



Noise Pollution in Onitsha Metropolis: Challenges and Solution

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Abstract

This study evaluated noise pollution in Onitsha metropolis, Anambra State, Nigeria in 2019. Noise levels were measured at forty sampling stations in the morning, afternoon and night within the study area for dry and wet seasons using modern noise level instruments. A control point was established at *Ideani/Nnobi* Junction with coordinates N 06° 05'.282" E 006° 55'.891" which was used as a reference point and for comparison with the sound levels recorded in designated locations. The results showed that the maximum noise level in the study area exceeded the Federal Ministry of Environment (FMEnv) limit by 7.8% in the dry season and by 13.11% in the wet season. Noise LAeq exceeded the NESREA LAeq limit by 29.89% in the dry season and by 33.44% in the wet season. The study indicated that the mean noise levels in the dry and wet seasons were within FMEnv limit of 90dB. It also showed that high noise levels were recorded around major junctions and market places within Onitsha, which are harmful to public health. The study further showed that transportation activities and trading activities at the market places are the main sources of high noise levels in the study area. Health impact assessment should be conducted in Onitsha metropolis for residents. State government should enforce compliance laws and regulate the activities of industries in the areas.

Keywords: Onitsha; Dry; wet; Noise; Level

1. Introduction

Onitsha is a metropolitan city located in Anambra State, Nigeria. It is known for its river port and as an economic hub for commerce, industry, and education. It hosts the Onitsha Main Market, the largest market in Africa in terms of geographical size and volume of goods. impact

Onitsha is one of such cities with high commercial activities that may contribute to noise pollution. Anthropogenic activities such as heavy truck movement, commercial vehicular movement, high vehicular traffic, heavy human congested/crowded areas, industrial activities, commercial market activities, mechanical workshop etc. may be the main causes of noise pollution in Onitsha metropolis ([1]. Primarily, man through his anthropogenic activities cause the noise pollution that bring threats to man and his environment [2]. Noise pollution, is an unwanted or excessive sound that can have deleterious effects on human health, wildlife, and environmental quality [3]. Noise pollution is commonly generated inside many industrial facilities and some other workplaces, but it also comes from highway, railway, and airplane traffic and from outdoor construction activities [4]

There are likely health issues that may arise from prevailing high noise level concentrations the public may be exposed to in the environment. It is noticeable that most residents of Onitsha metropolis are complaining of the noise pollution related diseases such as hearing loss, stress, high blood pressure, heart disease problems and some other health implications [5]. Sound is measured in decibels. There are many sounds in the environment, from rustling leaves (20 to 30 decibels) to a thunderclap (120 decibels) to the wail of a siren (120 to 140 decibels). Sounds that reach 85 decibels

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or higher can harm a person’s ears. Sound sources that exceed this threshold include familiar things, such as power lawn mowers (90 decibels), subway trains (90 to 115 decibels), and loud rock concerts (110 to 120 decibels) [6].

1.1. Description of the Study Area

1.1.1. Location

The study area coverage is approximately 16 kilometer square and is located in Onitsha commercial city and three adjoining LGAs. Onitsha metropolis comprises of Onitsha North LGA (Inland Town or Enu-Onitsha, Odoakpu, Omoba Phase 1 & 2 and Ose Okwodu), Onitsha South LGA (Fegge and Woliwo) in one hand and its environ (Part of Oyi, Idemili & Ogbaru LGAs) on the other hand (Fig.1). It lies in the outer fringes of Eastern Nigeria. The datum point is Borromeo/Ziks roundabout with latitudes N 06° 08'.801" and longitudes E 006° 48'. 831" and Control point at Ideani/Nnobi-Nkpor Rd junction in Idemili LGA which lies within latitudes N 06° 05'. 282" and longitudes E 006° 55'.891" . In the 2006 Nigerian census, Onitsha had an estimated population of over quarter a million people. Its urban area has been projected to reach around 6,000,000 inhabitants in 2021 [7]. Rapid urbanization in recent years negatively affects natural vegetation, local landscape and noise level [8]. Onitsha lies at a major east–west crossing point of the Niger River and occupies the northernmost point of the river regularly navigable by large vessels. These factors have historically made Onitsha a major center for trade between the coastal regions and the north, as well as between eastern and western Nigeria. These activities contribute to noise pollution in Onitsha.. There are basically two seasons obtainable in Onitsha zone in particular and Anambra state in general. These are the Dry and Rainy seasons. . But in recent time, there is death of exquisite harmattan, which has elicited complaints from farmers and agriculturists. These may not be unconnected with climate change and global warming as a result of mans’ activities, developments and insensitivity to nature and no thought or plan for environmental sustainability [9] [10] [11].

