



Assessment And Reduction Of Traffic Noise Pollution At Urban Intersections In Maharashtra

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Abstract: With the rapid pace of urbanization and industrial growth, noise pollution has become an inevitable by-product of modern development. This escalating issue is now a major concern for industrial corporations, businesses, and urban planners, affecting both productivity and quality of life. Noise mapping involves analyzing and categorizing urban areas based on noise levels to assess and manage noise pollution. In this study, noise levels were surveyed at seven key locations in Nashik city using a noise level meter. The collected data was utilized to develop GIS-based noise maps, which were subsequently compared with the permissible noise levels outlined by the Central Pollution Control Board (CPCB), New Delhi. The findings revealed significant exceedances of permissible noise limits in several zones, underscoring the urgent need for targeted noise mitigation measures. These insights provide a critical foundation for local authorities to implement effective noise reduction strategies and inform urban planning initiatives aimed at minimizing the adverse impacts of noise pollution on public health and quality of life.

Index Terms -Road traffic noise, urban intersection, noise map, GIS.

I. INTRODUCTION

Traffic noise pollution is an increasingly significant concern, particularly in urban areas, where it poses serious risks to public health. Prolonged exposure to high noise levels has been linked to stress, hearing loss, sleep disturbances, and even cardiovascular issues. Urbanization, industrialization, and the rapid growth of vehicular traffic are primary contributors, with traffic alone accounting for nearly two-thirds of the total noise in urban environments.

Nashik, like many rapidly developing cities, is grappling with the challenges of noise pollution. Factors such as population growth, unplanned urban development, and inadequate mass transit systems have amplified the problem. The increasing reliance on private vehicles and the lack of effective noise control measures further exacerbate the situation.

This study aims to address these challenges by utilizing noise mapping techniques to identify high-noise zones within Nashik city. Noise levels were recorded at seven key locations and compared with the permissible limits prescribed by the Central Pollution Control Board (CPCB), New Delhi. The resulting GIS-based noise maps provide a visual representation of noise distribution across the city and serve as valuable tools for noise management and urban planning, offering actionable insights to mitigate the adverse effects of noise pollution.

II. LITERATURE REVIEW

Noise pollution originates from various sources such as industrial operations, community activities, and transportation systems. Among these, vehicular traffic is recognized as the most dominant contributor. Studies estimate that vehicle-related noise accounts for nearly 70% of overall traffic noise emissions [1]. This environmental issue not only affects ecosystems but also poses significant health risks to humans, including hearing damage, elevated blood pressure, heart disease, stress, and sleep disorders [2].

Traffic noise is the aggregate sound produced by moving vehicles at a given observation point. The noise emitted by individual vehicles varies based on their type and operational conditions. Since road traffic comprises a mix of different vehicle categories—ranging from private cars to heavy-duty trucks—the noise output also fluctuates depending on the traffic composition, road type, and time of day. For analytical convenience, traffic noise studies typically group vehicles into two primary categories: light vehicles (such as automobiles) and heavy vehicles (like trucks) [4].

The selection of monitoring locations for noise measurement is crucial. Sites are generally chosen based on factors such as traffic density, population concentration, and the presence of sensitive areas like residential, commercial, and industrial zones, or sites with social significance [1].

Problem Statement

Noise pollution poses a severe threat to environmental and human health, with effects including:

- Interference with communication
- Damage to hearing and health issues such as hypertension and stress
- Increased risk of cardiovascular diseases

This study aims to identify noisy zones in Nashik city, highlighting areas where noise levels exceed permissible limits and providing data to support effective noise management.

Objectives

1. Collect and analyse noise levels at traffic signals in selected city of Maharashtra.
2. Analyse the data collected
3. Prepare maps for visualizing and managing noise pollution.
4. Provide actionable solution for noise mitigation.

III. METHODOLOGY

1] Data Collection:

Noise levels were measured using a digital noise meter at 5 signals in selected sample city during three specific time intervals:

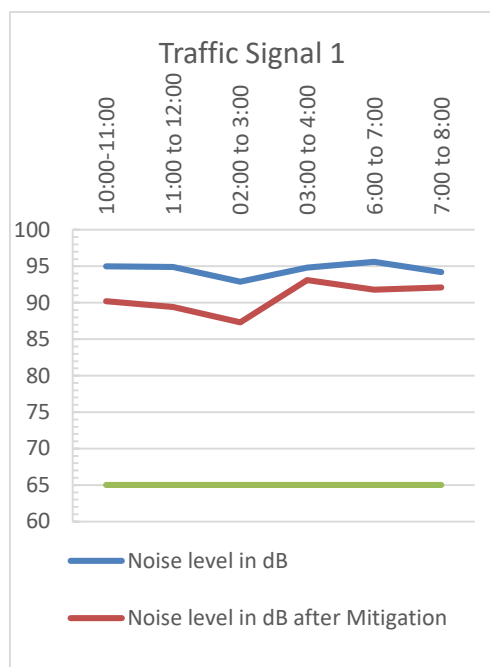
- 1) 9:30 AM – 12:00 PM
- 2) 2:00 PM – 4:00 PM
- 3) 6:30 PM – 8:00 PM

2] The collected data were analysed statistically to identify trends, peak noise levels, and compliance with permissible noise standards.

