nigeria and Ebenezer Obey sang on the risks of the coal miners risking their lives to provide a living for their families, all these are musically linked to climate change in Nigeria. In addition to the music itself, activities around music making are relevant for their climate connections including the music business, music concerts, and music recording and musical instruments. Classical art music production and performances around the world has primarily been one of the reflective and impressionistic engagements with nature, Ijaiya {9}, cited the Stephen Albert who recorded his Symphony *River Run on* climate change won the Pulitzer Prize *in 1983.* Artists, ethnographers, acousticians, scientists and others have, since the advent of recording technology, made sonic portraits of the environment. Also, David Dunn as a music composer expressed in his song the problem of the bark beetle in Western pine trees; when stressed by climate-change-exacerbated drought, the trees are more susceptible to beetle attacks. In this sense, Dunn collaborated with scientists to hear the beetles in order to develop tools to fight and prevent the infestations using sound {10}. Music traditions interact in complex ways with the climate, for example, composers use weather representation in musical activities, the most popular type of weather used is the *storm* presumably, as an allegory for emotional turbulence, such as in Benjamin Britten's Four Sea Interludes from the opera *Peter Grimes*. The wind was found to be the second most popular type of weather to feature in music. The Wind can have a variety of characters, from a gentle breeze rustling the trees, as in the beginning of the third movement of Berlioz's *Symphonie Fantastique*, to a full-blown Antarctic gale, as in *Sinfonia Antarctica* by Vaughan Williams. Strauss needed both sunshine

and the Alpine landscape to inspire him. Several other composers, such as Berlioz, Schubert, and Wagner, were also dependent on fair weather conditions, associated with high pressure, for their best output Wagner, for example, referred to *'bad-weather unemployment'* and wrote: *'This is the awful weather* {11}. Climate and music could also be linked in the area of climate control since musical instruments are compiled of many organic materials such as wood, metal, or plastic; it makes it difficult to preserve them if they are constantly exposed to high humidity especially as the case in Africa (Nigeria) because leather, wood, natural fibers, and other organic materials absorb moisture; if they are kept in non-climate-controlled environments. Moreover, Ballon {12} wrote that musical instrument plays the temperature range of a zone of the Northern Hemisphere and is tuned to the average temperature of that region, for example, the cello tracks the equatorial zone, and the viola plays the mid-latitudes. One violin plays the high latitudes, and the other traces Arctic temperatures. In this case, each instrument plays the pitch of the note to represent the temperature of that particular region. Finally, music and climate variables can be expressed as individual musical voices or as dynamic musical qualities, such as pitch, tempo, dynamics, and rhythm.

In some cases, musical activity contributes to promoting awareness through song messages or sometimes may encourage the conservation or sustainable development of natural resources with musicians' fundraising or the through the construction of musical instruments. However, in other cases, the musical activity may cause environmental destruction through certain raw materials used for the production of guitar and violin. Music creation, production, and consumption in Nigeria reflect the worldwide concern with environmental issues and climate change and, at the same time, have global impacts.

Persistent droughts and flooding, off-season rains and dry spells, have sent growing seasons out of orbit in a country (Nigeria) dependent on rain-fed agriculture. Alarm bells are ringing with lakes drying up and a reduction in river flow in the arid and semi-arid region which has

resulted in fewer water supplies for use in agriculture, hydropower generation, and other uses. The main suspect for all this havoc is Climate Change. The Intergovernmental Panel on Climate Change (IPCC){13}and major scientific organizations of industrialized countries, as a result of several studies, have concluded that the increase in global temperature since the middle of the twentieth century has been due mainly to human-induced (anthropogenic) greenhouse gases concentration via the greenhouse effect; while the warming effect of natural phenomenon such as solar variation contributed a small warming effect from pre-industrial times to 1950, and from then a reverse cooling effect. The United Nations Framework on Climate Change (UNFCC){14-15} uses the term "Climate Change" for human-induced change while the term "Climate Variability" is used for changes due to *External Forcing* which is climate change caused by change in the global energy balance owing to fluctuations in the Earth's orbit, ocean circulation, and atmospheric composition. Understanding global warming and its impact is important to meet the challenges of the growing culture of loud music/noise through musical productions and merchandising and their likely impact on the environment. The debate over global warming has been going all around the world, Ighoroje {16} stated that while few consider it as the biggest challenge of all times, others consider it as a climate shift that occurred in early 90's and have fallen flat since then. Those who believe have their own scientific reasons to back their claims; others have their own reasons to disregard their theories. Issues on loud music production as a global-warming pollution into the environment in Nigeria and Africa in general especially, with our hot atmospheric condition, calls for a serious debate. Global warming produces an increase in global temperature which impacts directly on human life and the natural environment. Increasing global temperature is having serious effects and consequences for the world, including rising sea levels, changes in climate patterns, change in the amount and pattern of precipitation, and more severe weather including stronger tropical storms, droughts, and heat waves, likely

including an expanse of the subtropical desert regions. Other indicators of global warming include Arctic shrinkage and resulting Arctic methane release, shrinkage of the world's rainforest (already very damaged by deforestation from logging and farming), increases in the intensity of extreme weather events, changes in agricultural yields, glacier retreat, species extinctions and changes in the ranges of disease vectors. The recent natural disasters caused by tropical cyclones, hurricane; flooding in Bangkok Thailand, Australia, and India; sea level rise, heat waves in Europe, coastal erosion and flooding due to high precipitations are attributable to global warming and associated extreme weather conditions. In the Sub-Saharan Africa, there had been persistent drought and desertification in recent years {17}

When Al Gore first wrote his article on global warming in 2015, several arguments came up from certain scientists such as Eliot Spitzer who concluded that "global warming was real and that prior estimates of the rate of warming as submitted by Al Gore were correct. Humans are almost always the cause {18}. In a contrary argument, John R. Christy {19-20} widely publicized consensus reports that 'thousands' of scientists are misrepresentative of climate science, containing overstated confidence in their assertions of high climate sensitivity. Climate models overestimate the response of temperature to greenhouse gas increases. Also shown was a lack of evidence to blame humans for an increase in extreme events. The argument positioned that it is wrong to convict Carbon dioxide (CO2) of causing any of these events because they've happened in the past before Carbon dioxide (CO2) levels rose. It was argued that it is a simple fact that CO2 is plant food and the world around us evolved when levels of CO2 were five to ten times what they are today{21}.

