

## Study On Noise Levels Across Different Zones of Visakhapatnam Influenced By Traffic Density



### Environmental Science

**KEYWORDS :** Noise Pollution, Traffic Noise Index, Vehicular density, Noise levels, Noise control.

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### ABSTRACT

Noise pollution is being considered as a growing health threat to both humans and animals with the rapid urbanisation along with increased vehicular movements resulted in unpredicted rise of noise pollution in the urban environment present study focused on 4 main junctions in Visakhapatnam to assess the varying sound levels influenced by increased traffic density, and the observed readings of noise levels were analysed for parameters like Leq, Ln, TNI (Traffic Noise Index) and the results thus obtained revealed that Maximum dB was observed at BHPV and Minimum was observed at Industrial Estate which shown a positive relationship with TNI.

### Introduction

The simple expression of term noise is an unnecessary sound and important form of energy, which is emitted by a vibrating body and on reaching the ear causes sensation of hearing through nervous system. The noise generally consists of three inter-related elements -the source, receiver and transmission path followed by the noise to reach receiver. This transmission path is usually the atmosphere through which sound is propagated, but can include structural materials of any building containing the receiver.

First of all things changed rapidly in the United States as the Federal government officially recognized noise as a pollutant and began to support noise research and regulation. Consequently, the National Environmental Policy Act (NEPA) in 1969 and the Noise Pollution and Abatement Act (more commonly called the Noise Control Act (NCA)) of 1972 came into existence. Afterward, the various European countries such as The Netherlands (1979), France (1985), Spain (1993) and Denmark (1994), etc. formulated national laws governing noise. The movement against noise pollution is weak in India.

Most of the people do not consider it as a pollutant and accept it as a part of their routine life. Of late, it has been recognized as a pollutant. In the late 1990s, it was considered necessary to regulate and control noise producing sources with the objective of maintaining the ambient air quality standards. Afterwards, Noise Pollution Regulation and Control Rules, 2000 was framed under the Environment Protection Act 1986 with defined set of guidelines for regulation and control of noise with respect to industrial, commercial, silent and residential zones.

A study by Singh and Mahajan (1990) conducted in Delhi and Calcutta; found that the noise level is 95dB as against the ambient limit of 45dB. Even at the "calm" places, it does not fall below 60dB. Berglund and Lindvall [1995] in their study highlighted that road traffic, jet planes, garbage trucks, construction equipment, manufacturing processes and lawn mowers are some of the major sources of the unwanted sound that is routinely being broadcasted into the air. Bond [1996] analyzed the noise pollution in Europe and reported that 16% of people are exposed to 40 dB or more of traffic noise in their bedrooms at night compared to World Health Organization's (WHO) average estimates of 30–35 dB for undisturbed sleep, how ever studies by Murli and Murthy [1983] studied the noise pollution in Vishakhapatnam and found that traffic noise exceeded 90 dB even in morning

hours and this has become a major source of nuisance in this city in this context the present study was designed to

1) Measurement of noise equivalent levels (Leq) during morning and evening hours at industrial areas of Visakhapatnam)

Measurement of Traffic Density to find out the impact of Traffic on noise levels at various junctions of industrial areas of Visakhapatnam)

### Study Areas:

A preliminary reconnaissance survey has been undertaken to identify the major noise generating sources in the area, Noise at generating sources have been identified based on the activities in the surrounding area, ambient noise due to industries and traffic and the noise sensitive areas like hospitals and schools the noise monitoring has been conducted for determination of noise levels at "4" locations in the study area. Altogether four traffic intersections were selected to monitor the noise levels during peak hours in the morning and evening. The sampling stations are:

S.No	Place	G.P.S Readings
1	Rushikonda	17°47'21.99"N 83°22'4.51"E
2	BHPV	17°44'21.90"N 83°15'48.38"E
3	Sindhia	17°41'49.43"N 83°15'14.66"E
4	Industrial Estate	17°42'7.78"N 83°12'21.36"E

**Table: Study locations**



**Fig: Google Image showing the 4 study locations**

### Materials and Methodology :

#### Instrument for Measuring of Sound Levels:

An Environment sound level meter 2001 (DL03) baseline technologies. It was used to measure the existing noise levels at the

various intersections. This battery operated instrument has a microphone, amplifier “A” weighting not work and an indicating meter which gives a reading in dB relative to  $2 \times 10^{-5}$  N/m<sup>2</sup>. The microphone responds directly to the pressure variations in the sound field and its output is amplified to give a reading of sound pressure level directly on the meter. “A” weighting network superimposes a frequency response on the amplifier similar to the human ear. The network is very similar to the inverted threshold curve and the measurements on the “A” scale are used and corrects well with subjective noise rating as well as with the risk of hearing damage from exposure to continuous noise. The reading range is divided into three limits 0-50 dB, 50- 100 dB and 100-150 dB. The display is digital alphanumeric type. Pressing hold button provided in the instrument for the purpose can hold the desired reading.

**Traffic Density Measurement**

The higher the traffic density the higher will be the noise levels. In the present study the traffic density at each junction was determined during the peak hours of the i.e., from 8 am - 11 a.m and 4 p.m - 7 p.m. The traffic volume was evaluated from every hour by counting the number of heavy & light vehicles that crosses the point measurement in either direction on road. While counting the number of vehicles the noise levels were also recorded simultaneously at every junction. Two wheelers, 3 wheelers and 4 wheelers come under light vehicles while buses and trucks come under heavy vehicles.