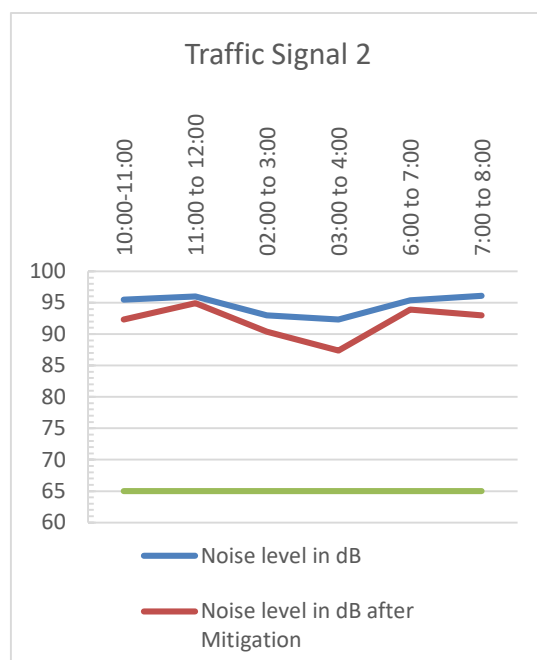
3] Noise Map Production

Noise maps were prepared using QGIS software in combination with Google Maps. These maps represent noise intensity variations across different times and locations, providing a visual tool for analysis.

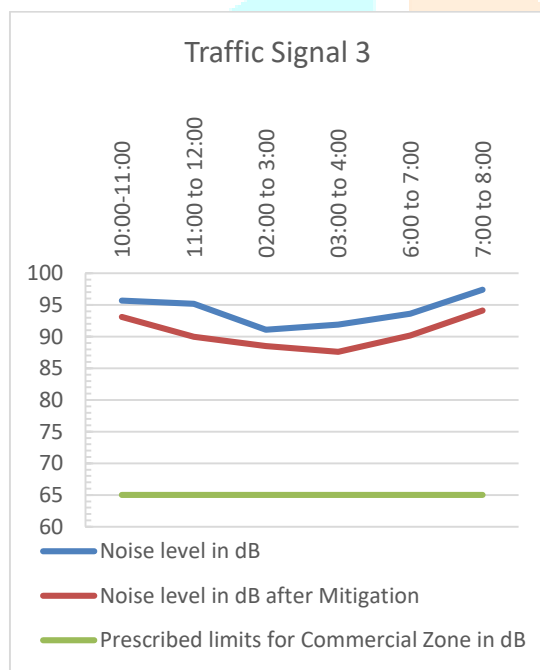
4] To mitigate noise pollution, a separate left lane for vehicles turning left will be designed to minimize idling and congestion at intersections, reducing noise from engine revving and frequent braking. Noise levels before and after implementation will be analysed to assess its effectiveness.