Zannin (22} stated the following in his Senate Environment and Public Works Committee testimony on Natural Resource Adaptation: Protecting Ecosystems and Economies that there is no scientific proof that human emissions of carbon dioxide (CO2) are the dominant cause of the minor warming of the Earth's atmosphere over the past 100 years. If there were such a

proof it would be written down for all to see. No actual proof, as it is understood in science exists. In further disagreement with the above statement, a study of the decibel scale which attempts to capture the volume of sound from various sources in modern societies and specifically in Ile-ife is a confirmatory investigation to establish that human emissions of carbon dioxide (CO2) are the dominant cause of the minor warming of the Earth's atmosphere. However, to arrive at the results as seen in table 1, a noise integrating dosimeter (see figure 1) was attached to the employee's belt or waistband and a small microphone connected to the dosimeter by a thin microphone cord, was fastened to the body on the top of the shoulder at a point midway between the ear and outside of the shoulder.

Figure 1:

Figure 1: Noise Integrating Dosimeter

For the measurements, a windscreen was placed over the microphone to reduce or eliminate wind noise or artifact noise, which can occur if objects bump against an unprotected microphone. Dosimeters were typically set up to collect noise measurement data using three different settings for integrating noise to allow comparison of noise measurement results with the three different noise exposure limits referenced in most HHE reports, the OSHA Permissible Exposure Limit, OSHA Action Level, and the NIOSH Recommended Exposure Limit. During noise dosimetry measurements, noise levels below the threshold level were not integrated by the dosimeter for the accumulation of dose and calculation of time-weighted

average noise level. The dosimeters averaged noise at a rate ranging from one second to sixty seconds. (See Table1)

Table 1.**The Decibel Scale and associated noise sources**

Decibel Value	**Noise Source**	**Decibel Values& Loudness Description of Ile-Ife, Nigeria)**			
0	Threshold of hearing	Day Time		Night Time	
10	Quite whisper	Decibel	Loudness Description	Decibel	Loudness Description
20	Conversation	0-30	Excellent Quality	0-30	Excellent Quality
20-50	Quite conversation	31-40	Very good quality	31-40	Very good quality
40-45	Hotel/theater	41-60	Good quality	41-50	Good quality
50-65	Loud conversation	61-75	Satisfactory quality	51-65	Satisfactory quality
65-70	Traffic on busy street	76-90	Unsatisfactory	66-75	Unsatisfactory
65-90	Train	91-110	Hazardous quality	76-90	Hazardous quality
75-80	Factory (light medium work)	>110	Not allowed	>90	Not allowed
90	Heavy traffic				
90-100	Thunder				

110-140	Jet plane take-off				
130	Threshold of pain				
140-190	Space rocket take-off				

Source {23} *Source {24}*

The noise sources as listed in Table 1 are typical of Western society. When placed in African context, the list will have to be extended to include sounds from mosques and churches (which are growing in leaps and bounds in modern African societies), noise of school children, sounds from record shops, street vendors, generators, light/heavy ammunitions, music merchandising/promotion, live performances, street shows and so on. It is important to observe also that the phenomena listed in the decibel scale do not occur in isolation. For example, a factory will not stop working because a jet plane is taking off; neither will noise of heavy traffic cease when thunder strikes. It, therefore, means that in modern societies, experiencing noise from multiple sources amounted to several decibels of sound amplitude almost on a daily basis. Again, while most of the sounds generated by the sources listed in the decibel scale exist momentarily, musical shows may last for several hours which translates to several hours of 'charging' the atmosphere with continuous vibrations of molecules of air. Among other things, this paper will reflect on the theory that loudness relates to power and domination of space and seeks to understand why music/sound professionals, government agencies and music consumers in Africa have come to accept loudness as a way of life.

Music, the Arts, and Climate Change: A Review

Enendu {25}stated that although issues of climate change and global warming began more as scientific inquiries and discourses, recent history has shown that there are great academic and artistic interests in the arts and the environment. For example, Weber et al {26} stated that in

2009, Wallace of the environmental studies program of Ursinus College Pennsylvania compiled a list of 282 songs released by musicians on environmental issues, while photo exhibitions have been organized in other areas of thematic focus on climate change. It has also been reported that Michael Jackson was working on a song on climate change before his death.

Energy, climate change, and impact of different music delivery methods were the focus of a study by Weber et al {27}. This study assessed the energy and carbon dioxide emissions with alternative methods of delivering one album of music to a final consumer, either through traditional retail method or via e-commerce sale of compact discussing digital download services. Several issues have been raised on the subject of noise pollution as a related area of loud music production in Nigeria today. Many legislative arms of government have also discussed and called for immediate actions on noise pollution taking into account the health hazards of loud sound emission to millions of Nigerians. Such action was taken by the Lagos State House of Assembly through a motion ‘’ Need for Regulation of Noise Pollution in Lagos State’’ {28} calling on the executive governor of Lagos to embark a public enlightenment campaign to sensitize the public on the dangers of noise pollution. The Nations Newspaper also reported that Acoustics experts have warned that unless the government enforces laws that will prevent noise pollution, many individuals may become deaf {29}**.**Noise is our enemy. It is not only a loud enemy of our ears; it is also an enemy to the environment as it pollutes our surroundings. Constant exposure to loud noise according to Cai Q et al, {30} affects our auditory system; especially when it is above the normal 85 decibels (dBs). Noise above the normal decibels is capable of perforating our ear membranes which can result in a temporary hearing loss. Figure 1 shows a typical photograph of the types of horn speakers used by most churches, mosques and recorded music sellers in Ile-Ife and other parts of Nigeria:

Figure 2.

