

# Health Effects of Noise from Timber Processing Plants on Workers and The Environment in Essien Udim Metropolis

AKPAN, VERONICA M.<sup>1</sup>, IKPE, EMEM O.<sup>2</sup>, EKANEM, KUFRE R.<sup>3</sup>

<sup>1, 2, 3</sup> *Department of Science Technology, Akwa Ibom State Polytechnic, Ikot Osurua, Nigeria*

*Abstract- Unwanted noise can negatively impact one's quality of life and lead to major health issues. To assess the noise exposure of sawmill workers in the timber and associated industries, measured noise levels should be compared to regulatory standards. The study used a Lutron (Model SL-4030) digital sound level meter and a NAVA 300 GPS to measure sound levels at two study locations. Results were recorded in decibels (dB) for morning and afternoon working periods over six days. The study found that all locations from stations A to E in Essien Udim above the regulatory limits (96.15 to 101.65 dB) for both morning and afternoon. Similar values were also reported at Essien Udim Industrial Market (93.19 to 94.96). All personnel in these places faced noise dangers that impacted their health and hearing abilities. Workers and operators who frequently visit the site and spend long hours near noise sources should use safety gear such ear plugs, muffs, goggles, and masks.*

**Keywords:** *Noise Pollution, Timber Processing, Occupational Health, Environmental Impact, Essien Udim*

## I. INTRODUCTION

The timber industry represents a critical component of Nigeria's socioeconomic development, serving as a significant contributor to the nation's Gross Domestic Product while providing large-scale employment opportunities. Within Akwa Ibom State, and specifically the Essien Udim metropolises, the forestry sector remains a vital economic engine, supplying essential raw materials for construction, furniture manufacturing, and infrastructure development (Esire et al., 2020; Jacob & Nelson, 2021).

These forestry-based activities are indispensable for local livelihoods; however, the mechanical processes involved—specifically milling, cutting, shaping, and

dust extraction—are inherently noise-intensive (Owoyemi et al., 2016).

While timber production is essential for economic growth, the increasing reliance on locally fabricated machinery that often lacks proper vibration and noise insulation has led to widespread, unregulated noise pollution. This industrial noise often transcends the confines of the processing plants, creating a persistent environmental burden for the surrounding communities (Anekwe & Avwiri, 2024; Orikipte & Ewim, 2023).

Noise pollution, a pervasive environmental concern in industrial settings, poses significant threats to both human health and ecological well-being. Timber processing plants, characterized by heavy machinery and continuous operational activities, are notorious sources of high-intensity noise. This research delves into the health effects of noise emanating from timber processing plants on workers and the surrounding environment in Essien Udim metropolis.

The study aims to elucidate the physiological and psychological impacts on exposed individuals, as well as the broader environmental consequences, drawing upon existing research and contextualizing it within the specific socio-economic and geographical landscape of the study area.

Understanding these impacts is crucial for developing effective mitigation strategies and ensuring sustainable industrial practices that prioritize the health and safety of both human populations and the natural ecosystem. The relentless hum and jarring sounds produced by chainsaws, planers, chippers, and conveyor belts in timber

processing facilities contribute to a complex acoustic environment that can exceed safe exposure limits.

This is particularly concerning in developing regions like Essien Udim, where industrial regulations might be less stringently enforced, and awareness of noise pollution's detrimental effects may be limited. The economic activities in these areas, often reliant on natural resources like timber, create a direct link between industry and the local population, making the investigation of these health effects a matter of immediate public health relevance.

#### Problem Statement

Despite the economic importance of the timber industry in Essien Udim, the lack of rigorous noise management practices poses significant public health risks. The auditory and physiological dangers of prolonged noise exposure in sawmill environments are well-documented; studies have shown that approximately 73% of noise measurements in such facilities exceed the 85 dB(A) limit established for industrial safety (Aremu et al., 2015).

