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Assessment of Noise Pollution at Different Bus Stations in Lucknow City of Uttar Pradesh, India

Bhavesh Kumar Singh[1], Dr. J. B. Srivastava[2],
[1]*Student, M.Tech Environmental Engineering, Department of civil Engineering, IET Lucknow -226024, U.P.,India*
[2]*Professor, Department of civil Engineering, IET Lucknow -226024, U.P., India*

Abstract: ***Noise is word related to undesire sound which disrupts quality of life .when the noise present in ambience exceeds the prescribed limits is called as noise .Excessive noise disrupts day to day activity such as sleep, conversation. It is a type of pollutant which was earlier neglected but as the growth and development took place, excessive noise started to disturb human activity .this lead to identification, quantification and regulation of noise by WHO .the paper present the noise pollution data interpretation of two bus stations of Lucknow city in the month of February 2021. Exposure to elevated level of noise may cause serious weight on the sound-related and sensory system This study deals with assessment of noise pollution at bus station of Lucknow. The noise level was monitored at Charbagh, Awadh and Nahariya for two day each with help of sound pressure level (SPL 1352). Since these three bus stations are inter as well as intra state bus station as they connect the Lucknow with various neighbouring districts so noise level generated here is quite high. Maximum numbers of buses are being operated from these three bus stations to cater the demand of people. With help of noise level various noise parameters were calculated such as L10, L90, L50, Leq, NC, LNP and TNI. for the purpose of proper study and representation of noise present at bus station. Leq value at Charbagh ranges from 73.5-82.3dB and for Awadh it ranges from74.6-82.7dB and for Nahariya it ranges from 77.8-84.4dB .It is observed that all the selected locations, the level of noise was found to be above prescribed noise standard level of CPCB. Such as high level of noise at bus station cause mental discomfort to passengers that needs to be taken care of while designing the bus terminal and proper attention must be paid to reduce to reduce mental agony to passengers as the number of buses are increasing so the noise level. Since Lucknow is still under the process of development thus it becomes to identify locations of noise hot spot and place suitable solutions and strategies to control the menace of noise pollution.***

Keywords: Noise pollution, CPCB Standards, Traffic Noise Index, Noise pollution level, Equivalent Noise Level

I. INTRODUCTION

Noise is a complex issue, emitted by various sources, which is a serious problem for the human environment. It is defined as unwanted sound. It negatively affects human health and is an important public health problem. Noise is the second most harmful factor after the polluted air, which affects the environment. One of the sources of noise that people fight with every day is the noise generated by means of transport. Indian urban population is experiencing higher noise levels due to unprecedented vehicle growth and rapid infrastructure development. Increasing noise levels in In dean cities can be related to sources like vehicular traffic, construction activities, industrial processes, spiritual cell abrasions and occasional fireworks. Noise propagation is dependent upon the urban structure viz. street profile, location of roads, distance of buildings from roads, construction sites, shape of the buildings and its orientation. Thus, it is evident that environmental noise varies spatially in urban area.

In recent years, public transport has been greatly advocated due to the desire of alleviating traffic congestion in metropolitan areas and the demand of reducing air emissions that induce climate change. Among various public transport modes, a tram is typically a light-rail public transport vehicle, which is faster than buses and much cheaper than rapid transit systems. The term “tram” is called in Europe and also known as “streetcar” or “trolley-car” in North America.

Transport plays a vital role in the economic and commercial development of countries and, consequently, in the well-being of their people. The transport system needs to be sustainable form an economic and social as well as an environmental aspect, to meet the demand of enlargement and sustainable development, but currently, the road transportation mode is being criticized more and more because of its major negative impact on the environment and the public health. Where the road traffic accidents have been and are continuing to be a major contributor of human and economic costs (Soltani and Askari, 2014). Therefore, for the prospect of sustainable development, the attraction for the railway transport has increased. Effectively, this main of transport has been considered one of the safest modes of transport in the world. Risk comparisons show that railway and air travel are the safest modes of transport per travelled passenger-kilometer (Sill and Kullberg, 2012).

