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Assessment of Nosie at Gorakhpur Highway from Nausad to Kauriram by Using CORTN Model

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***Abstract*- India has growing problem with noise pollution because of rapid urbanization, heavy traffic, construction noise, and manufacturing noise. In India people are not very much aware about noise pollution but deep down it is killing inside like slow poison, hence it is a kind of major form of pollution. In addition to generating annoyance, hearing loss and stress, noise pollution in cities also contributes to coronary heart disease. Although there are various noise sources are present around us, the primary contributor to neighborhood noise in urban areas of India is road traffic noise. The need for noise and traffic assessment based on appropriate prediction methodologies is driven by the rising trend of traffic noise along highways. In this study, the reading of traffic noise levels was taken by using the Sound Level Meter at 12 different sampling locations on Gorakhpur Highway (NH-24) in UP. The observed noise level is calculated by equivalent Noise Level whereas the predicted noise level is calculated with the help of the CoRTN (Calculation of Road Traffic Noise) Model using the speed of the heavy vehicles and the traffic volume. The main aim of this study is to calculate the noise level at different locations on Gorakhpur Highway (24) and then compare calculated data with Permissible Limits of CPCB. The result obtained from this study is found to be in error of ± 10 % band. It indicates that in India, the CoRTN model can be used for the prediction of noise levels. In the end, some suitable recommendations are provided to reduce the noise in certain areas where noise level is alarmingly high.**

***Keywords - Sound* level meter, Equivalent Noise Level, CoRTN Model, Traffic noise prediction**

1. INTRODUCTION

The definition of "noise" is a name given to the kind of sounds that is bothersome and unbearable. Noise comprises obtrusive and grating sounds which can be loud, unpleasant, and distracting. The diffusion of sound or noise may bring about a variety of issues in the person's activities which most of the times are harmfully detrimental. Noise may lower an individual's heart health. Several environmental factors, mainly wind, humidity, density, and other factors, are among the ones that affect how ear which is the most sensitive organ in the human body is responsive to noise. Moreover, such noises found in cities causes annoyance, hearing loss, and stress and the subsequent coronary heart disease. The permanent impact of noise onto brains through long-term is the main cause of sleep and mental issues. Furthermore,

[1] divided the noise impact of traffic, reliant on the noise intensity exposure and its length of time, into four categories: psychosomatic factors (hearing disorders), psychological factors (irritability and depression such as sleep problems and stress), physiological responses (high blood pressure, cardiovascular rate, and ulcers), and the quality of the work done (decrease in efficiency and inaccurate understanding of what is being conveyed). The WHO included noise pollution in the urban areas among the top three health threats posed by pollution beat only by air and water pollution. India is frighteningly facing problem with noise pollution that is particularly growing with rapid urbanization, heavy traffic, construction noise, and manufacturing noise. Health effects are often overlooked, however at the same time pollution by noise is variously dangerous. As a result, noise pollution faces a serious challenge and is one of the most serious types of pollution in India. Yet not all sources of noise are important. However, road traffic noise is a primary cause of domestic noise in urban area in India. The volume of traffic and individual automobiles contribute to the traffic noise.

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Also, "The WHO in 1999 suggested a standard guideline value for average outdoor noise levels of 55 dB(A), applied during normal daytime (16 hours) to prevent significant interference with the normal activities of local communities and is considered as a serious annoyance, while a value of 50 dB(A) as a moderate annoyance," as per WHO permissible limits for community noise levels for industrial, commercial, and traffic areas This study is done on Nausad to Kauriram (NH-24) in Gorakhpur, UP. Highway traffic noise is frequently the main source of noise in both rural and urban areas.

