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Acoustic Over-Exposure in the Institutional Land Use of Calabar Metropolitan Area, Cross River State, Nigeria

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Abstract

Every tertiary institution is meant to be a centre of excellence in terms of academic activities as well as an enabling environment to achieve such. However, many of these academic settings have turned into activity hubs of varying natures of land uses, which daily generate high acoustic levels. The study comparatively assessed noise levels across the two major tertiary institutions in Calabar metropolis, Nigeria. The objectives were to identify institutional sources of noise, perform a comparative analysis of noise levels across tertiary institutions in Calabar metropolis, as well as render viable measures for reducing the incidence and effects of noise levels in tertiary institutions within Calabar metropolis. Sound level data were acquired using BK Precision 732 Digital Sound Level Meters. Analysis was done using the Analysis of Variance (ANOVA) technique. From the test, the 'F' value calculated (2.74) is greater than the 'F' tabulated (1.86), which implies that there is a significant variation in noise levels within the University of Calabar and the University of Cross River State. Observations show that generator noise, socio-economic activities, extracurricular activities within tertiary institutions, traffic within and outside the school premises, and business outlets within the study locations are the main sources of noise pollution within the institutions. It was therefore recommended that university authorities should zone/allocate land uses to activities that are similar to each other so as to avoid land use conflicts and incompatibilities. Moreover, land uses that are not compatible with the university environment should be eliminated. University authorities should help reduce the total number of generating sets within the school premises by allocating one generating set which will serve all business operations within the school premises, and such should be away from lecture venues and other offices.

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1. Introduction

Every tertiary institution is meant to be a centre of excellence in terms of academic activities as well as an enabling environment to achieve such. However, many of these academic settings have turned into activity hubs of varying natures of land uses, which daily generate high acoustic levels.

According to [1][2][3][4][5][6][7][8][9], various land use elements and activities have been identified as the major sources and exacerbating factors in the degradation of ambience with respect to noise and general pollution.

In Nigeria, tertiary institutions exude and assimilate a cacophony of sounds daily. Every university must brave the wail of sirens, the clamour of construction, noise from electric generators, and the vehicular movement of traffic. These noise sources, according to [10], are part and parcel of the urban environment, of which Calabar is no exception.

The major role of tertiary institutions in Nigeria, as defined in the National Policy on Education[11], includes the provision of high-level manpower for national development, and this role is achieved through its core mandates of teaching, learning, and research. It is impossible for the roles of these tertiary institutions to be achieved without the presence of a tranquil university environment. According to [12], noise pollution around educational institutes produces multiple problems for the teaching-learning process and negatively affects the performance of both teachers and students. The extent to which universities are able to perform their core functions will depend on a number of factors, which include a quiet learning environment.

The environment of Nigerian universities has changed, with stringent economic conditions and rising enrolment that have resulted in overcrowding of the few available facilities. Library users in Nigerian universities are highly inconvenienced by sounds of varying loudness. This is because the university communities in Nigeria are now subjected to noise from vehicles, motorcycles, buses, sirens, noise from hawkers, electric generators, as well as noise from students and staff themselves. All these have given rise to a noisy educational environment, which makes working, leisure, learning, reading, studying, and teaching difficult, and sometimes impossible. Attempts have, however, been made at the Federal level of the Nigerian government to control noise in Nigeria.

2. The Problematic

Noise is an issue to be dealt with, constantly increasing, prevailing, and yet an unnoticed form of pollution plaguing educational institutions in the Calabar metropolis. The metropolis has increased from 99,352 persons in 1963 to over 371,022 persons in 2006 [13]. The population increase apparently resulted in an increase in economic activities and the proliferation of many religious houses within and outside the institutions, turning them into “noise factories”, creating several noise islands. Noise generation within these institutions has been recently seen to cause reading delays. A significant negative relationship has been found between noise levels and learning attainment, cognitive processing, and to a large extent, numeracy tasks.