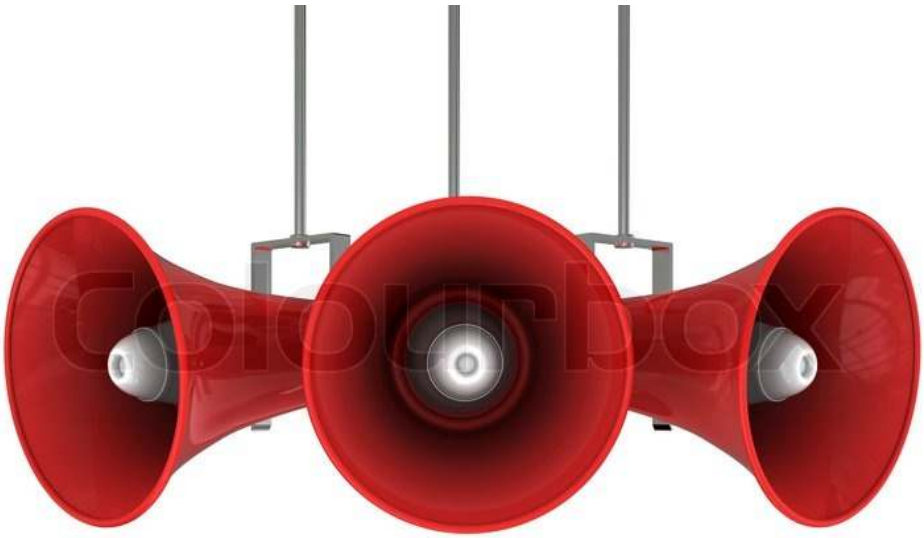


Figure 2: *Typical sample of Horn speakers used in most churches and mosques in Nigeria*

Music, especially the commercially promoted type, involves a long chain of human activities and energies. From songwriting to studio recording, cassette/CD duplication, live performances in theatres/ auditoria or open spaces, promotion and distribution of recorded music to the final consumer, the music production chain continually interacts with the environment as sonic, electrical, technological and industrial phenomena justifying its study as an anthropogenic factor in climate change as asserted by Holdren {31}

Recently, eateries, fuel filling stations, and motor garages are not left out in the notorious attitude of using loud sound/noise to shorten human life's span. Further observation was made by Finegold {32} that the risk of death from any cause was increased by 4% in areas with noise level over 60 decibels when compared to quieter areas. The argument further stated that Risk of death from ischemic heart disease was also increased by 3% in adults and 4% in the elderly in areas with daytime noise levels of 55-60 decibels when compared to areas with noise levels fewer than 55 decibels. In another study, it was also reported by

Emielu {33} that the incidence of hearing loss in the United States is approaching epidemic proportions. According to this study, a staggering one in three Americans now suffers some degree of hearing impairment, much of it is noise induced. Visits to some of these places have indicated that just at the entrance, you will be welcomed by the loud sound of more than 100dB emanating from the amplified speaker system which may make you think of a birthday or another celebration is on-going on these premises. The wattage of sound emanating from those speakers will leave customers partially deaf for about 2 minutes (120 seconds) after disengaging from the eatery, but little do the operators realize the dangers caused on the inhabitants of these areas where such eatery is located. Figure 2 is a photograph of an eatery named Tantalizer at Ile-Ife Nigeria with display of speaker system for sound amplification, which is a typical resemblance of the Tantalizer eateries nationwide:

Figure 3: Tantalizer eatery at Opa area of Ile-Ife, Picture was taken on July 15, 2015

Worship auditoria are not left out in this obnoxious attitude of loud sound production which is referred to (within the religious circle) as a strong element of praise. Nigerians are a set of people with high consciousness and regard for spiritual obligations and this is the reason for the great numeric strength of church attendees in Nigeria presently. Then the concept of sound perception worship places is subjective. Loud sound is equally relative because sound considered loud to one might not be loud to another. Cases have shown in several situations where a particular sound that has caused a discomfort to one has served as a tool for enjoyment to another. Sounds are perceived through hearing, hearing is achieved through the ear and the ear has a threshold of what sound it can accommodate. Any sound beyond what the threshold of human or animal ear can accommodate is considered as noise. Emielu {34} asserts that

> *''Sound is considered noisy when it is played at excessive volume with distortion of pure signals. It then becomes unpleasant to the human ear. A major distinction between sound and noise is that sound is regarded as noise when it becomes a source of inconvenience to the conveniences of man and animal. Noise pollution is not unique or peculiar to developing countries alone; it is a common occurrence and of highest magnitude in most of the advanced countries'*

However, as can be observed from the examples above, there is very little research if at all, on music and the environment in Africa. Yet, the threat of sound/noise pollution is currently on the increase in many African urban societies and the likely consequences of climate change and environmental is worth our academic attention. Nigerians live in a noisy environment and this is due to several human activities made through traffic, machinery and electronics which are barrages of sound. It was argued by Oyedepo {35} that almost everyone has had one experience of being temporarily "deafened" by a loud noise. This

"deafness" is not permanent, although it is often accompanied by a ringing in the ears, and one can hear another person if he raises his voice. Likewise, normal hearing comes back within a few hours at most. This sort of partial hearing loss is called Temporary Threshold Shift (TTS). For many years as a church musician, my argument has always been on the need to adequately treat the acoustics of a worship auditorium in order to meet the evolving challenges of loud sound production. There is the need to take into consideration what wattage of sound any room can accommodate? Speakers systems are set up in the church without proper acoustic consideration.

Sound Production, Transmission, Reception, and the Environment

The branch of physics which deals with sound is known as acoustics which can, therefore, be defined as the science that studies sound production, transmission, reception and the effects of sound in a given space or channel. In simple terms, the sound is thought of as the movement of air caused by a vibrating body. Anderton {36} asserts that “Sound is essential, the movement of air in the form of pressure waves, radiating from a source and radiating in all directions”. Three basic elements are needed to create sound: A vibrating body, a medium for the vibration to travel in and the resonating body who converts the vibration to a useable form. Vibrations are strong and get weaker with from the source. The speed at which the vibration travels is known as the speed of sound and is dependent on atmospheric pressure. Generally, it can be taken as 340,29m/s. However, it is very rare to have a simple state of a vibrating body, a medium, and a receiver because many things vibrate in our environment at the same time producing unwanted signals which we generally refer to as noise.