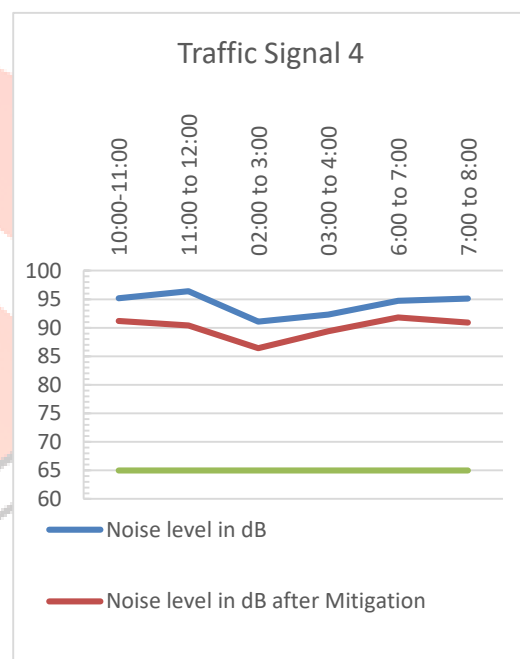
Graph No. 1



Graph No. 2



Graph No. 3



Graph No. 4

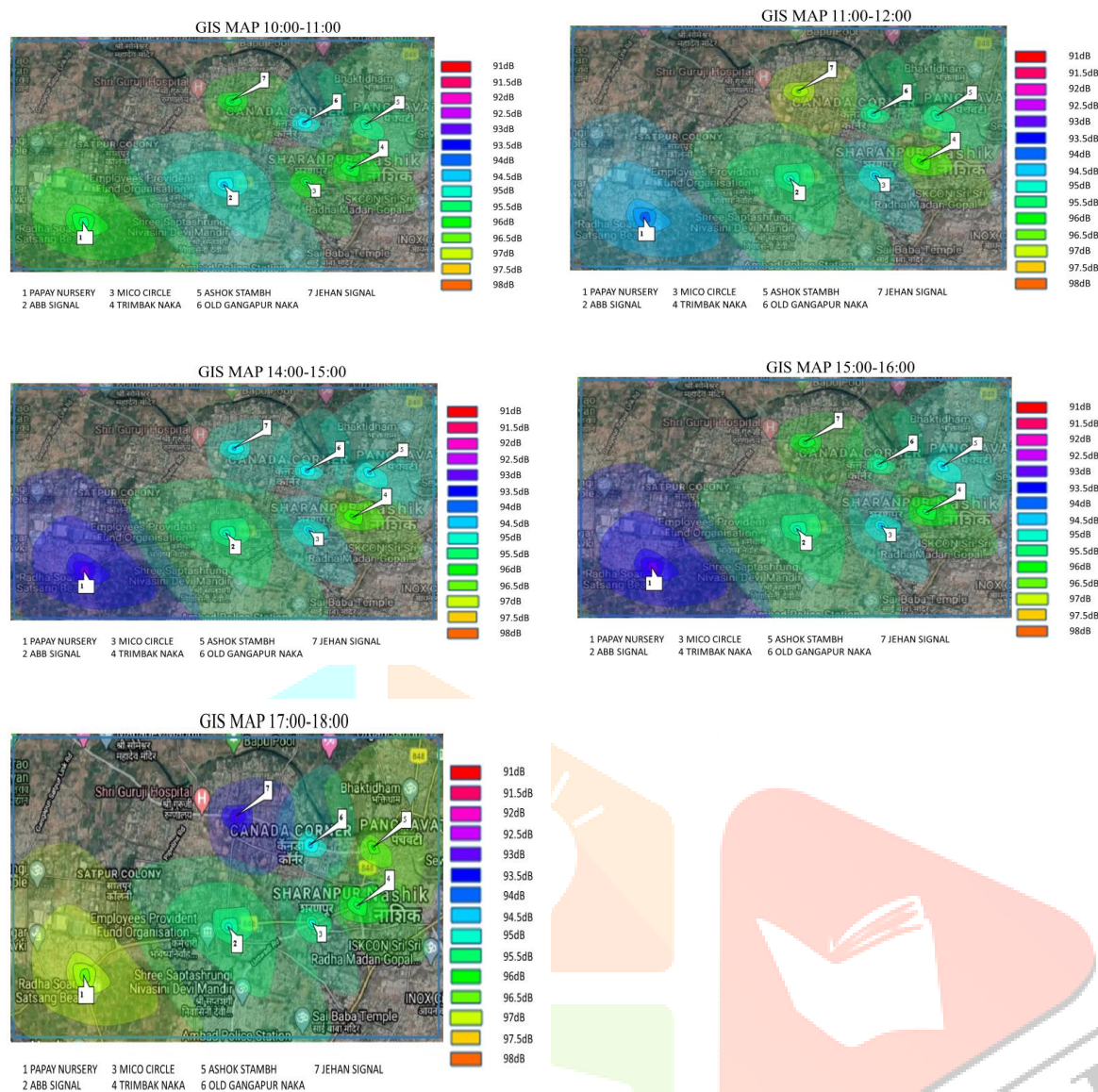
IV. RESULTS AND DISCUSSION

Noise level data from 4 traffic signals were analysed and compared with CPCB standards. Key findings include:

Excessive Noise Levels: All recorded values (97.4 dB to 91.1 dB) significantly exceed the prescribed limits for residential zones (55 dB during the day) and commercial zones (65 dB during the day).

Peak Noise Period: Noise peaks between 12:00 PM and 1:00 PM may indicate high human or vehicular activity during lunch breaks or shift changes.

The graphical representation of noise level at traffic signals using Qgis were prepared



The implementation of a separate left-turn lane resulted in a measurable reduction in noise pollution at the studied intersections. Noise levels, which previously ranged between 97.4 dB to 91.1 dB, decreased by an average of **2-4 dB** after the intervention. This reduction is attributed to the smoother flow of vehicles, minimizing idling time and reducing engine noise caused by frequent braking and acceleration.

V. CONCLUSIONS

The study concludes that all surveyed locations in Nashik city exceed the noise levels prescribed by CPCB. Key observations include:

- Traffic is the primary contributor to noise pollution.
- Noise levels are highest during peak traffic hours.
- GIS-based noise maps are effective tools for visualizing and managing noise pollution.

Despite the improvement, the noise levels after mitigation (ranging from **90 dB to 93 dB**) still exceeded the prescribed limits for commercial zones (**65 dB**). This suggests that while the intervention was effective, additional measures such as the use of noise barriers, green buffers, or stricter traffic regulations are necessary to achieve compliance with prescribed standards.

VI. ACKNOWLEDGEMENT

I extend my sincere gratitude to all those who supported and contributed to this research. I am deeply thankful to my institution and faculty members for their guidance and encouragement throughout the study. I also express my heartfelt thanks to the local authorities and traffic management teams for providing necessary data and insights.

Special thanks to my family and friends for their unwavering support and motivation during this work.

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