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Review Of Research

MEASUREMENT OF SOUND POLLUTION DURING GANESH FESTIVAL IN BARAMATI CITY

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ABSTRACT:
Noise plays an important role in our life. At sufficiently high levels noise can damage hearing immediately and at lower levels there may be a progressive impairment of hearing for normal people. For heart patients and blood pressure patients it causes irritating sensation. In this paper attempt has been made to make the people aware about sound pollution and the adverse effects of it.

KEYWORDS: *Sound Pollution, Decibel (dB), High wattage stereo, Sociological survey, Environmental pollutants, Hearing capability, Acoustic pressure.*

INTRODUCTION:

Noise is playing an ever-increasing role in our day-to-day lives. The trend towards the use of automated equipments, sports and pleasure crafts, high wattage stereo, large construction machinery, and increasing number of ground vehicles and aircraft has created a gradual acceptance of noise as a natural byproduct of progress.

Nevertheless, various noise monitoring studies and sociological surveys in recent years have indicated the need for noise abatement. Noise pollution is thus another environmental pollutant to be formally recognized as a genuine threat to human health and the quality of life. The fundamental insight we have gained is that noise may be considered a contaminant of atmosphere just as definitely as a particulate or a gaseous contaminant. There is evidence that at a minimum, noise can impair efficiency, adversely affect health and increase accident rates. At sufficiently high levels, noise can damage hearing immediately, and even at lower levels, there may be progressive impairment of hearing.

In this paper attempt has been made to put the record of sound pollution measurement made during Ganesh Festival period in Baramati City and industrial area in Baramati.

CHARACTERISTICS OF NOISE:

For all practical purposes, noise may be defined as unwanted sound therefore noise characteristics are essentially sound characteristics. Sound waves propagate through an elastic medium at a speed intrinsic to that material. In a gaseous medium such as air, sound waves produce significant changes in the density of air which in turn produce pressure changes. The parameter leading itself to quantification is sound pressure, the incremental variation in pressure above and below atmospheric pressure. In engineering terms, the acoustic pressure can be viewed as gauge pressure.

The human ear can detect sound pressures ranging from as low as $2*10^{-5}$ N/m^2, the threshold of hearing, to over 200 N/m^2, the threshold of pain. To express sound pressures logarithmic scale is used to cover the wide range of sound pressure. The decibel(dB) is a dimensionless unit used to express sound pressure level (SPL), the term level is used to emphasize the fact that a logarithm of ratio is being expressed.

The sound pressure level is defined as $SPL=10 \log(p^2/p_{ref}^2)$
$=20 \log(p/p_{ref})$ decibels

Where, p is the measured root mean square sound pressure (N/m^2) and p_{ref} is the reference sound pressure, $2*10^{-5}$ N/m^2. The reference pressure is the threshold of hearing such that 0 dB corresponds to limit of hearing. Noise measurements are nothing but sound measurements and the term ‘noise level’ is the word used synonymously with sound pressure level.

Comfort requires the sound level from all sources should be of the order of 65 dB or less, some typical noise levels are:[1]

100-110	Jet fly at 300m (1000 ft)
90-100	Power mower
80-90	Heavy truck with 64 km/h speed at 15m, food blender, motorcycle at 15m
60-70	Vacuum cleaner, air conditioner at 6m
40-50	Quite residential- day time
20-30	Wilderness

Noise levels have increased over the years and some authorities suggest that the average noise level in the cities have increased at about 1 dB per year for last 30 years.

The sound pressure level represents the magnitude of noise source and is one of the characteristics that can assess whether a given noise is considered to be annoying. There are other characteristics, both intrinsic to the noise and its context that dictate whether people will consider it to be annoying [2].

1. Frequency content or bandwidth
2. Duration
3. Presence of pure tone or transients
4. Intermittency
5. Time of the day
6. Location or activity

SOURCES OF SOUND POLLUTION:

In trying to identify the various sources of noise, one thinks of the din that characterizes modern cities. Major emphasize has been placed on community sound studies in urban areas [3-6]. This owns to the demonstrable fact that urban areas are noisier than rural areas, and because larger numbers of people live in urban areas, where they are presumably affected by the noise. Urban noise levels are complex mixture of noise from transportation, factories, industries, machines and people. The noise sources can be grouped into three types: transportation, industrial, and residential.