**Parameters measured during monitoring:**

For noise levels measured over a given period of time interval, it is possible to describe important features of noise using statistical quantities. This is calculated using the percent of the time certain noise levels exceeds the time interval. The notation for the statistical quantities of noise levels is described below

- Hourly leq values have been computed by integrating sound level meter
- Lday: As per the CPCB guidelines the day time limit is between 07.00 hrs to 22.00 hrs as outlined in ministry of environment and forest notification S.o 123(E) dated 14/02/2000.
- Lnight: As per the CPCB guidelines night time limit is between 22.00 hrs to 0700 hrs as outlined in ministry of environment and forest notification S.o 123(E) dated 14/02/2000.
- L10 is the noise level exceeded 10 percent of time
- L50 is the noise level exceeded 50 percent of time
- L90 is the noise level exceeded 90 percent of time

**Calculations:**

**Leq Calculation:**

The magnitude of sound energy in the environment over the period of time is expressed in terms of quality called Leq which is the equivalent continuous noise level if maintained continuously would equal to the total energy emitted during that period. It is expressed in dB (A) which is the average rate at which energy is received by the human ear during the period mentioned. Leq provides quite a good measure of intensiveness in that it lays more emphasis on occasional high noise levels, which can be quite disturbing. Leg the equivalent continuous energy level can be applied to any fluctuating noise level. Mathematically it is that constant noise level which over the same given time expends the same amount of energy as the fluctuating level. It is directly related to the mathematical integration of the square sound pressure when written as a mathematical expression it is:

$$L_{eq} = 10 \log \left[ \sum_{i=1}^{i=N} f_i 10^{\frac{L_i}{10}} \right]$$

Where,

N= the total number of samples taken

Li= the noise level in dB (A) of the i-th sample.

This expression is used for calculating Leq value for every half-an-hour at each junction.

For calculating Leq per day at each junction the formula used is,

$$L_{eq} = 10 \log \left[ \sum_{i=1}^N f_i 10^{\frac{L_i}{10}} \right]$$

Where,

fi = fraction of time

N= Total number of samples taken.

**Ln Calculation**

L10 is the noise level in dB (A) which is exceeded for only 10% of time and indicates an average maximum noise level. On the other hand noise level in dB(A) exceeded for 50% of measurement period would indicate a mean noise level & is termed as L50. L90 is a noise level exceeded over a long period of time that is 90% is called an average minimum noise level which indicates an average background noise level.

The L10, L50 & L90 were calculated from the noise levels that were recorded at an interval of 2 seconds for a period of half-an-hour at every junction. From the readings obtained for every half-an-hour the highest to the least values were noted in a descending order. Then the number of occurrences of each value was noted.

A graph is plotted with percentage of time on x-axis and noise level in dB (A) on y-axis. From this graph L10, L50 & L99 values were obtained which are the noise levels exceeded for 10%, 50% & 90 of time respectively.

**TNI calculation:**

Traffic noise index (TNI) is another parameter, which indicates the degree of variation in the traffic flow. This is also expressed in db (A) and can be computed using the relation.

$$TNI = L_{90} + 4(L_{10} - L_{90}) - 30$$

**Results and Discussion:**

**AT RUSHIKONDA:**

The maximum sound pressure level observed at RUSHIKONDA is 71.4 dB and the minimum sound pressure level observed is 53.2 dB and the Leq is found to be 58.9 dB and the TNI (traffic noise index) computed is 54.5 dB (A scale)

**AT INDUSTRIAL ESTATE:**

The maximum sound pressure level observed at INDUSTRIAL ESTATE is 71.1 dB and the minimum sound pressure level observed is 54.1 dB and the Leq is found to be 58.9 dB and the TNI (traffic noise index) computed is 50 dB ( A scale)

**AT BHPV:**

The maximum sound pressure level observed at BHPV is 97.5 dB and the minimum sound pressure level observed is 57.0 dB and the Leq is found to be 76.6 dB and the TNI (traffic noise index) computed is 92.7dB (A scale)

**AT SINDHIA:**

The maximum sound pressure level observed at SINDHIA is 89.2 dB and the minimum sound pressure level observed is 52.9 dB and the Leq is found to be 69.4 dB and the TNI (traffic noise index) computed is 72.6 dB (A scale)

Study area	2 wheeler	3 wheeler	4 wheeler	Heavy Vehicles
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B.H.P.V	722	402	224	508
Industrial Estate	112	52	34	86
Sindia	200	115	60	5
Rushikonda	210	110	55	9

### Vehicular moment recorded per Hour

Thus the observed readings showed a positive relationship with the TNIA maximum of 97.5 dB was observed at B.H.P.V and a minimum of 71.1 dB was observed at Industrial Estate with TNI values of 92.7 and 50 respectively. The maximum noise level at BHPV was due to the proximity with the NH-16 which attracts more traffic than the other study locations and the minimum levels were observed at Industrial Estate and Rushikonda study locations as there is less influx of traffic compared to the study locations.

### Conclusion:

Present study revealed the importance of implementation of noise abatement rules and regulations and the need for policy change in the controlling vehicular movements on the roads like developing special tracks for the Public transport facilities like 3 wheelers, which directly influencing the TNI values. And the development of Green belts in the city can also help in reduction of noise levels in the study area. Present study also recommends that the length and width of the roads should be re-framed in the city master plan with the raising traffic.

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