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Noise Pollution Assessment of Selected Junctions in Warri Metropolis and its Environs

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ABSTRACT
This research work presents the characteristics of noise levels in some strategic locations within Warri and its environs. An MS6701 Digital Sound Level Meter of range 30-130 dBA, and a Geographical Positioning System (GPS) was employed to measure the noise level at 40 strategic locations (T-junctions) and ascertain the location coordinates within the study area for six days (morning and evening periods). The Analysis of the empirical results revealed that the noise levels of the study area was relatively high with value range of 67 dBA to 85.01 dBA for the morning and 66.10 dBA and 88 dBA for the evening period. The results obtained were validated using the Microsoft Excel, SPSS, and QGIS software and the output was used in generating a noise map of the study area. The n-percent exceedance level (L_{10} and L_{90}), Traffic Noise Index (TNI) and the Noise Climate (NC) values were calculated for both morning and evening periods. The average results obtained from these calculated noise levels parameters were all higher than 55 dBA as recommended by the World Health Organization (WHO) and the National Environmental Standards and Regulations Enforcement Agency (NESREA) for residential areas.
Keywords: Noise Levels, Traffic Noise index (TNI), Noise Climate (NC), Warri Metropolis.

1. INTRODUCTION

In most Africa setting today, noise pollution has virtually become an integral part of urban life. The urban dwellers are exposed to one form of disturbing sound, ranging from sounds of different kinds of aircrafts, vehicles, trains, conditioning equipment's, power plants, commercial buildings, and so many others.

When you consider these three trends; population growth, urbanization and increased production/industrialization to meet human needs, it is imperative to consider the attendant noise pollution that will be associated with it. A high growing, industrialized area translates to more machines and noise generating activities. Some sources of noise include industrial/commercial activities, air, rail and road transport, social/religious gatherings and electricity generators. Compared to air and water pollution, noise pollution has been given less attention, a situation which is hoped to change with more studies and awareness.

The United Nations Environmental programme considered noise pollution and provided some general guidelines for the public to consider when handling noise related matters. Many countries and states have also come up with their own guidelines relating to noise such as the state of New York ("Noise Code - DEP," 2007) and Lagos, Nigeria (LASEPA, 2019). Excessive exposure to noise is a public health concern posing auditory and non-auditory health challenges. A cursory view through literature shows that road traffic is a very common research area in noise-induced sleep disturbance. Other research areas include other transportation means such as aircraft and train noise, hospital noise and wind turbine noise. In Nigeria, Obisung et al. (2016) conducted an empirical and social survey on the impact of road traffic noise induced sleep disturbance across five southern Nigerian cities and reported that the sleep disturbance

rate during night and day times were above 90% from respondents and noise level measurements across the study area.

The social survey work of Park et al. (2014) offered an interesting insight into hospital noise and sleep disturbance. Participants in the study were said to have noted different perceived noise sources disturbing their sleep (such as machines for intensive care unit, and humans for medical wardrooms). The study conducted for a sample population of 103 hospital patients across 29 wardrooms showed that over 86% said they experienced sleep disturbance.

The effects of traffic noise are well-documented in different literature. The effect stretches beyond human to birds (Goodwin & Shriver, 2011; Ware et al., 2015; Templeton et al., 2016; Zollinger et al., 2020). Traffic noise has also been demonstrated to be an invisible source of habitat degradation close to roads (Ware et al., 2015). Traffic noise is also linked to increased risk of hypertension (Bluhm et al., 2007), cardiovascular diseases (Halonen et al., 2015) and central obesity (Pyko et al., 2015)

The populace of Warri metropolis and its environs are not left out in the discomfort and frustrations associated with noise pollution especially from major junctions in the study area. The frequency of complaints from people in this area over time concerning the laud noise generated has increased significantly. This lay credence to this study is carried out to evaluate the noise level of the area and provide preventive and control measure where necessary on the noise generated within the environment. The major focus of this research is on the average man living and working within the environment close to these junctions where harmful sound is likely to occur.