In various Nigerian contexts, high-intensity noise has been directly linked to detrimental health outcomes among workers, including hearing impairment, with prevalence rates as high as 89.7% reported in some studies (Bright et al., 2018).

Beyond permanent hearing loss, workers frequently suffer from a spectrum of noise-related ailments, including tinnitus, hypertension, persistent headaches, fatigue, sleep disturbance, and increased levels of anxiety and stress (Aremu et al., 2015; Edwrad & Whiskey, 2020; Owoyemi et al., 2016).

Critically, the health implications of these timber processing plants are not restricted to the factory floor. Industrial noise constantly broadcast into the environment poses risks to neighboring residents—particularly vulnerable groups such as children, the elderly, and those with pre-existing health conditions—who are susceptible to stress, sleep disturbances, reduced cognitive functioning, and an overall lower quality of life due to continuous noise exposure (Orikpeta & Ewim, 2023).

Currently, there is insufficient data assessing the specific health impacts of timber plant noise in the Essien Udim metropolises. Consequently, this study addresses this research gap by pursuing the following objectives:

- Evaluate the current noise pollution levels generated by timber processing plants within the Essien Udim metropolises;
- Investigate the occupational health status of plant workers, specifically regarding noise-induced auditory and physiological ailments; and
- Analyze the environmental impact of industrial timber noise on the health and well-being of the immediate surrounding communities.

This assessment is essential to provide an empirical basis for recommending noise control strategies—such as sound insulation, vibration damping, and the enforcement of industrial safety standards—to mitigate these public health risks (Aremu et al., 2015; Owoyemi et al., 2016).

#### Health Effects on Workers

The direct exposure of workers to the intense noise levels within timber processing plants results in a cascade of adverse health outcomes, primarily affecting the auditory system but extending to other physiological and psychological domains. The most well-documented effect is noise induced hearing loss (NIHL).

This gradual, irreversible condition develops over time due to repeated exposure to sound levels exceeding 85 decibels (dB) for extended periods. In timber processing, machinery such as chainsaws can easily generate noise levels of 100-120 dB, while large industrial saws and planers can operate in a similar range. Even moderate noise exposures, if prolonged, can lead to significant hearing impairment.

This loss is often characterized by difficulty in understanding speech, especially in noisy environments, leading to communication challenges, social isolation, and a reduced quality of life. Early symptoms may include tinnitus, a persistent ringing

or buzzing in the ears, which can be highly distressing and disruptive.

Beyond hearing impairment, occupational noise exposure is increasingly linked to a range of non-auditory health effects. Stress is a significant physiological response to loud noise. The body's fight-or-flight response is triggered by persistent noise, leading to elevated levels of stress hormones like cortisol and adrenaline.

This chronic stress can manifest in various ways, including increased blood pressure, elevated heart rate, and a higher risk of cardiovascular diseases such as hypertension, ischemic heart disease, and stroke. Studies have shown a correlation between occupational noise exposure and an increased incidence of these conditions, even in individuals without pre-existing risk factors.

The constant sensory overload can also disrupt sleep patterns, leading to fatigue, reduced cognitive function, and an increased susceptibility to accidents in the workplace.

Furthermore, noise pollution can contribute to psychological distress. Workers exposed to high noise levels often report increased irritability, anxiety, and even symptoms of depression. The inability to communicate effectively due to hearing loss or the constant presence of disruptive noise can lead to frustration and a sense of helplessness.

This can negatively impact job satisfaction and overall mental well-being. In the context of Essien Udim, where many workers may rely on their employment for economic stability, the compounding effects of hearing loss, stress, and psychological distress can have profound implications for their livelihoods and family well-being.

The lack of adequate personal protective equipment (PPE) such as earplugs and earmuffs, or the improper use thereof, exacerbates these risks. Anecdotal evidence from similar industrial settings suggests that while PPE might be available, consistent and correct usage is often compromised due to discomfort, perceived inconvenience, or a lack of proper training and enforcement by management.

