



Study of Noise Pollution in Kolhapur City, Maharashtra, India

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Abstract:

Kolhapur city is a district place in the state of Maharashtra, India with population of 5, 49,283. It is one of the emerging industrial and commercial city of Western Maharashtra. Problems of pollution along with noise pollution are increasing with time especially due to increase in number of vehicles for transportation. In the present study, continuous monitoring of noise levels Leq dB (A) was carried out for three days in the month of December, 2011 at six different sites within the Kolhapur city. On the basis of location these sites were grouped into industrial, commercial, residential and silent zones respectively. The average noise level at industrial, commercial, residential and silence area are 74.28 dB (A), 65.52 dB (A), 58.88 dB (A) and 50.02 dB (A) respectively. The results showed that there is an enhanced pressure of noise at all sites due to increase in number of vehicles and facilities of transportation. All the sites under study showed higher sound level than the prescribed limits of Central Pollution Control Board (CPCB).

Keywords: Noise pollution, transportation, Sound level, Leq dB (A)

1.0 Introduction:

Noise is derived from the Latin word "nausea" implying 'unwanted sound' or 'sound that is loud, unpleasant or unexpected' (Singh and Davar, 2004). Noise is present in every human activity, and when assessing its impact on human well-being it is usually classified either as occupational noise (i.e. noise in the workplace), or as environmental noise, which includes noise in all other settings, whether at the community, residential, or domestic level e.g. traffic, playgrounds, sports, music (Concha-Barrientos *et al.* 2004). Noise pollution is a significant environmental problem in many urban areas. This problem has not been properly recognized despite the fact that it is steadily growing in developing countries (Jamrah *et al.*, 2006). Undoubtedly, the most important source of noise pollution in urban areas is related to road vehicles (Behzad *et al.*, 2007). Hearing is one of the most important of the human senses. It is essential for the location of sounds that may warn of danger, the enjoyment of pleasant sounds such as music and the natural environment and, most importantly for humans, the development of speech and language for communication (Safetyline, 2009). The World Health Organization (WHO) states that there is sufficient evidence that night noise exposure causes self-reported sleep disturbance and noise-induced sleep disturbance is viewed as a health problem. WHO also state there is evidence, albeit limited, that disturbed sleep causes fatigue, accidents and reduced performance (Naish *et al.*,

2012). The effects of noise are seldom catastrophic, and are often only transitory, but adverse effects can be cumulative with prolonged or repeated exposure. Sleep disruption, the masking of speech and television, and the inability to enjoy one's property or leisure time impair the quality of life. In addition, noise can interfere with the teaching and learning process; disrupt the performance of certain tasks, and increase the incidence of antisocial behavior (Table 1 and 2). There is also some evidence that noise can adversely affect general health and well being in the same manner as chronic stress (Schomer, 2001). Noise has devastating effects on neighborhoods and communities. Noise forces citizens to live in unhealthy environments or abandon their homes altogether in an attempt to escape (Noise Free America, 2010).

Kolhapur city is also known as Karveer Nagari and situated at a height of 1790 feet above mean sea level and 16°42' North latitude and 74°14' East longitude. It is located on the Sahayadri mountain range and south western part of the Maharashtra state. Kolhapur city has a network of 86.59 km roads of different width and there are 18 traffic signals. The total number of vehicles registered with Regional Transport Officer, Kolhapur is 7, 25,134 (2011). Kolhapur Municipal Transport (KMT) is a major means of public transport in Kolhapur city. KMT is equipped with 128 buses; there are 9183

three seater and 897 six seater auto rickshaws. For the people coming from distant places, a facility of state transport is available in the city (KMC, 2009). There are many legal provisions like the Noise Pollution (Regulation and Control) Rules, 2000 Abatement of 2010, and Environmental Protection Act, 1986 as well as other Acts like Motor Vehicle Act, 1988 etc. Even with these Acts exiting, the noise levels in Kolhapur city is increasing day by day and therefore, a study has been undertaken to study the status of noise pollution in Kolhapur city. The main objectives of the study is to check the noise levels in Kolhapur city and find out how the increasing number vehicles and transportation facility is responsible for noise pollution and how it affects the human population. This study will also add to the status of noise in the city like Kolhapur which can be a example for other developing cities to monitor noise on regular basis.