2. MATERIALS AND METHOD

2.1 Study Area

This research was conducted in Warri, Delta State, Nigeria, with the following coordinates 5°31'2.5''N latitude and 5°45.004'E longitude (Fig 1). The study area is the most populated town in Delta State located at the southern fringe of State with a size of 826 square kilometers with Agbarho, Udu and Uvwie as its suburb.

It is currently the economic nerve center of Delta State with many road networks and numerous industries such as refinery, seaport, and gas company. Warri is the busiest city in Delta State housing large numbers of socio-economic activities all through the day till night fall. These includes the presence of gas stations, petrol stations, malls, cinemas, supermarkets, clubs, bars, banks, restaurants, and shopping plaza. Other activities along major junctions and road networks in Warri include the presence of higher institutions of learning (Federal University of Petroleum Resources Effurun and Petroleum Training Institute Effurun), secondary and primary schools, churches, town halls, hospitals and residential buildings and offices.

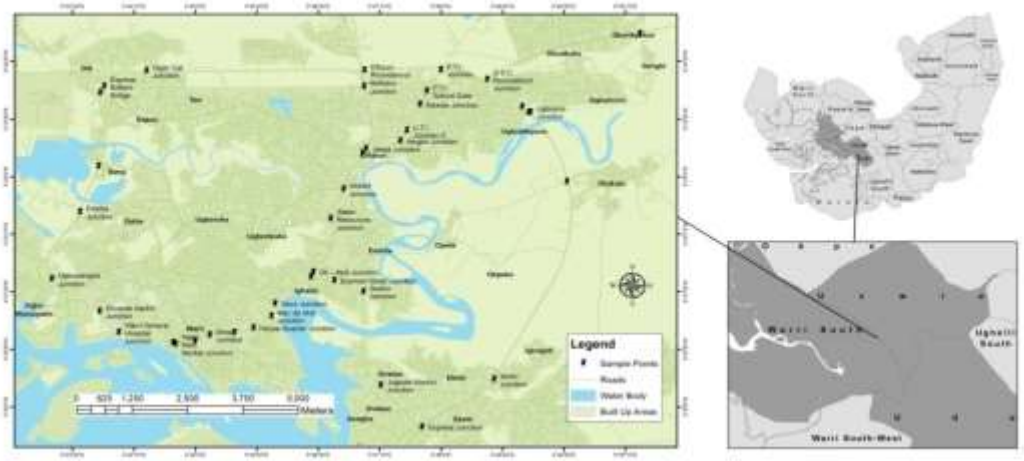

Fig. 1: Map of the study area

2.2 Data Collection

This study is executed by carrying out noise measurements at 40 strategic locations within Warri and its environs to determine the acoustic characteristics of the study area. The data was collected from 40 different junctions within Warri and its environs between the hours of 8am to 12 noon for morning section and 3pm – 7pm for evening section during workdays. An MS6701 Digital Sound Level Meter was held 1 m above the ground to avoid contamination, and also the geographical positioning system was employed to ascertain the location, and time synchronization, equipments were newly purchased hence it came well calibrated. Sampling locations considered in this study were categorized into their Local Government Areas as shown in Table 1 below.

Table 1. List of Junctions (40) grouped into their various Local Government Areas

UVWIE LGA	WARRI SOUTH & NORTH LGA	UDU & UGHELLI SOUTH LGA
Federal Junction	Deco Junction	Mofor Junction
Ugbromo Junction	Mac de Mot Junction	Express Junction
U.T.I Junction 1	Hausa Quarter Junction	Jugbale Market Junction
U.T.I Junction 2	Ginwa Junction	Otokutu Junction
Ugbologboso Junction	Okere Roundabout Junction	Sedico Junction
P.T.I School Gate	Warri Main Market Junction	
P.T.I Junction	Robot Road Junction	
Enerhen Motel Junction	Warri General Hospital Junction	
Orohmaro Junction	Ekurede Itsekiri Junction	
Alegbo Junction	Ugbuwangue Junction	
Refinery Junction	Express Bottom Bridge	
Jakpa Junction	Chevron Junction	
Masoje Junction	Warri Garage Junction	
Airport Junction	Edjeba Junction	
Water Resources Junction		
D.S.C Roundabout Junction		
Enerhen Junction		
Oil – field Junction		
Ekpan Junction by Express		
Niger Cat Junction		
Effurun Roundabout		

2.3. Noise Map of the Study Area

Noise maps were created using Inverse Distance Weighting (IDW) for different times of the day (morning, and evening). IDW is an interpolation tool used for interpolating the known set of point values over other parts of the area without values. It is available in QGIS (Quantum Geographical Information System) and other GIS (Geographical Information System) computer software. Unknown point values are computed from the weighted average of known point values.