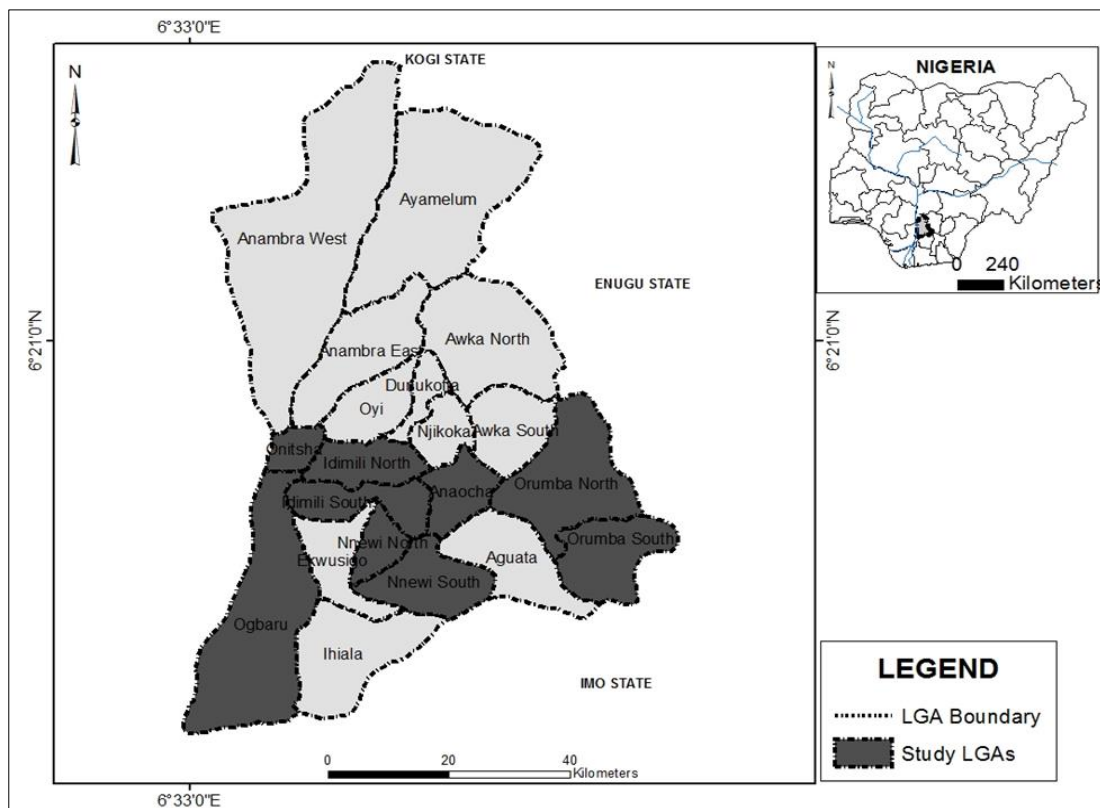


Figure 1 Map of Anambra State Showing Onitsha Metropolis

Onitsha commands most of commercial, agrarian and a few industrial activities activities in Anambra State, South East of Nigeria and the major commercial and business hub in the entire West African sub region [12]. Onitsha is the epicenter of the current Anambra state administration economic agenda to promote trade, commerce and industrialization without an appropriate Environmental Management to address noise pollution. The Orient Petroleum has commenced Oil and gas prospecting by Aguleri/Otuocha river thereby throwing open a window for a market for oil tools and equipment, which will further aggravate the already charged environment [13] (Pankajam et al 2005; [14] Efe 2006; [15] USEPA 2007; [16] Koku & Osuntogun 2007).

2. Material and methods

2.1. Field Sampling Techniques

The research adopted measurement of noise levels with the use of a Sound Level Meter (SLM) for field data collection using standard procedures. A total of forty sampling points and one control point were selected and used for the study across Onitsha metropolis. The sampling points were selected in accordance with World Health Organization [17] (WHO) 2005 guidelines for sampling point selection at the designated study areas (Fig.3).