Transportation sources of noise are comprised of automotive and aircraft noises, motorcycles, scooters and snowmobiles. Main contributor to transportation noise is automotive traffic. At speeds in excess of 60 miles/hr, tyre noises are most discernible, whereas at lower speeds engine noises tend to dominate. The road gradient can also have an effect of vehicular noise emission e.g. a 5% road gradient adds about 3 dBA to truck noise, whereas the effect on cars is insignificant. Noise levels increase as the number of vehicles and average speed increases. Aircraft noises have been the source of nuisance complaints from the public for a long time. The amount of aircraft activity, flight paths, take-off and approach and landing procedures determine the amount of noise contributed to the total level.

Industrial operations and equipments are significant noise sources. Main examples of industrial noise are machinery or machine tools, pneumatic equipments, high speed rotating or stamping operations, duct fan and blower systems. Noise levels of 105-115 dB are encountered in grinding polycarbonates and other tough plastics, industrial wood saws emit noise levels of 100-105 dB depending on the type of wood being cut. In lathe operations the noise levels are 100-110 dB, structure-borne noises from gear housing can vary between 92-105 dB. The personal exposure time is small about 10 minutes for a quick equipment checks. In other cases a full 8 hour day may be spent in the vicinity of noise. Community exposures to such noises would depend on the proximity to the noise sources and ambient noise levels in residential areas could be affected by more than 10 dB.

Both indoor and outdoor residential sources may not seem so significant at first but when one considers air conditioners, lawn mowers, power saws, dish washers, kitchen and laundry appliances, television, stereo, pets and children, the overall severity of these sources cannot be ignored. The simple increase in the number of tools, cars, gadgets and appliances used by modern industrial society can create a substantial noise burden.

EFFECTS OF SOUND POLLUTION:

Sound is of great value to mankind. It warns of danger and appropriately arouses and activates all of us. It allows us the advantages of music and speech. It can calm or excite us, it can elicit our joy or sorrow. However, irrelevant or excessive sound becomes noise and is undesirable. People react to noise through its effect on nervous system. A certain amount of subjectivity and value judgment enter our consideration e.g. not all people react to the noise in same way. A lawn mower and motorcycle emit an equivalent sound level, but a certain portion of population may find one to be inoffensive and the other to be annoying. The effects of human are obvious at high and low levels of noise level scale e.g. at 30 dB, noise is not an annoyance, whereas at 120 dB, it is definitely annoying to the point of producing physical discomfort in all hearers.

Effects of noise include physiological and annoyance types. In physiological type, there is a evidence indicating that exposure to noise of sufficient intensity and duration can permanently damage the inner ear and hence permanent hearing loss. Lass of sleep from the noise can increase tension and irritability even during sleep, noise can lessen or diminish the relaxation that the body derives from the sleep.

In the annoyance category, noise can interfere with speech communication and the perception of other auditory signals, the performance of complicated task can be affected by noise. Noise can adversely affect mood, disturb relaxation and opportunity for privacy [2]. Noise can detract from enjoyment of out environment and can affect the quality of human life.

MEASUREMENT OF SOUND POLLUTION:

Unlike air and water pollution measurements, noise measurement must include subjective as well as objective factors i.e. a straightforward physical measurement of noise magnitude must be augmented with subjective loudness and annoyance related factors this complication has given rise to a magnitude of units, rating scales and measurement schemes[10]. There are some basic elements that must be considered with regard to the magnitude of noise and its frequency and temporal distribution.

Noise levels are commonly measured by a hand held instrument called as sound level meter. The most vital part of sound meter is the microphone and an important measure of microphone performance for noise surveys is its directional response to sound. When noise comes from many different directions, the measuring microphone must respond identically to the various noises regardless of the angle of incidence.