In India, 70% of all traffic noise is caused by the highway system [2]. This include the traffic noises are major significance which are responsible for noise pollution and it is major root which are responsible for heavy noise pollution therefore, certain methodology are given such as CoRTN model and energy equivalent noise level which are used as calculations of noise level. There are several sources of highway noise. The CoRTN concept was developed in the United Kingdom in 1988 [3]. The distance from the side of the roadway to the receptor site is measured as 10 meters. Subsequent to that, precise adjustments must be made to factors such as vehicle flow, proportion of heavy vehicles, angle, road surface, road width, and barriers in order to obtain the ultimate hourly L10 value. The CoRTN model has been globally utilized and has been deemed precise for

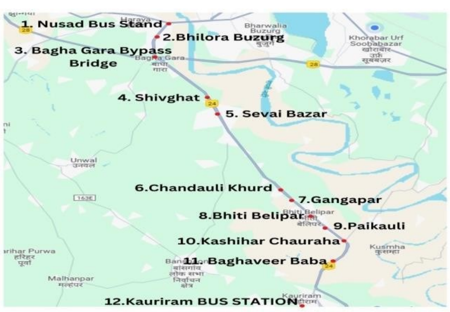

Figure 1. Map of Monitoring Station

predicting traffic noise [4] [5]. For slow-moving or accelerating conditions, noise from exhaust systems, engines, and power trains tends to predominate. At ordinary motorway speeds, tire/pavement noise is typically the most significant [6].

2. MATERIALS AND METHODS

2.1 Study area

Gorakhpur is situated in the Purvanchal region of Uttar Pradesh, India, adjacent to the Rapti river. It is situated 272 km east of Lucknow, the capital of the state. The location in question functions as the administrative centre for the Gorakhpur district, Gorakhpur division, and Northeastern Railway Zone. The city is home to a Gorakhnath shrine known as the Gorakhnath Math. In addition, the city has been the location of an Indian Air Force facility since 1963. Gita Press, established in Gorakhpur in 1926, holds the distinction of being the largest publisher of Hindu holy literature, encompassing renowned works such as the Ramayana and Mahabharata. Gorakhpur is situated adjacent to the Rapti River, which serves as a tributary to the Ghagra River. The eastern half of the city is home to Ramgarh Tal Lake, a lake of considerable size.The research covers the locations of different observations sites of NH-24 which are Nausad Bus Stand, Bhilora buzurg, Bagha gara near Gorakhpur bypass, Shivghat,Sevai, Chandauli Khurd, Gangapar, Bhiti Belipar, Paikauli, Kashihar Chauraha,BaghaBir Baba Mandir, Kauriram Bus Station.

2.2 Selection of Sampling location

The samples were gathered from several sources along the Gorakhpur Highway (NH-24). By using a precision sound level meter ((Bruel and Kjaer, Denmark (2232)), 40 readings were taken within 10 minutes with a difference of 15 seconds for each location of NH-24. Every location has a 6-hour reading, which is used to calculate the Leq.

3. EQUIPMENT USED

Bruel and Kjaer, Denmark (2232*)*: A high-precision sound level meter manufactured by Bruel and Kjaer in Denmark (model 2232). A sound level meter consists of essential components such as a microphone, amplifier, weighting networks, and a display that shows readings in decibels (which is one-tenth of a "bel," the unit of sound). The labeling of the Bruel and Kjaer 2232 noise meter appropriately indicates its functionality.

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Figure 2. Precision Sound Level Meter [Bruel & Kjaer Denmark (2232)]

3.1 Measuring tape

The process involves determining or quantifying the magnitude or extent of something. We mark the tape with both foot and meter measurements. It is highly valuable for accurately measuring the distance from the center of the lane and the distance from the edge of the road. Furthermore, because we do not have a Doppler speedometer, we can manually calculate the speed.

4.

Figure 3. Measuring Tape

3.3 Stopwatch

It is used to record the time when cars pass the 75m mark in order to manually calculate their speed.
The Android smartphone's powerful stopwatch featue was used.

Figure 4. Stopwatch

4. PARAMETER USED

4.1 Traffic Volume

Manual calculation of traffic volume is conducted at certain monitoring stations.The number of cars passing in each category during a single hour, in a certain direction, is measured and expressed as vehicles\hour.