Noise has also been found to negatively affect other performance-related aspects such as attention, concentration, and memory. Irrelevant speech has been shown to have a profound detrimental effect on students' literacy tasks. Noise sources within the study locations include transportation activities, economic activities within the school environment, generators, and photocopy stands. A school environment should be free from any form of noise pollution and also free from all forms of noise or economic activities; a serene environment is what a university environment should be made of and should be a premise for better concentration and learning, but the study location fails to live up to expectations. Our knowledge of noise levels in Nigerian universities hitherto is unknown. It is worrisome when the level of noise in an acclaimed educational facility is not known. This leaves a gap in understanding the levels of environmental noise in these centres of learning and research.

3. Aim and Objectives of the Study

The main aim of this study is to conduct a comparative analysis of noise level across tertiary institutions in the Calabar metropolis.

The objectives are as follows:

- To identify institutional sources of noise.
- To perform a comparative analysis of noise level across tertiary institutions in Calabar metropolis.
- To recommend measures for reducing the effects of noise levels across tertiary institutions within Calabar metropolis.

4. The Study Hypothesis

The hypothesis for this study thus states:

- H0: There is no significant variation in noise level across the two institutions (University of Cross River State and University of Calabar).

5. The Study Area

5.1. Location

The University of Calabar and the University of Cross River State lie within (6°20' - 6°40'N; 8°4' - 9°0'E), which are located in the Calabar municipality and Calabar South local government area (Figure 1). The 17-hectare site on the eastern side of the city of Calabar is between the Great Qua River and the Calabar River. Additional land has been acquired on both sides of the Great Qua River for the development of the University.