It predicts that each given point has a local influence that shrinks with space; giving higher weights to points closest to the prediction spot based on a distance decay effect. This technique was applied to measure the spatial distribution of noise levels in the area over the six periods of the days. The plots are presented in Fig 2

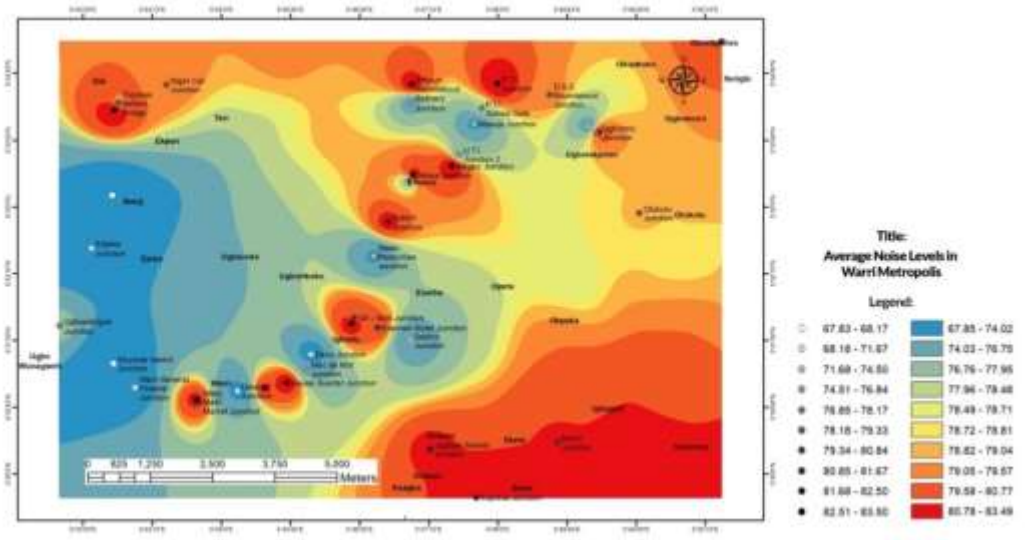

Fig 2 Morning and Evening noise levels of Warri and its Environ

Noise maps created after interpolation is presented in Figure 2. Noise levels were put against coordinates of the forty locations in the creating of the maps. A color gradient was applied to grading the noise levels from lowest (darker shades of blue) to highest (darker shades of red).

The legend of the map from Figure 2 shows that junctions coloured yellow to the red signifies higher noise values compared to other junctions due to commercial activities such as shops, fast food/eateries/restaurants, petrol station, music, and announcements from public address system, religious activities which sometimes hold along this junctions. The regions with the darkest blue hues signifies low noise values compared to other sample junctions because of lesser human activity and also with less traffic build-up which could be an indicator of why their noise levels were generally lower.

Other noise descriptors/indices like n-percent exceedance level (L_{10} and L_{90}), Traffic Noise Index (TNI), and Noise Climate (NC), were calculated to ascertain the lowest and highest values of the noise level. The n-percent exceeded level, Ln, describes the sound pressure level exceeded for n-percent of the measured time. L_{10} refers to the sound pressure level exceeded for 10% of the time while L_{90} is the level exceeded 90% of the time. Ln was calculated using graphical method.

Microsoft Excel and Statistical Package for the Social Sciences (SPSS) software was applied to analyze and validate the dataset while Quantum Geographical Information System (QGIS) was employed in developing a noise map of the selected strategic locations.