4.2 Spot Speed Measurement

To measure speed, two spots were designated on the road near the sample station, with a known distance of 50 meters between them. The stopwatch is used to record the duration it takes for the vehicle to cover the given distance. The speed in kilometers per hour for each type of vehicle is determined and recorded for each hour of research by dividing the distance by the time taken to cover the distance.

4.3 Noise Descriptors

This measure serves as a valuable indicator in instances where there is an anticipation of short duration and high impulsive noise levels. The Leq, or equivalent sound level, represents the average energy of sound levels over a specific time period. From the perspective of noise exposure, Leq is a reliable measure of the influence of noise on individuals and is commonly employed in noise impact assessments. The CPCB has implemented noise rules to safeguard those who are at risk of being exposed to various sources of noise.

The ambient noise level standards in India provide permissible noise levels for daytime (6:00 am to 10:00 pm) and nighttime (10:00 pm to 6:00 am), as outlined in Table-1. Additionally, the Noise Limit for Vehicles the Environment (Protection) Amendment Rules, 2000, provide notification of the noise limits for vehicles, which are specified in Table 2

.

TABLE 1: AMBIENT NOISE LEVEL STANDARDS IN INDIA (SOURCE: CPCB) [7]

S.No.	Area	Permissible Noise Level(A)	
1	Industrial Area	75	70
2	Commercial Area	65	55
3	Residential Area	55	45
4	Silent Zone	50	40

TABLE 2: NOISE LIMITS FOR VEHICLES IN INDIA (SOURCE: CPCB) [8]

S. no	Types of Vehicles	Noise Limits from 1st January 2003db(A)
1.	TWO-WHEELER Displacement upto 80cc Displacement more than 80cc but upto 175cc Displacement more than 175cc	75 77 80
2.	THREE-WHEELER Displacement upto 175cc Displacement more than 175cc	75 80
3.	Passenger car	75
4.	PASSENGER OR COMMERCIAL VEHICLE Gross vehicle weight upto 4000 Kg Gross vehicle weight more than 4000 Kg but upto 12000 Kg Gross vehicle weight more than 12000 Kg	80 83 85

5. METHODOLOGY

5.1 ENERGY EQUIVALENT NOISE LEVEL (Leq):

The energy equivalent noise level (Leq) equals the constant noise level whose acoustic energy is equivalent to the acoustic energy of a fluctuating noise over some time interval (Source: Environmental Noise Pollution by Patrick). The Leq is calculated by noting the ambient noise level (Li) generated by the vehicles at different locations on the highway using the Precision Sound Level Meter. For this, the Precision Sound Level Meter was put at a height of 1meter from the surface of ground. The instrument was positioned with the mic facing away from the direction of movement of the sources which produces the noise. The noise was recorded at the 21 mid hours from 25 to 35 minutes for the duration of 10 minutes. At every 15 seconds for the duration of 10 minutes, the noise level data was collected through the sound level meter. Hence, 40 data was collected. The Leq is calculated by:

$$L_{eq} = 10\, Log_{10} \sum_{n=1}^{i=n} f_i \times 10^{Li/10}$$

where n = total number of noise samples

f_i = ith samples time duration expressed as fraction of total sample time.

L_i = any ith sample noise level

5.2. CoRTN Model:

The CoRTN procedure (Calculation of Road Traffic Noise) has been developed by the Transport and Road Research Laboratory and the Department of Transport of the United Kingdom in the 1975 [9] and has been modified in the 1988 [10] . This model can predict both the indices namely $L_{10(1\ hour)}$ and $L_{10(18\ hour)}$. In terms of highway and non-highway road planning schemes, traffic noise prediction models mostly serve as a support tool. However, they can occasionally be used to examine the state of traffic noise and how it might develop in the future. Good number of countries prefer to utilize $L_{A,eq}$ descriptor, the A-weighted equivalent sound pressure level, in traffic noise impact assessment, while the UK and Australia utilize L_{10} descriptor for the same purpose [11]. In this model, the reference distance is taken at 10m from the edge of the nearside carriageway. Due to the unavailability of the Doppler Speedometer, the speed of the vehicles calculated physically. For the speed calculation, two points marked at 50m and note the time taken by the vehicle to cross the distance. Divide the distance by the time to calculate the speed. In this model, vehicles are categorized in two parts:

a) Heavy Vehicles: which includes trucks, tractors\ trailers, buses.

b) Light Vehicles:which includes cars, autos, motorcycles, vans, LCV's.

