A Study On Noise Pollution In Some Residential Areas Of Visakhapatnam

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Abstract - **Environmental noise is all unwanted sound in our community. Noise pollution a form of air pollution, is a threat to health and well-being .It is more severe and wide spread than even before, and it will continue to increase in magnitude and severity because of population growth, urbanization and the associated growth in the use of increasingly powerful, varied and highly mobile sources of noise. Noise is a serious environmental problem that requires attention. Visakhapatnam is a developing city having road, rail, air and sea transport connecting all parts of country. Day by day development causes a noisy environment in the city.In the present study, a noise survey is carried out in some residential areas in Visakhapatnam. Noise levels are monitored during peak traffic periods (9:00am to 10:00am, 12:00 noon to 1:00pm, 5:00pm to 6:00pm)with an interval of 30 seconds. Equivalent noise levels are calculated and compared with CPCB standards. Remedial measures are discussed. In order to suggest the remedial measures attenuation studies are also carried out using three barrier materials wood, glass and masonry.**

1. INTRODUCTION

Noise Pollution is defined as unwanted sound, undesired by the recipient. Defined physically it is intense and complex sound without agreeable musical quality. Noise has been therefore defined as an excessive, offensive, persistent or starling Sound, form of pollution and begun to Recognized as major evil. Noise is Unwanted sound which increases fatigue, and is distracter interfering with Efficiency of working .Noise interfaces with work rest and sleep. Noise is a sound which is disagreeable and disturbs the normal way of an individual. Noise is Sound which is an unavoidable part of our daily lives and has increasingly become a major burden on the quality of lives. Man is born with noise and Dies with that, noise are a part of human life and a natural product of life and therefore a natural product of human environment.

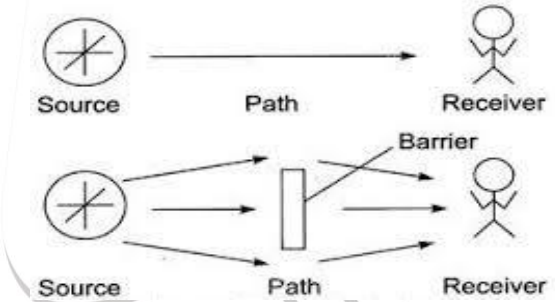

Figure 1: Inter-relationship between the elements of noise

1.1 Sources of noise:

Air Craft Noise
Noise from Rail track
Construction noise
Noise in industry
Noise in building
Noise from consumer products

1.2 Effects of noise:

When a sound wave propagates, when it reaches the outer ear, ear drum starts vibrating in sympathy to those vibrating , which are transmitted through the three small bones in the middle ear and then to the inner ear and cochlear hairs which are connected to the nerve cells. The basic hearing mechanism of the ear cochlea is the communication of sounds to brain by the small hair cells. Intense sound damages these cells, sometimes beyond recovery due to prolonged exposure to sounds. Noise has become a threat to our social existence. The misuse of public address system by indiscriminate use of machinery are all contributing a lot to the noise hell we find ourselves in. a peaceful life has become a social impossibility.

1.3 The Noise Pollution (control & regulation) Rules 2000

These Rules restrict noise level in zones specified as residential areas, silent Zones and commercial areas and industrial areas. Under the Noise (Rules and Control) Rules 2000, maximum permissible decibel levels for different zones are laid down as under

Table 1: Ambient noise level standards in India

Area Code	Category of area	Daytime in dB Leq	Night time in dB Leq
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Day time shall men from 6.00 am to 10.00pm
Night time mean from 10.00 pm to 6.00 am

1.4 Objectives of the study:

a) To identify residential areas for the noise survey in important residential zones of Visakhapatnam viz: Pithapuram colony, seethammadhara, H.B.Colony, Lawson's bay colony, M.V.P Colony.
b) To monitor noise pollution levels (daytime) at the identification selected residential zones.
c) To compare Leq with CPCB standards.

