

GIS-BASED ASSESSMENT AND MAPPING OF NOISE POLLUTION IN BARIGA AREA OF LAGOS STATE, NIGERIA

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Abstract

Globally, environmental issues are assuming high proportions with antecedent impacts and consequences. Noise pollution is one of the most critical environmental challenges affecting human health. This study aims at utilising the spatial technology of GIS in assessment and mapping noise pollution in Bariga suburb of Lagos State, southwestern Nigeria. A total of 31 sampling locations were designed for the collection of data classified based on residential, educational, traffic and commercial land uses. The WHO standards were used as limits for the designated land uses. Noise recordings were conducted using three periods of the day – morning, noon and evening. GIS-based assessment using IDW spatial interpolation technique was used for the mapping of the recorded noise values across the study area. The lowest daily average of noise ranged between 67.2 dB(A) and 76.7 dB(A) across all the land uses. Lowest values were recorded in residential areas while higher values were detected in commercial and traffic areas. The computed noise index showed that all parts of the study area returned high index of above 55 dB(A) for comfortability and low annoyance response to noise when compared with WHO standard. Thus, it was recommended that strict design of noise index should be developed for the study area for safety and sustainable environmental development.

Keywords: Noise Mapping, Noise mapping Index, GIS, Environmental Pollution, IDW

INTRODUCTION

Environmental pollution such as air, water, hazardous waste and noise pollution has always been of global concern affecting both the public's health (Banerjee *et al*, 2009) and the planet's fragile ecosystems (Butler, 2004; Ugwuanyi *et al*, 2004). Environmental pollution is assuming dangerous proportions all through the globe and Nigeria as a country is not immune to this problem. The

concentration of environmental pollution is significantly increasing and causing serious threat to the quality of the environment (Wing and Kwong, 2006). Management of environmental pollution is a challenge, although there are many management techniques, the problem of environmental pollution remains relatively unchanged.

One of the serious issues of environmental pollution is noise. Noise entomologically is derived from the Latin word 'nausea' denoting 'undesirable sound' or sound that is loud, unpleasant or unexpected' (Chauhan *et al*, 2010). Noise is an unwanted sound experience and noise pollution in large urban areas is regarded as a growing problem of communities experiencing development in built environment. Noise pollution is a type of energy pollution in which audible distracting sounds are projected from a single or multiple sources leading to obliteration of any natural process or causes human harm. Studies have shown that more than 20% of the world population lives under unacceptable noise levels and nearly 60% of the European population is exposed to high noise levels during the day (Silvia *et al*, 2003). Most cities of Africa are also exposed to the threats of urban noise particularly from vehicles and related traffic activities (Ugwuanyi *et al*, 2004). Saadu *et al* (1998) affirmed that most metropolitan cities of southwestern Nigeria are vulnerable to high noise indices; thus residents are susceptible to hearing and audibility challenges owing to the intensity of the urban transport activities.

Generally, high exposure to noise can cause feelings of annoyance and irritation, damage to auditory mechanisms, number of health related effects like physiological disorders, disturbances of daily activities and performances, hypertension and ischemic heart diseases (Carter, 1996). Space technological applications in form of Geographic Information Systems (GIS) have been employed to map, monitor and

model the dynamics of acoustic patterns across the globe. Mapping of noise with the utilization of GIS commenced in the mid-90s in which two approaches were employed for development of noise maps – in-situ noise metre measurement and prediction modelling tools (de Henk *et al* 2003; Mohammed *et al* 2005). GIS tools have made it possible to generate noise prediction maps with respect to location of people and their sensitivity to noise (de Henk *et al*, 2003).

In Lagos, all governmental efforts aimed at curbing noise pollution have yielded little or no impact. In many parts of Lagos metropolis particularly the traditionally residential area such as Bariga, the issue of having a safe, secured and friendly environment with respect to noise is at the lowest informational ebb. In addition, the sources of noise although visible are not considered harmful to human health. Thus, noise pollution maps are not readily available, not even for any sort of environmental monitoring or academic purposes. It is on this background that this study is set out to map the spatial distribution of noise level and its impact on the immediate environment in Bariga. The associated objectives are; to understand the different noise levels within the identified land uses; to capture the quantum and distribution of noise in the study area within a given time of the day; and provide noise mapping index for the purpose of environmental decision-making.