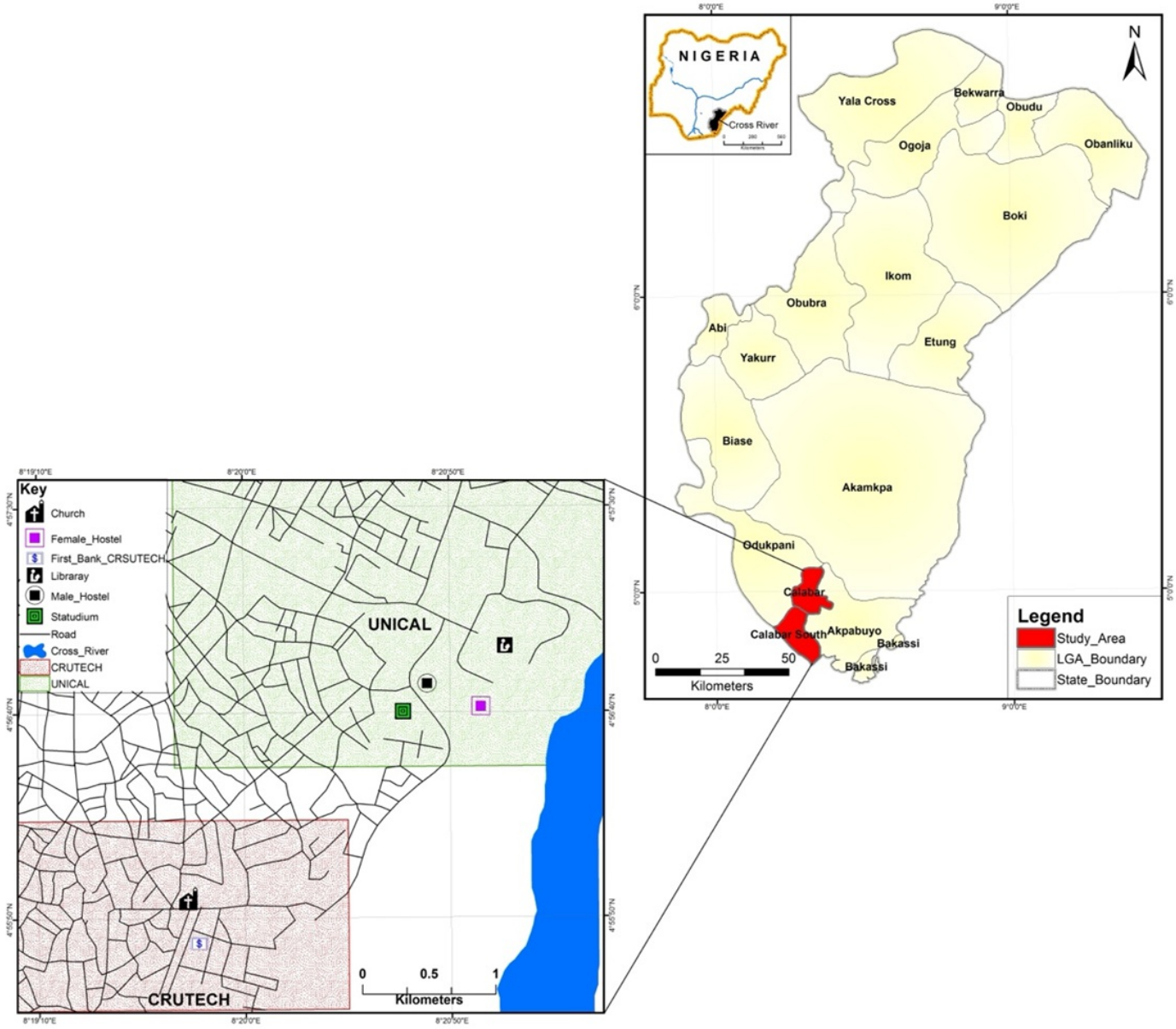

Figure 1. Cross River State map showing the University of Calabar (Unical) and The University of Cross River State (UNICROSS)

Source: By the Author, 2023

6. Method of Study

6.1. Instrumentation and Analytical Techniques

The experimental apparatus used in the recording of noise levels consisted of a BK Precision 732 Digital Sound Level Meter. It is equipped with a 4-digit Liquid Crystal Display (LCD), a condenser microphone, and an octave filter. During measurements, the microphone was positioned in such a way as not to be in the acoustic shadow of any obstacle in the field of the reflected waves. It has a resolution of 0.1 dB and an update cycle of 0.5 seconds. The system provides 30 to 130 dB capability in three convenient measurement ranges. The ranges are Low (30 to 80 dB), Medium (50 to 100 dB), and High (80 to 130 dB), with an accuracy of ±1.5 dB. The meter meets the International Electrotechnical Commission

(IEC) 651 Type II standard and includes frequency weighting of A and C and fast and slow time weighting. The A-weighting was used because of its recommendation for environmental and industrial studies [14]. Analysis was done using the analysis of variance (ANOVA) statistics.

