

Noise quality monitoring at various Shopping Malls of Gurugram City, Haryana, India

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Abstract - Present paper deals with preliminary survey of noise level at four selected shopping malls which are commercial areas of Gurugram City. The study was carried out in the month of April, 2018. The comparable noise level was smaller, 57.76, 52.07, 61.11, and 55.3 at Sahara, MG metropolis, City Centre, and Ambiance Malls respectively, in the morning 10:00-11:00 am due to less customers, and higher, 79.04, 79.06, and 81.16 at Sahara, City Centre, and Ambiance Malls respectively, in the evening between 7:00-8:00 pm due to more customers. Co-relation between L10 and L90 level was also studied and it was observed that when the L10 level increases then the L90 level also increases at all the studied shopping Malls. Noise climate (NC) was also studied and Ambiance shopping malls characterizes the highest variation with the levels of 18.4. The noise level recorded was usually higher at all the locations than the prescribed limits of CPCB.

Keywords: Equivalent Noise Level, Shopping Malls, NC (Noise Climate)

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I. Introduction

“A day will come where man will have to fight merciless noise as the greatest enemy of health,” said Nobel Laureate Robert Koch of Germany. Noise derived from the Latin word “nausea,” which signifies “unwanted sound” or “sound that is intense or unwanted, unpleasant.” [1]. Environmental noise pollution is a major problem in most countries, and it can be particularly bothersome in densely populated areas. Indeed, noise pollution is one of the most commonly complained-about aspects of our daily lives, as it has a direct impact on the quality of life and health of those who live near a noise source. Many of the demands of modern society result in the production of noise, such as increased noise levels from increased road traffic, larger airports, and increased housing and industry development in towns and cities. Noise will gradually get closer to where people live and work as our green spaces vanish and brown-field sites are redeveloped, resulting in more significant noise effects on people. High Sound may consist of wave motions in an elastic medium. These waves travel through the medium from the source of sound to the listener. Sound waves consist of vibrations in pressure, or oscillations of the medium in which they travel. Noise is a significant environmental feature that involves noise from industry, traffic, and

neighbors. Transport noise is becoming more prevalent as cities develop, making noise pollution a major public health concern. [2].

Noise pollution is caused by a rise in the number of inhabitants, leisure activities, factories, urbanisation, and human interference. [3]. Noise pollution is affected by a variety of factors, including the type of operation, population density, and even the local population and community. The majority of Indian cities and metropolises have noise levels that are higher than desirable. [4]. During festivals, the noise levels in Indian cities worsen. [5]. Noise pollution is a chronic issue in the environment. Noise exposure has a variety of psychological and physiological consequences for people's health. It has an effect on our actions, memory, mental performance, normal sleep period, and other health problems, either directly or indirectly. The present study aim to monitor the ambient noise quality of various shopping malls around Gurugram City to understand the pattern of noise level during the study duration.

II. Materials & Methods

Study Area

Gurgaon is a Delhi suburban city situated in Haryana, India. and is part of the National Capital Region of India shown in red color in fig.1. Pollution and noise pollution issues are becoming more prevalent over time, owing to



Figure 1: The geographical representation of the study area selected

The noise monitoring was conducted at Four Shopping mall Viz., Sahara Mall, MG Metropolis, City Center and Ambience Mall. The measurements of sound pressure level were carried out at five different area during the day between 10:00 AM -10:00 PM that is 12 Hours, with the help of "Sound Level Meter" MEXTECH SL-4012. In a 10-minute cycle, 20 SPL readings were taken at 30 second intervals during each sampling of noise. With the aid of a Sound Level Meter, the minimum and maximum SPL were also registered.

The following calculations can be used to measure the values of L10 and L90, which represent the amounts surpassed for 10% and 90% of the time, respectively, in

the number of cars used for transportation. In this report, noise levels Leq dB (A) were continuously monitored for three days in April 2018 at four separate shopping malls in Gurgaon.

a series of noise level records for a specified time period. [6]:

$$L_{10} = Leq + 3.0 \text{ dB(A)}$$

$$L_{90} = 0.467 \times Leq + 24.60$$

Noise Climate (NC) provides the range over which the sound levels fluctuate in an interval of time and is given by the following equation [7]:

$$NC = (L_{10} - L_{90}) \text{ dB (A)}$$

III. Results and Discussion

At four research sites, noise levels were measured in decibels (dB).

Fig. 2 shows the variation of 12 hours Equivalent Noise Level with standard deviation at four studied shopping malls. The Figure indicates that the equivalent noise level was lower i.e. 57.76, 52.07, 61.11 and 55.3 at Sahara, MG metropolis, City Centre and Ambience Malls respectively, in the morning 10:00-11:00 am due to less customers and in the evening between 7:00-8:00 pm higher noise level i.e. 79.04, 79.06 and 81.16 was recorded at Sahara, City Centre and Ambience Malls respectively, which may be due to as maximum number of people visited at shopping malls in the evening with their families for shopping, fun and entertainment activities.