MATERIALS AND METHODS

Study Area

Bariga is a suburban community located within Somolu local government area of

Lagos state, southwestern Nigeria. It is geographical defined within latitudes $6^{\circ} 31' 20''$ and $6^{\circ} 33' 30''$ North and longitudes $3^{\circ} 22' 0''$ and $3^{\circ} 24' 0''$ East (Fig. 1). It is bounded in the east by the Lagos lagoon, to the west by a Mushin Local government and the Lagos Mainland and Kosofe local government areas to the south and north respectively. The climate of the area fall within Koppen's AF wet equatorial forest climate. Throughout the year, temperature hardly falls below 20°C but averages about 22°C . The average annual rainfall is above 1830mm with some local variations. Elevation around

Bariga varies from about 2 meters to 10 meters above sea level. The study area can be categorized as residential with spots of commercial and educational land uses. As a key suburb of Lagos metropolis, movement of people from home to workplaces is the most essential source of traffic and transportation related noise. Infrastructures particularly road-based have remained quasi-constant over the years. Increase in the population of dwellers has not been complemented with improvement on road traffic and related facilities. Thus, moving vehicles oftentimes create the most noise.

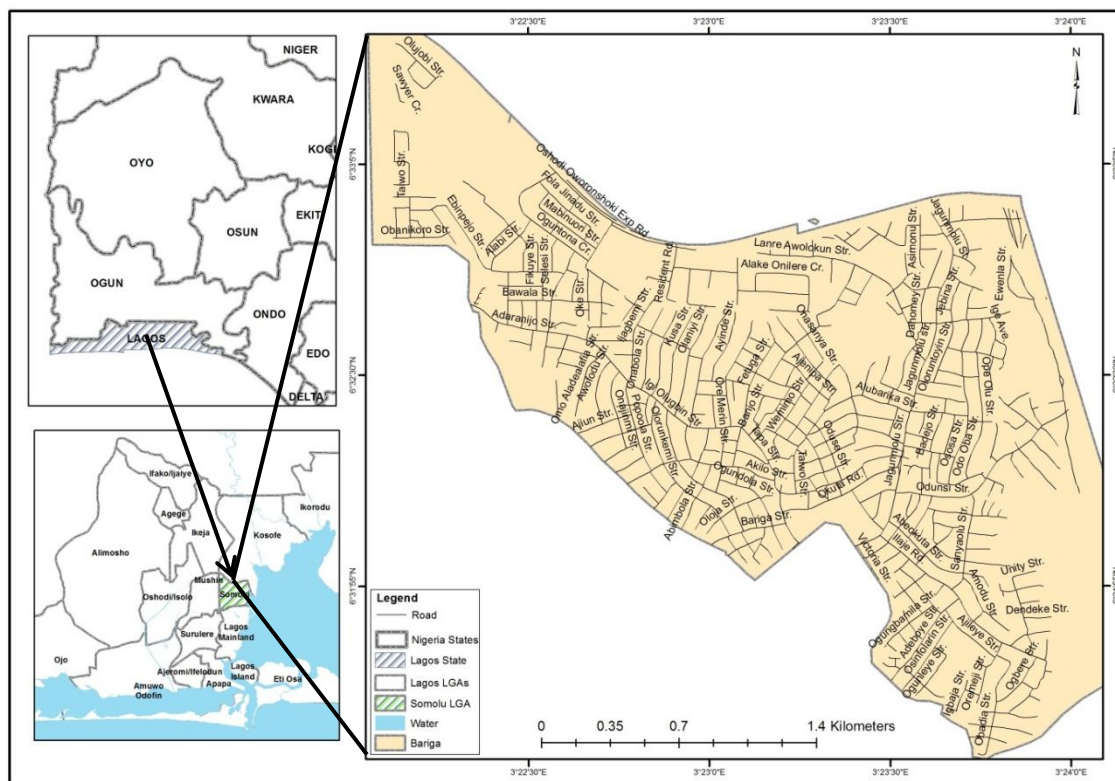


Fig. 1: The Study Area in Context of Lagos Metropolis and Nigeria

Source: (Laboratory for Remote Sensing & Geographic Information System, UNILAG 2013)

Data, Sources and Characteristics

Orthorectified *IKONOS* image of 2007 acquired from the archives of Laboratory in Remote Sensing and GIS, Department of Geography, University of Lagos was used as baseline data as well as delineation of roads. Extech 407730 sound level meter was used in collection of acoustic level data. A handheld Garmin 750 GPS was used for geolocation data and geotagging the noise values to the particular area of data collection. The GPS was configured to UTM Zone 31N based on WGS 1984 global datum which matches the location of the study area.