2.2. Description of the Sound Level Meter

The Sound Level Meter (SLM) consists of a microphone, electronic circuits and a readout display (Fig: 2).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 SLM takes the sound pressure level at one instant in a particular location. The response rate is the time period over which the instrument averages the sound level before displaying it on the readout. With most SLMs, the readings can be taken on either SLOW or FAST response.



Figure 2 Digital Sound Level Meter 200663

To take measurements, the SLM must be calibrated before and after each use. Calibration is necessary as it helps to give accurate readings to avoid obscure figures.

2.3. Method of noise measurement

Table 1 Description of Sampling Point and Coordinates

S/N	Sampling Point Key	Sampling Point Location	Coordinates
1	SP 1	Upper Iwaka Flyover, Odoakpu	N 06° 07'. 892" E 006° 47'. 627"
2	SP 2	Ochanja Market Round-About Odoakpu	N 06° 08'. 446" E 006° 47'. 070"
3	SP 3	Modebe Avenue/Iwaka Road Junction Odoakpu	N 06° 08'. 693" E 006° 46'.801"
4	SP 4	Zik Avenue/Belewa Junction, Govt Field Fegge	N 06° 08'.259" E 006° 46'.521"
5	SP 5	Uga Road Building Materials/PH Road, Fegge,	N 06° 07''.976" E 006° 46'.437"
6	SP 6	Niger Head Bridge By Timber Market, Fegge	N 06° 07'. 898" E 006° 46'. 022"
7	SP 7	Main Market/Bida Road/Bright Street/ New Mkt Road Junction, Otu Onitsha	N 06° 09'. 014" E 006° 46'. 453"
8	SP 8	Oseokwa Odu Market/Main Market/ Old Mkt Road Junction, Otu Onitsha	N 06° 09' 305" E 006° 46' 452"

9	SP 9	Old Nkisi Road/Ridge Road (Holy Trinity) , European Qtrs	N 06° 09'.709" E 006° 46'.777"
10	SP 10	Akpaka GRA/Nigeria Prisons	N 06° 10'.232" E 006° 46'.735"
11	SP 11	Onitsha "33" Reserve Area	N 06° 09'.737" E 006° 47'.867"
12	SP 12	DMGS/All Saints Cath/Ziks Round About, Inland Town	N 06° 09'.164" E 006° 47'.311"
13	SP 13	Emmanuel Church St/Awka Rd/ St Mary Cath. Church Junction, Inland Town	N 06° 09' 101" E 006° 48'.081 "
14	SP 14	Savoy/Water Works Road/Awka Road Junction, Inland Town	N 06° 08'.792" E 006° 48'.673"
15	SP 15	Borromeo/Ziks Round About (Onosi Onira Retreat)	N 06° 08'.801" E 006° 48'. 831"
16	SP 16	Nkpor Junction	N 06° 08'.836" E 006° 50'.013"
17	SP 17	New Spare Parts Market/Enugu-Onitsha	N 06° 09'.099" E 006° 49'. 983"
18	SP 18	Oye – Nkpor/Awka Old Road Junction	N 06° 09' 173" E 006° 50'.740"
19	SP 19	St Peters/Tarzan/Nkpor Express Junction	N 06° 09'.502" E 006° 50'.613"
20	SP 20	Ogbunike Building Materials (Km 8 Onitsha-Enugu Express Road	N 06° 09'.918" E 006° 51'.448"
21	SP 21	UgwuNwasike Round- About/OldAwka Road	N 06° 09'.126" E 006° 51'.837"
22	SP 22	Abatete/Alor/Ogidi/Ideani Junction	N 06° 07'.658" E 006° 55'.740"
23	SP23	Eke Nkpor (Umuoji/Npor/Obosi) Junction	N 06° 07'. 550" E 006° 51'.740"
24	SP 24	Iyasele Obosi Road, Ukwu-Udara Junction	N 06° 07'.441" E 006° 50'.088"
25	SP 25	Akaora/Minaj Junction, Obosi	N 06° 06'.513" E 006° 49'.148"
26	SP 26	Idemili/Obosi Flyover	N 06° 05' 759" E 006° 48'.571"
27	SP 17	Open Waste Dump Opposite Metallurgical Training Institute.	N 06° 06'.134" E 006° 47'.980"
28	SP 28	Ngbuka-Obosi (Old Spare Parts Market)	N 06° 06'.400" E 006° 47' 947"
29	SP 29	Amanato/ Lord Chosen Church/ Transformer Junction	N 06° 06' 825" E 006° 47'.738"
30	SP 30	Eze Iweka/Ezenwa Junction	N 06° 07'. 771" E 006° 47'.814"
31	SP 31	14 Field Engr Regiment (Sign Post), Military Catonement, Onitsha.	N 06° 08'.300" E 006° 48' 689"
32	SP 32	Open Field Omoba, Phase 2	N 06° 09'.165" E 006° 49'.355"
33	SP 33	CKC/QRC/Ugwunakpankpa Junction, Woliwo	N 06° 08'. 506" E 006° 47'.499"
34	SP 34	Atani Road By Sir Tony Ezenwa Road Junction, Harbour Industrial Layout 1, Ogbaru LGA.	N 06° 07'.576" E 006° 46'314"
35	SP 35	New Era Goat Market/Batho-Way, Habour Industrial Layout 2, Ogbaru LGA	N 06° 07'. 337" E 006° 45'.966"
36	SP 36	Second Niger Bridge Head, Ogbaru LGA	N 06° 06'.928" E 006° 45'.949"
37	SP 37	GMO Company Road, Okpoko, Ogbaru LGA	N 06° 07'.073" E 006° 46'.468"
38	SP 38	Ogboefere Industrial Market, Okpoko	N 06° 07'. 428" E 006° 47'.671"
39	SP 39	New Heaven Layout, Okpoko (St Rita Cath Church/ Christ Holy Church)	N 06° 07'.419" E 006° 47'.054"
40	SP 40	New Heaven Layout 2 (Diocese Of Ogbaru, El Shalom Convent, Okpoko.	N 06° 07'. 223" E 006° 47' 237"
41	Control Point	Ideani/Nnobi Junction, Ideani, Idemili LGA	N 06° 05'.282" E 006° 55'.891"