The cumulative effect of these health issues can lead to premature retirement, reduced earning capacity, and a significant burden on healthcare systems. For instance, a worker experiencing severe NIHL may struggle to find alternative employment, especially if their communication abilities are compromised.

The increased risk of cardiovascular disease further compounds these challenges, potentially leading to chronic illness and disability. The economic implications are also substantial, with increased healthcare costs for both individuals and employers, as well as lost productivity due to absenteeism and reduced efficiency.

The psychological toll can be equally devastating, impacting personal relationships and the ability to engage in social activities, further diminishing the overall quality of life for affected workers.

#### Environmental Impacts of Noise Pollution

The impact of noise from timber processing plants extends beyond the immediate vicinity of the facility, affecting the broader environment and its inhabitants. While often less tangible than air or water pollution, noise pollution can have significant ecological consequences, particularly on wildlife. Animals rely on sound for a variety of essential functions, including communication, predator detection, navigation, and foraging. Anthropogenic noise can interfere with these natural processes, leading to a range of detrimental effects Esiere et al, 2020.

In the environments surrounding Essien Udim, where natural habitats might be in proximity to industrial activities, the constant drone of machinery can disrupt the delicate balance of local ecosystems. For instance, the noise can mask the calls of mating birds, hindering their reproductive success. It can also interfere with the ability of predators to hunt and prey to detect approaching dangers, altering predator-prey dynamics.

Studies on various animal species have demonstrated that noise pollution can cause stress responses, changes in behavior, and even displacement from their natural habitats. This can lead to a reduction in biodiversity and a decline in the populations of sensitive species (Akpan et al, 2025).

The impact on avian populations is particularly well-documented. Birdsong, crucial for territory defense and mate attraction, can be drowned out by industrial noise, forcing birds to adapt by singing louder, at different times, or in different locations, which may not always be successful.

This can lead to reduced breeding success and shifts in species composition within noisy areas. Mammals also suffer. The constant noise can cause stress, leading to increased vigilance, reduced foraging efficiency, and avoidance of otherwise suitable habitats. This displacement can fragment habitats, isolate populations and making them more vulnerable to other environmental stressors.

Furthermore, noise pollution can affect nocturnal animals. The continuous hum of machinery can disrupt their ability to navigate and forage in the dark, impacting their survival rates. The cumulative effect of these disturbances can lead to a gradual degradation of the ecological health of the area, with subtle but significant long-term consequences for the resilience and functioning of the local environment.

The aesthetic and recreational value of natural landscapes can also be diminished by pervasive industrial noise, impacting the quality of life for local communities who rely on these areas for leisure and relaxation.

The spread of noise from these plants is not confined to the immediate surroundings. Sound waves can travel considerable distances, particularly in open landscapes, affecting areas that are not directly adjacent to the processing facilities. This means that even communities or natural areas located several kilometers away could experience elevated noise levels, potentially impacting wildlife and human well-being in those locations as well. The cumulative effect of multiple noise sources, even if individually not excessively loud, can create a generalized background noise that erodes the tranquility of the natural environment.

This is a critical consideration for the planning and siting of future industrial developments to ensure that the impacts are contained and do not infringe upon sensitive ecological areas or residential zones.

#### Mitigation and Management Strategies

Addressing the health effects of noise from timber processing plants requires a multi-faceted approach involving technological solutions, administrative controls, and behavioral changes. Effective mitigation strategies can significantly reduce noise levels and protect both workers and the environment.

Technological solutions focus on reducing noise at its source. This includes implementing quieter machinery designs, utilizing noise-reducing enclosures around noisy equipment, and maintaining machinery regularly to ensure optimal performance and minimize rattling or squeaking. For instance, installing vibration dampeners on heavy machinery can reduce the transmission of noise through structures. Using acoustic insulation materials in buildings housing processing equipment can also contain noise within the facility (Ede et al, 2024).

Administrative controls involve establishing work practices and policies that limit exposure duration and intensity. This includes implementing strict work rotation schedules, ensuring workers spend minimal time in high-noise areas, and establishing clear quiet zones within the plant where workers can take breaks and recover from noise exposure.