Noise level sampling and data computation

The sampling approach used is local administrative units coupled with land use category. Each land use was identified at the building footprint level i.e. based on

the use of the particular landed structure. Thus, residential, educational, traffic and commercial land uses were integrated into the sampling. Table 1 details the land use categories involved, the GPS coordinates and locations of data collection. Sound pressure values in decibels - dB(A) i.e. decibels in A-weighted scale were recorded for three periods of the day – morning, afternoon and evening. The data was collected between May 6th 2013 and June 1st 2013, on Mondays, Wednesdays and Saturdays, incorporating working days of the week and weekends. The noise assessment was conducted during morning (7-9 am), afternoon (12-2pm) and evening (5-7pm). Systematic noise indices were developed for appropriate and representative mapping as demonstrated by Saadu *et al* (1998) and Banerjee *et al*, (2009). These are;

- L_{eq-m} , L_{eq-n} and L_{eq-e} : hourly A-weighted equivalent sound level for the morning, noon and evening period;
- L_{m-n-e} : mean sound level for morning, noon and evening (MNE);
- NI : noise index, and
- L_{min} and L_{max} : minimum and maximum noise level during the sampling period

An estimation of the continuous sound level denoted as L_{eq} , was estimated from the recorded acoustic pressure level, this was necessary owing to challenges encountered in continuous data collection. This was computed using the equation;

$$L_{eq} (dBA) = 10 \log_{10} \left[\left(\frac{1}{N} \sum_{i=1}^N (10^{L_i/10}) \right) \right] \dots \dots \dots (1)$$

where,

L_i is the noise level i th reading and N denotes total number of recorded samples. These data were generated for the morning, noon and evening periods of the day as stated above. The morning, noon and evening L_{eq} equivalent were also used to compute the L_{m-n-e} values, which is a 12-hour equivalent on a continuous basis, and 5 dBA is added to evening time noise as a penalty mark. The L_{m-n-e} is expressed as:

$$L_{m-n-e} (dBA) = 10 \log_{10} \left(\frac{1}{12} \left[6 \left(10^{\frac{L_m}{10}} \right) + 4 \left(10^{\frac{L_n+10}{10}} \right) + 2 \left(10^{\frac{L_e}{10}} \right) \right] \right) \dots \dots \dots (2)$$

The noise index is a measure of annoyance behaviour of humans exposed to environmental noise, and this is estimated using the following mathematical expression;
 $NI (dBA) = 4X (L_{10} - L_{90}) + (L_{90} - 30)$ (3)
 where L_{10} (designated background noise) and L_{90} (highest noise) represent the percentile noise levels exceeded for 10% and 90% of the sampling period respectively.

Table 1: Distribution of noise mapping locations differentiated on Land use classes with respective GPS coordinates

Land use category	ID No	GPS Coordinates		Location name	Land use category	ID No	GPS Coordinates		Location name
		X	Y				X	Y	
Residential	2	542748	721627	Solanke Street	Traffic	8	543932	722258	Arobadade Street
	3	541002	723679	Obanikoro Street		14	543715	722550	Ososa Avenue
	4	542835	723992	Adeola Raji Avenue		15	544161	722715	Odunsi Street
	9	543711	722921	Ayoka Street		18	540955	724602	Olujobi Street
	10	542067	723313	Ojelade Street		21	542477	722312	Olorunkemi Street
	11	542630	723603	Lanre Awolokun Road		22	543360	722163	Ilaje Bus Stop
	13	541544	723358	Bawala Street		24	542764	722544	Ladi-lak Bus Stop
	17	542768	722952	Ayodele Street		27	540886	724064	Oyefeso Street
	25	543721	724126	Oke-Owo Street		29	543700	721887	Ilaje Road
	26	543522	721459	Oshinfolarin Street		30	542911	721196	Adeyinka Osijo Street
Educational	23	543734	721133	Community Road	Commercial	7	543275	722448	Abule Okuta Road
	31	543262	722288	Deji Aladejobi Street		16	543485	723215	Gbagada Road
	12	543272	721719	Council Obule Street		19	542678	722659	Tapa Street
Traffic	1	543322	723703	Safuratu Sekoni Street		20	543787	723606	Diya Street
	5	541696	723862	Fola Jinadu Street		28	543434	722509	Bariga Roundabout
	6	542274	722597	Kusa Street					

GIS interpolation technique for mapping

ArcGIS 10.1 software was used principally for mapping the recorded noise levels based on the computation itemised above. These values were mapped as points data relative to the specific location. To capture the adjoining areas and to cover the entirety of the study area, a contouring method was used based on IDW (inverse distance weighted) spatial interpolation

technique. Generally, interpolation predicts cell values in a raster format using a given albeit limited number of sample data. It is a veritable tool for prediction of unknown values for a given geographic point data which in this study is noise (Pamanikabud 1996, Anile *et al.* 2003, Yilmaz *et al.* 2005). IDW however explicitly implements the law of geography, which is pivoted on the hypothesis that closer

things are more related than those farther apart. For its prediction, IDW utilises the given values surrounding the predicted location. It predicts that each given point has a local influence that shrinks with space; thereby giving greater weights to points closest to the prediction location, based on distance decay effect. This process leads to the procedure being referred to as inverse distance weighted. This technique was applied to measure the spatial distribution and range of acoustics in the area for the three periods of the day.