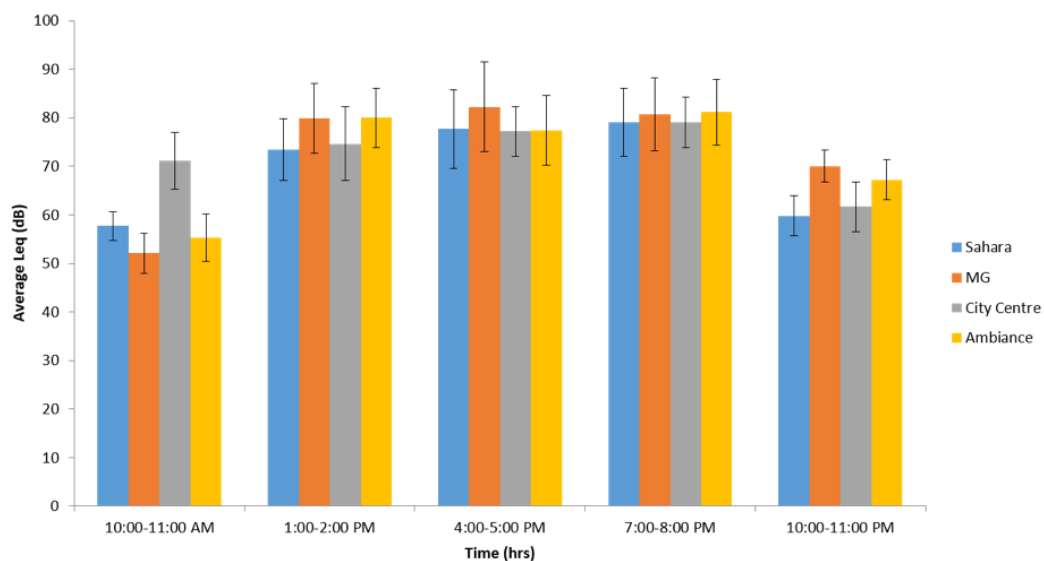


Figure 2: Variations 12-hour Leq. (dB) Equivalent Noise level values at Shopping Malls

The noise levels in all of the studied shopping malls exceeded the allowable limits set by the CPCB (Central Pollution Control Board) in India, according to the report. [8] as shown below (table 1).

Table.1 Noise level permissible limits prescribed by CPCB, India.

Area Code	Category of area/zone	Limits in dB (A)	
		Day Time	Night time
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence	50	40

Variation of Leq, Lmax, Lmin in 12 hours of the Shopping Malls:

Fig. 3 shows the variance of the observed Shopping Malls' 12-hour equivalent noise level Leq, maximum noise level (Lmax.), and minimal noise level (Lmin.). The figure indicates that the noise levels in shopping

centers are considerably higher, though they fluctuate over time. The highest noise level at Sahara Mall was 80.0 decibels, the lowest was 58.9 decibels, and the average noise level was 67.48 decibels.

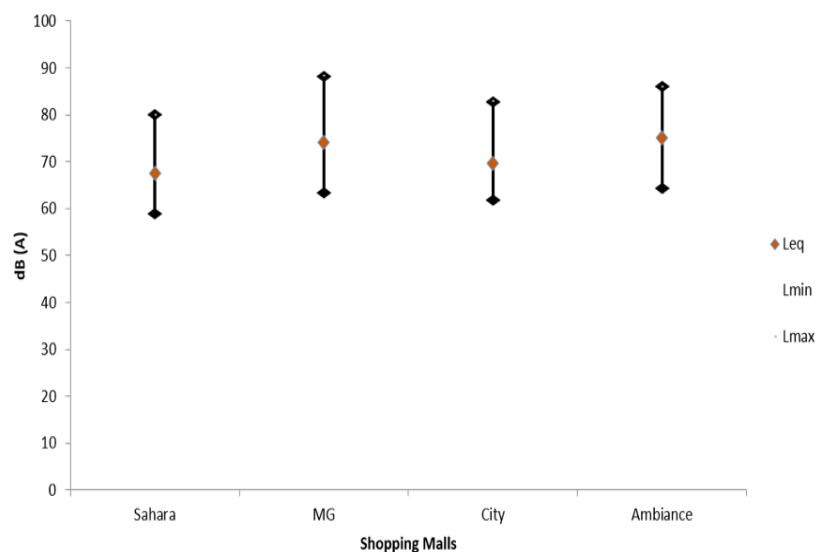


Figure 3: Variation of Leq, Lmax, Lmin. in 12 hours of the Shopping Malls

The highest noise level at the MG Metropolis was 88.20 dB, the lowest noise level was 63.30 dB, and the average noise level was 74.15 dB. The highest noise level was 82.8 decibels, the lowest was 61.9 decibels, and the average noise level was 69.56 decibels at City Centre Mall. The highest noise level was 86.0 decibels, the lowest was 64.30 decibels, and the overall noise level was 75.01 decibels at the Ambiance Mall.

