Noise Level Signatures Over Bida Town, Niger State, Nigeria

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Abstract

The trends towards urbanization in Nigeria mean that it becomes of academic interest to quantify and describe the levels and prevalence of urban noise pollution. In this study, noise level signatures over portions of Bida town were measured and the results have been duly presented. The core objective of this study is to quantify the levels of noise at strategic locations in Bida town in relation to the internationally-recognised tolerable level of 70dB so that a pattern of noise pollution in these areas could be established. A couple cadastral sheets from the map of Bida town were considered for this survey, and measurements were taken from over one hundred stations of interest on the ground. Thirty-four GPS points were surveyed for noise level values for each of the cadastral maps whence it was noticed that nearly all of these points suffer from high ambient amount of noise pollution at peak activity periods. In each case, the loudest contributor to environmental noise pollution was the electric milling machine. The noise level corresponding to the electric milling machine was found to be 97.06 dBA in Sheets 14 and 22; in Sheet 16 the noise level was peaked at 102.2 dBA. All of the principal sources of noise in the three sheets considered for investigation can be appropriately termed "noisy".

Keywords: Environmental pollution, noise, survey, health, hazard

Introduction

Interest is now being increasingly centred on noise pollution as an integral part of the concept of "environmental pollution" (Jonah et al 2009; Franssen et al., 2004; Abumere et al, 1999; Ising et al., 1999). The trends towards urbanization in Nigeria mean that it becomes of academic interest to quantify and describe the levels and prevalence of urban noise pollution. In this study, noise level signatures over portions of Bida town were measured and the results have been duly presented.

Problem Statement

At present, there exists no database on the noise pollution patterns of Bida town, so it is hoped that this study would serve as a pointer or "roadmap" in this regard.

Aim of Study

The core objective of this study is to quantify the levels of noise at strategic locations in Bida town in relation to the internationally-recognised tolerable level of 70dB so that a pattern of noise pollution in these areas could be established.

Scope of Study

Three cadastral sheets of Bida town were considered for this survey, and measurements were taken from over one hundred stations of interest on the ground. Before noise level measurements were made, site selection and co-ordinate identification were run in tandem for one hundred and fifty locations scattered on the ground in the parts of Bida towns identified on the cadastral sheets; the street locations of the stations of interest were recorded, as well as their corresponding Global Positioning System (GPS) values. These GPS values were recorded by the aid of a hand-held GPS unit. Subsequently, several values of noise levels were recorded at peak times at the appropriate stations that are affected by high noise levels.

Literature Review

Jonah et al (2009) pointed out that only a limited amount of studies have been carried out in Nigeria with respect to noise level measurements within Nigerian cities. Abumere et al (1999)

carried out a study to investigate noise pollution within Port-Harcourt City. Their study concluded that noise exposure limits in Port-Harcourt City exceeds the value recommended by the International Environmental Protection Agency (IEPA), i.e. 70dB; consequently they suggested some strategies for limiting noise levels in Port-Harcourt city. Menkiti (1976) highlighted the fact that the incidence of impaired hearing in Nigeria could be blamed on exposure to noise (Abumere et al, 1999). Onuu and Menkiti (1993) have analyzed the spectra of road traffic noise for parts of southeastern Nigeria and they concluded that this type of noise dominates the low frequency range, 500-800Hz (Abumere et al. 1999). The Microsoft Encarta (2008) stated that most hearing loss occurs in workplaces, where workers may be unable to avoid unhealthy noise, and where exposure may continue for years. Factory workers, construction workers, farmers, military personnel, police officers, firefighters, and musicians all have reason to be concerned about their occupational exposure to noise. Even at levels below those that cause hearing loss, noise pollution produces problems. Noise makes conversation difficult, interferes with some kinds of work, and disturbs sleep. As a source of stress, it can promote high blood pressure and other cardiovascular problems, as well as nervous disorders. Noise also puts stress on domestic animals and wildlife. In remote areas, helicopters and military aircraft often frighten animals. Aircraft noise in Alaska, for example, has been shown to reduce the survival rate of caribou calves. There is concern that increasing noise levels in the oceans may confuse the natural sonar that whales use to navigate, communicate, and locate food. Ouise (2002) has addressed the negative effects resulting from the exposure to road traffic noise on people's well being. Following observations, the writer said annoyance was one of the first and most direct reaction on environmental noise, and that the continuous exposure of people to road traffic noise lead to suffering from various kinds of discomfort; this he said reduced the number of their well being elements. He also said his conclusion was still determined by non-acoustical factors like sensitivity, socio-economic situation and age. He reported that certain quantitative relationship between the objective quantities characterising road traffic noise was established. Finally, he pointed out that the importance of these findings could be in more efficient ways of planning road traffic activity, in order to secure and provide some succour. Shih (1971) saw noise as sound with little or no periodicity, with its essential characteristic of undesirability. He then defined noise as any annoying or unwanted sound. He also pointed out that the rapid increase of noise level in the environment was a national public health hazard, and that noise affects man's state of mental, physical and social well-being, saying it was a type of air pollution. The author saw his work as an attempt to arrive at the understanding of the general situation on the problem of noise, being then, a rather new subject among other branches of science. His survey consisted of four major parts: the present status of noise pollution, its sources, its effects, and the control.