DATA ANALYSIS AND RESULT DISCUSSION

Overall noise level in Bariga

The background understanding of this study is that different land uses generate different levels of noise. This assertion was centred on the WHO recommendations on the impact of environmental noise on

humans. As shown in Table 2, there are four different land uses identified in Bariga with different noise values related to sampling period of the day and the departure from the global standards. The noise level (L_{eq}) for each land use was coalesced with the average daily noise (L_{m-n-e}). Differences in time coupled with intensity of anthropogenic activities typify the quantum of noise generated. For instance, in the morning period, traffic areas generate the highest noise level while the residential areas have the least. In the afternoon, the same pattern subsists. At the evening period, the noise level increases skewing towards commercial and educational areas. Similar patterns were detected for daily average and L_{m-n-e} . The daily average values are similitude of these observations. Since there are no national environmental noise standards, the WHO guidance values were used as assessment parameters to detect the extent of exceedance.

Table 2: Summarised mean noise level (L_{eq} and L_{m-n-e}) for each land use category

Sampling Period and benchmark limits	Land use Category			
	Residential	Commercial	Traffic	Education
Morning	67.2 ± 10.2	72.7 ± 9.1	76.7 ± 18.7	71.3 ± 2.1
Noon	66.2 ± 8.2	77.1 ± 12.0	77.8 ± 19.3	73.1 ± 6.6
Evening	71.6 ± 9.3	82.1 ± 13.8	82.1 ± 21.5	76.9 ± 12.9
Daily average	63.5	73.84	71.1	73.77
L_{m-n-e}	70.14	84.02	73.41	80.8
WHO Limit (Day)	55	70	70	55
WHO Limit (Night)	50	65	65	50

All noise level in dB(A) units

Land use and environmental noise levels

An assessment of the noise levels measured with respect to different land uses will provide a closer view of the particular anthropogenic activity that is exposed to noise and its impact on the environment. Table 3 displays the average noise levels (L_{eq}) in residential areas as well as the extent of departure from the WHO standards. In all the sampled location points, the detected noise levels exceed the WHO standards for all the periods of the day. All the day, Gbagada, owing to proximity to Federal highway, recorded the highest value. In the morning it recorded 67.2 dB(A) with 12.2 dB(A)

exceedence value, noon 68.5 dB(A) with exceedence value of 13.5 dB(A) and by the evening time it returned 71.6 dB(A) with exceedence of 21.6 dB(A). The placement of sampling instrument could be a factor for this recorded value. The daily average is a similitude of the periodic L_{eq} values. However, the noise index values showed that the proximity of Lanre Awolokun Street and Ayoka Street to noisome activities could have a particularly high health effects on the residents. These areas have 87.46 and 85.41 noise index values respectively.

Table 3: Mean noise levels and noise index in residential areas

	Sampling location number									
	2	3	4	9	10	11	13	17	25	26
Morning	61.9	61.1	57.0	66.8	60.6	67.2	58.8	62.3	67.2	59.4
Exceedence factor	6.9	6.1	2	11.8	5.6	12.2	3.8	7.3	12.2	4.4
Noon	61.9	59.9	59.9	66.2	58.0	68.5	61.2	60.5	63.6	61.4
Exceedence factor	6.9	4.9	4.9	11.2	3	13.5	6.2	5.5	8.6	6.4
Evening	65.9	65.9	65.4	70.7	65.0	71.6	62.3	63.4	67.6	64.6
Exceedence factor	15.9	15.9	15.4	20.7	15	21.6	12.3	13.4	17.6	14.6
Daily average	63.24	62.30	60.77	67.89	61.20	69.09	60.78	62.05	66.13	61.80
L_{m-n-e}	71.25	70.25	68.6	76.21	69.06	77.49	68.62	69.98	74.34	69.71
NI	77.51	75.92	73.30	85.41	74.04	87.46	73.33	75.49	82.43	75.06

The detected L_{eq} values in areas with high traffic activity particularly in road transport areas in Bariga are documented in Table 4. Out of the 13 sample locations, three locations returned values below the set standards, an indication of low traffic activity during specific periods of the day in those areas. Ilaje Bus Stop (location 22) recorded all-day high values (morning 76.7

dB(A), noon 77.8 dB(A), and evening 82.1 dB(A)). These values are directly proportional to the intensity of human activities observed in the area (informal market and high vehicular movement). At most times of the day, the market activities often obstructs traffic, which eventually leads to almost all-day traffic in the day. Areas with lowest values such as

Kusa Street, Fola Jinadu Street, Olujobi Street, Ososa Street have lower traffic activities during the day compared to Ilaje Bus Stop. The noise index values computed for the traffic areas are higher within the high risk areas designated by

the WHO. In fact, there are two areas with extremely high index values above 100 dB(A). Ilaje Bus Stop and Ladi-Lak Bus Stop have noise index values of 104.1 dB(A) and 102.5 dB(A) respectively indicating a very high index of annoyance response.