2. RESULTS AND DISCUSSION

The result of the average noise levels of the forty (40) junctions measured over six days were grouped into their various Local Government Areas as presented as shown in Tables 2 to 4. Analysis of the results revealed that the Petroleum Training Institute (PTI) has the highest noise value of 83 dBA and 84 dBA for both morning and evening while the Ekurede Itsekiri junction has the lowest value of 68.33 dBA and 67.33 dBA for both morning and evening, respectively. Analysis of the empirical result revealed that the measured 40 junctions were relatively high with range value of 67.33 dBA to 84 dBA, for both morning and evening periods respectively. The minimum and maximum measured noise Levels (in dB) was obtained to be 67 dBA and 85.01 dBA for morning, and 66.10 dBA and 88dBA for the evening, respectively.

Table 2 Average Noise Levels of Junctions Measured in Uvwie Local Government Area

Location Name (Uvwie LGA)	GPS Reading	Time of the Day	Mean	Standard Deviation	Variance
Federal Junction	N05˚34'.857"	Morning	82.67	2.52	6.35
	E005˚50'.424"	Evening	77.67	2.52	6.35
Ugbromo Junction	N05˚33'.836"	Morning	81.67	1.53	2.34
	E005˚.49'.089"	Evening	83.00	2.00	4.00
U.T.I Junction 1	N05˚33'.901"	Morning	72.67	2.52	6.35
	E005˚48'.988"	Evening	76.33	2.52	6.35
U.T.I Junction 2	N05˚33'.593"	Morning	77.33	2.52	6.35
	E005°47'.581"	Evening	76.00	2.65	7.02
Ugbologboso Junction	N05°33'.826"	Morning	80.00	1.00	1.00
	E005°49'.070	Evening	76.33	1.53	2.35
P.T.I School Gate	N05°34'.108"	Morning	79.66	1.53	2.34
	E005°47'.824"	Evening	76.67	2.08	4.33
P.T.I Junction	N05°34'.386"	Morning	83.00	2.00	4.00
	E005°47.996	Evening	84.00	2.00	4.00
Enerhen Motel Junction	N05°31'.641"	Morning	80.33	2.52	6.35
	E005°46'.694"	Evening	80.66	1.53	2.35
Orohmaro Junction	N05°33'.297"	Morning	77.00	2.00	4.00
	E005°47'.036	Evening	76.67	2.08	4.33
Alegbo Junction	N05°33'.456"	Morning	82.33	2.52	6.35
	E005°47'.500"	Evening	83.33	2.52	6.35
Refinery Junction	N05°34'.167"	Morning	76.00	1.00	1.00
	E005°47'.058"	Evening	75.00	1.00	1.00
Jakpa Junction	N05°33'.357"	Morning	82.33	2.08	4.33
	E005°47.082	Evening	82.00	1.00	1.00
Masoje Junction	N05°33'.932"	Morning	72.67	2.52	6.35
	E005°47'.741"	Evening	73.67	2.52	6.35
Airport Junction	N05°32'.832"	Morning	81.33	1.53	2.35
	E005°46'.807"	Evening	81.67	1.53	2.35
Water Resources Junction	N05°32'.444"	Morning	74.67	1.53	2.35
	E005°46'.650"	Evening	72.33	1.53	2.35
D.S.C Roundabout Junction	N05°34'.258"	Morning	77.33	2.52	6.35
	E005°48.562	Evening	81.33	1.53	2.35
Enerhen Junction	N05°31'.684"	Morning	81.67	1.53	2.35
	E005°46'.410	Evening	82.67	1.53	2.35
Oil – field Junction	N05°31'.745"	Morning	79.00	3.61	13.0
	E005°46'.436"	Evening	81.33	1.00	1.00
Ekpan Junction by Express	N05°34'.085"	Morning	82.67	2.52	6.35
	E005°43'.838"	Evening	82.67	2.08	4.33
Niger Cat Junction	N05°34'.372"	Morning	80.33	2.52	6.35
	E005°44'.403"	Evening	78.33	1.53	2.35
Effurun Roundabout	N05°34'.380"	Morning	82.00	2.00	4.00
	E005°47'.064"	Evening	82.00	2.65	7.02

