TRANSPORTATION NOISE, A NEW THREAT TO MEGA CITIES AND METROPOLITAN CITIES – A CASE STUDY OF AHMEDABAD CITY

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A B S T R A C T - **In Ahmedabad city, along with development of city, transportation facility has also been improved. Improvement of transportation has many benefits though it creates many environmental problems like air pollution, noise pollution, water pollution etc. Transportation Induced Noise pollution is a new threat to Mega cities and Metropolitan cities like Ahmedabad. Noise pollution makes many adverse effect on human being like it interferes spoken communication, it causes Ear Impairment, it causes reduced task performance, it causes disruption to sleep, it causes hypertension as well as cardiovascular problems, It causes negative social behavior ect. Noise also makes adverse effect on Fetuses, newborn baby and to school going children. Due to noise, Impaired educational task performance takes place in school going children and hence Noise can be awarded as slow killer. By keeping in view to adverse effect of noise, it is necessary to know that whether noise is above or below than it is permissible limit. If noise is found above it's permissible limit, sufficient remedial measures should be taken to save human being from it's adverse effect. For assessment of noise in Ahmedabad city, three areas were selected. To assess road traffic noise, Gitamandir four cross roads was selected which is in vicinity of state transport bus station and hence considered as one of the most noisy areas of the city. Noise Level reading were taken separately for day time as well as for night time at every five minutes of interval. For each location, Leq (Equivalent Noise Level) was calculated separately for day time noise as well as for night time noise. The calculated Leq was Compared with Standards Given by Central pollution control board. Also it was calculated that the obtained noise level was high by what percentage with compare to standards given. The result revealed that for day time noise Leq is 76.18 dB against it's permissible limit of 65dB (As per Standards of noise given by Central Pollution Control Board).Which was higher by 17.20 % to it's permissible limit. By the same way Leq for night time noise was 75.68 dB against it's permissible limit of 55 dB . Which was higher by 37.6 % to it's permissible limit. For assessment of rail traffic noise, Maninagar Railway Crossing area was selected which is a broad gauge Railway line. It carries Ahmedabad-Bombay route which is one of the most busiest rail routes of India. The Noise Level reading were taken for day time as well as for night time. The result revealed that for day time noise, Leq was 87.28 dB against it's permissible limit of 55 dB. Which was higher by 58.69 % to it's permissible limit. By the same way for night time noise, Leq was 83.41dB against it's permissible limit of 45 dB. Which was higher by 85.35 % to it's permissible limit. For assessment of air traffic noise, residential area besides Ahmedabad airport's runway , at Sardarnagar area was selected. This is the location which is in vicinity of runway from where mostly take off operation of aircraft is carried out. The Noise Level reading were taken during day time as well as during night time. The result revealed that for day time noise, Leq was 73.89 dB against it's permissible limit of 55 dB. Which was higher by 34.34 % to it's permissible limit. By the same way for night time noise Leq was 77.10 dB against it's permissible limit of 45 dB. Which was higher by 71.33 % to it's permissible limit.**

Index Terms - **Transportation Noise, Cardiovascular dieses, Hypertension, Fetuses.**

I INTRODUCTION

Noise word came from Latin word "nau-sea" which means 'Undesirable Sound'[1] or sound Which is unpleasant to Human being.[2] In fact environmental noise is a threat to health as well as comfort of life. Along with air and water pollution, noise pollution is a new threat to metropolitan as well as Megacities cities like Ahmadabad. Now a days noise pollution level is at it's highest level than never before and it continuously increases because of many manmade activities such as high growth in population, urbanization, growth of automobiles etc. In fact transportation induced noise is major source of noise in metropolitan cities. Noise is produced by road , rail and air transportation facilities. The people residing by side of busy highways, rail tracks and airports are more prone to have adverse effect of noise and hence, it is necessary to measure the level of noise in each respective zone. Obtained reading of noise should be compared with permissible level of noise to know that how noise is above or below than it's permissible limit. In our country noise is considered as part of life but the same concept is not there in entire world. In Netherland Authority do not permit to built house in area which has noise level above 50 dB for 24 hours.[1] Many countries are using 'porous-asphalt' technology which can abate traffic noise by 5 db.[1] In our country, Noise pollution (regulation and control) act 2000 has given permissible noise standards as guidelines for regulation and control of noise for different areas/zones. As per a survey carried out by central pollution control board of India, revealed that the average noise level in Delhi was recorded as 80 dB against the permissible limit of 55 dB.[1] The C.P.C.B. also noted that in Bombay, at crowded places, the noise level was almost double than it's permissible limit for residential standards.[1]

II STANDARDS FOR NOISE POLLUTION

Table no.1 Ambient air quality standards with respect of noise:[7]

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

Note Here:

1. Day time means the time from 6.00 a.m. to 10.00 p.m.
2. Night time means the time from 10.00 p.m. to 6.00 a.m.
3. Silence zone is the area not less than 100 meters around hospitals, educational institutions and courts. Also silence zones are the zones which are declared by the competent authority.
4. Mixed categories of areas may be declared as one of the four of above mentioned categories by the competent authority.