Regular noise monitoring within the plant is crucial to identify areas exceeding safe limits and to assess the effectiveness of implemented controls. Establishing clear operational guidelines and enforcing them rigorously is paramount.

Perhaps the most critical aspect for worker protection is the consistent and correct use of personal protective equipment (PPE). This includes providing high-quality earplugs and earmuffs and conducting regular training on their proper fitting and use. Education campaigns should highlight the irreversible nature of NIHL and the importance of protecting hearing from an early stage. Employers have a responsibility to ensure that PPE is readily available, comfortable to wear, and that workers understand its significance (Ede et al, 2024).

For environmental protection, careful site selection and buffer zones are essential. Industrial facilities should ideally be located away from residential areas

and sensitive ecological habitats. Establishing a sufficient buffer zone, often comprising trees and vegetation, can help to attenuate noise levels before they reach surrounding areas. Land use planning and zoning regulations should take into account the potential for noise pollution from industrial activities.

Community engagement and awareness are also vital. Educating local communities about the risks associated with noise pollution and involving them in decision-making processes related to industrial development can foster a sense of shared responsibility and support for mitigation efforts. Public health campaigns can raise awareness about the importance of noise reduction and its benefits for overall well-being.

In the context of Essien Udim, where resources might be limited, a tiered approach to mitigation might be most practical. Initially, focusing on the most critical aspects, such as enforcing PPE usage and basic maintenance of machinery to reduce immediate noise hazards, can be a starting point. Gradually, as resources allow, investments in quieter machinery and acoustic treatments can be explored.

Collaboration between government agencies, industry stakeholders, and local communities is key to developing and implementing sustainable noise management plans that are both effective and economically viable for the region. The long-term health and environmental sustainability of these communities depend on proactive measures taken to control noise pollution from their industrial base.

## II. LITERATURE REVIEW

**Noise Pollution in Industrial Settings** Industrial noise is primarily generated by machinery, saws, and transportation within timber processing facilities. Studies globally have established a link between noise exposure and adverse health outcomes among workers (Basner et al., 2014).

**Health Effects of Occupational Noise** Hearing impairment, stress, sleep disturbances, and increased risk of hypertension are common among exposed workers. Non-auditory effects, such as reduced

productivity and impaired communication, are also significant (WHO, 2018).

**Environmental Impact** Noise pollution affects surrounding communities and local wildlife, disrupting daily life and ecological balance.

Hayward and Helbich (2024) experimentally assessed the possible association of environmental noise levels with demographic and socioeconomic neighborhood compositions. They cross-sectionally examined long-term noise levels for 9,372 neighborhoods in the Netherlands and then linked the noise levels with administrative data on neighborhood characteristics for the year 2021.

Linear and non-linear spatial regression models were fitted to explore the associations between noise, demographic, and socioeconomic neighborhood characteristics. The results showed that 46% of the neighborhoods exhibited noise levels surpassing the recommended threshold of 53 dB to prevent adverse health effects.

The regressions uncovered positive and partially non-linear neighborhood-level associations between noise and non-Western migrants, employment rates, low-incomers, and address density. Conversely, the researchers found negative associations with higher-educated neighborhoods and those with a greater proportion of younger residents. Neighborhoods with older populations displayed a U-shaped association.

It was concluded that this national study showed an inequality in the noise burden, adversely affecting vulnerable, marginalized, and less privileged neighborhoods.

Aletan and Garba (2020) examined the environmental impact of the location of two leading sawmills on the adjoining residents in Ilorin, Kwara State, Nigeria. The data for this study were collected from primary and secondary sources. Sources of the primary data were physical observations, oral interview, and questionnaire administration.