2. LITERATURE REVIEW

2.1 General

The word noise comes from the Latin word nausea meaning seasickness. Noise is defined as unwanted human created sound that disrupts the environment .It has been defined as unwanted sound, a potential hazard to health and communication dumped into the environment with regard to the adverse effect it may have on unwilling ears.

2.2 Noise Pollution - A Silent killer:

Noise pollution did not create much public concern due to ignorance about the treacherous effect of noise on both workers in industry in particular and the public in the community in general. Noise is an important environmental pollutant like noxious gases that befoul our air, water and soil. Noise is a technology generated problem and that the overall noise doubles every ten years keeping pace with our social and industrial progress.

Wilson.M.R.E (1999) reveal that outdoor noise was monitored at 1300 sites covering 100 zones including domestic, educational, clinical, commercial & industrial establishments .based on the intensity of noise, the city is categorized into different noise level zones. It is vivid from the investigation that no area has got the sound level less than 45 dB. Even though the garden city is embellished by vegetative sink; the traffic noise has become the sole cause for the ambient noise. This type of noise may be exacerbated in the narrow streets of this older city, where sound reverberates between the buildings. Noise is a slow agent of death, it became a part and parcel of everyday life .Hence and it cannot be stopped totally but can be controlled to an optimum level.

Kanchan Garg B.A et al (2003), conducted the study in Bangalore city with a population of 59.8 lakhs has a vehicular population of around 12.97 lakhs, which in one vehicle for every five persons. Noise levels monitored at nine busy traffic junctions and three residential areas.The traffic junctions viz., Minerva circle, Malleswaram circle, M.G.Road, K.R.Market, K.R.circle, Yeswanthapur circle, Mekhri circle, Ananda Rao circle and south end circle are the few busiest traffic junctions in the city in the sense that they have high vehicular density with a total number of vehicles / min is between 5-172 in non-peak hours and 15-211 in peak hour.

The Leqsobtainedare73.6dB,69.3dB,77.2dB,69dB,75.8dB,73.6dB,77.6dB,75.1dB. The results says that during the course of study ,it has been observed that the noise levels are quiet high in all sampling locations .Hence noise pollution prevention and control is very essential like noise can be controlled at source transmission path and receiver . Use of protective aids like headphones, helmets, planting of trees etc.

Usha Madhuri.T (2003), carried out noise survey in residential areas near railway tracks in Visakhapatnam. The monitoring of noise levels in residential areas in the vicinity of railway tracks in Visakhapatnam was done using noise meter from 6.00 am to 6.00 pm at every 5 minutes interval. Areas selected were Marripalem, Bajji junction and Gopalapatanam .Equivalent noise levels were calculated .The equivalent noise levels obtained were 70.08 dB(A) at Marripalem,72.85 dB(A) at Bajji junction and 70.29dB(A) at Gopalapatanam. The approximate distances of these monitoring points from railway track are 60m, 80m and 30m respectively at Marripalem Baji junction and Gopalapatnam .At Bajji junction monitoring was also done within a house where Leq obtained was within the prescribed limit. Since the noise levels obtained at Bajji junction outside and inside the house vary by 27.23 dB (A) it is observed that building materials are effective in noise reduction .Hence attenuation studies have also been conducted for different barrier materials.

Vidya Sagar.T et al (2006), says that Visakhapatnam is an industrial and sea port city located on the east coast of India. A hospital (RCD hospital), residential area (Lawson's Bay Colony), traffic zone (Jagadambajunction, Andhra Pradesh State Road Transport Corporation Complex junction and Seethammadhara junction) and industrial zone (Sea port) were chosen to monitor the noise levels. The observed noise level at RCD hospital at daytime were 44-53 dB(A).The LN10 and Lpeak values were found in between 51-70 dB(A) and 63-93dB(A) respectively The observed noise level was more than 10dB(A)in any time. The background noise at Santhi Ashram was approximately 3dBA less at night time and 2dB less at day time compared to ambient air quality noise standards (AAQNS) for silent zone. The ambient air quality noise levels (AAQNL) at traffic junctions were 5dBA or more than those prescribed by AAQNS for commercial zone and most of the values were found in the range of 80+10 dBA, among which 75% values were found in the range of 110 + 10 dBA. AAQNL near port were found in the range of 5 to 10 dB(A)positive shifts on AAQNS due to conveyor operation. The AAQNL were alarming even in the absence of conveyor system, indicating the impact of vehicular traffic.