Results and Data Analysis

Sheet 14: The noise level dataset for the stations of Sheet 14 that were recognised to suffer from significant noise pollution are presented in Table 1.

Table 1: Values of Noise Levels from Various Sources

S/N	Sources of Noise	Rating	UTM Values	Local Coordinates	1st Reading (dBA)	2nd Reading (dBA)	3rd Reading (dBA)
1	Lister generator	75kVA	X: 0827656 Y: 1006328	E: 11.9804396° N: 009.0924367°	90.0	91.2	90.9
2	Vulcanising machine	3hp	X: 0827677 Y: 1006351	E: 11.9806322° N: 009.0926429°	93.2	92.4	92.46
3	Elemax generator	3kVA	X: 0827726 Y: 1006415	E: 11.9810823° N: 009.0932174°	87.3	82.4	83.3
4	Birla Yamaha generator	0.8kVA	X: 0827810 Y: 1006354	E: 11.9818411° N: 009.0926601°	91.2	86.2	86.7
5	Milkano generator	27.5kVA	X: 0827814 Y: 1006218	E: 11.9818673° N: 009.0914312°	93.8	92.6	93.0
6	Birla Yamaha generator	0.8kVA	X: 0827824 Y: 1006309	E: 11.981965° N: 009.0922525°	91.2	86.2	86.7
7	Vulcanising machine	3hp	X:0827867 Y:1006267	E:11.9823526° N: 009.0918699°	93.2	92.4	91.8
8	Lister generator	10.5kVA 20W	X:0827935 Y:1006217	E: 11.9829668° N: 009.0914132°	90.0	91.2	90.9
9	Grinding machine		X: 0827018 Y: 1006193	E: 11.9746315° N: 009.0912645°	95.5	96.8	98.9
10	Yamaha generator	2kVA	X: 0828128 Y: 1006066	E: 11.9847094° N:009.0900348°	95.5	93.1	96.3
11	Vulcanising machine	3hp	X:0828146 Y:1006156	E: 11.9848798° N: 009.0908465°	93.2	92.4	91.8
12	Elemax generator	3kVA	X: 0828181 Y:1006070	E: 11.9851914° N: 009.090067°	87.3	82.4	83.3
13	Grinding machine		X: 0828105 Y:1006063	E: 11.9845002° N: 009.0900094°	95.5	96.8	98.9
14	Tiger head generator	0.8kVA	X: 0828357 Y: 1006097	E:11.9867928° N: 009.0902978°	88.3	86.7	85.5
15	Imec diesel engine	2.6kVA	X: 0828364 Y:1006088	E:11.9868558° N: 009.090216°	86.3	86.5	87.5
16	Elemax generator	3kVA	X: 0828433 Y: 1006037	E: 11.987479° N: 009.0897501°	87.3	82.4	83.3
17	Vulcanising machine	3hp	X: 0828437 Y: 1006014	E: 11.9875136° N: 009.089542°	93.2	92.4	91.8
18	Vulcanisin	3hp	X: 0828522	E: 11.9882836°	93.2	92.4	91.8