The sound level meter was held upright at arms level in a suitable and stable elevation without shaking and turned *on* at the power button of the device. The display unit was observed closely as it measured the levels in decibels for actual, minimal and maximum readings. Noise measurement was carried out in all the sampling stations in the morning, afternoon and evening and the means taken.

It should be noted that before the field measurements, a reconnaissance visit was undertaken to establish the sampling points (Table 1). The control point is Ideani/Nnobi Junction with coordinates N 06° 05'.282" E 006° 55'.891" which was used as a reference point and for comparison of the sound level recorded in designated locations.

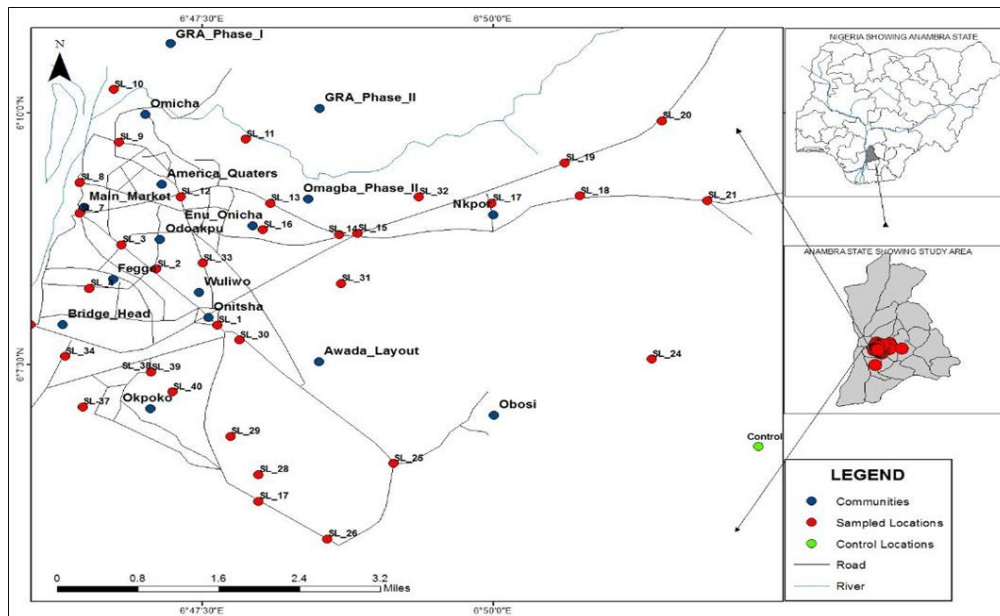


Figure 3 Map of Description of the Study Area

3. Results of noise measurement

Noise levels measured at the stations during the dry season (Table 2. and Figure 4) ranged from 47.33dB (A) to 97.0dB (A) with a mean value of 75.1dB (A) and a standard deviation of 14.60dB (A). A noise value of 28.3dB (A) was obtained at the control station (CP1) in the dry season. The minimum value of 47.33dB (A) was measured at station SP21 (Ugwu Nwasike Round- About/Old Awka Road); while the maximum value of 97.0dB (A) was recorded at station SP9 (Old Nkisi Road/Ridge Road (Holy Trinity)/European Qtrs). The mean value falls within FME nv limit of 90dB (A), while the maximum value exceeded the limit by 7.8%. The computed LAeq value for the dry season is 90.92dB (A); this value exceeded the NESREA LAeq limit of 70dB (A) by 29.89%.

Table 2 Mean Noise Levels Measured in the Study Area

Station	Dry season Noise (dB A)	Wet season Noise (dB A)
SP1	94.6	87.4
SP2	88.4	88.2
SP3	88.4	101.8
SP4	90.3	86.8
SP5	59.8	59.4
SP6	65.4	97.3
SP7	93.0	90.5
SP8	94.9	94.9
SP9	97.0	96.5
SP10	81.0	79.4
SP11	81.7	81.4
SP12	79.0	78.0
SP13	83.7	85.3
SP14	83.7	80.5
SP15	81.5	87.0
SP16	90.3	86.7
SP17	90.4	88.8

SP18	82.0	81.6
SP19	84.7	84.2
SP20	57.2	56.9
SP21	47.3	81.3
SP22	81.3	80.1
SP23	75.0	63.2
SP24	77.7	75.2
SP25	48.0	47.7
SP26	49.0	81.5