In all, according to Kadis {37} sound waves once generated move through the air causing ripples and changes in air pressure which we perceive as sound. Sound waves are longitudinal waves just like ocean waves; creating a crest and troughs (rising and falling

waves) as they move through the air. As such, there is a strong relationship between sound and atmospheric pressure or other climatic conditions basically as a result of latitudinal differences in temperature due to differential receipt of insolation which provides a partial explanation of differences in latitudinal pressure and also accounts for the differing behavior of sound in various places and enclosures. Generally, a sound wave is set in motion and is made to vibrate and is then transmitted usually through the air or atmosphere and received by the human ear.

The basic elements of sound include frequency (arising from the number of crest-trough combination per second), amplitude (loudness), and speed of travel as well as intensity (strength of signal). Music is generally referred to as organized sound that is pleasant to the ear while noise is defined as unorganized or unwanted sound that is unpleasant to the ear. However, Nagi {38} argued that it is important to point out that a very thin line exists between music and noise. Consequently, music can easily become noisy when it is played into the threshold of pain; it then becomes unpleasant to the human ear. Noise pollution is not unique or peculiar to developing countries alone; it is a common occurrence and of the highest magnitude in most of the advanced countries. For instance, Kapoor and Singh {39} assert that until the third century China used noise for torturing instead of hanging men for the dangerous crime. Similarly in India, until lately, noise considered grievous because traditionally, the remedy for noise pollution was a civil suit for a civil offense just like any other serious crime.

Loudness as Power and the Domination of Space

Schaffer {40} argued that “loudness relates to power”. While this assertion may be true, it should be stressed here that the idea that loudness relates to power is not typically African; given the acoustic nature of our instruments as well as performance contexts and audience

size. Rather, loudness as power and domination of space may be traceable to the West where the industrial revolution introduced not only electronic equipment with volume controls but most significantly, the technology of amplification and sound reinforcement which have come to define contemporary professional musical practice based on the effects of European incursion and eventual colonization. African musicians and their audience have inherited the *technology of loudness* as an essential aspect of contemporary musical performances. As Greene {41} rightly observes "as Western sound technologies are drawn into music making around the world, their hard wirings begin to structure local musical practices in certain ways, imposing their musical logics on societies that adopt them. In this sense, Thèrberge {42} stated that musicians have become not only producers of music but also significant consumers of technology. However, while industrial societies have evolved several laws to regulate loudness, most African nations do not have restrictive laws in this regard. Rather, for patrons, musicians, and marketers, loudness remains connected to social status and power which supports Schaffer's theory. The end result of all these is the creation of a sound culture of loudness. Few examples are provided here to buttress the points.

In the late 1990s, Benson and Hedges Cigarette Company tagged one of their series of musical shows '*Loud in Lagos'*. This show and many others which followed across Nigerian cities usually consisted of the heavy wattage of the sound generation which could be heard several kilometers from the venue of performance with the same frequency balance, amplitude and sound intensity. Since these pioneering efforts by Benson and Hedges, many other multi-national companies such as Nigerian Breweries, GLO, MTN, Airtel, Coca-Cola, and Pepsi have resorted to using very loud music and popular musicians as brand-marketing strategies in their so-called 'Road Shows'. Events such as 'Star Trek', 'Glo Show', Maltina and Malta Guinness 'Street Dance' among several others, have become important events that involve heavy wattage of music and sound reinforcement as well as gaseous emissions from

trucks that transport equipment, generating sets and possibly radiations from electronic/ICT equipment used. These phenomena, of course, have their implications on the environment either in the short or long run. It is the contention of this paper that as more and more companies and organizations join this bandwagon in what may be described in advertising terms as a '*war of brands'*, the music will keep on getting louder if only to enforce and re-enforce brand supremacy and command brand loyalty. While it has been argued above that loudness takes up social gatherings and activities, there is no mention of atmospheric space which sound occupies. Because sound travels through the air and is also conditioned by atmospheric pressure, it stands to reason that at certain sound pressure levels (SPL) which are even higher than the threshold of pain, the atmosphere may be saturated with loud sound and over time could lead to pollution and environmental degradation with resultant effects on human state of health. According to research published in *Environmental Health Perspectives{43},*long-term exposure to traffic noise may account for approximately 3 percent of coronary heart disease deaths (or about 210,000 deaths) in Europe each year. In professing a solution to heart disease death, Jones {44} suggested that one of the key ways is by lowering stress hormones such as cortisol, adrenaline, and noradrenaline, which, over time, can lead to high blood pressure, stroke and heart failure. One review of research by Gehring et al {45-46} showed that "arousal associated with night-time noise exposure increased blood and saliva concentrations of these hormones even during sleep. Noise pollution can harm human health in many ways, aside from heart ill-health and lead to hearing loss. Many of these are just beginning to be explored. For instance, a study on pregnant women by Green {47} found that exposure to noise pollution may lead to lower birth weight.

Nagata {48} in his discussion argued that 'loudness' syndrome has encroached into religious worship centers with the heavy wattage of sound blaring from Hi-fi equipment in churches,

especially the modern Pentecostal churches since the 1990s. There seems to be also a ‘war’ of sounds in churches today to win more converts or show superiority over their ‘less endowed’ colleagues without considering audience size and other implications for architectural and environmental acoustics. In some of the church services attended as part of data collection for this research, it was found out that any attempt to reduce the volume of music or the preacher’s microphone , was met with vehement resistance and sometimes open confrontation between the sound engineer and the pastor or musicians.

Moving away from the corporate arena, musicians, and their patrons have also resorted to a war of supremacy through sound amplitude and intensity. In Nigeria and in Ghana, for example, people are attracted to the venue of social ceremonies through loud noise/music rather than by invitation cards; the louder the music in a social gathering, the more successful is such ceremony. It is also a common practice for celebrants to show their affluence on such occasions by inviting many musical groups to perform in a singular social gathering. Buttressing the claim on the use of sound for social gathering and party celebration was the case of a funeral ceremony attended recently in Ile-Ife which had eight live bands playing simultaneously at maximum volume level to determine whose sound is the loudest. In such a situation, for example, loudness or amplitude became a selling point for the musician and also a sign of supremacy over one another. This action of multi-musicians performing at and for a particular occasion as orchestrated by a show of class syndrome was a reflection of Nigerian’s ignorance on the health dangers acquired through loud sound assimilation. Figure 3further expresses the speaker set up of a typical popular musician’s bandstand in Nigeria:

Figure 4: The speaker system of a band at a social function in Ile-ife.