Table 4: Mean noise levels and noise index in traffic areas

	Sampling location number												
	1	5	6	8	14	15	18	21	22	24	27	29	30
Morning Exceedence factor	73.4	64.2	58.0	71.3	67.7	71.5	59.6	65.0	76.7	75.8	74.7	70.3	73.6
Noon Exceedence factor	3.4	-5.8	-12	1.3	-2.3	1.5	-10.4	-5	6.7	5.8	4.7	0.3	3.6
Evening Exceedence factor	74.5	66.5	58.5	70.9	68.3	72.0	61.5	64.0	77.8	77.3	76.1	72.7	75.5
Daily average	4.5	-3.5	-11.5	0.9	-1.7	2	-8.5	-6	7.8	7.3	6.1	2.7	5.5
L_{m-n-e}	78.4	68.4	60.6	74.3	72.1	74.7	64.4	68.4	82.1	80.7	76.6	74.6	79.9
NI	13.4	3.4	-4.4	9.3	7.1	9.7	-0.6	3.4	17.1	15.7	11.6	9.6	14.9
	75.45	66.36	59.05	72.17	69.36	72.73	61.82	65.80	78.88	77.94	75.81	72.53	76.34
	84.22	74.58	66.76	80.75	77.77	81.35	69.73	73.98	87.85	86.86	84.61	81.13	85.17
	98.26	82.81	70.38	92.69	87.91	93.64	75.09	81.86	104.10	102.50	98.88	93.30	99.78

L_{eq} values and related statistics for the commercial and educational areas are documented in Table 5. Bariga is fundamentally a residential area with few commercial land uses. The identified areas are mere clusters of low-income shopping centres and traditional markets, thus 5 sampling points were identified. In the morning period, Diya Street recorded the highest value of 75.8 dB(A) with exceedence value of 5.8 dB(A). This was followed by Gbagada Road with 75.4 dB(A) and exceedence value of 5.4 dB(A). Tapa Street had the least value of 63.6 dB(A) which is below the WHO standards. By noon, the L_{eq} values increased drastically with Gbagada Road recording the highest value of 78.70 dB(A). At the evening

period, higher values were recorded with Gbagada Road having the highest value of 82.14 dB(A) and exceedence value of 17.17 dB(A). The average L_{eq} values showed that Gbagada Road recorded highest value of 90.72 dB(A) with respective high noise index of 103.87 dB(A) which is higher than the mean index. Educational areas are anticipated to have lower sound levels since tranquillity is required in such areas. Three of such areas were captured in this study as shown in Table 5. All the educational areas returned high L_{eq} values with Community Road having the highest average value. Similarly, the noise index values are also high with the lowest value of 84.42 dB(A) and highest value of 94.19 dB(A).

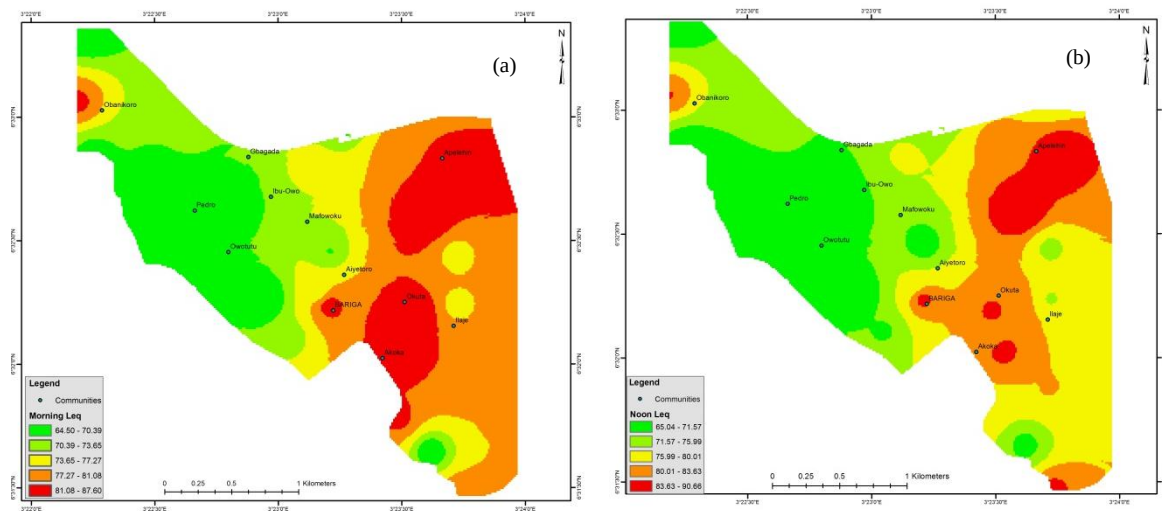
Table 5: Mean noise levels and noise index in commercial and educational areas