Table 1 . WHO Community Noise Guidance

Environment	Critical health effect	Sound level dB(A)*	Time hours
Outdoor living areas	Annoyance	50 - 55	16
Indoor dwellings	Speech intelligibility	35	16
Bedrooms	Sleep disturbance	30	8
School classrooms	Disturbance of communication	35	During class
Industrial, commercial and traffic areas	Hearing impairment	70	24
Music through earphones	Hearing impairment	85	1
Ceremonies and entertainment	Hearing impairment	100	

Source: <http://www.consultnet.ie>

2.0 Methodology:

The present study was conducted at ten different locations in the Kolhapur city. For this purpose four zones i.e. industrial, commercial, residential and silence zone were selected within the city. The ambient noise level was monitored with the help of Sound Level Meter (AZ Instruments, 8921) during day time (0800 - 1000 hrs) and evening time (2200-

2400 hrs.). Leq noise rating system was used to calculate the noise level as there is higher fluctuation in the ambient noise level during the working days. Monitoring of road traffic noise equivalent levels (Leq) at similar type of zones was carried by Thangadurai *et al.*, 2005. The noise monitoring was carried out as per protocols given by (Maiti, 2003). Precaution was taken to avoid echo or resonance of sound by selecting suitable distance from the source. Readings were recorded after interval of ten seconds for six minutes at every site during day and evening time.

Table 2. Change in Sound Level (dB) in Apparent Loudness

Changes in Sound Level, dB	Changes in Apparent Loudness
1	Almost imperceptible
3	Just perceptible
5 - 6	Clearly noticeable
10	Twice (or half) as loud

Source: <http://www.trafficnoise.org>

Ambient sound levels were compared with that of the standards prescribed in Environmental Protection Act, 1986 and standards of CPCB (Tripathy, 1999). The Noise Pollution (Regulations & Control) Rules, 2000 has given noise limits for different areas and the Noise Pollution (Regulations & Control) Rules, 2000 is an amendment made by Govt. of India in the year 2010. These limits were used to compare the noise levels in respective areas under study.

Table 3: Noise standards for Ambient Noise level

Area code	Category of area	Limits in dB(A)	
		Day time	Night time
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence zone	50	40

“Night time” means the period between 10.00 p.m. and 6.00 a.m. (Noise rules 2000 amended in 2010).The intensity of sound is measured in sound pressure levels (SPL) and common unit of measurement is decibel, dB. The community (ambient) noise levels are measured in the A - weighted SPL, abbreviated dB (A). This scale resembles the audible response of human ear.

Sounds of frequencies from 800 to 3000 HZ are covered by the A - weighted scale.

2.1 Study Area: Following are the locations in the Kolhapur city which were covered during the survey with respect to zones. The sources of noise may vary according to daily activities. The sources may be Residential (loudspeaker, various ceremonies, automobiles, domestic instruments like mixers etc.), commercial (vendor shouts, automobiles, aeroplanes, marriages, laboratory, machinery etc.), industrial (generator sets, boilers, plant operations, trolley movement, transport vehicles, pumps, motors etc.). The sites were selected depending upon their location in the city. In the city Udyam Nagar and Y. P. Powar Nagar are the two industrial areas where there are various types of industries adding to noise pollution. Mahadwar Road is at the heart of city and hence there are many commercial shops and heavy traffic density is seen. Central bus stand (CBS) is a state transport bus stand where many commercial shops and hotels are located. Shivaji Peth is an old residential area of the city

where population density in more and Tarabai Park is new residential area in the city where population density is less. Shivaji University is situated on the boundry of the city covers hundreds of acres area for educational institutions. CPR (Chhatrapati Pramilaraje Hospital) is Governmental District Hospital which provides almost all type of health services.

Table 4: Study Sites in the Kolhapur city

Area code	Category of area	Location of Sites
A	Industrial	Udyam Nagar
		Y.P.Powar Nagar
B	Commercial	Center Bus Stand (CBS)
		Mahadwar Road
C	Residential	Shivaji Peth
		Tarabai Park
D	Silent Area	Shivaji University
		C.P.R Hospital

Table 5: Status of Noise Levels at Various Zones in Kolhapur City

Sr. No.	Zones	Name of the site	Sound level dB (A) Leq					
			05/12/2011		06/12/2011		07/12/2011	
			Day time	Night time	Day time	Night time	Day time	Night time
1	Industrial	Udyamnagar	77.3	70.3	79.3	70.8	78.0	71.2
		Y.P Powar	75.5	71.2	77.3	71.3	76.9	72.3
2	Commercial	CBS	74.3	59.3	76.2	59.8	74.3	58.3
		Mahadwar road	71.4	58.3	72.2	54.5	73.3	54.3
3	Residential	Shivaji Peth	63.8	56.4	64.3	56.2	69.1	63.5
		Tarabai Park	60.4	51.0	60.2	52.0	56.4	53.3
4	Silence	Shivaji University	53.6	42.3	46.3	42.2	53.7	43.3
		C.P.R Hospital	56.6	48.4	58.2	50.4	55.4	49.8

(Figures in bold indicate Noise level above prescribed limit)

Table 6: Day and Night time average of Noise Levels at Various Zones in Kolhapur City

Area	Day Time	Night Time
Udyamnagar	78.20	70.77
Y.P Powar	76.57	71.60
CBS	74.93	59.13
Mahadwar road	72.30	55.70
Shivaji Peth	65.73	58.70
Tarabai Park	59.00	52.10
Shivaji University	51.20	42.60
C.P.R Hospital	56.73	49.53