- Percentage of heavy vehicles considered as the key parameters in this study.

- The algorithm of CORTN model as per [11] [12]

$$L_{10} = L_0 + \Delta f + \Delta p + \Delta g + \Delta d + \Delta s + \Delta c + \Delta a + \Delta r$$

Where, L_{10} = hourly basic noise level

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Δf = traffic speed and heavy vehicles percentage correction

Δp = correction for road surface

Δg = gradient correction

Δd = adjustment for the slant distance between the source and the receptor

Δs = shielding adjustment between the road (source) and the adjustment

Δc = adjustment for the ground cover attenuation

Δa = angle of view of the road correction

Δr = corrections for the reflection from the opposite side of the buildings

$\boldsymbol{L_0} = \mathbf{42.2} + \log_{10} q \mathrm{dB(A)}$

$\mathbf{\Delta f} = 33\log10\left(v + 40 + \frac{500}{v}\right) + 10log_{10}\left(1 + \frac{5p}{v}\right) - 68.8$

where, v = hourly mean traffic speed in km/h

p = heavy vehicles percentage

$= \frac{100f}{q}$

where f = heavy vehicles hourly flow

q = total hourly traffic flow

Δp = − 1 dB(A).

it is applicable only for the road surface of impervious bituminous and concrete if speed of traffic is < 75 km/h.

Δg = 0.3G.

where G = gradient of the road, applicable only where roadway pavement is extremely steep or assigned for the uphill vehicles flow on the single carriageways.

$\Delta d = -10\log_{10}(d'/13.5)\mathrm{dB(A)}$

Where d' = shortest slant distance between the source and the receptor

$= [(d+3.5)^2 + h^2]^{1/2}$

where d = horizontal distance from the nearside carriageway edge

h = height of the sound level meter from the surface of the ground which is taken as 1 meter

$\mathbf{\Delta c} = 5.2\ \mathrm{I}\log_{10}[(6H - 1.5)/(d + 3.5)]$; **For 0.75 ≤ H < 0.75**

Δc =0; **For H ≥ ($\boldsymbol{d}$ + 5)/6**

where H = average height of propagation

I = it is based on the absorbent ground's different percentage between the source and the receptor

d = horizontal distance from the nearside carriageway edge to the receptor

$$\mathbf{\Delta a} = 10\log_{10}\left(\frac{\theta}{180}\right)\mathrm{dB(A)}$$

where**θ** = angle of view of the road in degrees

Δr = +1.5γdB(A)

where γ = is the built-up façade proportion

$=\left(\frac{\theta_S}{\theta}\right)180^{\circ}$

where θ_s = sum of the angles by all the individual reflecting facades on the opposite side of the road As we know that CORTN model is based on the L_{10} values, so an adjustment is required to (L_{eq}). So, L_{eq} (Equivalent Noise Level) is calculated from the following empirical formula [13]:

$$\boldsymbol{L_{eq} = 0.94L_{10} + 0.77}\ \mathbf{dB(A)}$$

6. RESULT AND DISSCUSSIONS

6.1 Location 1 (Nausad Bus Stand): The observed value came in range of (75.41-80.64)db(A), while the predicted values come in range (71.60-74.03)db(A) and the mean % Error is 6.49%. The obtained results are tabulated in Table 3.1.

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TABLE 3.1. COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 1

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	80.67	72.80	0.10	9.75	6.49
7:00-8:00	75.41	73.86	0.02	2.06	
8:00-9:00	81.64	73.73	0.10	9.69	
9:00-10:00	78.99	74.03	0.06	6.28	
10:00-11:00	75.41	71.60	0.05	5.06	
11:00-12:00	77.60	72.86	0.06	6.12	

6.2 Location 2 (Bhilora Buzurg), The observed value came in range of (76.68-79.79)db(A), while the predicted values come in range (71.30-75.45)db(A) and the mean % Error is 7.27%. The obtained results are tabulated in Table 3.2.