	Sampling location number and land use							
	Commercial area					Educational area		
	7	16	19	20	28	23	31	12
Morning	72.7	75.4	63.6	75.8	72.3	69.20	71.30	71.40
Exceedence factor	2.7	5.4	-6.4	5.8	2.3	14.2	16.3	16.4
Noon	73.10	78.70	65.10	77.10	72.00	73.10	69.30	66.50
Exceedence factor	3.1	8.7	-4.9	7.1	2	18.1	14.3	11.5
Evening	76.31	82.14	68.27	79.93	75.1	76.87	72.57	64.01
Exceedence factor	11.31	17.14	3.27	14.93	10.1	26.87	22.57	14.01
Daily average	74.04	78.75	65.66	77.61	73.15	73.06	71.06	67.30
L_{m-n-e}	85.74	90.72	76.84	89.52	84.8	82.95	77.74	78.38
NI	95.87	103.87	81.62	101.94	94.35	94.19	90.80	84.42

Spatial distribution of noise in Bariga

The tabulated details of noise distribution of Bariga create a need to further understand the place-based spatial distribution of noise. Fig. 2 is a cartographic representation of the L_{eq} of the morning, noon and evening period of the day based on the location of

connected communities in Bariga. Across the study area, the mapped values indicate high noise values above the WHO standards except in few areas where low values were detected.



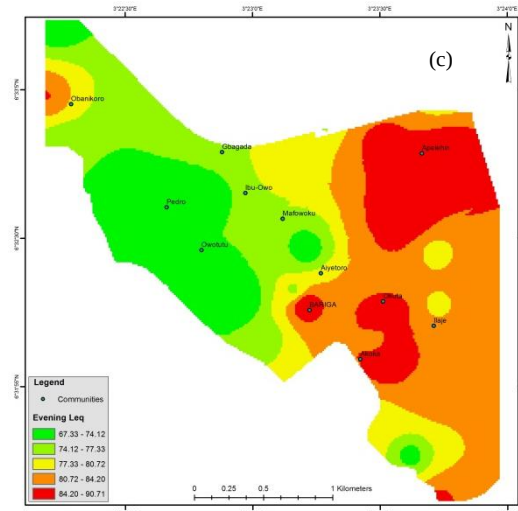


Fig. 2: The distribution of Noise (L_{eq}) values in Bariga for the three periods of the day: morning, afternoon, and evening.

With the observed trend of high noise values, the morning recorded the least L_{eq} values. The mapped values range between 64.5 dB(A) to 87.6 dB(A) depicting lower and higher limits for the period. Residential communities such as Pedro, Owotutu, and parts of Gbagada recorded the lower limits. Areas with higher L_{eq} values include Bariga, Akoka, Abule Okuta, Obanikoro and Apelehin. These could be related to high transportation and commercial activities that is gradually building up in these areas. Usually, noise in these areas are triggered by early-risers-to-work attitude of the residents mostly white-collar job workers and market men and women who travel to wholesale markets in parts of Lagos to buy goods that will be resold to residents in Bariga. The intensity of the afternoon noise is a

little higher than the morning period but well distributed compared to the morning period which is observable within the traffic areas. This was observed in the same areas with high L_{eq} in the morning. Apelehin, Abule Okuta, Bariga and Akoka owing to high transportation activities have high L_{eq} values. Thus, they are susceptible to noise disturbances in the noon period of the day despite having a high residential cum educational land use structure. The observed crude values of L_{eq} in the evening period depict a form of spatial skewness towards the traffic areas. It can be affirmed that L_{eq} values points to high environmental noise in the entire Bariga settlement triggered by high transportation activity combined with intense local commercial activities.