	g machine		Y: 1005981	N: 009.0872306°			
19	Yamaha generator	3kVA	X: 0828486 Y: 1005914	E: 11.9879514° N: 009.088635°	95.5	93.1	96.3
20	Elemax generator	3kVA	X: 0828489 Y: 1005898	E:11.9879775° N; 009.0884903°	87.3	82.4	83.3
21	Sunico generator	8kVA	X: 0828525 Y: 1005880	E:11.9883033° N: 009.088325°	97.3	93.2	91.7
22	Tiger head generator	0.8kVA	X: 0828636 Y:1006848	E: 11.9893846° N: 009.0970611°	88.3	86.7	85.5
23	Birla Yamaha	0.8kVA	X: 0828560 Y: 1006850	E: 11.9886941° N: 009.0970849°	91.2	86.2	86.7
24	Himo gasoline generator	10.5kVA	X: 0828617 Y: 1006851	E: 11.9892122° N: 009.0970896°	95.5	80.4	90.0
25	Milkano generator	10.5kVA	X: 0828683 Y: 1006907	E: 11.9898162° N: 009.0975906°	93.8	92.6	93.0
26	Corn milling machine		X: 0828739 Y: 1006853	E: 11.990321° N: 009.0970986°	95.5	96.8	98.9
27	Vulcanising machine	3hp	X: 0828772 Y: 1006848	E: 11.9906206° N: 009.097051°	93.2	92.4	91.8
28	Welding machine	87kVA	X: 0828806 Y: 1006875	E: 11.9909302° N: 009.0971297°	94.3	95.7	96.1
29	Tiger head generator	0.8kVA	X: 0828917 Y: 1006821	E: 11.9919363° N: 009.0967962°	88.3	86.7	85.5
30	Yamaha generator	3kVA	X: 0828928 Y: 1006817	E: 11.9920359° N: 009.0967593°	95.5	93.1	96.3
31	Tiger head generator	0.8kVA	X: 0828941 Y:1006849	E: 11.9921565° N: 009.0970474°	88.3	86.7	85.5
32	Birla Yamaha	0.8kVA	X: 0828972 Y: 1006801	E: 11.9924346° N: 009.0966115°	91.2	86.2	86.7
33	Vulcanising machine	3hp	X: 0828995 Y: 1006813	E: 11.9926445° N: 009.0967182°	93.2	92.4	91.8
34	Vulcanising machine	3hp	X: 0828024 Y: 1006818	E: 11.9838206° N: 009.0968357°	93.2	92.4	91.8

The sources of noise identified in Sheet 14 together with their corresponding mean prevailing values have been identified and tabulated in Table 2 in juxtaposition with the IEPA-recognised threshold value of 70dBA.

Table 2: Mean Values of the Sources of Noise of Sheet 14

	Sources of Noise	Threshold Values (dBA)	Av. Noise Val.(dBA)
1	Welding machine	70	95.40
2	Vulcanising machine	70	92.46
3	Electric miller	70	97.06
4	Petrol generator	70	84.30
5	Diesel generator	70	93.10

The relationship of Table 2 is presented in visual format as Fig. 1.