Relation between L10 and L90 of the Shopping Malls

Correlation between L10 and L90 noise level of the Shopping Malls were also studied as shown in the fig.4. The x-axis represents the L10 noise level, while the y-axis represents the L90 noise level. It was discovered that the correlation coefficient between the L10 and L90 levels is 1, indicating that the two levels are very closely

related. When the L10 level rises, the L90 level rises as well in all of the malls tested. Similar type of strong

correlation between L10 and L90 was also found by [9] in small urban areas of Jessore city of Bangladesh.

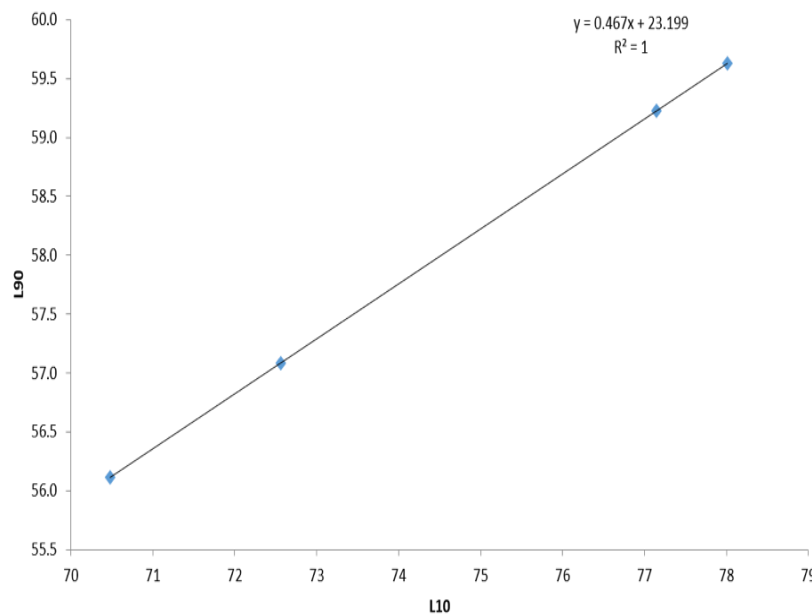


Figure 4: Relation between L10 and L90 of the Shopping Malls

The spectrum over which sound levels fluctuate in a given time interval is defined by NC (Noise Climate). As seen in fig. 5, Ambiance Shopping Mall has the highest

fluctuation with NC rate of 18.4 and Sahara Shopping Mall has the lowest fluctuation with 14.4. owing to relative stability of noise sources.

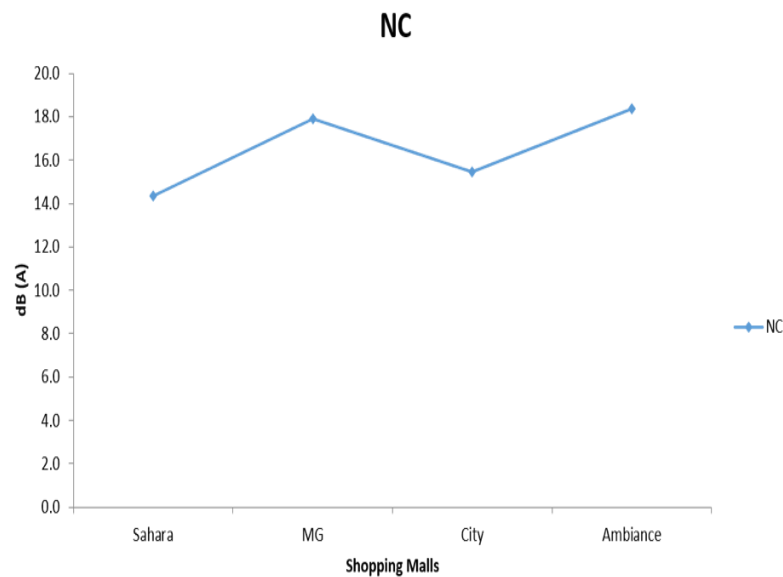


Figure 5: Variation of Noise climate (NC) level of the Shopping Malls

IV. Conclusion

A noise monitoring has been conducted at four different locations of Gurugram City. The average equivalent noise level (Leq) along with L₁₀, L₉₀ and Noise climate showing higher values in comparison to National Ambient Noise Standards prescribed by CPCB. People activities such as shopping, fun games, food courts, discotheque, music shows etc. contributing higher level

of Leq and other noise indices. Higher intensity of noise level will affect the consumer behavior in term of shopping, excursing and other commercial activity.

V. Future Scope

Future scope of our study envisages the influence of sound on consumer's shopping behaviors in shopping

malls. This study will help to create a positive environment at shopping malls as positive mood can easily increase the consumer spending.

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