7. Results

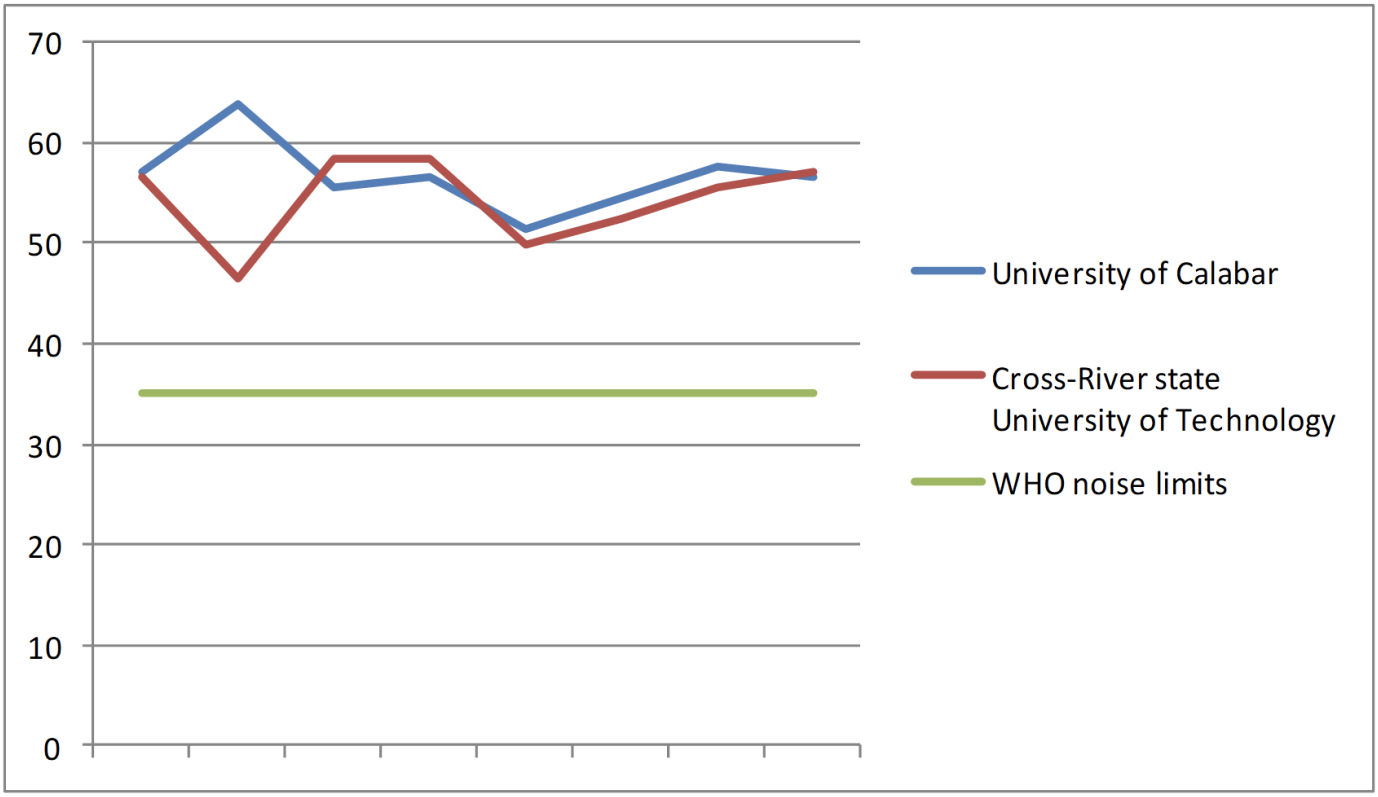

Figure 2. Comparative Assessment of Noise Levels within the University of Calabar and University of Cross River State.
Source: By the Author, 2023

Figure 2 shows a graphical representation of different noise levels within the two tertiary institutions (University of Calabar and University of Cross River State). The data presentation shows that noise levels are relatively high within the University of Calabar than at the University of Cross River State. Both institutions exceed WHO noise level limits, thus resulting in increased noise levels which are above that of WHO recommendations. This is because of increased socio-economic and educational activities within the University of Calabar environment compared to that of UNICROSS.