Due to ignorance of the dangers of loud sound on human health, Nigerians appreciate loud music, especially under the influence of alcohol; this gives strength to the celebrant and guests alike. This is also an avenue to display wealth affluence as a tool for the oppression of the less privileged.

Use of Headphones as Sound Facilitator

A variety of sound systems is to be found in the variety of amplification systems in the form of headphones and earphones that come in all shapes and sizes. These devices are used improperly as they can cause permanent hearing loss. According to Oishi {49} 'Hearing is a complex sense involving both the ear's ability to detect sounds and the brain's ability to interpret those sounds, including musical sounds and the sounds of speech. Exposure to noise pollution, especially for younger people, has gone from huge boom boxes and car stereo speakers to sound delivered directly into the ear through headphones or earphones.

Hearing specialist Schessel {50-51} commented that Headphones and earphones appear to be the most damaging. Because noise-induced hearing loss is a result of intensity (loudness) and duration of exposure, Schessel writes that;

> *'these devices may be capable of inducing a permanent bilateral sensor neural hearing loss especially if they are used at a volume setting of four or above for extended periods'*

Schessel {52} further stressed to consider some loudness/time facts using decibel as a unit of measurement that:

at 95 dB, the damage will occur after four hours of exposure per day,
at 100 dB, the damage will occur after two hours of exposure per day,
at 105 dB, the damage will occur after one hour of exposure per day,
at 110 dB, the damage will occur after 30 minutes of exposure per day,
at 115 dB, the damage will occur after 15 minutes of exposure per day, and
at 120-plus dB, the damage occurs almost immediately.

The use of headphones is becoming most popular among Nigerians especially, youths between the teen ages and early adulthood. This practice, however, is also found among adults. Many Nigerians are not conscious of the danger inherent in the regular use of headphones or earphones which are probably a result of ignorance of the effects of the use of earphones. They probably enjoy the loud sound and ignore medical warnings on the dangers and effects these practices have on their health. Figure 5 (a-b) illustrates the existing various types of headphones and earphones and to reflect the ignorance of most Nigerians in the culture of the use of headphone.

Figure 5 (a & b):

(a) (b)

Figure 5 (a&b): Two types of the existing headphones and earphones commonly used by youths and adults in Nigeria

Some studies have found somewhat increased risks for temporary hearing damage from listening to music during strenuous exercise, compared to when listening to rest. Some Finnish researchers, such as Airo et al {53-54} recommended that exercisers should set their headphone volumes to half of their normal loudness and only use them for half an hour. With modern technology for the production of noise canceling headphones which are so effective that a person may not be able to hear oncoming traffic or pay attention to environmental factors has put many Nigerians in an untimely death. Airo considered loud music from headphones application as one of the general dangers caused by the users and can lead to dangerous health situations {55}

Sound Pressure and Measurement Level

Senturia {56-57} stated that the minimum acoustic pressure audible to the young human ear judged to be in good health is approximately 20 ×10−6 Pa, the minimum audible level called the *threshold of hearing.* For the normal human ear, pain is experienced at sound pressures of the order of 60 Pa; this level is the *threshold of pain {57}.* The Bel which is the logarithm of the ratio of two quantities, one of which is a reference quantity is employed in the sound measurement: to avoid a scale which is too compressed over the sensitivity range of the ear,

the decibel is introduced. The sound pressure level (SPL), in decibels (dB) which is often measured with a sound level meter, is obtained from this equation: SPL (dB) SPL (Db) =10log ($P^2rms/^2ref$)

The equivalent noise level using A-weighting was taken every fifteen minutes in each location between 6:00 am and 12:00 pm and the $L_{Aeq, T,}$ of each market center was calculated using the set of parameters below (See Table 2)

Table 2: The setting of parameters used for measurement for the study

Settings of parameters used for measurement	
Parameters	Settings
Meter fall-off speed	100 ms
Average interval between measurement	1 s
Sampling rate	High
Weighting	A
Automatic Gain Control	By-passed
Microphone	Enabled

Method of Data Collection

The application was launched on the phone in a quiet office and in a room in a quiet residential area for the purpose of calibration. The period of measurement was divided into three sections: 6:00 to 12:00, 12:00 to 18:00 and 18:00 to 21:00. Readings of average noise level were taken every fifteen minutes with the mobile phone held at ear level in each of the locations.

Discussion

The average noise level in the three major Markets in the city ranged from 93.33 to 105 dBA, 89.65 to 97.30 dBA and 89.89 to 92.3 dBA during the morning hours (6:00-12:00), afternoon hours (12:00-18:00) and evening hours (18:00-21:00) respectively. Noise in the markets is mostly from horns of vehicles, sound from loudspeakers of hawkers of different kinds of goods and noise from a conversation between people. As a result of the high level of background noise, traders have to shout to make themselves heard by customers. This accounts for the high level of the equivalent noise level in the markets from morning till evening (6:00 to 18:00) compared to the residential areas as shown in Table 1. The average noise level in the three residential areas under study in the city ranged from 81.75 to 96.04 dBA, 75.1 to 89.65 dBA and 85.71 to 98.09 dBA during the morning hours, afternoon hours and evening hours respectively. The noise level is higher at Ijigbo roundabout compared to other residential areas because it is at the heart of the city. Noise in this location is caused by vehicles and commercial activities.