TABLE 3.2. COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 2

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	77.72	72.21	0.07	7.09	7.27
7:00-8:00	79.06	71.95	0.09	9.00	
8:00-9:00	79.49	72.16	0.09	9.21	
9:00-10:00	76.68	71.30	0.07	7.01	
10:00-11:00	79.79	73.26	0.08	8.18	
11:00-12:00	77.91	75.45	0.03	3.16	

6.3 Location 3 Bagha Ghara(Gorakhpur Bypass), The observed value came in range of (75.7-76.2)db(A), while the predicted values come in range (72.1-73.6)db(A) and the mean % Error is 5.4%. The obtained results are tabulated in Table 3.3

TABLE 3.3 COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 3

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	77.8	72.1	0.08	7.3	5.4
7:00-8:00	75.7	72.2	0.05	4.6	
8:00-9:00	76.6	73.6	0.04	4.0	
9:00-10:00	77.3	72.5	0.06	6.2	
10:00-11:00	76.2	73.1	0.04	4.1	
11:00-12:00	77.7	72.9	0.16	6.2	

6.4 Location 4 (Shivghat), The observed value came in range of (77.62-80.19)db(A), while the predicted values come in range (72.65-75.60)db(A) and the mean % Error is 6.29%. The obtained results are tabulated in Table 3.4

TABLE 3.4. COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 4

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	78.00	72.65	0.07	6.85	6.29
7:00-8:00	77.62	73.41	0.05	5.43	
8:00-9:00	78.46	73.48	0.06	6.34	
9:00-10:00	78.16	73.26	0.06	6.27	
10:00-11:00	80.19	73.14	0.09	8.80	
11:00-12:00	78.77	75.60	0.04	4.03	

6.5 Location 5 (Sevai): The observed value came in range of (77.23-77.79)db(A), while the predicted values come in range (72.36-74.83)db(A) and the mean % Error 5.11%. The obtained results are tabulated in Table 3.5.

TABLE 3.5. COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 5

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	77.48	74.83	0.03	3.42	5.11
7:00-8:00	77.76	72.36	0.07	6.94	
8:00-9:00	77.23	73.06	0.05	5.40	
9:00-10:00	77.79	74.01	0.05	4.86	
10:00-11:00	77.74	74.66	0.04	3.96	
11:00-12:00	77.50	72.81	0.06	6.06	

6.6 Location 6 (Chaundali Khurd), The observed value came in range of (76.51-80.76)db(A), while the predicted values come in range (72.36-74.83)db(A) and the mean % Error is 5.16%. The obtained results are tabulated in Table 3.6.

TABLE 3.6. COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 6

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	77.17	73.30	0.05	5.0	4.95
7:00-8:00	77.42	73.54	0.05	5.0	
8:00-9:00	76.51	72.69	0.05	4.9	
9:00-10:00	77.22	73.36	0.05	4.9	
10:00-11:00	76.86	73.02	0.05	4.9	
11:00-12:00	80.76	76.68	0.05	5.0	

6.7 Location 7(Gangapar), The observed value came in range of (76.91-78.36)db(A), while the predicted values come in range (72.83-74.69)db(A) and the mean % Error is 4.84%. The obtained results are tabulated in Table 3.7.

TABLE 3.7. COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 7

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	77.44	72.83	0.06	5.96	4.84
7:00-8:00	76.91	73.14	0.05	4.91	
8:00-9:00	77.11	73.13	0.05	5.16	
9:00-10:00	77.30	74.29	0.04	3.89	
10:00-11:00	78.36	74.60	0.05	4.80	
11:00-12:00	78.05	74.69	0.04	4.31	

6.8 Location 8(Bhiti Belipar), The observed value came in range of (76.14-77.82)db(A), while the predicted values come in range (73.20-74.21)db(A) and the mean % Error is 3.95%. The obtained results are tabulated in Table 3.8.