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II. MATERIALS AND METHOD

A. Study *area*

Lucknow, which is the capital city of Uttar Pradesh, situated in northern India is chosen for study. Lucknow is a developing area .It has a developing inter and intra state bus station with increasing number of buses every year. It has two major bus station namely charbagh and Awadh were selected for the purpose of study .Table 1 shows the latitude and longitude of both places.

B. *Sampling sites*

Table-1

S.Number	Location	latitude	longitude
1	Charbagh	80919975ºN	26.832344ºE
2	Awadh	81.015694ºN	26.873428ºE

C. *Data Collection*

At the chosen point Charbagh and Awadh bus stop. Checking was conveyed at a tallness of 1.5 meter and 1 meter away from chest during hour long at time period seconds. The timetable chose during the day time was as per the following which are diverse planning morning 10:00AM to 11:00AM, 11.00AM to 12:00PM, 01:00PM to 02:00PM, 02:00PM to 03:00PM.the observing was conveyed for two days at the three stations in month of February .The length has been chosen to cover the majority of the aspect of the day so commotion created for the duration of the day could be handily determined.

D. *Measurement Characteristic of Sound*

Diverse commotion boundary like L10, L50 and L90 were processed from the examined data.L10 is the degree of sound surpassing for 10% of absolute season of estimation or Peak Noise Level, L50 is the degree of sound surpassing for half of all out season of estimation or Mean Sound Level, L90 is the degree of sound surpassing for 90% of complete season of estimation or Background or Residual Noise Level.L10 and L90 were determined in Microsoft Office Excel .These boundaries were utilized for the assessment of Noise Climate (NC), Equivalent Continuous Noise Level (Leq) and Noise Pollution Level (Lnp), Traffic Noise Index. Following these conditions were utilized to figure the clamour contamination records:

NC = L10 –L90 …….(1)

Leq= L50+ [(NC)2 /60]……...(2)

LNP= Leq+ NC ……..(3)

TNI= 4(L10 –L90) + (L90 -30)……(4)

Where,

NC is Noise Climate; L10 is the level of sound outperforming for 10% of supreme period of assessment

Peak Noise Level; L50 is the level of sound outperforming for half of complete period of assessment

Mean Sound Level; L90 is the level of sound outperforming for 90% of hard and fast period of assessment

Leq is Equivalent consistent uproar level;

LNP is the Noise Pollution Level;

TNI is the traffic upheaval record;

Table-2

CPCB Noise standards

Types of ZONE	Day Time dB(A)	Night Time dB(A)
Industrial	75	70
Commercial	65	55
Residential	55	45
Silence	50	40

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III. RESULTS

The calculated values of the noise pollutants (L10, L90,L50,NC,Leq,LNP,TNI) for the two sampling stations in February month and the noise pollution level is exceed the CPCB noise standards.

Table-3
Average noise parameters at study location (10:00AM-11:00AM)

TIME	10:00AM-11:00AM						
Parameters	L10	L90	L50	NC	Leq	LNP	TNI
Charbagh							
DAY-1	82.3	65.1	73.4	17.2	78.3	95.9	103.9
DAY-2	84.1	67.6	74.8	16.5	79.3	95.8	103.6
Awadh							
DAY-1	80.2	67	73.3	13.2	76.2	89.4	90
DAY-2	82	68.2	74.5	13.7	77.6	91.3	93.1

The maximum values of L10, L90, L50, NC, Leq, LNP and TNI are obtained as 84.1dB, 68.2dB, 74.8dB, 17.2dB, 79.3dB, 95.9dB and 103.9dB. The minimum value values of L10, L90, L50, NC ,Leq, LNP and TNI are obtained as 80.2dB,65.1 dB, 73.3dB, 13.2dB,76.2dB, 89.4dB and 90dB incorporating data of two day for the time10:00AM-11:00AM for both days.