Table 3 Noise generation level (dBA)

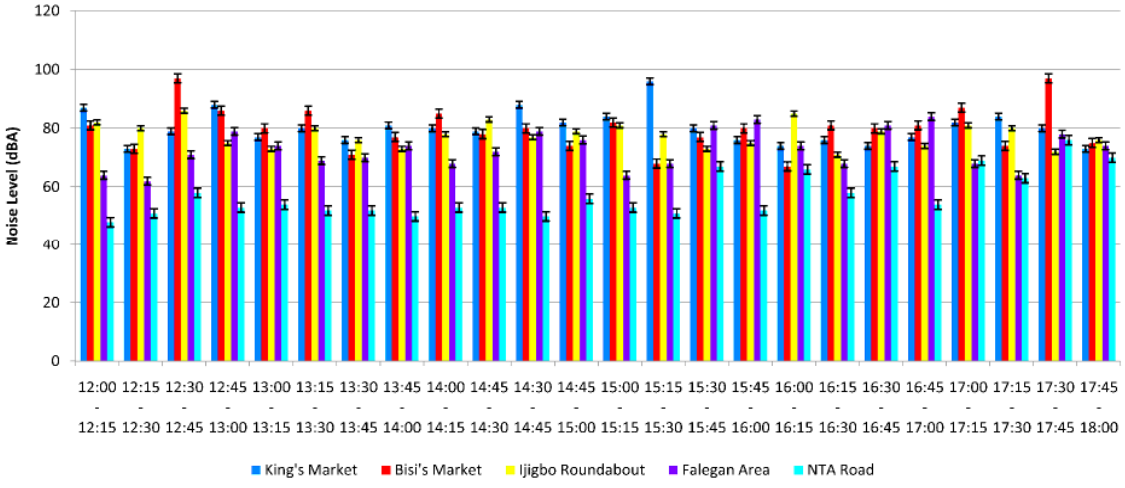
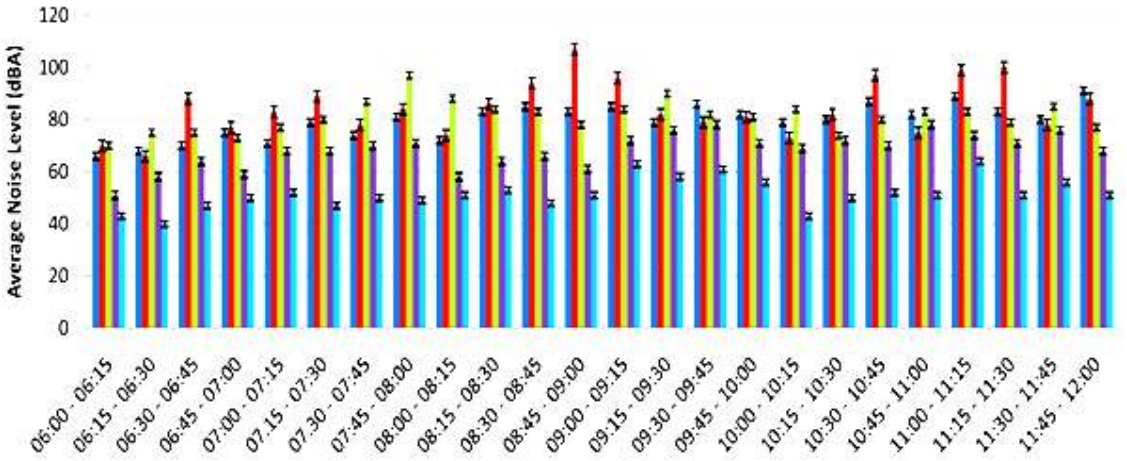


Table 4 Average Noise Generation Level



The relevance of figures 3and 4 is to show how Nigerians are daily exposed to the noise level of between 89-90 Db or more.

Table 3. Average noise level at the locations between 6:15 am and 9:00 pm. (Overall Result)

	Time of Measurement			
Locations	6:15 hr-12:00 hr (Average (dBA)	12:15 hr-18:00 hr Average (dBA)	18:15 hr-21:00 hr Average (dBA)	Average of Noise Level in Each Study Area
King's Market	93.33	94.98	89.89	92.73
Ijigbo Roundabout	96.04	89.65	98.08	94.59
NTA Road	85.71	75.10	79.64	80.15
Bisi Market	105.40	97.30	92.30	98.33
Falegan Area	81.75	86.78	85.71	84.74
Average of Noise Level in All the Study Areas between 6:15 hr-12:00 hr	**92.46**	**88.76**	**89.14**	
			Total Average---	**90.12**

The average noise level in all the locations for the study between 6.15 am and 9.00 pm as provided in table 4 gave an insight into how Nigerians, either actively or passively, are daily subjected to noise average of between 89.65 minimally and 90.12 maximally. This has a great

health implication on the citizens. The daily assimilation of noise decibel per day is higher than the recommended value of 60 dBA by World Health Organization (WHO)

The Way Forward

The problems of noise pollution in Nigeria are widespread. Several studies have shown that noise levels in metropolitan cities exceed specified standard limits. A study by Ugwuanyi et al {58} conducted a research in Makurdi, Nigeria found that the noise pollution level in the city was about 3 dB (A) to 10 dB (A) above the recommended upper limit of 82 dB (A). Anomohanran {59} also found that the peak noise level at a road junction in Abraka, Nigeria to be 100 dB (A) Ochuko {60}) states that, this noise level is higher than the recommended level of 60 dB (A) for commercial and residential areas. Ochuko {61-63} investigated the level of noise pollution in selected industrial locations in Benin City, Nigeria. The average ambient noise level in Sawmills, Electro-acoustic market, and food processing industrial areas was measured to be above 90 dB (A). In the United States of America for example, out of about 32 environmental laws, provision is made for noise control. The US noise control act {62} of 1972 establishes a national policy to promote an environment for all Americans from the noise that jeopardizes their health and welfare. The United Kingdom too has environmental laws including legislation on noise {63}. Of great significance is the formation of The Noise Abatement Society in the U.K. established by John Connell. Georgiandou {64} accounted that in 1960, Connell successfully lobbied the noise abatement act through parliament, establishing for the first time in the U.K. that noise is taken as a statutory nuisance. Cohen {65}, however, submitted that over the years, the society has been involved in creating awareness and education about sound and the use of sound. Due to the ignorance of Nigerians about the existing close nexus between noise pollution and sustainable city, little or no attention is paid to the control of noise pollution. The execution and implementation of the laws as regard environmental pollution are never effective to the letter. It is observed that

the persistence of this problem could endanger the future stability of human health and could aggravate the human health catastrophe in the fast growing cities in Nigeria.

The first approach and an effective measure of abating noise pollution are to control through heavy taxation on the so-called celebrants and the performing musical band. Moreover, a maximum volume level of sound production in the public should be prescribed in order to maintain a particular sound volume which will commensurate with the ideal sound level expected, though, this measurement of an ideal sound level is equally subjective.