Ten (10) percent of the houses that were within 1 kilometer radius of the two sawmills were selected using systemic random sampling yielding a total of 131 questionnaires administered on residents. These

data were analyzed with the aid of descriptive statistical analysis such as frequency and percentage. The study revealed that majority of sampled residents were not pleased with the location of the sawmills in their neighborhood as they considered that the sawmills impacted negatively on them such as frequent headache, hearing problem and respiratory ailment among others due to Machine noise, dust and particles, and Smoke.

Ede et al. (2024) conducted a study to assess noise pollution in the motor parks at Izuchukwu Junction Nnewi, Anambra State, Nigeria. Six motor parks were assessed and they included Eastern Mass Park, Romchi Park, Izuchukwu Park, Ihiala mass transit park, Globis Park and Onitsha South Park.

The researchers employed a descriptive cross-sectional design and the noise level was determined with the use of calibrated sound level meter at time intervals. Measurements were taken in the morning (6.00 - 9:00am), afternoon (12:00 - 2:00pm) and evening (4:00 - 6:00pm) for one week.

The collected data were analyzed using descriptive statistical analysis. From the results, Eastern Mass Park had the highest (81.62dBA) which exceeded the permissible noise levels by WHO and NESREA with a range of 60dB. Romchi Motor Park recorded 81.2dB while the least (72.8dB) was on Izuchukwu Motor Park. The total average of the studied motor parks was 77.7dB and it was beyond the WHO and NESREA recommended permissible limit of 70dB and 60dB respectively in all the motor parks.

Vehicle engine and horn honking were observed to be the lead sources of noise. It was concluded that public health education on noise pollution should be prioritized to sensitize the public about the health effects of noise pollution and how to prevent it.

### III. EXPERIMENTAL PROCEDURES

Materials collection and analysis

The SL-4030 is a single hand-held digital sound level meter used for measuring noise level in any environment. Data collected from the two sampling sites were compared with relevant standards. Overall morning and afternoon for six days values were

computed and measured. Average of the six days for the two locations were calculated as mean values for the sampling sites. The morning and afternoon mean results were subjected to spatial interpolation to identify areas of high noise level.

The wood processing plants considered for the study were Table saw, Surface planer, Carving machine, and Curving saw commonly-used within the timber markets at Essien Udim metropolis, Nigeria.

Data acquisition and analysis

Measurements of noise levels were implemented using the sound level meter at various distances ranging from 1 m to 10 m from each of the selected machines/wood processing plants. Three identical samples of each processing plant were surveyed per location after which the mean and corresponding standard error values of the data obtained for each distance were computed. Measurements of the noise levels were similarly performed under two conditions of operation of the surveyed machines such as unloading and loading conditions in which cases the machines were powered externally.

During each noise measurement schedule, the sound meter was held at the level of the machine stage above the ground and care was taken to ensure that the line of propagation of the sound from the machine was maintained with respect to height of the meter above the ground. For all the loading conditions, the average maximum distance of the machine operator was determined.

Within each of the study locations, the environmental data such as geographical coordinates, weather parameters (temperature, and relative humidity) were measured using the GPS, thermometer, and relative humidity meter respectively. Figure 1 shows the photos taken during noise level measurement at one of the study sites.

IV. RESULTS AND DISCUSSION

Results:

Table 1: -Sampling points at Essien Udim

Longitude	Latitude	STATION:	Name of Station	MORNING	AFTERNOON
7.658925	5.127115	A	Afaha Ikot Ebak	97.6	101.645
7.718176	5.099774	B	Ukana Akpa Utong	98.155	98.43
7.59587	5.095682	C	Ikot Edem Udo	97.30667	96.15167
7.615504	5.13669	D	Ikot Obiokson	95.55833	97.60667



Figure 1. Photos taken at a site during noise level measurements

For the purpose of gathering qualitative data to provide insights into the health implications of the exposure to the measured noise levels, the questionnaires were administered to the workers and plant managers alongside semi-structured interviews granted. The parameters considered for acquisition of useful qualitative data from the respondents/subjects (workers and plant managers) in this case were basically the duration of exposure to the occupational noise within the processing plants, health issues experienced during and after work, social demography as well as clinical examination.