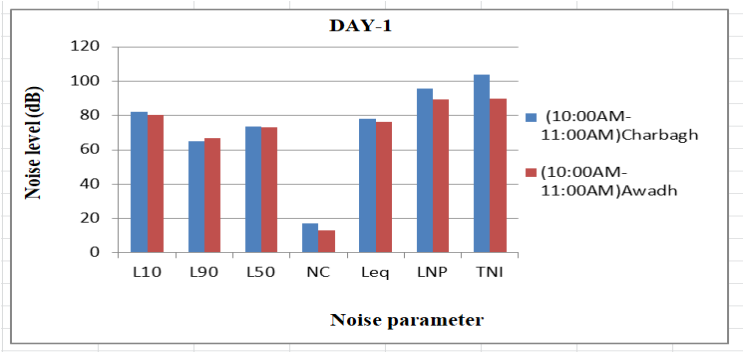


Figure 1-Average Noise Parameter for day 1(10:00AM-11:00AM)

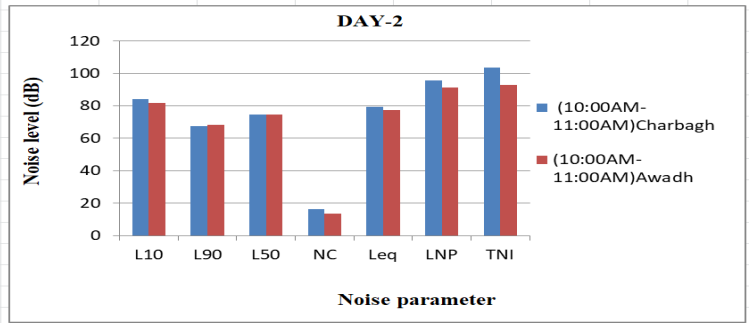


Figure 2-Average Noise Parameter for day 2(10:00AM-11:00AM)

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Table-4
Average noise parameters at study location (11:00AM-12:00PM)

TIME	(11:00AM-12:00PM)						
Parameters	L10	L90	L50	NC	Leq	LNP	TNI
Charbagh							
DAY-1	85.3	69.8	78.3	15.5	82.3	97.8	101.8
DAY-2	79.1	65.7	73.2	13.4	76.1	89.5	89.3
Awadh							
DAY-1	82.5	64.8	73.8	17.6	78.9	96.5	105.3
DAY-2	84	67.2	74.5	16.7	79.1	95.5	104.2

The maximum values of L10, L90, L50, NC, Leq, LNP and TNI are obtained as 85.3dB, 69.8dB, 78.3dB, 17.6dB, 82.3dB, 97.8dB and 105.3dB. The minimum value values of L10, L90, L50, NC ,Leq, LNP and TNI are obtained as 79.1dB,64.8 dB, 73.2dB, 13.4dB,76.1dB, 95.5dB and 105.3dB incorporating data of two day for the time 11:00AM-12:00PM for both days.

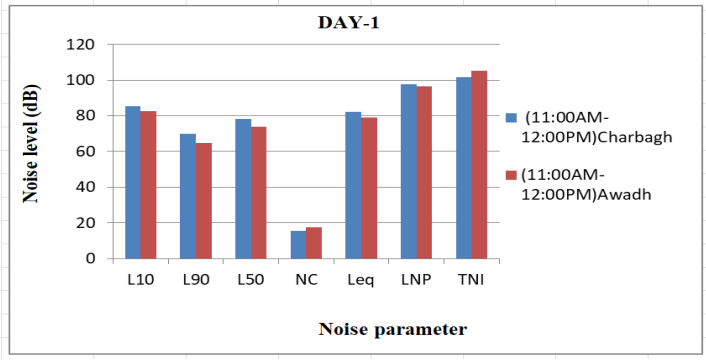


Figure 3-Average Noise Parameter for day 1(11:00AM-12:00PM)