Secondly, the use of a combination of barriers as noise barriers is among the most common alleviative measures used. They are most effective if they break the line of sight between the noise source and the receptors being protected, and if they are thick enough to absorb or reflect the noise received. Various materials and barrier facade patterns have been extensively tested to provide maximum reflection, absorption, or dispersion of noise without being aesthetically ugly.

Conclusion and Recommendations

This study has drawn attention to an important and emerging area of discourse in the arts which may advance death. A number of action plans can be taken to abate the environmental noise pollution in Nigeria. People are not expected to spend more than two hours at social gatherings and not more four hours per day in the markets; those whose major sources of income involve selling in these markets may consider the use of ear protective devices. Awareness about harmful effects of loud music/ noise among people is very low, hence the generation and exposure to excessive noise.

The paper observes that while some attention is currently being paid to music and climate change, the issue of loud music and noise pollution from such occurrences have been ignored.

Our societies, especially in Africa, are becoming very noisy in the name of musicality and over time, this may constitute environmental hazards through distortions in atmospheric pressure. Although establishing a direct relationship between noise/music and climate change will require a multi-disciplinary research over several years and in several climatic and cultural zones, this paper concludes that loud music and noise are subtle agents of environmental degradation. It also submits that electrical/electronic equipment used for sound production and re-enforcement could also cause environmental hazards through some forms of radiations and gaseous emissions. Owing to the increasing noise levels occasioned by very loud music and other agents in African cities, the time has come to begin legislation on noise control. It is recommended that acceptable optimal standards of sound production either in enclosures or in open spaces should be established for effective sound control. More importantly, a lot of awareness and advocacy should be carried out in order to sensitize the citizenry on the dangers of very loud music which most times translate to noise. Finally, it is recommended that sound/noise pollution should form part of the environmental policies of African nations.

References

1. Preventing Occupational Hearing Loss: A Practical Guide Edited by John R. Franks, Mark R. Stephenson, and Carol J. Merry. U.S. Department of Health and Human Services, Public Health Service Centers for Disease Control and Prevention. National Institute for Occupational Safety and Health Division of Biomedical and Behavioral Science Physical Agents Effects Branch 2011
2. Newman, Edwin B. "Speech and Hearing". American Institute of Physics handbook. New York: McGraw-Hill. 1972. pp. 3–155.
3. Atic Nedzad, et al. "NERC compliant decentralized load frequency control design using model predictive control." Power Engineering Society General Meeting, 2003, IEEE. Vol. 2. IEEE.
4. Bies, D and Hansen, C. *Engineering noise control: Theory and Practice*. New York: E & FN Spon Press. 2009.
5. Ballon, G. *A Sound Engineer's Guide to Audio Test and Measurement*. United Kingdom: Elsevier's science and technology Ltd 2000.
6. www.google.com/comments/Algore/climatechange accessed February16, 2016
7. Ochuko, A. Evaluation of Environmental Noise Pollution in Abuja, the Capital City of Nigeria. *IJRRAS*, 14, 2013, pp. 470-476.
8. Anomohanran .O, Iwegbue C.M.A, Oghenerhoro I.O and Egbai, I.J.C, Investigation of Environmental Noise Pollution Level of Abraka in Delta State, Nigeria, Trends in Applied Sciences Research 3 (4) 2008, pp. 292-297.Intergovernmental Panel IPCC-xx/doc. 2 on climate change Twentieth session agenda item: 2 Paris, February 2003. Pg.19-21
9. Ijaiya, H. The Legal Regime of Noise Pollution in Nigeria. *Beijing Law Review*, **5**, 1-6. http://dx.doi.org/10.4236/blr.2014.51001 2014.
10. Ijaiya, H. The Legal Regime of Noise Pollution in Nigeria. *Beijing Law Review*, **5**, 1-6. http://dx.doi.org/10.4236/blr.2014.51001 2014.
11. World Health Organization (WHO) (2001) Occupational and Community Noise. Fact sheet Number 258, Revised February 2001, Geneva.

12. Ballon, G. *A Sound Engineer's Guide to Audio Test and Measurement*. United Kingdom: Elsevier's science and technology Ltd. 2000.
13. Assessing the Costs of Adaptation to Climate Change: A Review of the NUFCCC and Other Recent Estimates, August 2009. Pg. 63-65
14. Assessing the Costs of Adaptation to Climate Change: A Review of the NUFCCC and Other Recent Estimates, August 2009. Pg. 63-65
15. Assessing the Costs of Adaptation to Climate Change: A Review of the NUFCCC and Other Recent Estimates, August 2009. Pg. 63-65
16. Ighoroje, A.D.A., Marchie, C. and Nwobodo, E.D. (2004) Noise-Induced Hearing Impairment as an Occupational Risk Factor among Nigerian Traders. *Nigerian* Journal of Physiological Sciences, 9, 14
17. http://en.wikipedia.org/wiki/global_warming accessed March 26, 2016
18. www.google.com/comments/Algore/climatechange accessed February16, 2016
19. www.epw.senate.gov/US Senate Environment and Public Works Committee accessed February 2016
20. www.epw.senate.gov/US Senate Environment and Public Works Committee accessed February 2016
21. www.epw.senate.gov/US Senate Environment and Public Works Committee accessed February 2016
22. Zannin, P.H.T., Ferrera, A.M.C. and Szerametta, B. Evaluation of Noise Pollution in Urban Parks. Environmental Monitoring Assessment, 118 2006 pg. 423-433,
23. Encarta Premium Dictionary, 2009
24. Data Collection on Ile-Ife residents
25. Enendu, L.O.M. "Sound Recording in Theatre Planning and Installation 1994 pg.24-26
26. Weber, L, Koomey, J. and Matthews, S. "The Energy and Climate Change Impact of Different Music Delivery Methods". U.S.A. 2007. pg. 215- 216.
27. Weber, L, Koomey, and Matthews, S. "The Energy and Climate Change Impact of Different Music Delivery Methods". U.S.A. 2007. pg. 215-216.
28. www.thenationonline accessed October 2015.
29. www.vanguardonline accessed October 2015
30. Cai, Q. Patel M, Coling D, and Hu. B.H. "Transcriptional changes in adhesion – related Genes as site-specific during noise-induced cochlear pathogenesis". Neurobiology of disease 2012 pg.723-732
31. Holdren, J. P. Climate-Change Science, and Policy: What Do We Know? What Should We Do? Keynote Address, Kavli Prize Science Forum, International Cooperation in Science, Oslo, September 6, 2010
32. Finegold, L.S., Harris, C.S. and von Gierke, H.E. Community Annoyance and Sleep Disturbance; Updated Criteria for Assessing the Impact of General Transportation Noise on People. *Noise Control Engineering Journal*, 42, 1994 pg.25-30
33. Emielu, Austin. 'Nigerian Highlife Music' Centre for Black and African Arts and Civilization. 2013, (pp. 45-56)