Table 3 Average Noise Levels of Junctions Measured in Warri North & South Local Government Area

Location Name (Warri North &South LGA)	GPS Reading	Time of the Day	Mean	Standard Deviation	Variance
Deco Junction	N05°31'.342"	Morning	71.33	1.53	2.35
	E005°45'.971"	Evening	70.00	1.00	1.00
Mac de Mot Junction	N05°31'.179"	Morning	77.33	2.08	4.33
	E005°45'.927"	Evening	75.67	2.08	4.33
Hausa Quarter Junction	N05°31'.022"	Morning	82.67	2.52	6.35
	E005°45'.706"	Evening	82.33	1.53	2.35
Ginwa Junction	N05°30'.931"	Morning	73.33	1.53	2.35
	E005°45'.172"	Evening	70.00	1.00	1.00
Okere Roundabout Junction	N05°30'.852"	Morning	74.67	1.53	2.35
	E005°44'.995"	Evening	76.67	2.08	4.33
Warri Main Market Junction	N05°30'.811"	Morning	80.67	2.08	4.33
	E005°44'.757"	Evening	81.00	1.53	2.35
Robot Road Junction	N05°30'.833"	Morning	82.67	2.52	6.35
	E005°44'.726	Evening	81.00	1.00	1.00
Warri General Hospital Junction	N05°30'.968"	Morning	70.67	3.06	9.36
	E005°44'.062"	Evening	71.67	3.06	9.36
Ekurede Itsekiri Junction	N05°31'.239"	Morning	68.33	1.53	2.35
	E005°43'.830"	Evening	67.33	1.53	2.35
Ugbuwangue Junction	N05°31'.663"	Morning	77.67	2.52	6.35
	E005°43'.247"	Evening	78.00	2.65	7.02
Express Bottom Bridge	N05°34'.170"	Morning	81.00	2.00	4.00
	E005°43'.885"	Evening	76.67	4.16	17.31
Chevron Junction	N05°33'.128''	Morning	68.67	1.53	2.35
	E005°43'.817"	Evening	67.67	2.08	4.33
Warri Garage Junction	N05°30'.965"	Morning	80.33	2.52	6.35
	E005°45'.473"	Evening	82.00	1.00	1.00
Edjeba Junction	N05°32'.535"	Morning	70.00	2.00	4.00
	E005°43'.589"	Evening	70.00	1.53	2.35

Table 4 Average Noise Levels of Junctions Measured in Udu Local Government Area

Location Name (Udu & Ughelli South LGA)	GPS Reading	Time of the Day	Mean	Standard Deviation	Variance
Mofor Junction	N05˚30'.354"	Morning	80.33	2.52	6.35
	E005˚48'.646"	Evening	81.33	1.53	2.34
Express Junction	N05˚29'.733"	Morning	81.33	1.53	2.34
	E005˚47'.765"	Evening	82.00	2.00	4.00
Jugbale Market Junction	N05˚30'.276"	Morning	82.67	1.53	2.34
	E005˚47'.264"	Evening	80.00	2.00	4.00
Otokutu Junction	N05°32'.929"	Morning	79.33	1.53	2.35
	E005°49'.534	Evening	78.33	2.08	4.33
Sedico Junction	N05°31'.497"	Morning	72.67	2.52	6.35
	E005°47'.050	Evening	75.33	2.52	6.35

The Noise Climate (NC) which is the range of sound levels fluctuations over a period of time and the Traffic Noise Index (TNI) which indicates the variation analysis of sound levels in a given time frame were determined as contained in Table 5, 6, 7. Analysis of Table 5, 6, 7, revealed that at the various junctions (40), the Noise Climate is highest at Oil field junction with a value of 11 dBA while it has the lowest value of 2 dBA at Express Bottom Bridge Junction for morning period. During the evening period, Express Bottom Bridge Junction had the highest Noise Climate value of 13.0 dBA while Edjeba, Ginuwa, Deco, and Refinery are the lowest with values of 3.5 dBA. The high-pressure levels of L_{10} are likely due to intermittent or sporadic events such as traffic noise. L_{90} sound pressure levels are mostly associated with background or ambient level of a noise environment.