3.0 Results and Discussion:

In the present study the average noise level at all sites was found to be above the prescribed limits of CPCB during the 5th December 2011 to 7th December 2011 .The noise level showed a significant variation at different sites which gradually increased or decreased on the basis of location of the site. On the three monitoring days, average noise level during the day time were 77.38 dB (A) (industrial), 73.62 dB (A) (commercial), 62.37 dB (A) (residential) and 53.97 dB (A) (silence zone) which is 2.38, 8.62, 7.37 and 3.97 dB more respectively as compared to CPCB standards. Similarly during Night time 71.18 dB (A) (industrial), 57.42 dB (A) (commercial), 55.40 dB

(A) (residential), 46.07 (silence zone) which is 1.18 , 2.42 , 5.40 and 6.07 dB more respectively for Industrial ,commercial, residential and silence zone as compared to CPCB standards.

The average level dB (A) for day and night noise level was highest at Industrial area i.e Udyamnagar 74.48 dB (A), Y.P.Powar Nagar 74.08 dB (A) and in CBS commercial area i.e 67.03 dB (A) while lowest at Shivaji University i.e 46.90 dB. All residential areas experienced noise levels above the prescribed limits. Interestingly, the noise levels at Chhatrapati Pramilaraje Rughnalya (C.P.R Hospital) and Shivaji University which are silent zones were also above the given standards. One of the major causes for this increased level is increased number of vehicles and the enhanced transportation activities. Lad *et al.*, (2011) studied noise level in the Kolhapur city during Diwali festival (2009) and reported that the noise levels are continuously increasing. Pawar and Joshi, (2005) have reported that the noise level of Ichalkaranji city are very higher than prescribed limit of Noise given by the Maharashtra Pollution Control Board. Gangwar *et al.*, (2006) reported that noise level in Bareilly Metropolitan city was slightly higher than the prescribed limit of the Central Pollution Control Board. Pathak *et al.*, (2008) reported that traffic noise became main reason of headache, high BP, and other stresses among the exposed individuals in adjoining working places in Varanasi city. Sagar and Rao , (2006) studied Noise Pollution Levels in Visakhapatnam city (India) and found that ambient air quality noise levels are alarming even in the absence of conveyor system indicating the impact of vehicular traffic. Sampath *et al.*, (2004) studied ambient air quality in major cities in Kerala and showed that delineation of silence zones and commercial zones with closer measurement spatially will help to make these zones classification more meaningful. Singh and Davar (2004), explored the sources, effects, reactions and suggestions for controlling the excessive noise. Agarwal and Swami (2010) confirmed that the transportation sector is one of the major contributors to noise in urban areas. Hence, as a first step towards assessment of noise pollution, measurement was taken up with emphasis on traffic noise. Essandoh and Armah, (2011) were carried out study to evaluate the noise pollution levels in Kotokuraba commercial area of Cape Coast, Ghana. The focus was on five selected areas as commercial centers, road junctions/busy roads, passengers loading parks, high-density residential areas, and low

density residential areas and found that the transportation is the main cause of noise pollution. Wani and Jaiswal (2010) studied the noise level of Gwalior city and found that the honking of horns, flow of ill maintained vehicles, poor road conditions and encroachments on road sides cause traffic congestion were found to be the reason for high noise level in Gwalior.

Increasing number of vehicles in the Kolhapur city increases the number of noise sources, road construction at various parts of the Kolhapur city, road jams are observed at several parts of the city, people are not following traffic rules, the mismanagement of traffic and infrastructure of the city is not as good as it should be and therefore majority of the places noise levels are well above the CPCB standards. In the day time noise levels in industrial zone (Udyam Nagar and Y. P. Powar Nagar) were above the standard limits. In Industrial area noise levels are reduced as compared to day time due to fewer vehicles and no industrial activity during the night time. The noise levels at both the locations from commercial areas (CBS and Mahadwar road) is more due to heavy traffic during day time and their location in the city i.e Mahadwar Road surrounded by intense commercial area and Mahalaxmi Temple due to which heavy crowd and traffic. But the Noise levels at Commercial zone at CBS stand is more as compared to Mahadwar road because there is Central Bus Stand as well as Chhatrapati Shahu Maharaj Terminal is nearby and hence, more vehicles are moving during night time also. The noise level at Shivaji Peth is more as compared to Tarabai Park because two main roads (Radhanagari Road, Gaganbawada road) pass through and around Shivaji Peth area. Also there is Rankala S.T. Stand and Gangavesh S.T. stand are nearby this residential area. CPR situated in the heart of the city hence the transportation around hospital is more hence noise level is higher due to more noise. The noise level at Shivaji University is less due very less number of vehicles as compared to the all the other sites studied.

4.0 Conclusion:

From the present study, it can be confirmed that the increased use of vehicles is the main cause of increased noise level in the Kolhapur city. Therefore, there is a need for increased awareness among people including the Government officials to prevent the long-term health risks associated with noise pollution.

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