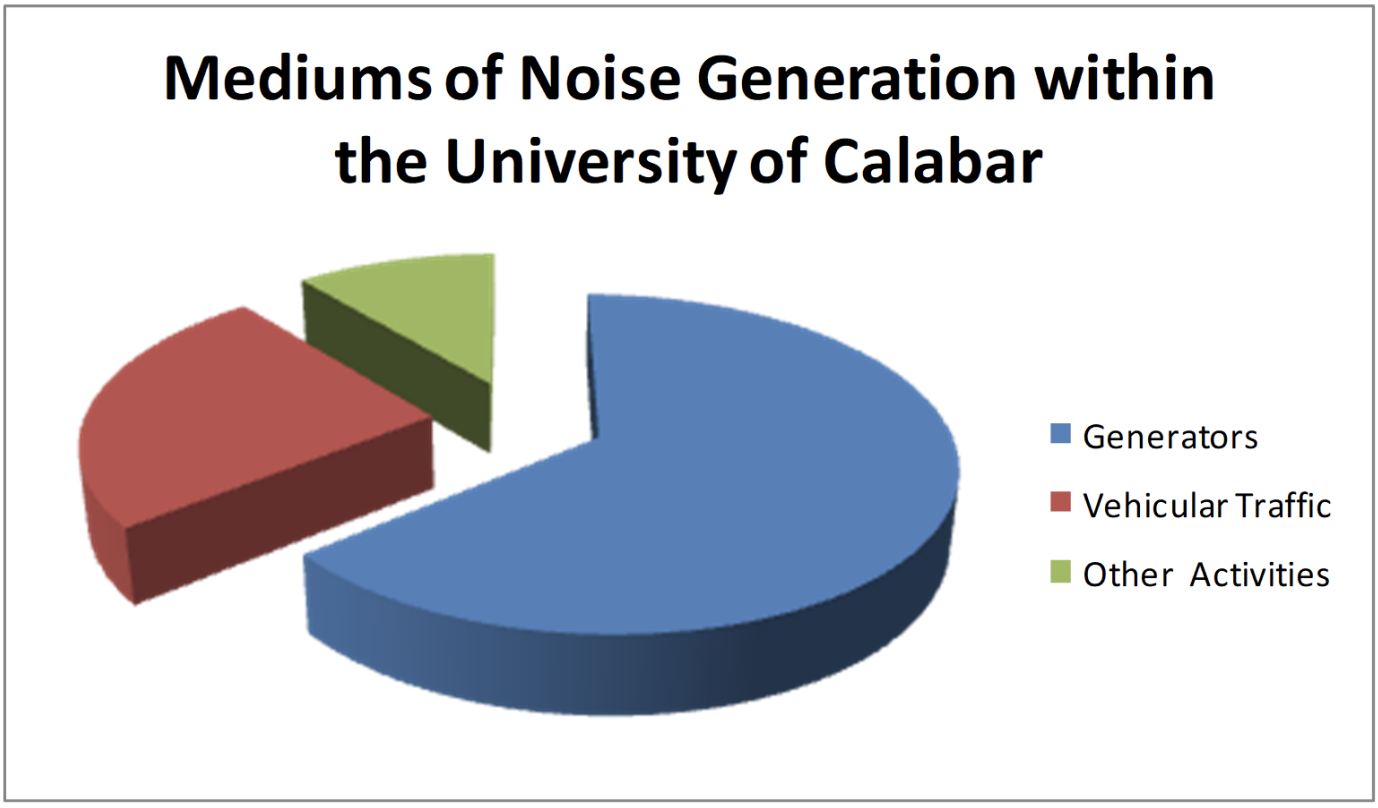

Figure 3. Mediums of Noise Generation within the University of Calabar

Source: By the Author, 2023

This presentation shows that electricity generating sets operated by business centres within the school premises and vehicular traffic within and out of the school premises are the mediums with the highest level of occurrences, while other activities are relatively at a medium scale.