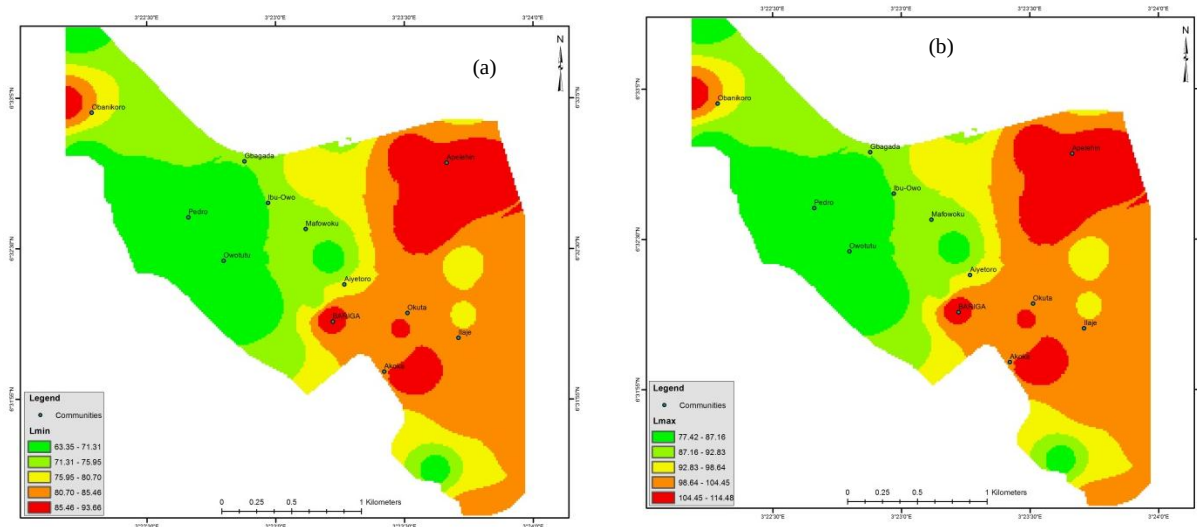


Fig. 3: The index of Noise (a) L_{min} and (b) L_{max} in Bariga

In order to weigh the temporal assessment of environmental noise in Bariga, it is essential to examine the detected limits of noise. The overall minimum (L_{min}) and maximum (L_{max}) limits of noise detectable in Bariga were captured and depicted in Fig. 3. The lower limits (L_{min}) shows the baseline minimum noise levels detected in the area while the upper limits depicts the converse. The L_{min} range 63.35 dB(A) to 71.31 dB(A) captured in neighbourhoods such as Pedro, Owotutu, Gbagada, Ibu-Owo and parts of Aiyetoro indicate with values that correlates with WHO standards for outdoor residential areas. However, values beyond the 70 dB(A) marks indicate exceedence. This value is recorded within the L_{max} areas. Although, the L_{min} value indicates probability, it is a function of environmental variables particularly aforementioned human activities. L_{max} values indicate that noise levels in the entire Bariga suburb may not be higher than 114 dB(A). It is therefore to ensure that activities generating noise incidence in Bariga should be put to check.

Periodical Noise index of Bariga

The observed noise pattern suggests that Bariga is highly sensitive to economic activities such as commercial and transportation. The observed pattern has led to designation of some communities as being environmentally-unsafe due their proximity to noise-generating activities. Periodic noise index of Bariga as depicted in Fig. 4 considers specific periods of the day and the human reaction in form of response i.e. displeasure. The index values represent the extent of human displeasure to increasing noise values for each period of the day and the general noise index for the study area. The high index value for the morning period is a function of the observed human activities that generate noise. 87 dB(A) and above depict high annoyance in areas such as Bariga, Akoka, Abule Okuta, Apelehin and parts of Obanikoro. Lower values are roughly distributed during this period of the day.