SP27	75.0	75.3
SP28	74.7	66.2
SP29	75.1	75.1
SP30	76.3	80.5
SP31	78.7	76.2
SP32	77.0	84.7
SP33	79.0	86.4
SP34	80.7	76.3
SP35	75.7	75.7
SP36	65.5	64.9
SP37	59.7	59.2
SP38	71.1	70.1
SP39	62.0	71.9
SP40	74.2	61.8
Range	47.3 - 97.0	47.7 - 101.8
Mean	75.1	77.5
Stdev	14.6	13.95
CP1	28.3	30.3
FMEnv limit	90	90

The wet season noise measured in the study area (Table 2 and Figure 4) ranged from 47.7dB (A) to 101.8dB (A) with a mean value of 77.5dB (A) and a standard deviation of 13.95dB (A). A noise value of 30.3dB (A) was obtained at the control station (CP1) in the wet season. The minimum value of 47.7dB (A) was measured at station SP25 (Akaora/Minaj Junction, Obosi); while the maximum value of 101.8dB (A) was recorded at station SP3 (Modebe Avenue/Iweka Road Junction Odoakpu). The mean value falls within FMEnv limit of 90dB (A), while the maximum value exceeded the limit by 13.11%. The computed LAeq value for the dry season is 93.41dB (A); this value exceeded the NESREA LAeq limit of 70dB (A) by 33.44%.

High noise levels were obtained at stations SP1, SP4, SP7, SP8, SP9, SP16 and SP17 during the dry season period as shown in Table 2. These noise levels exceeded the FMEnv permissible exposure limit of 90dB (A). Similarly, high noise levels were obtained at stations SP3, SP6, SP7, SP8 and SP9 in the wet season period. Again, these noise levels exceeded the FMEnv permissible exposure limit of 90dB (A).

4. Discussion

The maximum noise level in the study area exceeded the FMEnv limit by 7.8% in the dry season and by 13.11% in the wet season. Also, computed LAeq values exceeded the NESREA LAeq limit by 29.89% in the dry season and by 33.44% in the wet season. The study indicated that the mean noise levels in the dry and wet seasons fall within FMEnv limit of 90dB (A); it also showed that there are high noise levels around major junctions and market places within Onitsha,

which are hazardous to public health. The study further showed that transportation activities and trading activities at the market places are the main sources of high noise levels in the study area.