TABLE 3.8 COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 8

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	77.31	73.20	0.05	5.32	3.95
7:00-8:00	77.82	74.11	0.05	4.78	
8:00-9:00	76.19	74.16	0.03	2.66	
9:00-10:00	76.14	74.21	0.03	2.54	
10:00-11:00	76.92	73.82	0.04	4.03	
11:00-12:00	77.59	74.18	0.04	4.40	

6.9 Location 9 (Paikauli), The observed value came in range of (76.01-76.77)db(A), while the predicted values come in range (73.43-74.75)db(A) and the mean % Error is 3.14%. The obtained results are tabulated in Table 3.9.

TABLE 3.9 COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 9

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	76.77	73.43	0.04	4.36	3.14
7:00-8:00	76.70	74.36	0.03	3.06	
8:00-9:00	76.01	74.31	0.02	2.24	
9:00-10:00	76.61	74.75	0.02	2.42	
10:00-11:00	76.66	73.66	0.04	3.91	
11:00-12:00	76.65	74.45	0.03	2.87	

6.10 Location 10 (Kashihar Chauraha), The observed value came in range of (76.2-78.7)db(A), while the predicted values come in range (73.00-75.1)db(A) and the mean % Error is 4.6%. The obtained results are tabulated in Table 3.10

TABLE 3.10 COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 10

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	76.7	73.7	0.04	4.0	4.6
7:00-8:00	78.7	73.5	0.07	6.6	
8:00-9:00	76.2	73.8	0.03	3.2	
9:00-10:00	77.7	73.9	0.05	4.9	
10:00-11:00	78.1	75.1	0.04	3.9	
11:00-12:00	77.0	73.0	0.05	5.2	

6.11 Location 11 (Bagahabir Baba Mandir) ,The observed value came in range of (77.38-79.38)db(A), while the predicted values come in range (73.04- 75.23)db(A) and the mean % Error is 5.56%. The obtained results are tabulated in Table 3.11.TABLE 3.11

COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 11

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	79.38	73.23	0.08	7.75	5.56
7:00-8:00	78.88	74.37	0.06	5.72	
8:00-9:00	78.02	73.58	0.06	5.69	
9:00-10:00	78.08	75.23	0.04	3.65	
10:00-11:00	78.61	74.72	0.05	4.95	
11:00-12:00	77.38	73.04	0.06	5.61	

6.12 Location 12 (Kauriram Bus Station), The observed value came in range of (77.02-79.77)db(A), while the predicted values come in range (72.90-74.50)db(A) and the mean % Error is 5.04%. The obtained results are tabulated in **Table 3.12.**

TABLE 3.12 COMPARISON BETWEEN OBSERVED AND PREDICTED NOISE LEVELS AT LOCATION 12

Time	Observed hourly (Leq)	Predicted hourly (Leq)	Error	%Error	Mean% Error
6:00-7:00	77.68	72.90	0.06	6.15	5.04
7:00-8:00	77.02	73.87	0.04	4.09	
8:00-9:00	79.77	73.72	0.08	7.58	
9:00-10:00	77.03	74.46	0.03	3.35	
10:00-11:00	77.48	73.96	0.05	4.55	
11:00-12:00	78.03	74.50	0.05	4.52	

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The range of Observed noise level (Leq) and the Predicted noise level (Leq) are shown in agreement diagram given Figure 5; As per the analysis, the percentage error comes out to be in the range of -10 % to +10 % shown in Agreement plot:

