

# Noise Mapping And Remedial Measures To Transportation Induced Noise - A Case Study Of Ahmedabad City

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**Abstract-** In Ahmedabad city, rapid development has taken place. Due to development, many environmental problems has also taken place like Water pollution, Air pollution, Noise pollution ect. Among all these pollutions, Noise pollution is a new threat to not only Ahmedabad city but to all megacities and Metropolitan Cities. Transportation is one of the major sources for Noise pollution. Road, Rail and Air transportation contribute to Noise pollution. For faster and comfort movement of the people, bus rapid transit system (B.R.T.S.) is started in Ahmedabad city. There is an international airport in Ahmedabad city along with a domestic airport. Number of international and domestic flights increases day by day for Ahmedabad city, which continue to increase in noise level. Noise makes both auditory and non auditory adverse impact on human body. Noise can be awarded as Modern Plague due to it's many adverse effect on human body as well as on comfort of life. Noise makes adverse effect on auditory system of human being and can cause Ear impairment. Noise triggers Blood Pressure. Noise causes hypertension. Noise causes Cardiovascular Disorders. Noise causes feeling of fatigueness. Noise causes risk of reduced task performance. Due to noise, Educational performance in school going children reduces. Noise also affects fetuses and new born. Hence, it is necessary to measure level of noise and if it is above it's permissible limit, sufficient remedial measures should be taken to save people from adverse effect of noise. Noise mapping is a graphical way to represent picture of noise. This system is used for current study. Three areas were selected to study noise. For assessment of road traffic noise, Gitamandir four cross roads was selected which is besides state transport bus station. This location contains movement of all State Transport buses across Gujarat state. Noise mapping was prepared at this location by taking noise level reading at various locations among the study area. Noise map revealed that the noise was 84 dB at some places of study area. Remedial measures were suggested to reduce effect of noise. For assessment of rail traffic noise, Maninagar railway crossing area was selected. This rail track is a broad gauge railway track carrying Ahmedabad – Bombay rail traffic and contains heavy movement of both passenger trains and goods trains. This track is considered as India's one of the busiest rail tracks. The Noise level readings were taken at various

locations of the study area and Noise mapping was prepared which revealed that noise is 100 dB around some area of Maninagar railway crossing and remedial measures were suggested. For assessment of air traffic noise, residential area of Sardarnagar besides Ahmedabad airport's runway was selected. This is the location which is in vicinity of runway from where mostly take off and landing operation of aircraft is carried out. Noise Mapping was prepared by taking Noise level reading at various locations of study area and noise mapping revealed that noise is 86 dB at some locations of the study area. Remedial measures were also suggested to muffle noise.

**Keywords-** Transportation Noise, Noise Mapping, Blood Pressure, Cardiovascular Disorder

## I. INTRODUCTION

Noise is Undesirable sound that reaches to our ears.<sup>[1]</sup> or in another word we can say that it is the sound which is unpleasant to us.<sup>[2]</sup> In fact noise is a threat to health and comfort of life for mankind. Noise pollution can be awarded as slow killer due to it's various adverse effect. Noise is a new threat to metropolitan cities like Ahmedabad. Now a days noise pollution is severe than never before and continuously increases day by day along with development of the city. In fact many efforts are needed to muffle noise and create awareness for noise. A survey war carried out by Central Pollution Control Board in Delhi and results revealed that in most of the places in Delhi, the noise level exceeds than It's permissible limit.<sup>[1]</sup> In Ahmedabad city, during Diwali festival, the noise level in residential zones was measured as 83 dB against it's permissible limit of 45 dB and 55 dB<sup>[4]</sup> Hence, it is necessary to measure level of noise. If it is above permissible limit, sufficient remedial measures should be taken..

## II. CONCEPT OF NOISE MAPPING

Noise mapping is a way of Graphical presentation of Noise and it is a new way to present picture of noise. In noise

mapping, the contour of noise are produced. A noise contour is an imaginary line joining the locations having equal noise level. From noise mapping one can identify high Noise area (hotspot) as well as low noise area (cooler or quiet). Noise mapping can serve following purposes: Firstly, it can be used to identify the areas where noise levels are high. Secondly, sufficient action plan can be prepared to reduce noise level and its effect. Thirdly, effectiveness of different noise reducing methods can be tested and compared. On the basis of that, the most cost effective method can be identified. Fourthly, local authority can use it for developing local development plans. Commercial and residential developers can use it to find the part of the city where noise is under acceptable limit and on the basis of that, they can take decision for development of a residential or commercial establishment.