34. Emielu, Austin. 'Nigerian Highlife Music' Centre for Black and African Arts and Civilization. 2013, (pp. 45-56)
35. Oyedepo, S.O. and Saadu, A.A. (2010) Evaluation and Analysis of Noise Levels in Ilorin Metropolis, Nigeria *Environmental, Monitoring, and Assessment*, 160, pg. 563-577.
36. Anderton, Craig. *Home Recording for Musicians.* New York: Amsco Publications.1978. pg. 8-10)
37. Kadis Jay. The Science of Sound Recordings. Focal Press, Elsevier 225 Wyman Street, Waltham, MA 02451, USA, 2012. pg. 27-28
38. Nagi G.K, Dhillon M.K., and Dhaliwal G.S. 'Noise Pollution. New Dehli: Common Wealth Publishers. (1999)
39. Kapoor B S and Singh, K. Noise the Insidious Killer", The Tribune of 25 November, 1995. Pg.16
40. Schaffer A.H. Noise and its effects, Administrative Conference of the United States. 1991
41. Greene, D. Paul and Porcello Thomas 'Wired for Sound: Engineering and Technologies in Sonic Cultures. Middletown Connecticut. 2005 pg.65
42. Thèberge, Paul. Any Sound You can Imagine: Making Music /Consuming Technology. Middletown Connecticut. 1997 Pg.6-69
43. Environ Health Perspectives. 2007 November; 115(11): A536–A537.
44. Jones. D.M. Chapman A.J. & Auburn T.C.(1981) "Noise in the Environment: Social Perspectives". www.medscape.com/viewarticle accessed on 14/06/2015
45. Gehring U, Tamburic L, Sbihi H, Davies HW, Brauer M. Impact of noise and air Pollution on pregnancy outcomes. 2014, www. US National Library of Medicine, National Institute of Health, accessed April 22, 2016
46. Gehring U, Tamburic L, Sbihi H, Davies HW, Brauer M. Impact of noise and air Pollution on pregnancy outcomes. 2014, www. US National Library of Medicine, National Institute of Health, accessed April 22, 2016
47. Greene, D. Paul and Porcello, Thomas (2005). Wired for Sound: Engineering and Technologies in Sonic Cultures. Middletown Connecticut: Wesleyan University Press.
48. Nagata, M. Church Acoustics, Nagata Acoustics News. Vol. 01-9, Nos. 165. 2001
49. Oishi and Schacht, J. "Emerging treatments for noise-induced hearing loss". Expert Opinion on emerging drugs 2011.Vol. 16 (2): pp. 235–45.38.
50. Schessel DA, Recurrence rates of acoustic neuronal in hearing preservation surgery. *Am J Otol* 1992; 13:233-5
51. Schessel DA, Recurrence rates of acoustic neuronal in hearing preservation surgery. Am J Otol 1992; 13:233-5
52. Airo, Erkko; J. Pekkarinen; P. Olkinuora. "Listening to music with earphones: An Assessment of noise exposure," *Acustica–Acta Acustica*,1996. pp. 82, 885–894
53. Airo, Erkko; J. Pekkarinen; P. Olkinuora. "Listening to music with earphones: An Assessment of noise exposure," *Acustica–Acta Acustica*, 1996. pp. 82, 885–89.
54. Airo, Erkko; J. Pekkarinen; P. Olkinuora. "Listening to music with earphones: An

Assessment of noise exposure," *Acustica–Acta Acustica*, 1996. pp. 82, 885–89.
55. Airo, Erkko; J. Pekkarinen; P. Olkinuora. "Listening to music with earphones: An Assessment of noise exposure," *Acustica–Acta Acustica*, 1996. pp. 82, 885–89.
56. Senturia BH, Marcus MD, Lucente FE. Diseases of the External Ear-An Otologic-Dermatologic Manual. New York: Grune & Stratton; 1980
57. Senturia BH, Marcus MD, Lucente FE. Diseases of the External Ear-An Otologic-Dermatologic Manual. New York: Grune & Stratton; 1980
58. Ugwuanyi J.U, Ahemen.I and Agbendeh A.A, "Assessment of Environmental Noise Pollution in Makurdi Metropolis, Nigeria", J. Pure Appl. Sci. 2004. 6(2), 134-138,
59. Anomohanran .O, Iwegbue C.M.A, Oghenerhoro I.O and Egbai, I.J.C, (2008) Investigation of Environmental Noise Pollution Level of Abraka in Delta State, Nigeria, Trends in Applied Sciences Research 3 (4): 292-297
60. Ochuko, A. (2013) Evaluation of Environmental Noise Pollution in Abuja, the Capital City of Nigeria. *IJRRAS*, 14, 470-476.
61. Ochuko, A. (2013) Evaluation of Environmental Noise Pollution in Abuja, the Capital City of Nigeria. IJRRAS, 14, 470-476.
62. Ochuko, A. (2013) Evaluation of Environmental Noise Pollution in Abuja, the Capital City of Nigeria. IJRRAS, 14, 470-476.
63. Ochuko, A. (2013) Evaluation of Environmental Noise Pollution in Abuja, the Capital City of Nigeria. IJRRAS, 14, 470-476.
64. Georgiandou, E., Kourfidis, K. and Ziomas, I. Exploratory Traffic Noise Measurements at Five Main Streets of Thessaloniki, Greece. *Global NEST*: *The International Journal*, 6, 2004, pg. 53-61.
65. Cohen, Sheldon. "Sound effects on behavior." *Department of Psychology*1981, pg 286.