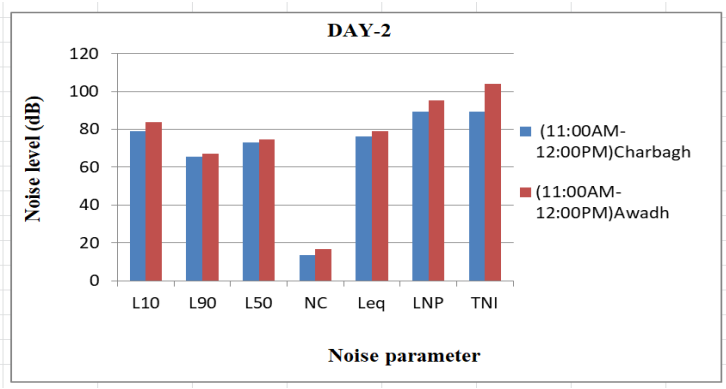


Figure 4-Average Noise Parameter for day 2(11:00AM-12:00PM)

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Table-5
Average noise parameters at study location (1:00PM-2:00PM)

TIME	(1:00PM-2:00PM)						
Parameters	L10	L90	L50	NC	Leq	LNP	TNI
Charbagh							
DAY-1	78.4	66.1	74.3	12.3	76.8	89.1	85.3
DAY-2	77.2	65.3	71.2	11.9	73.5	85.4	82.9
Awadh							
DAY-1	85.6	69.2	78.2	16.4	82.7	99.1	105
DAY-2	79.1	65.1	73.6	14	76.9	90.9	91.1

The maximum values of L10, L90, L50, NC, Leq, LNP and TNI are obtained as 85.6dB, 69.2dB, 78.2dB, 16.4dB, 82.7dB, 99.1dB and 105dB. The minimum value values of L10, L90, L50, NC, Leq, LNP and TNI are obtained as 77.2dB, 65.1dB, 71.2dB, 11.9dB,73.5dB, 85.4dB and82.9 dB incorporating data of two day for the time 1:00PM-2:00PM for both days.

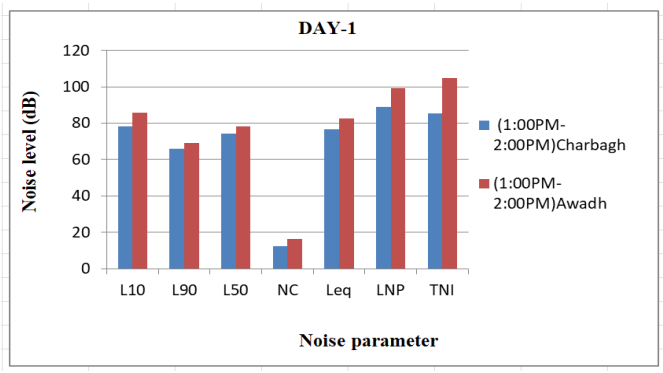


Figure 5-Average Noise Parameter for day 1(1:00PM-2:00PM)

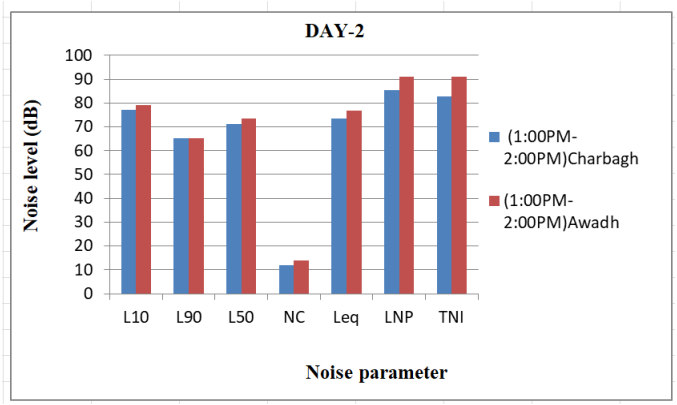


Figure 6-Average Noise Parameter for day 2(1:00PM-2:00PM)