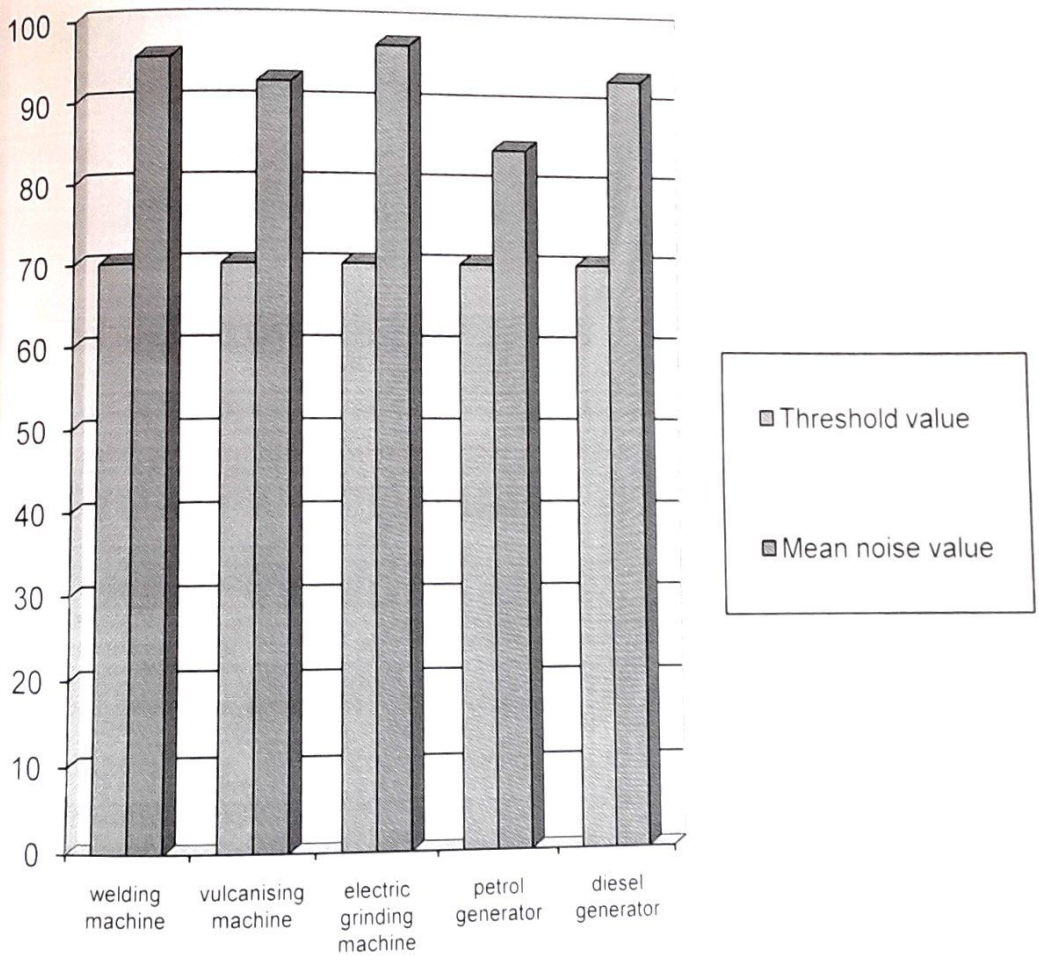

Fig. 1: Bar chart representation of the values of the sources of noise vis-à-vis the threshold value. Vertical axis is in dBA.

Sheet 22: The noise level dataset for the stations of Sheet 22 that were recognised to suffer from significant noise pollution are presented in Table 3.

Table 3: Values of Noise Levels from Various Sources

S/N	Sources of Noise	Rating	UTM Values	Local Coordinates	1st Reading (dBA)	2nd Reading (dBA)	3rd Reading (dBA)
1	Lister generator	75kVA	X:0170525 Y:1003075	E: 06.003274 N: 009.0629154	87.3	82.4	83.3
2	Vulcanising machine	3hp	X: 0170541 Y: 1003085	E: 06.0034186 N: 009.0630070	93.2	92.4	92.4
3	Elemax generator	3kVA	X: 0170553 Y: 1003068	E: 06.003529 N: 009.0628738	88.3	86.7	85.5
4	Birla Yamaha generator	0.8kVA	X: 0170572 Y: 1003070	E: 06.0037015 N: 009.0628738	91.2	86.2	86.7
5	Milkano generator	27.5kVA	X: 0170604 Y: 1003080	E: 06.0039915 N: 009.0629665	93.8	92.6	93.0
6	Birla Yamaha generator	0.8kVA	X: 0170627 Y: 1003068	E: 06.0042014 N: 009.0628598	91.2	86.2	86.7
7	Vulcanising machine	3hp	X: 0170675 Y: 1003090	E: 06.0042014 N: 009.0630621	93.2	92.4	91.8
8	Lister generator	10.5kVA 20W	X: 0170724 Y; 1003063	E: 06.0050832 N: 009.0628219	90.0	91.2	90.9
9	Grinding machine		X: 0170773 Y: 1003052	E: 06.0055293 N: 009.0627261	91.2	86.2	86.7
10	Yamaha generator	2kVA	X: 0170775 Y: 1003136	E:06.005523 N: 009.063485	95.5	93.1	96.3
11	Vulcanising machine	3hp	X: 0170789 Y: 1003202	E: 06.0056634 N: 009.0640824	93.2	92.4	91.8
12	Elemax generator	3kVA	X: 0170818 Y:1003252	E: 06.0059232 N: 009.0645362	87.3	82.4	83.3
13	Grinding machine		X: 0170848 Y: 1003321	E: 06.0061907 N: 009.0651617	95.5	96.8	98.8
14	Tiger head generator	0.8kVA	X: 0170880 Y: 1003303	E: 06.0064828 N:009.0650015	88.3	86.7	85.5
15	Imec diesel engine	2.6kVA	X: 0170922 Y: 1003289	E: 06.0068655 N: 009.0648782	86.3	86.5	87.2
16	Elemax generator	3kVA	X: 0170970 Y: 1003270	E: 06.0068643 N: 009.0649172	87.3	82.4	83.3
17	Vulcanising machine	3hp	X: 0171022 Y:1003125	E: 06.0077865 N: 009.0634041	93.2	92.4	91.8
18	Vulcanising machine	3hp	X:0171006 Y:1003099	E: 06.007643 N:009.0631681	93.2	92.4	91.8
19	Yamaha generator	3kVA	X: 0170987 Y:1003076	E:06.0074721 N: 009.0629589	95.5	93.1	96.3