The effect of noise on human depends not only on its magnitude but also on its frequency content because the ear is not equally sensitive to noise at all frequencies in the audible range of 20-20000 Hz. Attempts to characterize the frequency response of human ear by subjective methods have given rise to psycho-acoustic data which is used to develop frequency correction factors. A frequency weighing system was derived according to which some frequencies where emphasized more than others. This system yields a single number rating of noise, representing noise levels in a manner similar to subjective impression of human ear. This particular weighting system is designated scale ‘A’ and readings using this system are expressed as ‘A’ level decibels or dBA. The ‘A’ scale places less emphasize on low frequency sound (below 500Hz) and provides more weight to annoying middle and high frequency sounds (500-4000Hz). An alternate weighting scale, C-weighting, was developed to incorporate human response to loud and typically low frequency sound sources such as explosions.

CASE STUDY:

The measurement of sound intensity was carried out with digital sound pressure level meter at 30 pandols in Baramati City and Industrial area, Baramati during the Ganesh Festival period in 2008 and 2009. As an example the data of sound level for one of the pandols is given in the following tables

Table 1: Shri Ganesh Mitra Mandal (Year-2008):

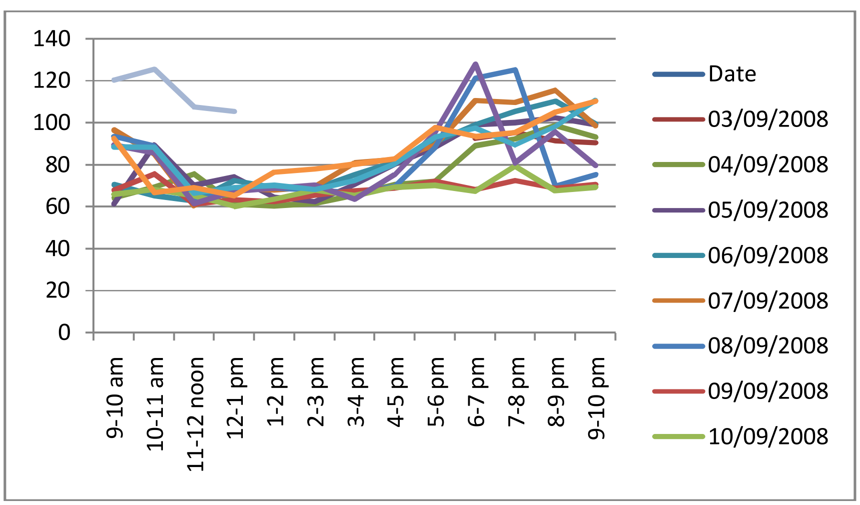
Time Date	9-10 am	10-11 am	11-12 noon	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	6-7 pm	7-8 pm	8-9 pm	9-10 pm
3/9/08										92.4	95.3	91.4	90.5
4/9/08	63.9	69.1	75.4	61.1	60.2	61.4	65.3	70.2	72.1	89.1	92.2	98.5	93.1
5/9/08	61.1	89.4	70.1	73.9	64.4	62.2	70.2	80.1	88.1	99.0	100	102.2	99.0
6/9/08	70.2	65.0	62.5	72.1	68.7	68.1	75.1	81.0	90.5	98.8	105.1	110	99
7/9/08	96.4	85.1	60.4	68.8	67.9	69.7	80.6	82.4	89.2	110.6	109.7	115.4	98.5
8/9/08	93.2	88.6	62.5	67.7	68.4	67.6	66.5	69.4	88.1	121.0	125.1	69.4	75.2
9/9/08	67.7	75.5	61.2	63.2	62.3	65.5	67.4	68.5	72.2	68.0	72.4	68.5	70.4
10/9/08	65.7	68.2	65.3	60.1	63.4	67.7	65.1	69.2	70.1	67.2	79.2	67.6	69.3
11/9/08	89.2	85.5	61.5	67.2	68.7	70.2	63.5	75.2	95.2	127.5	80.6	95.4	79.5
12/9/08	88.5	88.2	66.4	69.1	70.0	68.1	72.4	80.4	93.1	97.2	89.2	98.2	110.4
13/9/08	92.3	66.7	68..8	65.2	76.3	77.7	80.2	82.6	97.7	93.4	95.2	105.1	110.2
14/9/08	120.2	125.2	107.2	105.3									