High noise levels of this sort has been observed at various junctions in the urban city of Port Harcourt [18] (Ugbebor, and Yorkor, 2015). The high noise levels at these stations can be attributed to transportation and market activities. Vehicular traffic around Iweka flyover, Belewa junction, old and new market road junction, old Nkisi road and Nkpor junction were major sources of high noise in these areas. In addition, trading activities around Onitsha main market and new spare parts market also contributed to high noise observed in these areas. [18] Ugbebor, Yorkor and Nwogu (2017) reported that market activities generated enormous noise, which adversely affects human health [8]th. They attributed market noise to the use of grinding machines, public address systems, generators, ringing of bells and shouting by traders.

Computed LAeq values in both the dry and wet seasons exceeded NESREA LAeq limit indicating high noise pollution in the study area [19]. The high noise values around the junctions and market places with Onitsha are hazardous to human health. People living and doing business around these areas are exposed to high noise pollution with potential risk of noise related health problems [20]. The people may experience both psychological and physiological noise effects such as hearing impairments, tinnitus, elevated blood pressure and annoyance. Physiological reactions resulting in cardiovascular and, vasoconstriction diseases may also occur [21]. Prolonged exposure to noise of value higher than regulatory limits can result in temporary loss of hearing (temporary threshold shift) or permanent loss (permanent threshold shift) [22]. The FMEV permissible noise limit for an 8-hour working period is 90dB (A), while the NESREA LAeq limit for daily exposure is 70dB (A) [23] [24].

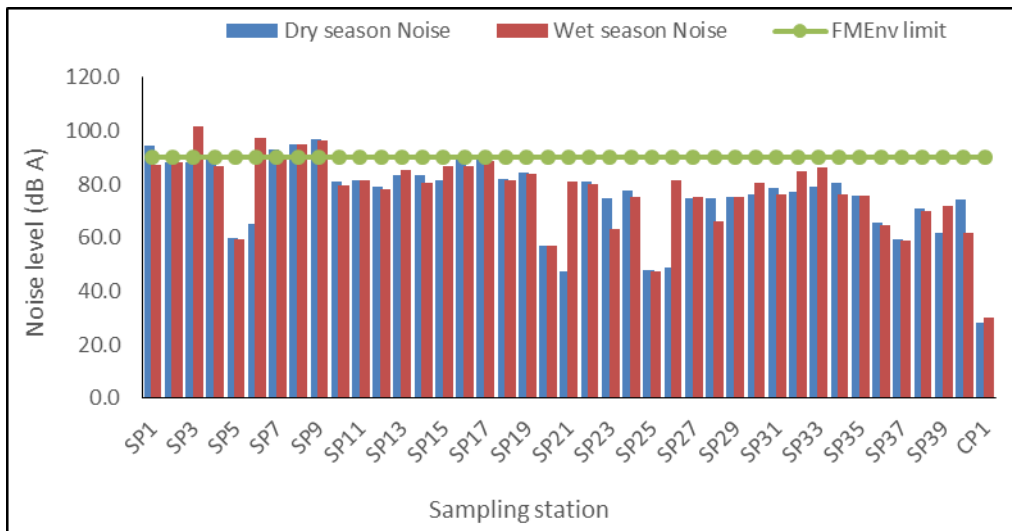


Figure 4 Measured Noise Levels in Comparison with FMEV Limit

5. Conclusion

The maximum noise level in the study area exceeded the FMEV limit by 7.8% in the dry season and by 13.11% in the wet season. Also, computed LAeq values exceeded the NESREA LAeq limit by 29.89% in the dry season and by 33.44% in the wet season. The study indicated that the mean noise levels in the dry and wet seasons fall within FMEV limit of 90dB (A); it also showed that there are high noise levels around major junctions and market places within Onitsha, which are hazardous to public health. The study further showed that transportation activities and trading activities at the market places are the main sources of high noise levels in the study area.

Recommendations

- The following recommendations are made based on the outcomes and findings of the study.
- Regular medical check-ups are required for residents of Onitsha metropolis.
- The State Government should enforce environmental compliance laws and regulate the activities of industries in the areas.
- Flyover bridges should be constructed at major junctions to reduce traffic congestions in Onitsha metropolis.

- Further studies should be carried out to assess the impacts of NOISE pollution on the health of the people of Onitsha metropolis.
- Advanced modelling should be carried out to evaluate the nonlinear relationship between NOISE, air pollutants and meteorological parameters

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest with the publication of the manuscript or an institution or product that is mentioned in this manuscript. Also there is no conflict of interests with the products that compete with those mentioned here.

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