20	Elemax generator	3kVA	X: 0170955 Y: 1003045	E:06.0071836 N: 009.0626765	87.3	82.4	83.3
21	Sunico generator	8kVA	X: 0170972 Y:1003003	E:06.0073412 N: 009.0622983	97.3	93.2	91.7
22	Tiger head generator	0.8kVA	X: 0170971 Y:1002968	E: 06.0073348 N: 009.0619821	88.3	86.7	85.5
23	Birla Yamaha	0.8kVA	X: 0170958 Y: 1002910	E:06.007221 N: 009.0614572	91.2	86.2	86.7
24	Himo gasoline generator	10.5kVA	X: 0170919 Y: 1002832	E: 06.0068724 N: 009.0607497	95.5	80.4	90.0
25	Milkano generator	10.5kVA	X: 0170903 Y: 1002785	E: 06.0067306 N: 009.0603239	93.8	92.6	93.0
26	Corn milling machine		X: 0170890 Y: 1002754	E: 06.0066147 N: 009.0600429	95.5	96.8	98.9
27	Vulcanising machine	3hp	X: 0170884 Y:1002737	E: 06.0065615 N: 009.0598889	91.2	86.2	86.7
28	Welding machine	87kVA	X: 0170885 Y: 1002714	E: 06.0065723 N: 009.0596812	94.3	95.7	96.1
29	Tiger head generator	0.8kVA	X: 0171024 Y: 1003027	E:06.007812 N: 009.062519	88.3	86.7	85.5
30	Yamaha generator	3kVA	X: 0171069 Y: 1003024	E:06.0082211 N: 009.0624952	95.5	93.1	96.3
31	Tiger head generator	0.8kVA	X: 0171080 Y:1003025	E: 06.008321 N: 009.0625051	88.3	86.7	85.5
32	Birla Yamaha	0.8kVA	X: 0829066 Y: 1004525	E: 11.9931181 N: 009.0760444	91.2	86.2	86.7
33	Vulcanising machine	3hp	X: 0829051 Y: 1004588	E: 11.9929956 N: 009.0766145	93.2	92.4	91.8
34	Vulcanising machine	3hp	X: 0829047 Y: 1004640	E: 11.992954 N: 009.0770846	93.2	92.4	91.8

The sources of noise identified in Sheet 22 together with their corresponding mean prevailing values have been identified and tabulated in Table 4 in juxtaposition with the IEPA-recognised threshold value of 70dBA

Table 4: Mean Values of the Sources of Noise of Sheet 22

	Sources of Noise	Threshold Values (dBA)	Av. Noise Val.(dBA)
1	Welding machine	70	95.40
2	Vulcanising machine	70	92.46
3	Electric miller	70	97.06
4	Petrol generator	70	84.30
5	Diesel generator	70	93.10

The relationship of Table 4 is presented in visual format as Fig. 2.