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Table-6
Average noise parameters at study location (2:00PM-3:00PM)

TIME	(2:00PM-3:00PM)						
Parameters	L10	L90	L50	NC	Leq	LNP	TNI
Charbagh							
DAY-1	81.6	62.9	68.2	18.7	74	92.7	107.7
DAY-2	79.8	62.4	71.3	17.4	76.3	93.7	102
Awadh							
DAY-1	81.1	63.2	69.3	17.9	74.6	92.5	104.8
DAY-2	81.4	63.2	71.9	18.2	77.5	95.7	106.3

The maximum values of L10, L90, L50, NC, Leq, LNP and TNI are obtained as 81.6dB, 63.2dB, 71.9dB, 18.7dB, 77.5dB, 95.7dB and 107.7dB. The minimum value values of L10, L90, L50, NC ,Leq, LNP and TNI are obtained as 79.8dB,62.4 dB, 68.2dB, 17.4dB,74dB, 92.5dB and 102dB incorporating data of two day for the time 2:00PM-3:00PM for both days.

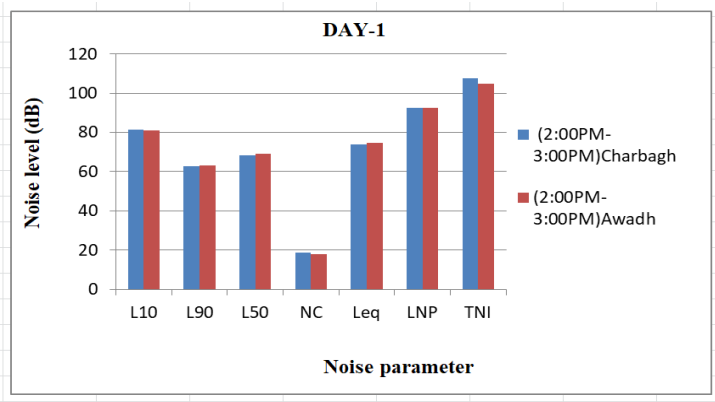


Figure7 -Average Noise Parameter for day 1(2:00PM-3:00PM)

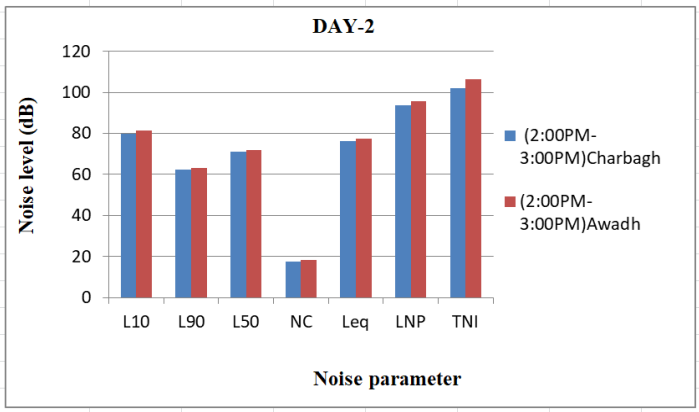


Figure 8-Average Noise Parameter for day 2(2:00PM-3:00PM)