These pieces of information were sought with the assurance of treating them with absolute confidentiality and anonymity. The noise-distance data were analyzed graphically using Origin software (Version 2019b). More so, the completed questionnaires were collected and sorted. Those administered to subjects who were on medications were excluded and the remaining ones were duly utilized as intended in this research. The responses from the subjects were quantified and described based on frequencies per identified health challenge.

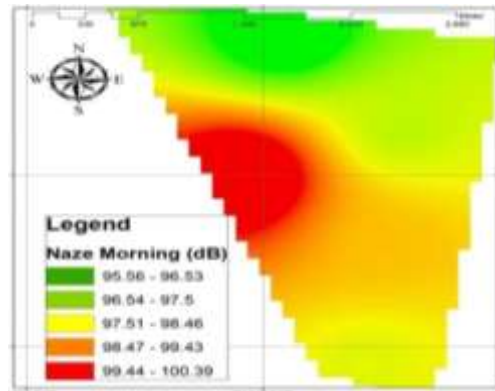


Fig 2: -Map of Industrial Market Afaha Ikot Ebak, Noise Level.

The noise measurement for the beginning of work period was revealed in the figure 2 above. The noise level was segmented into five areas at dB (A) covering the five sampling points starting from 95.56 dB (A) to 100.39 dB (A). See the figure 2 above. From the IDW spatial interpolation results, it as revealed that the noise levels from the entire area were above limit and however, the western part of the market had the highest recorded noise

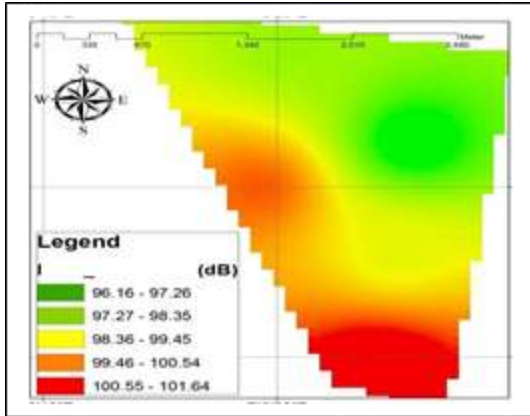


Fig 3: -Map of Ukana Akpa Utong, Noise Level.

The noise measurement for peak work time revealed an increase in noise levels in the sawmill's west and south regions (see figure 3 above). Figure 3 shows that the noise level was separated into five (5) groups based on dB(A) at the five sampling locations in the sawmill, ranging from 96.16 dB(A) to 101.64 dB(A). This image was also made using IDW spatial interpolation to blend noise values from many sample points. It was discovered that the bulk of machines used in the afternoon were the biggest source of noise.

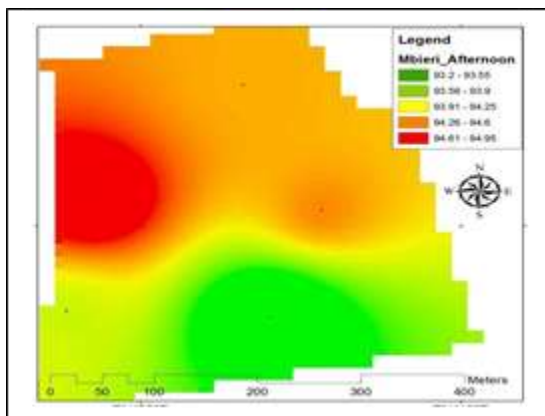


Figure 4: -Map of Ikot Edem Udo Noise Level.

Figure 4 depicts the noise level measurement for work in the market. The noise level was divided into five sections at dB (A) to cover the five sampling points ranging from 92.57 dB (A) to 95.61 dB. The IDW spatial interpolation results revealed that noise levels throughout the area were above the FEPA limit.