Avnish Chauhan et al (2010), conducted the study at different zones of Dehradun City of Uttarakhand. It reveals that Exposure to high level of noise may cause severe stress on the auditory and nervous system. Transportation and horns used in vehicles are

the major source of noise pollution in Dehradun City. The study was carried out different locations with Sound Level Meter to assess the day and night sound levels in Dehradun City. Noise level (dB) at Day Noise level (dB) at Night Basant Vihar 76.1±9.51 55.3±6.21, Subash Nagar 81.7±7.44 dB, 46.2±5.68dB; Karanpur 86.0±5.12dB, 51.3±2.64dB; Majra 96.3±8.15dB, 89.67--8.54dB;Chakrata Road 90.5±5.32dB, 59.4±2.3dB;Rajpur Road 92.2=4.52dB,59.0±2.32dB. It is observed that all the selected locations, the level of noise was found to be above prescribed noise standard level of CPCB, India. . Automobiles specially three wheelers (autorikshaw), poor maintenance as well as music systems used in these three wheelers,were found to be major sources of noise pollution in Dehradun, resulting in improper communication, sleeplessness. All selected sites were exposed to higher noise level as compared to Indian standard noise level prescribed by CPCB (Central Pollution Control Board), New Delhi, India. To reduce noise pollution several measures can be implemented such as proper maintenance of vehicles and roads, proper checking of vehicles, poor and old vehicles should be banned and plantation of trees. Most important step to tackle with noise pollution is to make aware the people about noise pollution and its adverse effects.

3: METHODOLOGY

3.1 Measurement of sound:

Intensity and frequency are the two important properties of sound. The unit of measurement of intensity is **DECIBEL (dB) .**The decibel scale begins with zero. One unit or one decibel is the smallest change of sound intensity which an average healthy human ear can perceive. Human ear is more sensitive to sound of middle frequencies i.e.100Hz. As compared to low and high frequencies in this range.(20 to 20,00Hz).

3.2 Equivalent noise level (Leq):

The magnitude of sound energy in the environment over a period of time is defined as Equivalent noise level (Leq). Leq is the constant noise level that would result in the same total sound energy produced over a given period. It can be measured in either A, C or Z (Liner) modes. Adding Leq values requires taking an anti-log of each value. The addition can be performed as follows

$$\mathbf{Leq = 10 \log_{10}[1/N\{\sum 10\text{^}li/10\}]}$$

Where i=1 to n

N = Total number of days

Where n is the total number of readings taken with a half minute interval. An Environmental noise pollution meter of model SL-4001 was used to measure the noise level in residential zones in Visakhapatnam. An octave band filters (noise meter) consists of a microphone, amplifier, filter hank, a detector and an indicating meter.

3.3 Calibration of Noise level meter:

An Environmental noise pollution meter of model SL-4001 was used to measure the noise level in residential zones in Visakhapatnam. The sound level meter is built in the internal calibration accuracy calibration VR (3- 10**)** on the front panel .The following procedures to calibrate the instrument accurately.

3.3.1 Calibrated via internal 94 dB generator

The sound level meter is built in the internal standard 94 dB/ 1 KHz square wave generator for the purpose to calibrate come amplifier circuit. According to the following procedures to calibrate the instrument before making operation, if the instrument not in use for a long time

1. Slide “Range selector” (3-7) to 50-100 position.
2. Slide “Fast/slow selector” (3-6) to slow position.
3. Slide “A/C weighting and calibration selector” (3-4) to 94 dB CAL position
4. Carefully the “calibration VR (3-10) with screw driver until the display read within94.0 + or – 0.2 dB.

3.4 Study Area:

Visakhapatnam city in Andhra Pradesh is having natural harbor that were operated even in ancient times. Visakhapatnam is surrounded by the naval base station, major industries, educational institutions and religious places.