From Table 4, 5, 6, the traffic noise index (TNI) which is a variations in traffic flow for the 40 junctions, recorded the highest for morning to be 86 dBA at the Oil field Junction and lowest at Ekurede Itsekiri Junction (54.5 dBA). Express bottom Bridge (90.5 dBA) has the highest TNI in the evening while the lowest was at the Deco junction 52.0 dBA.

Table 5 L_{10} and L_{90} Exceedance Levels, Traffic Noise Index (TNI), Noise Climate (NC) calculated for Uvwie LGA

Location Name (Uvwie LGA)	Time of the Day	L_{10} (dBA)	L_{90} (dBA)	Noise Climate (NC) (dBA)	Traffic Noise Index (TNI) (dBA)
Federal Junction	Morning	86.5	78.5	8.0	80.5
	Evening	81.0	73.5	7.5	73.5
Ugbromo Junction	Morning	84.0	79.0	5.0	69.0
	Evening	86.0	79.5	6.5	75.5
U.T.I Junction 1	Morning	76.0	68.0	8.0	70.0
	Evening	79.0	72.5	6.5	68.5
U.T.I Junction 2	Morning	82.0	74.0	8.0	66.0
	Evening	81.5	74.0	7.5	64.0
Ugbologboso Junction	Morning	81.5	78.5	3.0	60.5
	Evening	79.0	74.5	4.5	62.5
P.T.I School Gate	Morning	81.5	76.5	5.0	66.5
	Evening	81.0	74.5	6.5	70.5
P.T.I Junction	Morning	82.0	79.5	2.5	59.5
	Evening	87.5	80.5	7.0	78.5
Enerhen Motel Junction	Morning	82.5	78.5	4.0	64.5
	Evening	81.0	73.5	7.5	73.5
Orohmaro Junction	Morning	80.0	73.0	7.0	71.0
	Evening	82.0	74.5	7.5	74.5
Alegbo Junction	Morning	87.0	79.0	8.0	81.0
	Evening	88.0	80.0	8.0	82.0
Refinery Junction	Morning	78.0	75.0	3.0	57.0
	Evening	76.5	73.0	3.5	57.0
Jakpa Junction	Morning	84.5	78.5	6.0	72.5
	Evening	83.5	79.5	4.0	65.5
Masoje Junction	Morning	76.5	68.0	8.5	72.0
	Evening	75.5	69.5	6.0	63.5
Airport Junction	Morning	84.5	79.5	5.0	69.5
	Evening	83.0	79.0	4.0	65.0
Water Resources Junction	Morning	76.5	72.0	4.5	60.0
	Evening	75.0	70.5	4.5	58.5
D.S.C Roundabout Junction	Morning	82.0	74.0	8.0	76.0
	Evening	86.0	77.5	8.5	81.5
Enerhen Junction	Morning	83.5	79.0	4.5	67.0
	Evening	86.0	77.5	8.5	81.5
Oil – field Junction	Morning	83.0	72.0	11.0	86.0
	Evening	84.0	79.5	4.5	67.5
Ekpan Junction by Express	Morning	86.0	78.5	7.5	78.5
	Evening	87.5	80.5	7.0	78.5
Niger Cat Junction	Morning	85.0	77.0	8.0	79.0
	Evening	81.5	76.5	5.0	66.5
Effurun Roundabout	Morning	85.0	78.5	6.5	74.5
	Evening	87.5	79.5	8.0	81.5

Table 6. L_{10} and L_{90} Exceedance Levels, Traffic Noise Index (TNI), Noise Climate (NC) calculated for Warri South & North LGA