All values are in decibels (dB)

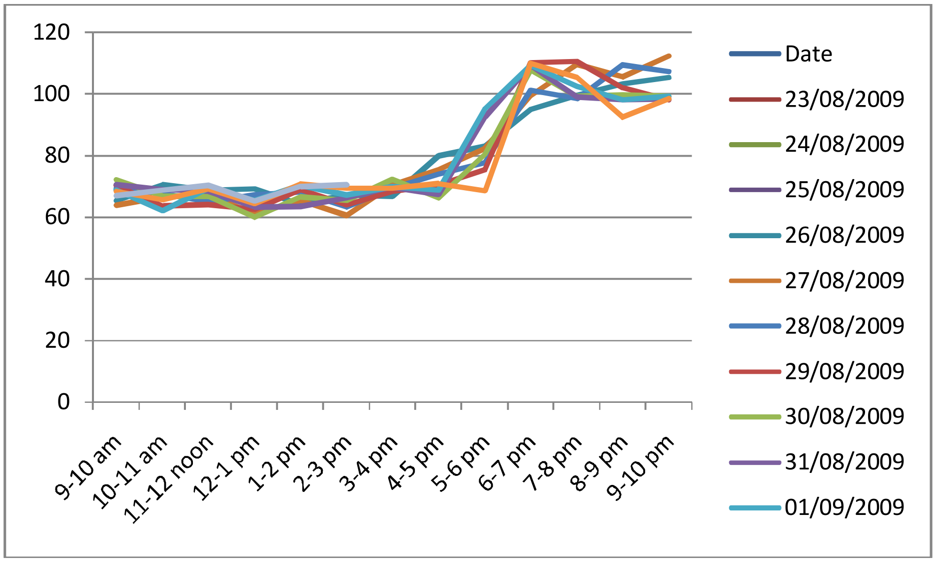
Table 2: Shri Ganesh Mitra Mandal (Year-2009):

Time Date	9-10 am	10-11 am	11-12 noon	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	6-7 pm	7-8 pm	8-9 pm	9-10 pm
23/8/09													
24/8/09													
25/8/09													
26/8/09	65.5	70.5	68.8	69.1	64.3	67.3	66.8	80.0	83.1	95.0	99.4	103.3	105.3
27/8/09	63.9	66.6	67.1	61.0	65.3	60.5	70.5	75.3	82.3	99.4	109.7	105.5	112.4
28/8/09	69.3	67.5	65.0	67.3	68.1	63.3	69.3	74.1	77.7	101.2	98.5	109.4	107.3
29/8/09	70.4	63.7	64.1	62.5	69.0	64.1	68.4	70.5	75.3	110.1	110.5	101.9	98.1
30/8/09	72.1	66.8	66.9	60.0	66.7	65.4	72.2	66.3	80.5	107.8	99.3	99.7	99.2
31/8/09	70.5	69.0	68.3	63.3	63.5	66.3	69.7	67.5	92.4	109.3	99.1	98.2	98.3
1/9/09	68.8	62.1	69.4	65.4	70.4	67.2	69.9	68.8	95.1	109.2	102.3	98.0	99.2
2/9/09	68.3	65.5	69.1	64.4	70.6	69.3	69.3	70.9	68.5	110.0	105.4	92.3	98.5
3/9/09	67.1	68.8	70.3	65.3	69.9	70.5							

All values are in decibels (dB)



Shri Ganesh Mitra Mandal (Year-2008)



Shri Ganesh Mitra Mandal (Year-2009)

CONCLUSIONS:

1. Between 9am to 6pm the measured intensity is below 80dB.
2. Between 6pm to 10pm the measured intensity varies between 80dB to 120dB.
3. From the feedback of the people, it is understood that the heart patients and blood pressure patients feel uneasy if the intensity of sound is above 80dB.
4. Normal people find uneasiness and sleep loss to certain extent due to high intensity sounds.

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