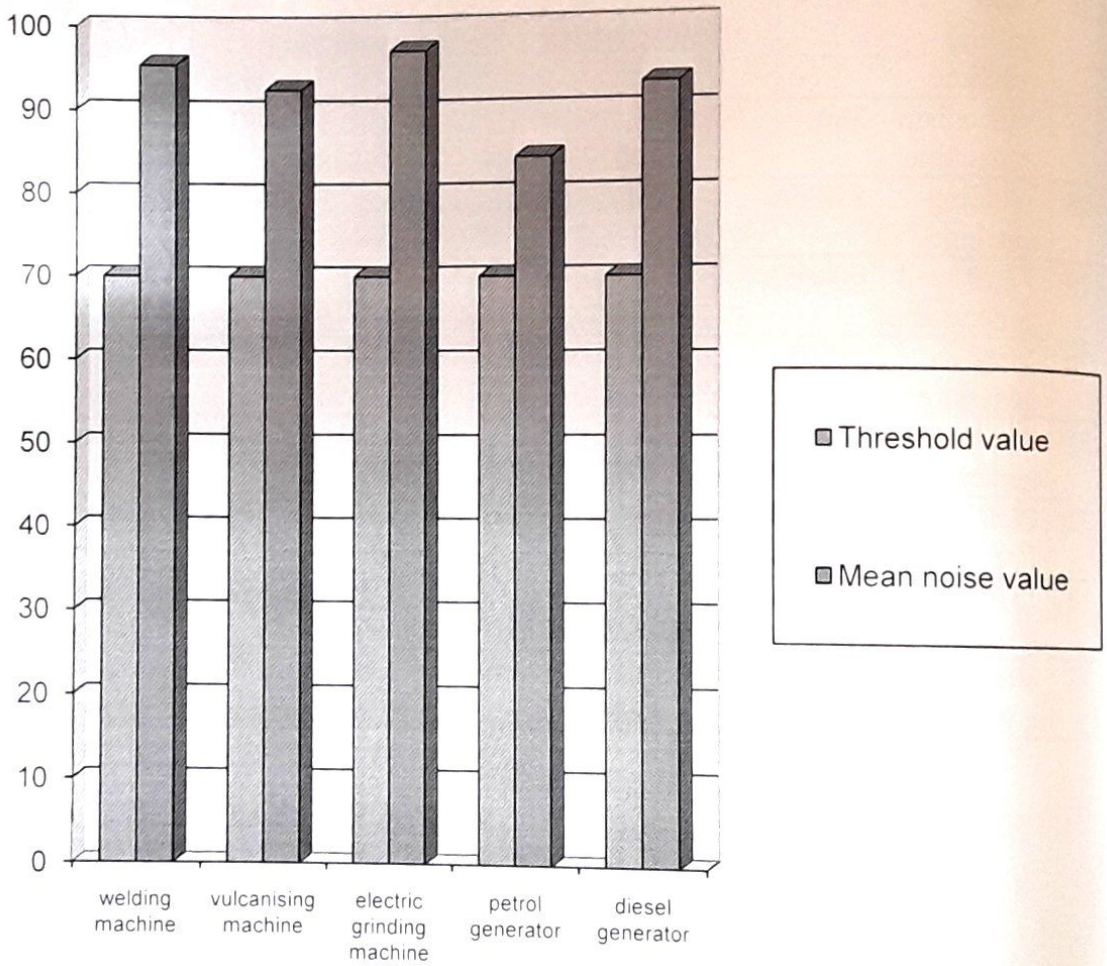

Fig. 2: Bar chart representation of the values of the sources of noise vis-à-vis the threshold value. Vertical axis is in dBA.

Sheet 16: The noise level dataset for the stations of Sheet 16 that were recognised to suffer from significant noise pollution are presented in Table 5.

Table 5: Values of Noise Levels from Various Sources

S/N	Sources of Noise	Rating	UTM Values	Local Co-ord.	1st Reading (dBA)	2nd Reading (dBA)	3rd Reading (dBA)
1	Vulcaniser's pump	5.5hp	X-0171287 Y-1005560	N- 09^{0}05.125' E- 006^{0}00.600'	94.0	93.8	94.2
2	Diesel Generator	60kVA	X-0171292 Y-1005522	N- 09^{0}05.105' E- 006^{0}00.604'	95.3	95.8	96.7
3	Petrol Generator	0.8kVA	X-0171297 Y-1005493	N-09^{0}05.105' E-006^{0}00.606'	91.5	92.8	93.7
4	Vulcaniser's pump	8kVA	X-0171199 Y-1005491	N-09^{0}05.087' E-006^{0}00.553'	94.0	93.8	94.2
5	Petrol Generator	2.9kVA	X-0171293 Y-1005459	N-09^{0}05.071' E-006^{0}00.605'	91.5	92.8	93.7
6	Diesel Generator	8.8kVA	X-0171286 Y-1005552	N-09^{0}05.013' E-006^{0}00.699'	95.3	95.8	96.7
7	Petrol Generator	0.8kVA	X-0171281 Y-1005264	N-09^{0}04.965' E-006^{0}00.699'	91.5	92.8	93.7
8	Petrol Generator	2kVA	X-0171289 Y-1005271	N- 09^{0}04.969' E- 006^{0}00.603'	91.5	92.8	93.7
9	Vulcaniser's pump	5.5hp	X-0171291 Y-1005272	N- 09^{0}04.969' E- 006^{0}00.604'	94.0	93.8	94.2
10	Diesel generator	8kVA	X-0171268 Y-1005160	N-09^{0}04.908' E-006^{0}00.592'	95.3	95.8	96.7
11	Diesel Generators	30kVA	X-0171263 Y-1005117	N-09^{0}04.885' E-006^{0}00.589'	95.3	95.8	96.7
12	Petrol Generator	0.8kVA	X-0171304 Y-1005099	N-09^{0}04.875' E-006^{0}00.612'	91.5	92.8	93.7
13	Welding Machine		X-0171376 Y-1005605	N-09^{0}05.150' E-006^{0}00.649'	95.5	80.3	90
14	Petrol Generator	0.8kVA	X-0171408 Y-1005601	N-09^{0}05.148' E-006^{0}00.667'	91.5	92.8	93.7
15	Welding Machine	7kVA	X-0171292 Y-10052718	N- 09^{0}05.211' E- 006^{0}00.603'	95.5	80.3	90
16	Petrol Generator	800W	X-0171296 Y-1005740	N- 09^{0}05.223' E- 006^{0}00.605'	91.5	92.8	93.7