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IV. CONCLUSIONS

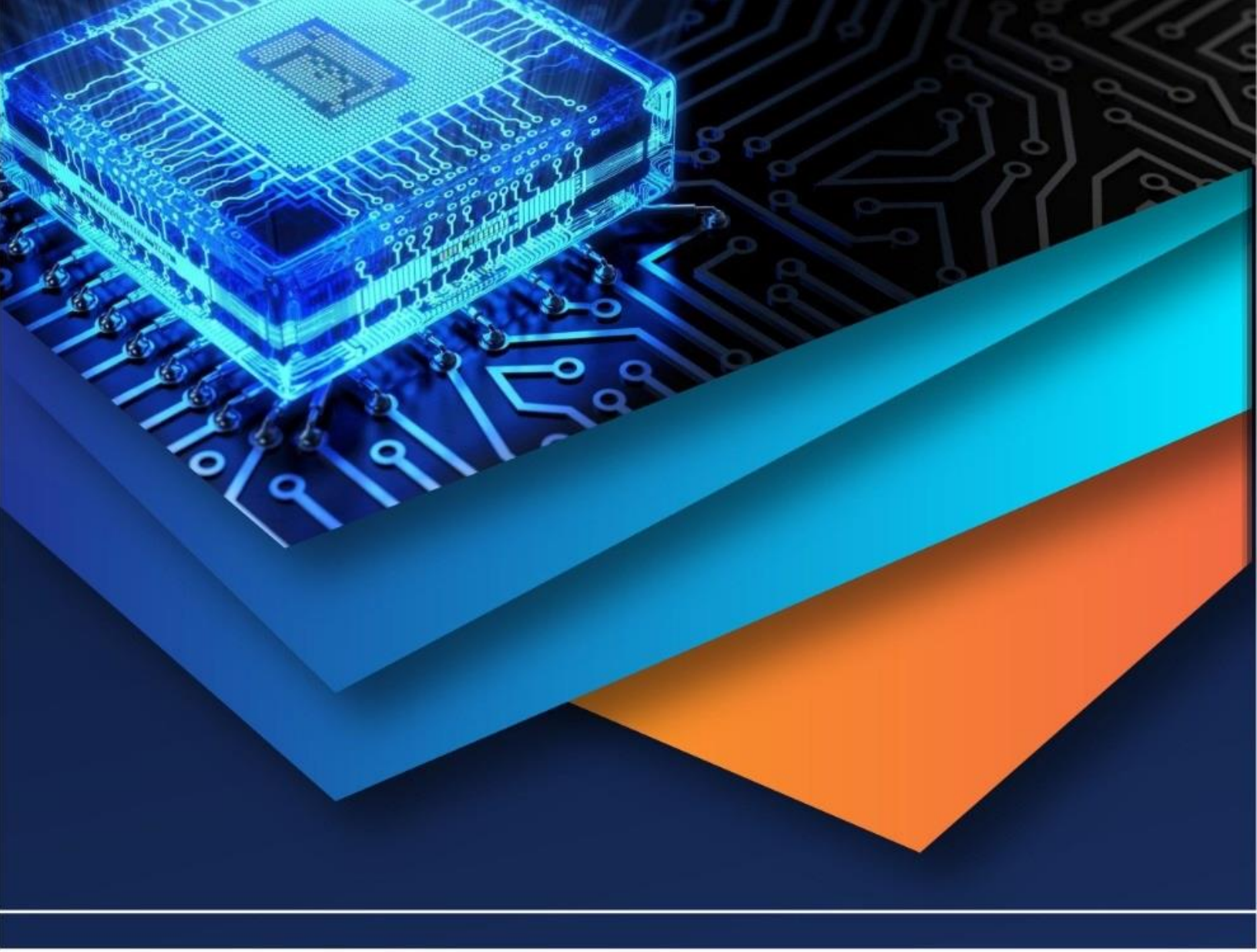
The calculation of Noise pollution in the month of February such as L10, L90, L50, NC, Leq, LNP, and TNI for the assessment of noise pollution. The results revealed are as follows-

A. The value of **Leq** is higher than all the sampling stations and exceeds the CPCB Noise standards.
B. The highest Leq was 82.7 dB and lowest was 74 dB of these two bus station .These values are significant to cause the mental agony and stress. The menace of noise is growing day by day in developing cities.
C. Noise at bus station can be reduced by making structural designs such as noise reducing wall panel.
D. Overall study suggests that the level of noise pollution in bus stations of Lucknow city is higher than the CPCB Noise standards. This is causes stress, annyoance, cardiovascular disease, sleep disturbance, tinnitus and even cognitive impairment in children.

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