In the present day some residential areas in Visakhapatnam have been considered for noise survey.

The areas selected for noise survey are:

1. Pithapuram colony.
2. Seethammadhara.
3. H.B colony.
4. Lawson’s bay colony.
5. M.V.P colony.

The readings are taken from 9:00am-10:00am, 12:00 noon-1:00pm, 5:00pm-6:00pm with an interval of every 30 seconds.

3.5 Experimental Procedure:

a) Monitoring of noise levels in dB (A) peak traffic periods at selected residential areas.
b) Using MS excel, calculations of equivalent noise levels (day time) Leq.

4. RESULTS AND DISCUSSIONS:

Experimental procedure was conducted on 18/02/2016 to 31/05/2016 in and near Pithapuram colony, Seethammadhara, H.B colony, Lawson’s bay colony and M.V.P colony.Equivalent noise levels *Leq* dB (A) in the selected residential areas is evaluatedLeq values are evaluated at selected residential zones i.e.

1. Pithapuram colony.
2. Seethammadhara.
3. H.B colony.

4. Lawson's bay colony.
5. M.V.P colony.

4.1 MODEL TABLES AND CALCULATIONS:

Table 2:Leq values at pithapuram colony

S.NO	DATE	Leq(avg)
1	18/2/2016	72.06
2	19/2/2016	72.74
3	20/2/2016	71.09
4	21/2/2016	70.36
5	22/2/2016	73.37
6	23/2/2016	71.74
7	24/2/2016	72.95
8	25/2/2016	71.66
9	26/2/2016	72.96
10	27/2/2016	70.76
11	28/2/2016	70.94
12	29/2/2016	71.72
13	1/3/2016	72.88
14	2/3/2016	73.00
15	3/3/2016	71.12

Calculation of Leq values at pithapuram colony:

Leq=10 $\log_{10}$[1/N{∑10^li/10}]

Where i= 1 to n

The case study at pithapuram colony was conducted from 18/02/2016 to 03/03/2016

∑10^li/10= 276387580

N=15

Leq=10 $\log_{10}$[1/15{276387580}]

Leq=10*7.26 = 72.6 dB

At location pithapuram colony Leq value observed is 72.6 dB

The CPCB standard value for residential area is 55 dB.

Pithapuram colony Leq value is exceeded by 17.6 dB when compared with the CPCB standard value of residential area.

Table 3: Leq values at seethammadhara

S.NO	DATE	Leq(avg)
1	4/3/2016	70.06
2	5/3/2016	68.95
3	6/3/2016	70.08
4	7/3/2016	72.13
5	8/3/2016	71.5
6	9/3/2016	70.61
7	10/3/2016	69.51
8	11/3/2016	69.44
9	12/3/2016	68.81
10	13/3/2016	68.72
11	14/3/2016	68.68
12	15/3/2016	70.73
13	16/3/2016	71.08
14	17/4/2016	70.11
15	18/4/2016	70.64

Calculation of Leq values at SEETHAMMADHARA:

Leq=10 $\log_{10}$[1/N{∑10^li/10}]

Where i = 1 to n

The case study at location seethammadhara was conducted on 04/03/2016 to 18/03/2016

∑10^li/10=157054812,

N=15

Leq=10 $\log_{10}$[1/15{157054812.3}]

Leq=10*7.01=70.1 dB

At location seethammadhara the Leq value observed is 70.1 dB

The CPCB standard value for residential area is 55 dB

Seethammadhara leq value is exceeding 15.1 dB when compared with the CPCB standard value of residential area.