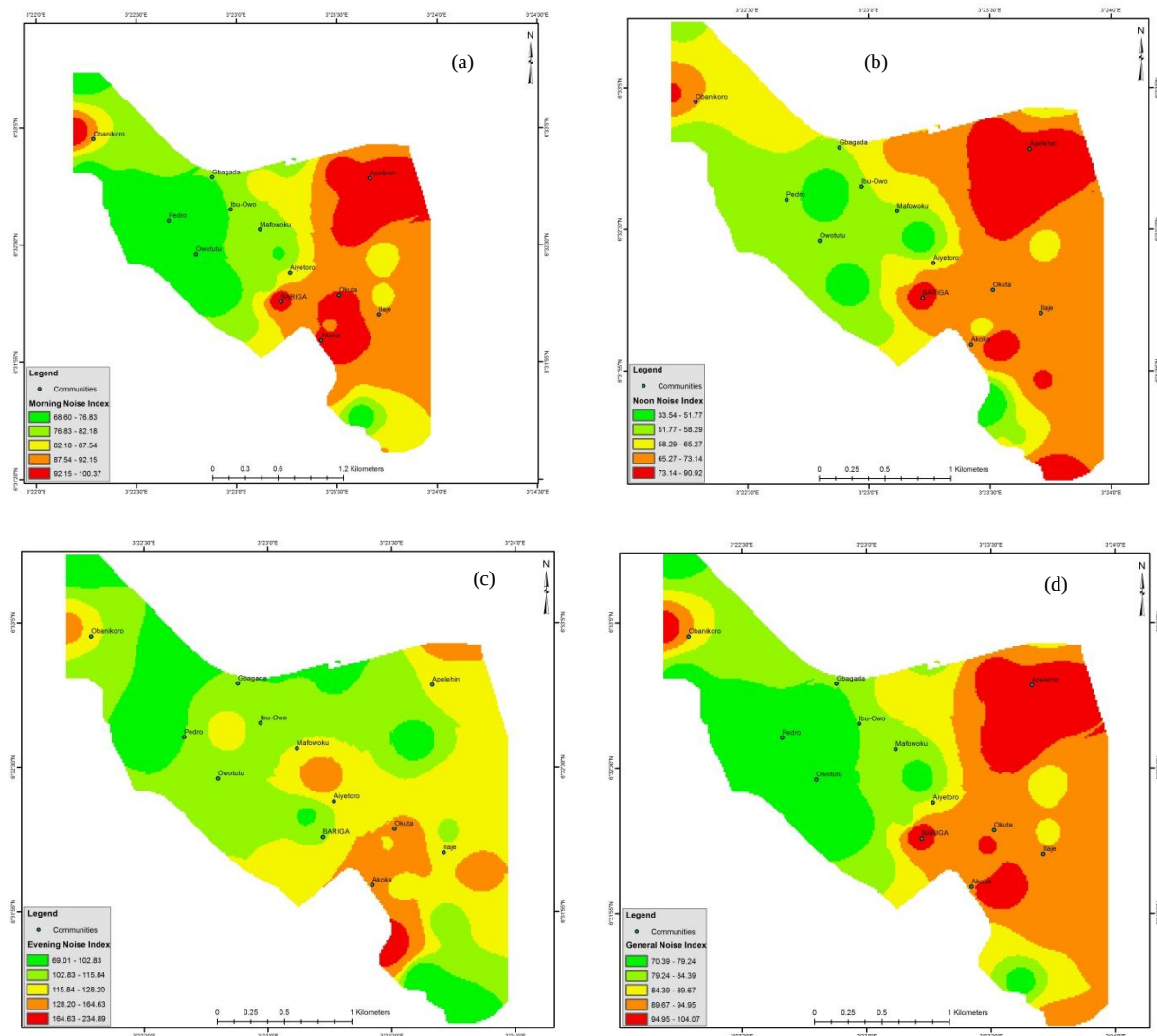


Fig. 4: Periodic noise indices of Bariga

In the noontime, the noise index reduces with respect to human activities. However, high index is possible in areas aforementioned although with reduced intensity compared to the morning period. The highest noise indices were recorded in the evening period. Obanikoro, Apelehin, Abule Okuta, Akoka, parts of Akoka, Aiyetoro, and Bariga all recorded high values indicating the need to check the human activities stimulating noise in these

areas. The cumulative noise index for the area showed that incidence of noise pollution is high with likely consequences that will adversely affect the residents of the study area. The least exposure index of 70.39–79.24 dB(A) is well distributed within communities with low traffic activity and high residential occupation. This area could be zoned as comfortable with low noise risk values. Other higher values up to 104.07 dB(A) point to high

values of annoyance vulnerabilities. These indices are noticeable in residential and educational areas such as Akoka, Abule Okuta, Ilaje, Apelehin and parts of Mafowoku and Gbagada. This showed that the entire area has high susceptibility to noise-driven health challenges. Therefore, the occurrence of uncontrollable noise-driven annoyance, partial deafness and other possible noise-related health challenges might be rife in these areas.

CONCLUSION

The study has examined the distribution of noise in Bariga suburb of Lagos metropolis, via monitoring and GIS-based mapping for decision making purposes. Review of literature showed that there are no localised standards and regulations on noise as an environmental pollution that requires scientific measurement and appropriate data collection as well as regulation-assessment mechanisms. As a result of this gap, the World Health Organisation (WHO) standards were used as limits for noise assessment. The method adopted for data collection examined the possible contribution of specific land uses – residential, educational, commercial, and traffic to noise generation. The results all points to high noise values and consequent high impact on human health,

learning and environmental safety of all residents of the area.

According to the result of the study, it is essential to check the impact of increasing transportation and marketing activities in the study area with respect to noise. Areas such as Apelehin, Obanikoro, Ilaje, Akoka, Bariga, Gbagada, require consistent checks on the variety to human activities such as transport and commercial activities. Road transportation regulations should be defined in such a way that it will include concerns for human health as regards to the dangers and hazards of it. Marketing activities should be re-organised in an environmentally-friendly manner. The use of loud speakers should be discouraged in already noisy environment such as markets. Motorists should devoid from unnecessary usage of horns as this contributes enormously to traffic-stimulated noise in places such as Ilaje, Bariga and parts of Gbagada. Road signs indicating silence for educational areas should be considered for the safety of pupils and teachers. In addition, Ministry of Environment at the Federal and State level should collaborate to conduct a metropolitan noise assessment study. Such study will produce a comprehensive noise pollution and regulations standard for sustainable environmental development in Lagos with respect to the identified land uses.

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