Assessment of Ambient Noise Levels in Different Zones of Raipur City, India

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Abstract - Environmental noise pollution has become a significant concern in rapidly urbanizing cities due to increasing traffic, industrialization, and population growth. The present study aims to assess ambient noise levels in different zones of Raipur, India, including commercial, residential, industrial, and silence zones. Noise measurements were conducted at 25 selected locations during daytime and nighttime using a calibrated sound level meter.

The equivalent continuous noise level (Leq) was computed to evaluate the overall noise exposure, and the results were compared with standards prescribed by the Central Pollution Control Board. The findings reveal that industrial zones recorded the highest noise levels (Leq ≈ 85 dB), followed by commercial zones (≈ 80 dB), while residential and silence zones also exceeded permissible limits.

1. INTRODUCTION

Environmental pollution has emerged as one of the most pressing challenges associated with rapid urbanization and industrialization. Among various types of pollution, noise pollution has gained increasing attention due to its direct and indirect impacts on human health and environmental quality. Unlike air or water pollution, noise pollution is often underestimated because it does not leave visible residues; however, its effects are significant and widespread.

Noise can be defined as any unwanted or unpleasant sound that disrupts normal activities such as sleeping, conversation, or working. In urban environments, noise is generated from multiple sources including vehicular traffic, industrial machinery, construction activities, public events, and domestic appliances. The continuous exposure to elevated noise levels can lead to physiological and psychological disorders.

In rapidly growing cities, the increase in population density, transportation demand, and infrastructure development has intensified the problem of noise pollution. Urban areas are characterized by mixed land use, where residential, commercial, and industrial activities coexist, leading to complex noise environments.

2. LITREATURE REVIEW

Noise pollution has emerged as a significant environmental issue due to rapid urbanization, industrialization, and increased transportation activities. In urban areas like Raipur, rising infrastructure and traffic have increased ambient noise levels. This chapter reviews previous studies related to noise assessment, sources, impacts, and analysis methods.

Several researchers have studied ambient noise levels in urban environments:

Vijay R et al. (2015) conducted a GIS-based assessment of ambient noise in urban areas and found that commercial zones recorded the highest noise levels due to heavy traffic and continuous human activity. Their study demonstrated that spatial mapping techniques are highly effective in identifying noise hotspots and planning mitigation strategies.

Sharma A (2016) analyzed ambient noise levels in residential areas and reported that most locations exceeded permissible limits during daytime. The study attributed this to increasing vehicular movement and mixed land-use patterns, emphasizing the need for stricter regulation and monitoring.

Kumar M (2017) investigated industrial noise pollution and observed that industrial zones exhibited the highest variability in noise levels due to intermittent machinery operations. The study recommended implementing engineering controls to reduce noise emissions.

According to Gupta R (2018), silence zones such as hospitals and educational institutions often fail to comply with permissible noise limits because of nearby traffic and lack of enforcement. The study highlighted the importance of strict implementation of silence zone regulations.

Chakrabarti T (2019) reported a steady increase in urban noise levels over the past decade due to rapid urbanization and population growth. The study stressed the need for continuous monitoring and updated environmental policies.

3. METHODOLOGY

Raipur is the capital city of Chhattisgarh with rapid urbanization and industrial growth. The city includes commercial, residential, industrial, and silence zones. Raipur is selected as the study area due to: Rapid urbanization ,Increasing traffic congestion .Several factors affect noise levels in Raipur: Traffic density ,Road conditions

A total of 25 locations were selected across four zones: commercial, residential, industrial, and silence zones.Noise levels were measured using a Sound Level Meter with range 30–130 dB, A-weighting, and fast response.Measurements were taken during day (6 AM–10 PM) and night (10 PM–6 AM) for 15–30 minutes at 1.5 m height.

4. RESULT & DISCUSSION

The analysis of collected data reveals that noise levels vary significantly across different zones. The variation is influenced by land use, traffic density, and human activities.**General Trend Observed:**

- Industrial > Commercial > Residential > Silence Zone

Zone	Day Mean	CPCB Lin	Exceedance
Commercial	80.28571	65	+15.3
Residential	62	55	+7
Industrial	85	75	+10
Silence	55.5	50	+5.5