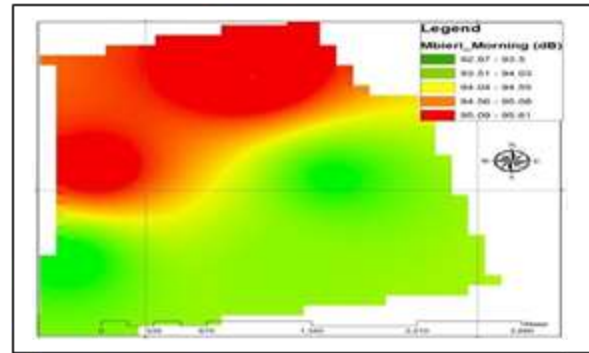


Figure 5: -Map Ikot Obiokon Noise Level.

The measurement found an elevated noise level during the peak work period in the afternoon. The noise level was divided into five (5) groups at dB(A) to cover the five sample sites in the market, ranging from 93.2 dB(A) to 94.95 dB(A), as shown in Figure 5. This figure was also an IDW spatial interpolation of afternoon noise data taken at several market sampling points. It was shown that the majority of machines utilized in the afternoon were the largest contributors of noise.

## DISCUSSION

The findings underscore the significant and multifaceted health implications of noise pollution originating from timber processing plants for both workers and the environment in Essien Udim. Workers are exposed to an elevated risk of noise induced hearing loss, chronic stress, cardiovascular problems, and psychological distress due to prolonged exposure to high decibel levels.

These issues not only diminish their quality of life but also have considerable economic consequences through increased healthcare costs and reduced productivity. Simultaneously, the surrounding environment suffers from the disruption of wildlife communication, behavior, and habitat integrity, potentially leading to a decrease in biodiversity and ecological imbalance.

The spread of noise beyond the immediate industrial zones means that the impact is far-reaching, affecting communities and natural areas at a distance.

Therefore, a comprehensive and proactive approach to noise management is imperative. This necessitates a combination of technological advancements in noise reduction, strict administrative controls and work practices, consistent and proper use of personal protective equipment, and robust environmental planning, including the establishment of buffer zones and thoughtful site selection.

Raising awareness within the workforce and the wider community about the detrimental effects of noise pollution and the importance of mitigation measures is equally crucial. Ultimately, sustainable industrial development in Essien Udim hinges on the effective management of noise pollution, ensuring the well-being of its human population and the preservation of its natural heritage for future generations. Collaborative efforts involving industry, government, and the community are essential to implement and sustain these vital mitigation strategies, paving the way for a healthier and more environmentally sound industrial landscape.

The 8- and 10-hour exposure limits for FEPA standards were used to compare the results obtained from actual noise level measurements at chosen stations in the research location (sawmill), as workers spend up to 8 hours each day at the site. Throughout the investigation, the average noise level measured in the cardinal directions surpassed FEPA regulations. The measurement for six days differed since not all operators and traders started work at the same time.

Many of the operators of noise-generating machines, especially those who work with the spindle (stenner) machines, from observation, already have symptoms of noise-induced hearing loss, as most of them could not hear at the sound level of normal conversation, and so one has to increase her tone before they could hear or communicate with her very well, and this confirms the report of Rilind (2019) that noise damage the brain, hearing power, poor sleep, psychological disorder, and so on Furthermore, noise pollution has been linked to autism spectrum disorder (ASD), which can produce hyperacusis (an excessive sensitivity to sound) (Stiegler and Davis, 2010). Menkiti and Agunwamba (2015) revealed that the average noise level was 97.60dB, which exceeds the WHO threshold of 50dB for residential zones. The

location of these sawmills led people to establish both their residential dwellings and private schools in the vicinity, expanding the population that is exposed to this noise pollution.

The afternoon measurements revealed that the highest noise levels are generated between 12 and 4 p.m., when all machines and engines are in use, more buyers are in the market, and more private and commercial vehicles enter and exit the area, particularly those transporting wood and allied products. Road transportation contributes significantly to the country's economic and social growth.