Location Name (Warri South & North LGA)	Time of the Day	L_{10} (dBA)	L_{90} (dBA)	Noise Climate(NC) (dBA)	Traffic Noise Index(TNI) (dBA)
Deco Junction	Morning	74.0	69.0	5.0	59.0
	Evening	71.5	68.0	3.5	52.0
Mac de Mot Junction	Morning	79.5	73.5	6.0	67.5
	Evening	80.0	73.5	6.5	69.5
Hausa Quarter Junction	Morning	86.0	78.0	8.0	80.0
	Evening	85.0	80.5	4.5	68.5
Ginwa Junction	Morning	76.0	73.0	3.0	55.0
	Evening	71.5	68.0	3.5	56.0
Okere Roundabout Junction	Morning	76.5	72.0	4.5	60.0
	Evening	81.0	75.0	6.0	69.0
Warri Main Market Junction	Morning	84.5	78.0	6.5	74.0
	Evening	82.5	77.5	5.0	67.5
Robot Road Junction	Morning	86.5	78.0	8.5	82.0
	Evening	82.5	77.5	5.0	67.5
Warri General Hospital Junction	Morning	76.5	67.5	9.0	73.5
	Evening	77.5	68.0	9.5	76.0
Ekurede Itsekiri Junction	Morning	71.0	66.5	4.5	54.5
	Evening	70.0	65.5	4.5	53.5
Ugbuwangue Junction	Morning	81.5	73.5	8 .0	75.5
	Evening	79.5	75.0	4.5	63.0
Express Bottom Bridge	Morning	79.5	77.5	2.0	55.5
	Evening	81.5	68.5	13.0	90.5
Chevron Junction	Morning	70.5	65.5	5.0	55.5
	Evening	72.0	65.5	6.5	61.5
Warri Garage Junction	Morning	85.0	77.0	8.0	79.0
	Evening	83.5	76.5	7.0	74.5
Edjeba Junction	Morning	73.50	67.0	6.5	63.0
	Evening	71.5	68.0	3.5	52.0

Table 7 L_{10} and L_{90} Exceedance Levels, Traffic Noise Index (TNI), Noise Climate (NC) calculated for Udu LGA

Location Name (Udu LGA)	Time of the Day	L_{10} (dBA)	L_{90} (dBA)	Noise Climate(NC) (dBA)	Traffic Noise Index(TNI) (dBA)
Mofor Junction	Morning	85.0	76.5	8.5	80.5
	Evening	84.5	79.5	5.0	69.5
Express Junction	Morning	84.5	79.5	5.0	69.5
	Evening	85.0	79.0	6.0	73.0
Jugbale Market Junction	Morning	85.0	80.0	5.0	70.0
	Evening	83.0	77.0	6.0	77.0
Otokutu Junction	Morning	82.0	77.5	4.5	65.5
	Evening	80.5	74.5	6.0	68.5
Sedico Junction	Morning	76.0	68.0	8.0	70.0
	Evening	79.5	71.5	8.0	73.5

The analysis of the noise levels recorded in all locations for morning and evening periods were above 55 dBA for maximum acceptable noise levels for mixed residential areas as recommended by National Environmental Standards and Regulations Enforcement Agency (NESREA). With the noise levels above government permissible limits there is need for the government to consider noise abatement measures in order to curb the high noise levels.

Comparing results from other research, with the NESREA permissible limits for noise, it hence shows that they are above limits which are similar to what was obtained in this study.