17	Vulcaniser's pump	5.5hp	X-0171308 Y-1005834	N-09^{0}05.274' E-006^{0}00.611'	94.0	93.8
18	Petrol milling machine	5.5hp	X-0171322 Y-1005982	N-09^{0}05.354' E-006^{0}00.618'	93.5	93.8
19	Petrol Generator	500W	X-0171355 Y-1006190	N-09^{0}05.467' E-006^{0}00.635'	91.5	92.8
20	Milling machines	5.5hp	X-0171359 Y-1006245	N-09^{0}05.497' E-006^{0}00.637'	100.9	99.9
21	Diesel Generator	500kVA	X-0171351 Y-1006375	N-09^{0}05.567' E-006^{0}00.632'	95.3	95.8
22	Speakers (video club)	800W	X-0171344 Y-1006424	N- 09^{0}05.594' E- 006^{0}00.628'	98.9	99.4
23	Vulcaniser's pump	5.5hp	X-0171337 Y-1006495	N- 09^{0}05.632' E- 006^{0}00.624'	94.0	93.8
24	Diesel Generator	8kVA	X-0171218 Y-1006307	N-09^{0}05.530' E-006^{0}00.560'	95.3	95.8
25	Petrol Generator	3.5kVA	X-0171223 Y-1006257	N-09^{0}05.503' E-006^{0}00.563'	91.5	92.8
26	Diesel Generator	60kVA	X-0171126 Y-1006238	N-09^{0}05.492' E-006^{0}00.510'	95.3	95.8
27	Diesel Generator	8.8kVA	X-0171207 Y-1005961	N-09^{0}05.288' E-006^{0}00.556'	95.3	95.8
28	Petrol Generator	2kVA	X-0171288 Y-1005670	N-09^{0}05.185' E-006^{0}00.601'	91.5	92.8
29	Petrol Generators	0.8kV	X-0171403 Y-1005502	N- 09^{0}05.094' E- 006^{0}00.664'	91.5	92.8
30	Motorcycle garage	5.5hp	X-0171665 Y-1005464	N- 09^{0}05.075' E- 006^{0}00.807'	94.0	93.8
31	Welding machines	7kVA	X-0171793 Y-1005524	N-09^{0}05.108' E-006^{0}00.877'	95.5	80.3
32	Motorcycle garage	5.5hp	X-0171938 Y-1005537	N-09^{0}05.116' E-006^{0}00.956'	94.0	93.8
33	Block making machine	7kVA	X-01712276 Y-1005527	N-09^{0}05.112' E-006^{0}01.140'	98.3	98.4
34	Vulcaniser's pump	5.5hp	X-01712393 Y-1005489	N-09^{0}05.092' E-006^{0}01.204'	94.0	93.8

The sources of noise identified in Sheet 16 together with their corresponding mean prevailing values have been identified and tabulated in Table 6 in juxtaposition with the IEPA-recognised threshold value of 70dBA.

Table 6: Mean Values of the Sources of Noise of Sheet 16

S/N	Sources of Noise	Threshold Values (dBA)	Av. Noise Val.(dBA)
1	Welding machine	70	88.60
2	Vulcanizing machine	70	94.00
3	Grinding machine	70	102.20
4	Petrol generator	70	92.70
5	Diesel generator	70	95.90
6	Loudspeakers	70	99.00

The relationship of Table 6 is presented in visual format as Fig. 3.