Table 1 Noise Exceedance

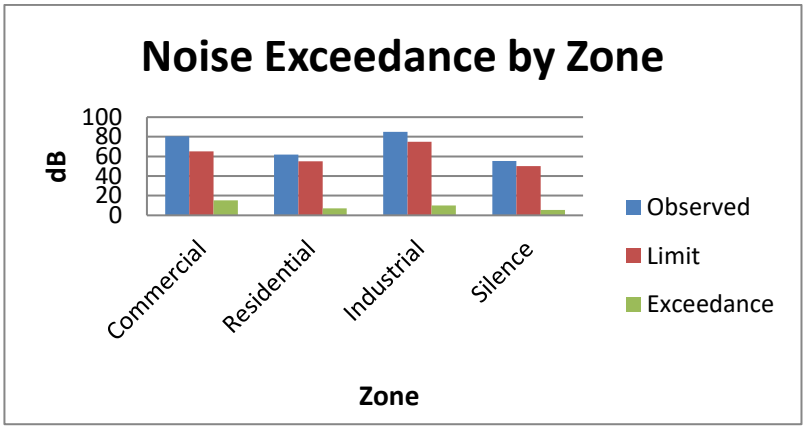

Figure 1: Extent of noise exceeding permissible limits in different zones.

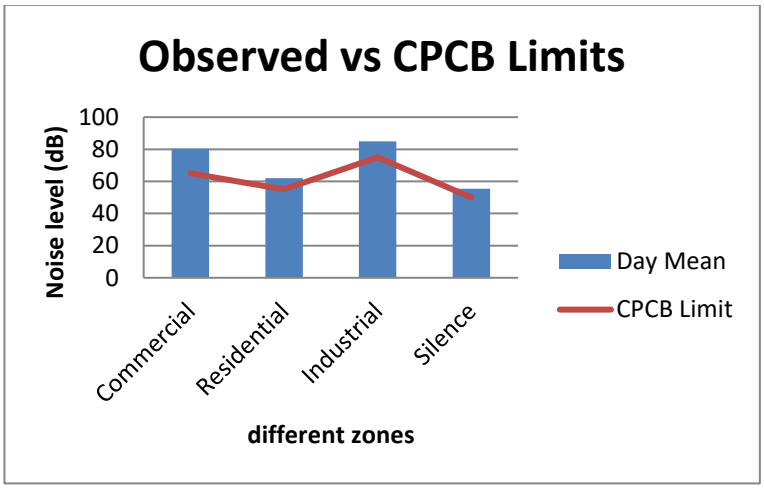

Figure 2: compares observed noise levels with CPCB standards. (Day)

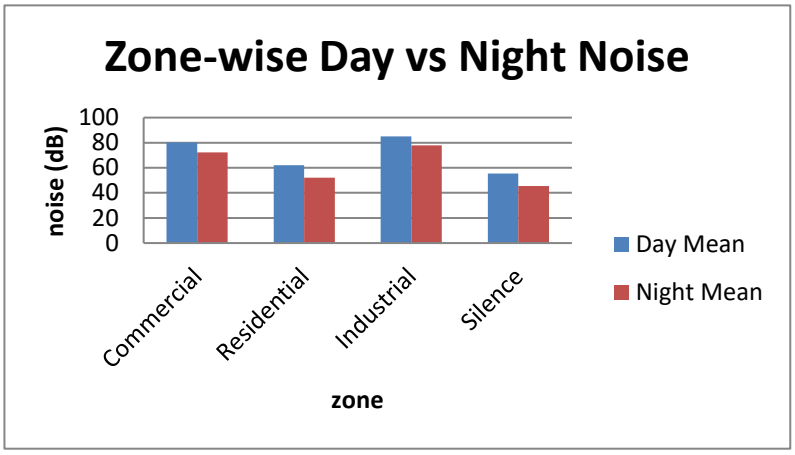

Figure 3: illustrates comparison of day and night noise levels across zones.

5. CONCLUSION AND RECOMMENDATIONS

The present study assessed ambient noise levels across commercial, residential, industrial, and silence zones of Raipur city. The analysis was carried out using statistical methods, graphical representation, and comparison with standards prescribed by the Central Pollution Control Board.

Based on the results, the following conclusions are drawn:

Zone-wise Noise Levels

- Industrial zones recorded the highest noise levels (Leq ≈ 85 dB day, 78 dB night) due to continuous machinery operations.
- Commercial zones also exhibited high noise levels (Leq ≈ 80 dB day), mainly due to traffic congestion and human activities.
- Residential zones showed moderate noise levels, but still exceeded permissible limits.

Silence zones, which are expected to be the quietest, also exceeded CPCB limits, indicating poor enforcement.

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