*dB (A) Leq denotes the time weighted average of the level of sound in decibels on scale A related to human hearing.
"decibel" is a unit by which noise is measured.
"A", in dB(A) Leq, indicates the frequency weighting measurement of noise which corresponds to frequency response characteristics of the human ear.
Leq is energy mean of the noise level for a specific period of time.

III L_{eq} CONCEPT [11]

Mackenzie l. Davis and David a. Cornwell wrote in their book[11] that Leq , that means the equivalent continuous equal energy level can be applied to any fluctuating noise level. Over a given time, Over given time, It is constant noise level which, expends the same amount of energy as fluctuating for the same period of time. It is denoted as follows:

$$L_{eq} = 10 \log 1/t \int_0^t 10^{L(t)/10} \, dt$$

Where, t = Time over which Leq is determined.
L(t) =Time varying noise level in dB(A)
In fact there is no well-defined relationship between L(t) and time, so a series of independent sample of L(t) is to be taken and

due to that This expression is modified to:

$$L_{eq} = 10 \log \sum_{i=1}^{i=n} 10^{L_i/10}\ t_i$$

Where, n = Total number of samples taken
Li = Noise level of the i th sample in dBA
ti = Fraction of total sample time

IV METHODOLOGY FOR COLLECTION OF DATA AND ANALYSIS OF DATA

STEP-1 ROAD TRAFFIC NOISE: For measurement of road traffic noise, Readings were taken at Gitamandir four cross roads during day time (from 6.00 a.m. to 10.00 p.m.) at every 5 minutes of interval. Also the Noise level reading were taken on the same location during night time (from 10.00 p.m. to 6.00 a.m.) at every 5 minutes of interval.

STEP-2 RAIL TRAFFIC NOISE: For measurement of rail traffic noise, the Noise Level reading were taken at Maninagar railway crossing, close to railway track during day time (from 6.00 a.m. to 10.00 p.m.) at every 5 minutes of interval. Also the reading were taken on the same location during night time (from 10.00p.m.to 6.00a.m.) at every 5 minutes of interval. Also the readings were taken at the time of arrival of train if train arrives in between five minutes duration.

STEP-3 AIR TRAFFIC NOISE: For measurement of aircraft noise, the Noise Level reading were taken at Sardarnagar area , close to Runway strip during day time (from 6.00 a.m. to 10.00 p.m.) at every 5 minute interval. Also the reading were taken on the same location during night time (from 10.00p.m.to 6.00a.m.) at every 5 minutes of interval. Also reading were taken at the time of arrival or departure of aircraft if it takes place in between five minutes of interval.

STEP-4 ANALYSIS OF CALCULATED DATA: Collected Sound pressure level readings were analyzed for road traffic noise, rail traffic noise and air traffic noise, and Leq was Calculated.

STEP- 5 COMPARISON OF OBTAINED RESULT: Calculated value of Leq for road traffic noise, rail traffic noise and air traffic noise were compared with available standards of ambient air standards for different zones for day time as well as for night time. Also it was calculated that by what percentage, the Leq was higher with compare to standards given for the noise.

V RESULT

Calculated Leq and It's Comparison With permissible standards of Noise was As Below:

Table no. 2. comparison of calculated Leq with permissible standards of noise

SR.NO	LOCATION	RELEVANT ZONE	TYPE OF NOISE	Calculated Leq	PERMISSIBLE LIMIT	PARCENTAGE INCREASE OR DECREASE
1	Gitamandir Four Cross Road (Day Time Noise)	Commercial Zone	Road Transport Noise	76.18	65.00	17.20 %
2	Gitamandir Four Cross Road (Night Time Noise)	Commercial Zone	Road Transport Noise	75.68	55.00	37.6 %

3	Maninagar Railway Crossing (Day Time Noise)	Residential Zone	Rail Transport Noise	87.28	55.00	58.69 %
4	Maninagar Railway Crossing (Night Time Noise)	Residential Zone	Rail Transport Noise	83.41	45.00	85.35 %
5	Sardarnagar-Besides Runway (Day Time Noise)	Residential Zone	Air Transport Noise	73.89	55.00	34.34 %
6	Sardarnagar-Besides Runway (Night Time Noise)	Residential Zone	Air Transport Noise	77.10	45.00	71.33 %

VI CONCLUSION

From table it is concluded that among the observed locations:

(i) The highest noise Level (Leq) is Rail transport noise during night time (at Maninagar Railway Crossing) which is higher than it's permissible limit by 85.35%.

(ii) The second highest Noise Level (Leq) is Air transport noise during night time (at Sardarnagar Besides runway)which is higher than it's permissible limit by 71.33 %.

(iii) The third highest noise Level (Leq) is Rail Transport noise during day time (at Maninagar Railway Crossing) which is higher than it's permissible limit by 58.69 %.

(iv) Fourth highest noise Level (Leq) is Road Transport noise during night time (at Gitamandir four cross roads) which is higher than it's permissible limit by 37.60 %.

(v) Fifth highest noise Level (Leq) is Air Transport noise during day time (at Sardarnagar Besides runway)which is higher than it's permissible limit by 34.34 %.

(vi) Sixth highest noise Level (Leq) is Road Transport noise during day time (at Gitamandir Four cross roads) which is higher than it's permissible limit by 17.20 %.

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