The station's noise-producing machinery includes generators, spindle molder machines, stenner machines, planning machines, mortising and grooving machines, sawing machines, and so on.

According to Koushki et al. (2007), the majority of workers did not consider noise levels to be a concern. However, some of them who were aware of the impact of noise on their health are still present due to poverty and unemployment.

#### ACKNOWLEDGEMENT

The authors are thankful to the Tertiary Education Trust Fund (TETFund), Nigeria for providing financial support for this research and permitting the authors to publish the work.

#### REFERENCES

- [1] Akpan, V. M., Akpan, A. O., & Ekpenyong, N. E. (2025). Health implications of timber processing plant noise on workers and the environment in Ikot Ekpene metropolis, Akwa Ibom State, Southern Nigeria.
- [2] Anekwe, U., & Avwiri, G. (2024). Evaluation of Noise Pollution Level in Selected Sawmill Factories in Port Harcourt and Environs, Rivers State, Nigeria. *American Journal of Environmental Science and Engineering*, 8(1), 1-8.
- [3] Aremu, A. S., Omoniyi, J. O., & Saka, T. (2015). Indoor noise in academic libraries: A

- case study of University of Ilorin Main Library, Nigeria. *African Journal of Library, Archives and Information Science*, 25(1), 5-14.
- [4] E.A. Okorie, N.A. Alugbala, I.E. Nwaoma, O.S. Mercy, R.E. Adeyem, I.J. Akem, N.J. Chidiebere, B.T. Onyeje, O.E. Akem, I.C. Eberechi (2024), "Assessment of Noise Pollution in the Motor Parks at Izuchukwu Junction and its Axis in Nnewi, Anambra State, Nigeria," *International Journal of Scientific Research in Multidisciplinary Studies*, Vol.10, pp.11–18, 2024.
- [5] Esiere, N. E., Ndulue, N. B., & Akpan, M. P. (2020). Factors affecting timber production in Akwa Ibom state (Nigeria) and the way forward. *Asian Journal of Research in Agriculture and Forestry*, 6(3), 31-40.
- [6] Jacob, D., & Nelson, I. (2021). Application of time-series analysis in predictive modelling of forest revenue sources in Akwa Ibom State, Nigeria. *International Journal of Agriculture Forestry and Life Sciences*, 5(1), 50-58.
- [7] Koushki, P. A., Kartam N. and Almutairi A. (2007) worker's perceptions & awareness of noise pollution at construction sites in Kuwait. *Civil Engineering & Eval Systems* 21
- [8] M. Hayward, M. Helbich (2024), "Environmental noise is positively associated with socioeconomically less privileged neighborhoods in the Netherlands," *Environmental Research*, Vol.248, Article 118294, 2024.
- [9] Menkiti Nwasinachi, Agumwamba Jonah (2015). Assessment of noise pollution from electric generators in a high-density residential area. *African Journal of Science, Technology, Innovations and Development*. 306-312.
- [10] O.E.Aletan, E.O. Garba (2020), "Environmental Implication of Sawmill Industries on Adjoining Residents in Kwara State, Nigeria," *International Journal of Scientific Research in Multidisciplinary Studies*, Vol.6, pp.28-31, 2020.
- [11] Orikpete, O. F., & Ewim, D. R. E. (2024). A Systematic Approach to Exploring Recent Improvements in the Sustainability of Biodiesel Production. *Localized Energy Transition in the 4th Industrial Revolution*, 20-39.
- [12] Owoyemi, J. M., Habeeb, O. Z., & Elegbede, I. O. (2016). Sustainable wood waste management in Nigeria. *Environmental & Socio-economic Studies*, 4(3), 1-9.
- [13] Rilind Elezaj (2019) Noise pollution effects. [www.healtheuropa.eu](http://www.healtheuropa.eu)
- [14] Stiegler, L. N. and Davis R. (2010). Understanding sound sensitivity in individuals with autism spectrum disorder. *Focus on Autism and other developmental disabilities*. 25 (2): 67-75.