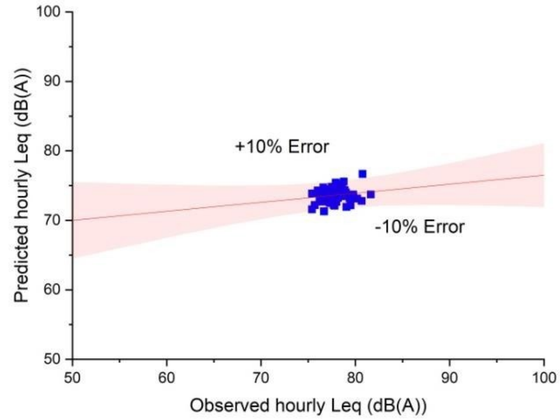

Figure 5. Agreement diagram

TABLE 4. RANGE OF OBSERVED AND PREDICTED NOISE LEVELS AT DIFFERENT LOCATION COMPARED TO PERMISSIBLE LIMITS OF CPCB

S.no	Locations	Range of Observed Noise Level	Range of Predicted Noise Level	Permissible Limits of Noise Level	Remark
1	Nausad Bus Stand	75.41-81.64	71.60-73.86	65	High Noise Level
2	Bhilaura Buzurg	71.60-73.86	71.30-75.45	55	High Noise Level
3	Bagha Ghara(Gorakhpur Bypass)	75.7-77.8	72.1-73.6	55	High Noise Level
4	Shivghat	77.62-80.19	72.65-75.60	65	High Noise Level
5	Sevai	77.23-77.79	72.36-74.83	65	High Noise Level
6	Chaundauli Khurd	76.51-80.76	72.36-74.83	65	High Noise Level
7	Gangapar	76.91-78.36	72.83-74.69	65	High Noise Level
8	Bhiti Belipar	76.14-77.82	73.20-74.21	65	High Noise Level
9	Paikauli	76.01-76.77	73.43-74.75	55	High Noise Level
10	Kashihar Chauraha	76.2-78.7	73-75.1	65	High Noise Level
11	Bhaghabir Baba Mandir	77.38-79.38	73.04-75.23	65	High Noise Level
12	Kauriram Bus Stand	77.02-79.77	72.90-74.50	65	High Noise Level

7. CONCLUSIONS AND RECOMMENDATINS

In this study, the assessment was carried out at Gorakhpur highway (NH-24) Nausad to Kauriram at 12 different locations. It was observed that the recorded noise levels at all the sites was high than the prescribed limit of Central Pollution of Control Board but noise Level of Nausad Bus Stand is lies between (75.41dBA to 81.64dBA) and (71.60dBA to 73.86dBA) at NH-24 are drastically higher which confirms that the study area is at risk of traffic noise pollution and may pose a great threat to the health of inhabitants of the city in the long term. This is because a high level of noise may not cause immediate serious effects, but if such a noisy environment prevails, it may affect the population. As a result, the competent authority must take action to reduce the noise level before it's too late. Here are some recommendations.

1. The residential areas should be guarded by the noise barriers like green belt development to enhance the sustainable development, turn down global warming and coherently reduce the noise pollution.
2. By employing the results of this study, traffic flow and speed limitations can be designed, particularly along noisy highway routes that are close to cities and urban areas. The goal of this study is to reduce the traffic-related noise. Additionally, it is believed that limiting traffic volume and speed in sensitive locations may be very effective in lowering noise levels along the highway corridors.
3. A committee can be organized to maintain the peaceful environment in the city, with the anonymous public complain system and penalize whosoever against it.
4. An improvement to the pavement surface may also help to reduce the noise. For the places in the hotriculture at the highway corridors should be promoted because vegetation can work as noise barrier and can be quite effective in reducing noise level
5. It is anticipated that traffic volume and speed regulations will be beneficial in India and other countries in reducing noise along highways.
6. Due to this, the study findings very beneficial for environmental evaluation and traffic planning, particularly about traffic noise.

Frequently overlooked, noise pollution has a detrimental impact on human beings, causing discomfort, decreased focus, and hearing loss, among other effects. Whether we realize it or not, every individual plays a role in the creation of noise pollution, as the majority of our daily actions produce varying levels of noise. Therefore, achieving control over noise pollution is unattainable unless every individual is conscious of it. It is imperative that everyone contributes to reducing noise pollution, as it might be considered a harmful and insidious toxin.

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