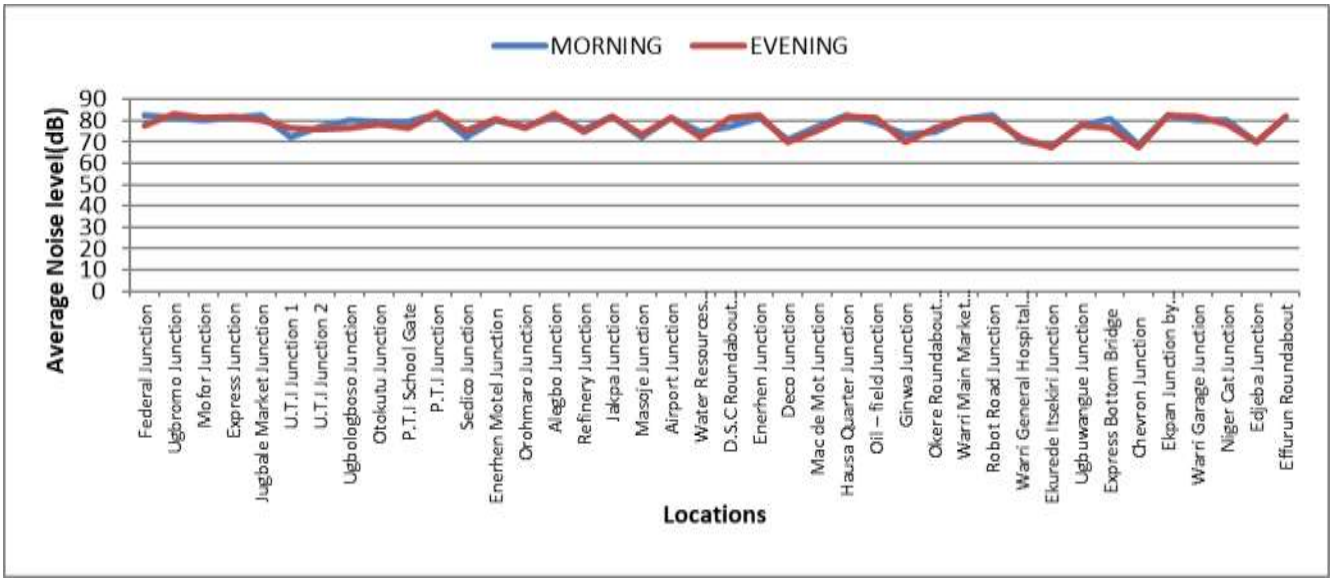

Fig. 3: Variations for Morning, and Evening periods

The result of the validation of data for morning and evening periods are presented as Figure 3, which illustrates that there is no significant difference between the analysis of the noise level measurements for both morning and evening periods, they both fall in same range due to the various activities going on in these busy junctions. Meaning that during morning and evening periods, the noise level in the study areas is high thereby it may lead to various effects (auditory and non-auditory).

Risk associated with Noise indices

Any traffic noise index above 74 dBA is considered a threshold value that can cause annoyance to human. Results from this study revealed the average traffic noise index is were above 74 dBA at Federal junction (morning), Ugbromo Junction (evening), Mofor Junction (morning), Jugbale market junction (evening), PTI Junction (evening), Alegbo Junction (morning and evening), DSC roundabout (morning and evening), Enerhen junction (evening), Hausa quarter junction (morning), oil field junction (morning), robot road junction (morning), Warri general hospital (evening), Ugbuwangue junction (morning), express bottom bridge (evening), Ekpan junction (morning and evening), Warri garage junction (morning and evening), Niger cat junction (morning), and Effurun round about (morning and evening). This high traffic noise value as observed in this study may have resulted from high vehicular traffic, tricycle riders, and vehicle honking and other human activities during that period and this could result in annoyance for residence at those periods of the day. The result further showed that there was no traffic noise index value lesser than 50 dBA with the least value being Deco junction (evening) at 52 dBA, this low value is as a result of low vehicular traffic and other activities as compared to other junctions with higher values. The overall results revealed that recommended permissible noise level during sleeping hour of 45dBA is not achievable in the study area, which calls for serious concern for the populace of warri and its environs and the government of the State for urgent need of noise pollution law or edict.

CONCLUSION

The Measurement of Noise Characteristics at some selected junctions in Warri, Delta state has been carried out. Forty junctions were selected in the study area from which noise level was measured with a noise level meter. Comparing the values of noise levels measured at the selected junctions which range from 66.10 dBA – 88 dBA with NESREA and WHO standards (55 dBA), indicates that the measured

values were above the standard limits for residential areas but within limits for commercial areas except for a few locations.

With the level of traffic noise measured, there is need for the redesigning of Warri city and its environs to re-classify the areas that should be designated as residential/schools, commercial and industrial to avoid noise pollution impacts that may be detrimental (hearing impairment) to residence and reading and learning inhibition of pupils of schools close to these junctions.

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