### III.METHODOLOGY FOR COLLECTION OF DATA AND ANALYSIS OF DATA

III.1 Road Traffic Noise: To prepare noise contour (noise mapping) for noise generated by road traffic, Gitamandir four cross roads area was selected and noise level reading were taken by Noise level meter at different locations of the study area.

III.2 Rail Traffic Noise: To prepare noise contour (noise mapping) for noise generated by rail traffic, Maninagar Railway crossing area was selected and noise level reading were taken at different locations of the study area especially at the time when blowing horn sound of the train was heard.

III.3 Air Traffic Noise: To prepare noise contour (noise mapping) for Noise generated by air traffic, Sardarnagar area around air strip was selected and the noise level reading were taken at different locations of the study area at the time when noise due to take off or landing operation of aircraft was heard.

III.4 Analysis of Observed Data: Observed noise level reading for road Traffic noise, rail traffic noise and air traffic noise were used to develop contour with the help of contour preparation software. X- co ordinate and Y- co ordinate were found out for each and every point (from where noise level reading were taken). Z - co ordinate was taken as observed noise level reading at that location. Then Auto Cad Civil 3D Software was used to prepare contour of noise.

III.5 Suggestions: Suggestive measures were given for three study area to reduce noise.

## IV. RESULT



Fig.no.1 Noise Mapping for area of Gitamandir four cross roads.



Fig. no. 2 Noise Mapping for area of Maninagar Railway Crossing.



Fig. no. 3 Noise Mapping for area of runway of Ahmedabad

## V. CONCLUSION AND REMEDIAL MEASURES

V.1 Conclusion From Obtained Noise Map it is concluded that:

(i) Road transport Noise is higher, 84 dB at Gitamandir four cross roads short from entrance of state transport bus station

(ii) Rail transport Noise is higher, 100 dB in the area of Maninagr Railway crossing.

(iii) Air transport Noise is higher, 86 dB at the area which is in vicinity of landing and take-off operations of aircraft.

V.2 Following Remedial Measures are Suggested to Abate Noise

V.2.1 Measures to abate Road Traffic Noise:

(1) Noise barrier : Noise barrier should be constructed on both sides of roads having heavy traffic noise.

(2) Use Arboriculture: As trees plays an important role to abate noise, trees should be planted on both sides of road and at suitable available space. By planting trees not only noise can be abated but air pollution can also be reduced and the area can be made more pleasant.

(3) Set backs and buffer zones : At the time of developing new area, sufficient set back ( distance between centre of road to facing side of building ) should be kept sufficient so that heavy traffic noise on road can not harm to people residing nearby roads. Sufficient Setback with sufficient belt of trees is one of the most effect ways to abate noise.

(4) Sound absorbing panels: Sound absorbing panels should be Installed to reduce road side noise. Noise absorbing panels should be installed on walls of each under bridge of the city.

(5) Construction of low noise pavement : Roads should be Constructed by CRMB (Crumb Rubber Modified Bitumen) which produces very less noise. Another option is to use porous asphalt pavement. By using porous asphalt pavement, noise can be reduced by 3 dB(A) to 5 dB(A).

(6) Manage traffic flow : By managing traffic flow, congestion on road can be reduced. By reducing congestion, noise can also be reduced on road. Employ following methods to manage traffic flow:

- (i) Adaptive traffic control system
- (ii) Dedicated freight road
- (iii) Bye pass and ring road
- (iv) Restriction of speed
- (v) Bumps
- (vi) Design of road junction
- (vii) Speed monitoring system

(7) Restrict time and area : Heavy vehicles or commercial vehicles above certain capacity or weight should not be allowed to enter on road in residential area during night and week days. No heavy vehicle like truck, buses ect. should be allowed to run any where in the city except emergency services.

(8) Reduce road traffic noise at source: Vehicles making noise beyond certain limit should not be allowed to move on road. New vehicles should be encouraged.

(9) Reduce effect caused by horn : City buses, B.R.T.S. buses and State transport buses produces intense noise by blowing horn. Hence, drivers of buses should be educated that they should blow horn at low level and blow horn higher only when it is prime necessity.

(10) Joint construction method for elevated roads and bridges: Joints placed in roads causes greater vibration and hence produce greater noise. Joint less construction method should be used to abate noise from bridges and elevated roads.