Table 4: Leq values at H.B colony:

S.NO	DATE	Leq(avg)
1	19/3/2016	72.48
2	20/3/2016	71.5
3	21/3/2016	74.00
4	22/3/2016	74.72
5	23/3/2016	73.56
6	24/3/2016	72.26
7	25/3/2016	72.26
8	26/3/2016	71.25
9	27/3/2016	72.03
10	28/3/2016	73.24
11	29/3/2016	72.61
12	30/3/2016	70.65
13	31/3/2016	73.30
14	1/4/2016	73.00
15	2/4/2016	72.49

Calculation of Leq values at H.B COLONY:

Leq=10 $\log_{10}$[1/N{∑10^li/10}, Where i= 1 to n

The case study at H.B colony was conducted on 19/03/2016 to 02/04/2016

∑10^li/10= 277929492

N=15

Leq=10 $\log_{10}$[1/15{277929492}]

Leq=10*7.26=72.6 dB

At location H.B colony Leq value observed is 72.6 dB

The CPCB standard value for residential area is 55 dB

H.B colony Leq value is exceeded by 17.6 dB when compared with the CPCB standard value of residential area.

Table 5: Leq values at Lawson's bay colony

S.NO	DATE	Leq(avg)
1	2/5/2016	57.04
2	3/5/2016	57.53
3	4/5/2016	59.05
4	5/5/2016	59.91
5	6/5/2016	60.05
6	7/5/2016	56.79
7	8/5/2016	55.43
8	9/5/2016	61.36
9	10/5/2016	57.57
10	11/5/2016	60.58
11	12/5/2016	59.06
12	13/5/2016	61.61
13	14/5/2016	57.53
14	15/5/2016	55.66
15	16/5/2016	61.85

Calculation of Leq values at Lawson's bay colony:

Leq=10 $\log_{10}$[1/N{10^li/10}]

Where i= 1 to n
The case study at Lawson's bay colony was conducted on 02/05/2016 to 16/05/2016
∑10^li/10= 12495020.92
N=15
Leq=10 $\log_{10}$[1/15{ 12495020.92}]
Leq=10*5.92=59.2 dB
At location Lawson's bay colony Leq value observed is 59.2 dB
The CPCB standard value for residential area is 55 dB
Lawson's bay colony Leq value is exceeded by 4.2 dB when compared with the CPCB standard value of residential area.

Table 6: Leq values at M.V.P colony:

S.NO	DATE	Leq(avg)
1	17/5/2016	66.01
2	18/5/2016	67.02
3	19/5/2016	67.67
4	20/5/2016	68.45
5	21/5/2016	65.14
6	22/5/2016	63.63
7	23/5/2016	67.27
8	24/5/2016	67.17
9	25/5/2016	65.13
10	26/5/2016	68.22
11	27/5/2016	68.92
12	28/5/2016	66.61
13	29/5/2016	62.68
14	30/5/2016	69.47
15	31/5/2016	66.58

Calculation of Leq values at M.V.P colony:
Leq=10 $\log_{10}$[1/N{10^li/10}]
Where i= 1 to n
The case study at M.V.P colony was conducted on 17/05/2016 to 31/05/2016
∑10^li/10= 75519583.5
N=15 Leq=10 $\log_{10}$[1/15{ 75519583.5}]
Leq=10*6.70=67.01 dB
At location Lawson's bay colony Leq value observed is 67.01 dB
The CPCB standard value for residential area is 55 dB
Lawson's bay colony Leq value is exceeded by 12 dB value when compared with the CPCB standard value of residential area.

Equivalent noise levels(Leq) in the selected residential areas:

Table 7: equivalent noise level(Leq) in the selected residential areas

Residential areas	The Measured Leq values	CPCB Standard values (day time)
Pithapuram colony	72.65	55
Seethammadhara	70.19	55
H.B colony	72.67	55
Lawson's bay colony	59.20	55

M.V.P colony	67.01	55

5. CONCLUSIONS

At Pithapuram colony, the Leq dB(A) value observed is 72.65 dB,At Seethammadhara, the Leq dB(A) value observed is 70.19 dB.At H.B colony the Leq dB(A) value observed is 72.67 dB.At Lawson's bay colony the Leq dB(A) value observed is 59.20 dB.At M.V.P colony the Leq dB(A) value observed is 67.01 Db.

6 FUTURE WORKS

Noise levels are assessed during the day time only. If the noise values are assessed during the night time too then Average Noise level can be assessed. The values of both day time and night time are required to create Noise mapping data. So in future the study can considered and create Noise Mapping contours if night time values are also included

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