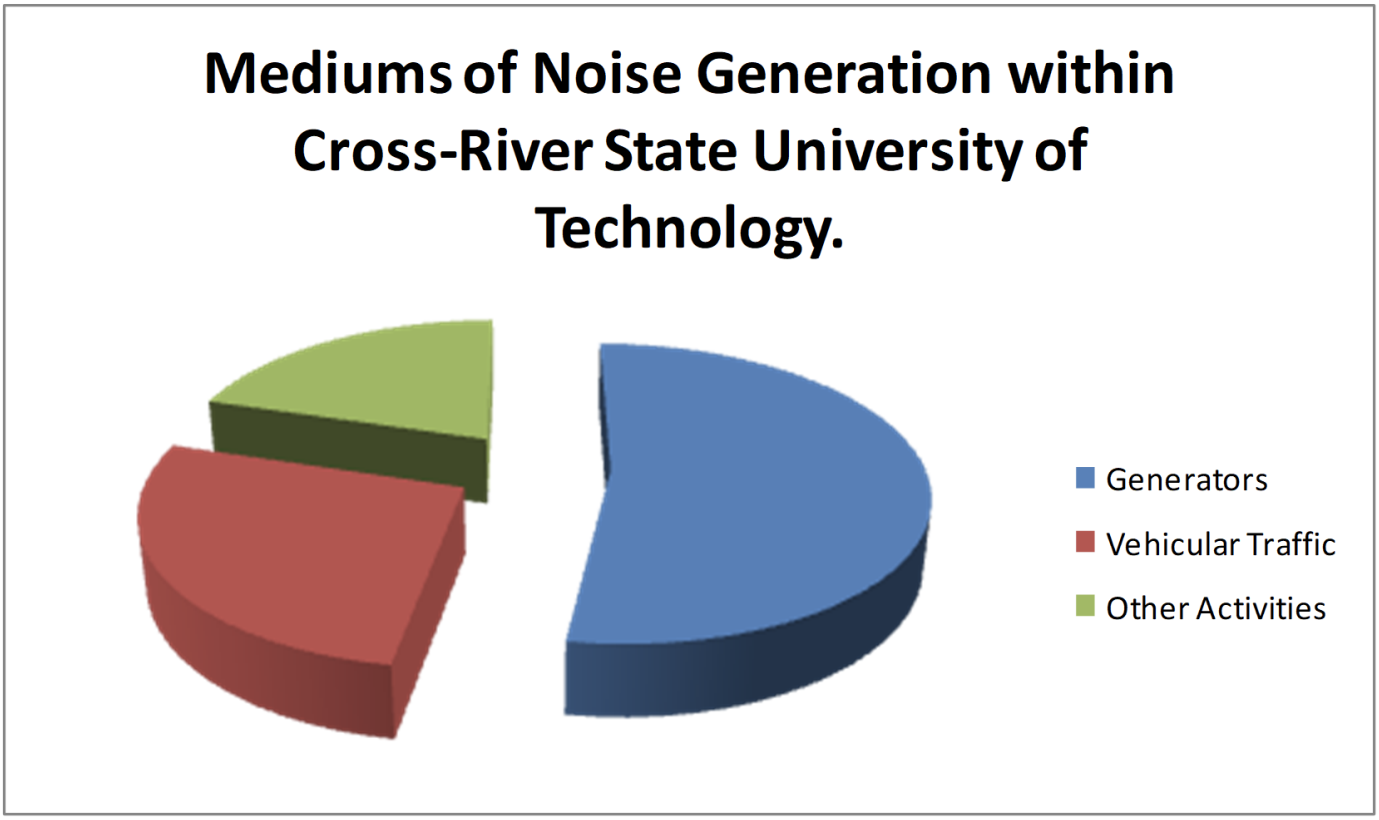

Figure 4. Mediums of Noise Generation within the University of Cross River State

Source: By the Author, 2023

The presentation shows that generating sets operated by business centres within the school premises and vehicular traffic within and out of the school premises are the mediums with the highest level of occurrences, while other activities are relatively low.

7. Discussion of Findings

The findings show that generator noise, socio-economic activities, extracurricular activities within tertiary institutions, traffic within and outside the school premises, and business outlets within and outside the study locations are the main sources of noise pollution within the study location. These can be observed by going through various analysed noise levels within the tertiary institutions during the course of the study. Analysed noise levels show that noise levels within the two study locations result from human activities within and outside the study locations. Upon identifying the sources of noise generation within the study location, the apparent consequences include. In order to proffer solutions to the problem of noise generation within the study location, an array of suggestions was put forward by the researcher to curb the challenges of noise generation within the study locations.

Analysis was done using the Analysis of Variance (ANOVA) technique. From the test, the ‘F’ value calculated (2.74) is greater than the ‘F’ tabulated (1.86), which implies that there is a significant variation in noise levels within the University of Calabar and the University of Cross River State. Observations show that generator noise, socio-economic activities,

extracurricular activities within tertiary institutions, traffic within and outside the school premises, and business outlets within the study locations are the main sources of noise pollution within the institutions

8. Recommendations

Sequel to the study objectives, the following recommendations are therefore put forward to help ameliorate the observed challenges of increased noise levels within the study locations:

- University authorities should zone/allocate land uses to activities that are similar to each other to avoid land use activity conflicts and incompatibilities.
- Land uses that are not compatible with the university environment should be eliminated.
- All non-academic activities, such as bush clearing and sanitation, should be conducted after study periods.
- Electricity supply within the university environment should be consistent to reduce the use of generators in business centers within the school premises.
- University authorities should aim to reduce the total number of generators within the school premises by allocating a single generator to serve all business operations within the school premises. This generator should be located away from lecture venues and other offices.

9. Conclusion

The study conducted a comparative analysis of noise level in 2 major universities within the Calabar metropolis. Findings show that noise occasioned by various economic activities, are relatively higher in the University of Calabar than in the University of Cross River State. However, the universities must be purged of every intolerable noise-producing activity. This leads to the conclusion that increased socio-economic and educational activities within the University of Calabar environment have led to increased noise level.

Plate 1. Generators as a major source of noise

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