(11) Maintain Roads: If roads are poorly maintained, more noise is produced and hence, roads should be maintained properly to make a good riding surface and reduce noise. Resurfacing of road should be carried out whenever is necessary.

(12) Educate women : As noise makes adverse effect on fetuses, new born and children hence, Women should be educated about adverse impact of noise.

(13) Location away from Noisy area : Maternity hospitals and children hospitals should not be allowed in vicinity of noisy rods and highways etc.

(14) Educational institutes : Schools or any type of educational institutes should not be provided in vicinity of heavy traffic roads. Proper noise control measures should be taken to abate noise if schools or educational institutes are provided in vicinity of noisy roads.

(15) Noise mapping : Noise Mapping of the city should be carried out to identify heavy noise area and low noise area.

For future generation and public health, research should be carried out on Transportation induced noise.

#### V.2.2 Measures To Control Rail Transportation Noise:

(1) Noise barrier: Noise barrier should be constructed on both sides of rail track especially when railway passes through residential area. By providing noise barrier on both sides of rail track, movement of people and animals on rail way track can be prevented. Due to restriction to movement of people and animals, rail engine driver do not need to make horn and hence, rail noise can be suppressed.

(2) Reduction in rail corrugations : Corrugations on rail track produce more noise when train moves on it. Hence, proper care should be taken to maintain rail track and reduce corrugations of rail track.

(3) Educate Driver of Rail Engine: Whistle of engine produce as much as 80 dB – 100 dB noise which produce annoying effect. Hence driver should blow horn only when necessary. Driver of engine should be given knowlrdge about adverse effect of noise.

(4) Noise mapping: Noise mapping of the city especially for area close to busy rail track should be carried out to know the area which is the most affected by rail traffic noise.

(5) Location away from Noisy area : Maternity hospitals and children hospitals should not be allowed to locate in vicinity of busy rail track to save children and new born from adverse effect of noise.

(6) Educational institutes: Any educational institutes should not be located in vicinity of busy rail track. If schools or educational institutes are provided in vicinity of such noisy rail track, proper noise control measures should be taken to abate noise so that adverse effect of noise on health and education of children can be minimized.

#### V.2.3 Measures To Control Air Transportation Noise:

(1) Construct noise barrier: Noise barrier in the form of R.C.C. wall should be constructed by all sides of runway. The height of wall should be such that in convenience can not take place to any air craft as well as noise can also be reduced.

(2) Operational Restriction : As an aircraft uses it's engine's full capacity at the time of take-off operation, it creates more noise. Due to this reason, Employ restriction of take-off operations during night. Also the aircraft making noise beyond certain limit should not be allowed to operate during

night. Night time noise curfew should be employed. The disadvantage from this action is that it becomes difficult to schedule long distance flights. Partial curfew is another alternate in which airport authority can permit only certain operations at night, depending on class of aircraft but scheduled departure of noisier aircraft should be prohibited.

(3) Use Fixed Electrical Ground Power Unit[9]: An Aircraft Power Unit (APU) is an integral part of an aircraft which is used to provide power to start the main engines. APU is also used for various functions inside aircraft such as cooling, heating, ventilation system for comfort of passengers while passengers are boarding. This APU can be connected to a hydraulic pump, which allows operation of flight controls and power equipment without running the main engines. When APU is absent, Ground power unit (GPU) can also be used for the same purpose. GPU can be used to provide electrical power, engine start capability, air-conditioning ect. Aircraft coming at any airport either uses APU system or GPU system and As a result there is increased noise pollution at airports. Further, GPU and Pre Conditioned Air Unit (PCA) use heavy duty diesel engines which run at high RPM. This result in additional noise pollution of 80-85dB for GPU and 90-100dB for PCA unit. The Aerobridge mounted unit known as Fixed Electrical Ground Power ( FEGP ) should be used as an alternate means of APU. Use of these aerobridge mounted units by aircraft parked at aerobridge will reduce Noise. This system will help in minimizing noise at airport.

(4) Location of Air Strip : When new airport is planned, air strip should be located away from residential areas.

(5) Noise mapping : Government should carry out noise mapping of area surrounding airport premises. The most affected air noise area should be found out. Free medical checkup camp should be arranged by government in the area which is most affected by noise.

(6) Care to pregnant woman: Special care should be taken for pregnant woman and children to keep them away from noise because noise affects fetuses, new born and children.

(7) Care for Maternity Hospitals: Maternity hospitals as well as children hospitals should not be allowed in vicinity to air strip so as to save children and new born from adverse effect of noise.

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