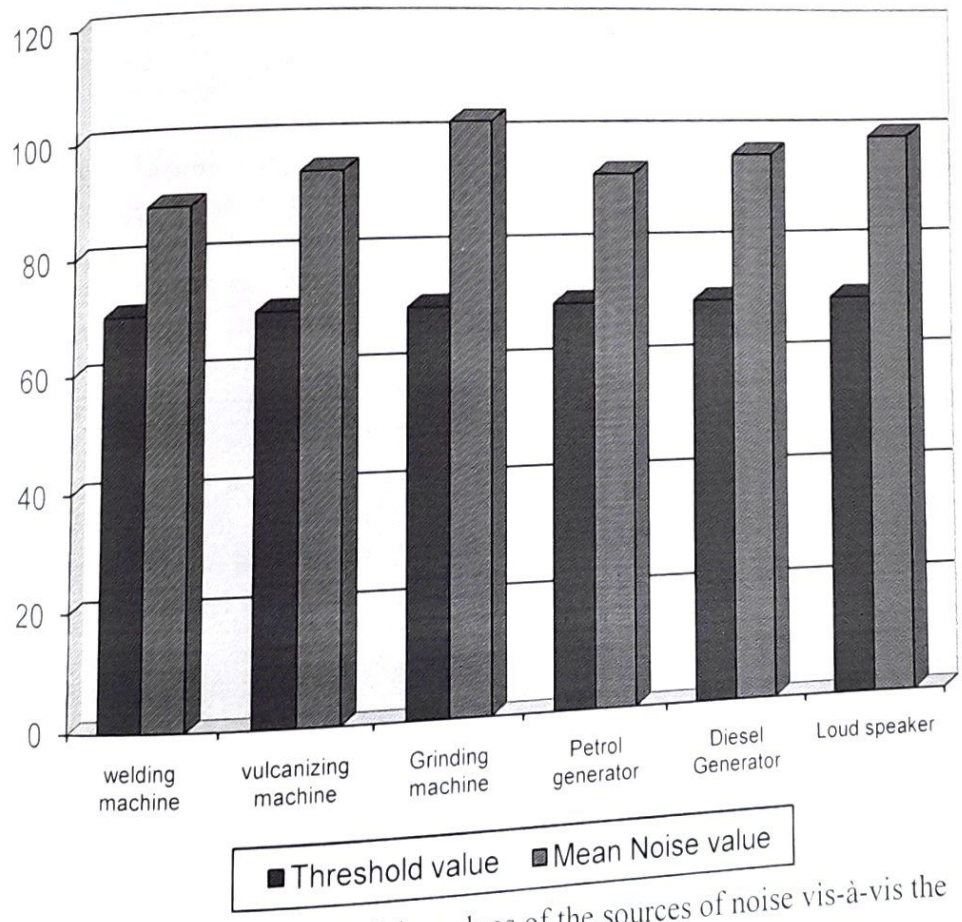

Fig. 3: Bar chart representation of the values of the sources of noise vis-à-vis the threshold value. Vertical axis is in dBA.

Discussion

Of the fifty stations earmarked for survey in Sheet 14 (Table 1), only thirty-four stations were found of interest for noise level measurements; at each of these thirty-four stations, three values of the noise level meter measurements were recorded at two-minute intervals and the results are shown in Table 1. Next, the *sources of noise* identified in Sheet 14 together with their corresponding mean prevailing values have been identified and tabulated in Table 2 in juxtaposition with the IEPA-recognised threshold value of 70dBA. Fig. 1 shows the relationship between the values of noise emitted by the main noise culprits identified in Sheet 14 (welding machine, vulcanizing machine, electric milling machine, petrol generator, and diesel generator) and the 70dBA value. Sheets 22 and 16 have also been analysed in like manner. However, the "loudspeaker" associated with outdoor music store was identified in Sheet 16 as an additional source of noise.

Conclusion

Nearly all of the stations considered in Sheet 14 are observed to suffer from comparatively high noise levels ranging from a peak of 97.06 dBA at stations 9, 13, and 26 to the coincident value of 70dBA at stations 23 and 32. All of the various sources of noise emit sound well above the 70dBA benchmark; of the various sources of noise, the electric milling machines produce the highest level of 97.06dBA.

From Sheet 22, we observe that all of the stations surveyed for noise are characterized by values greater than the 70dBA threshold; not surprising, though, is the fact that the electric milling machine produces the loudest sound in the neighbourhoods of this sheet (Fig. 2). All of the points surveyed in Sheet 16 also show noise level values above the threshold, with the peak of 102.2dBA seen at station 20; from Fig.3 we note that an electric milling machine was located at this point. Whilst not all of the one hundred and fifty stations originally selected were found to be of interest for noise measurements, the stations that were surveyed show predominance signature of high intensity noise at peak activity periods. All of the principal sources of noise in the three sheets considered for investigation can be appropriately termed "noisy".

Recommendations

Remedial measures that could taken to mitigate the effects of high noise levels in the various neighbourhoods of Bida town should be built in into the overall local government urban development policy whereby (i) households and businesses should be encouraged to buy generators with high muffling capabilities, (ii) music and videos vendors should be discouraged from blaring tunes at unreasonably high volumes, (iii) as much as possible mechanic garages, welding workshops should sited a reasonably distance away from residential neighbourhoods and the workmen in these outfits should be encouraged to wear earmuffs when their machines are in operation, (iv) housewives should be encouraged to use quieter vegetable blenders instead of the unbearably loud electric milling machines that are a common sights in many households. It is recommended that, in the nearest future, a more detailed survey over longer exposure periods spread across several days should be conducted for Bida in order to define a broader noise signature picture for the town.

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