

Evaluation of Noise Pollution: A Case Study of Udaipur, Tripura, India

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Abstract- Noise pollution is considered to be one of the biggest problems in any urban livelihoods. Unplanned urbanization coupled with rapid growth of vehicular population causes increasing trend of noise pollution problem. Industrial activity, construction activity, use of loud speakers & public addressing systems, vehicular horns and other mechanical devices etc. in and around the town are the various noise sources have contributed deleterious effect on human health. The present study is an evaluation of present trend of noise in the Udaipur town areas. Equivalent noise levels monitored in nine different stations in different parts of the town area and observed that the noise level is much above the statutory limits of Central Pollution Control Board. This study reveals that some areas of Udaipur town are highly exposed to the noise pollution.

Keywords: Urbanization, Noise pollution, Equivalent noise level, Evaluation, Udaipur town.

1. INTRODUCTION

Tripura is a third-smallest State in the country, India. Tripura is surrounded by the Bangladesh in three sides. The State has an international boundary of 839 km with Bangladesh and a boundary of 162 km with some other Indian States such as Assam and Mizoram. The State has a geographical area of 10,491 km² (4,051 square miles) and population of 36,71,032 as per the census report of 2011. Administratively, the state has been divided into 8 districts, 23 sub-divisions, 45 blocks, 31 revenue circles, 185 tehsils and 874 revenue maujas. Agartala is the state capital; while Udaipur is one of the districts headquarter among other districts headquarters. Udaipur city is famous for Tripura Sundari Temple (Tripureswari Temple). It is the core identity of State as well as National by means of heritage, cultural, historical interest of the people. The city was old capital of Tripura during the Kingdom. It is important for both historical and tourist interests. Rapid urbanization, unplanned industrial activities along with human intervention has resulted serious environmental degradation in and around the town. Among other pollution problems, the noise pollution is serious environmental concern of the city.

Every environmental pollution problem has roots in the past be it water, air or noise pollution and all these problems are becoming critical in the recent years due to rise in the use of modern technologies [1]. In our environment sound is caused by vibrations in the air or in some other medium that reach human ears and stimulate a sensation of hearing. But when the sound becomes loud, sharp, disagreeable or unwanted and produces undesirable physiological and psychological effects in an individual, by interfering with one's social activity is called noise [2].

Mainly, noise pollution has two sources, one is industrial and other one is non-industrial sources. Industrial noises are usually produced by rotating, reciprocating or any other types of machinery, or by high pressure high velocity gases, liquids or vapour involved in the industrial processes. Non-industrial source of noise includes the noise created by automobiles/transport/vehicular traffic. Several other sources of noise pollution includes blaring of loud speakers and sirens, shouting of hawkers, playing of children, general life and activities, ringing of temple and church bells, etc. do produce different levels and tones of noises [2].

Noise pollution is a slow and subtle killer [3] and no doubt it adversely affects human health. The noise could be result in loss of hearing, stress, high-blood pressure, loss of sleep, distraction affecting productivity, and a general reduction in the quality of life. The effects of noise are difficult to quantify because tolerance levels among different populace and types of noise vary considerably. Indiscriminate use of horn by the vehicles and wide spread use of loudspeakers in social and religious ceremonies caused several health hazards to the urban inhabitants. It may cause deafness, nervous breakdown, mental disorder, heart troubles, high blood pressure, dizziness and insomnia [4]. Sometimes, Household equipment and appliances produce the noise level which is more than double the acceptable (45dB) limit of noise level. This excessive noise could carry several ill-effects viz. annoyance, speech interference, sleep disturbance, mental stress, headache, and lack of concentration [5]. The adverse effects of noise have not even spare the birds (Robins,

sparrows, wrens and blackbirds). Those living near busy roads could not hear each other and thus unable to contact for propagation [6].

2. SITE DESCRIPTION

Udaipur town is located in southern part of the State Tripura. It is the districts headquarter of Gumati district. The Udaipur town is located about 55 km from Agartala, the capital of Tripura. Udaipur is located at 23.53°N 91.48°E and it has an average altitude of 22 metres (72 feet). The town has an average wind speed of 4 km/h. The town has a population of 32,781. Udaipur is dotted with historic temples and lakes. Figure 1 shows the location of the study area.

3. MATERIALS AND METHOD

In order to assess the temporal distribution of noise pollution load, major noisy area has been identified in respect of commercial, residential and silent zones. Accordingly, noise levels have been measured in each identified station. Three stations have been chosen for category of commercial zone. Similarly, three stations for residential and remaining three stations for silent zones. The study was conducted during the pre-monsoon period of the year. Noise level was monitored in six different hours in a day. Sound Level Meter Latron SL-4001 was used as a tool for monitoring of noise levels.

Monitoring was carried out using the instrument at a height of 1.3 to 1.5 m and 1 m away from the chest. Basically, the range of 30 – 180 dB(A) was used in this study. Ambient sound levels are being compared with the prescribed standards of CPCB (Central Pollution Control Board), India. The National Ambient Air Quality Standard in respect of Noise as specified under the Noise Pollution (Regulation and Control) Rules, 2000 is being referred for the present study [7].

Table 1: The Ambient Air Quality Standards in respect of Noise given by CPCB

Area	Category of Area / Zone	Limits in dB(A) L_{eq} *	
		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: -
1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
 2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
 3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.
 4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

* dB(A) L_{eq} denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A “decibel” is a unit in which noise is measured.

“A”, in dB(A) L_{eq} , denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

L_{eq} : It is an energy mean of the noise level over a specified period.

The noise levels were calculated in (L_{eq}) using the following formula.

The formula is as follows:

$$L_{eq} = 10 \log \left[\sum_{i=1}^{i=n} t_i X(10)^{\frac{L_i}{10}} \right]$$

Where, L_{eq} = Equivalent Noise Level

n = Total number of sound samples

L_i = The noise level of any i th sample

t_i = Time duration of i th sample, expressed as fraction of total sample time.

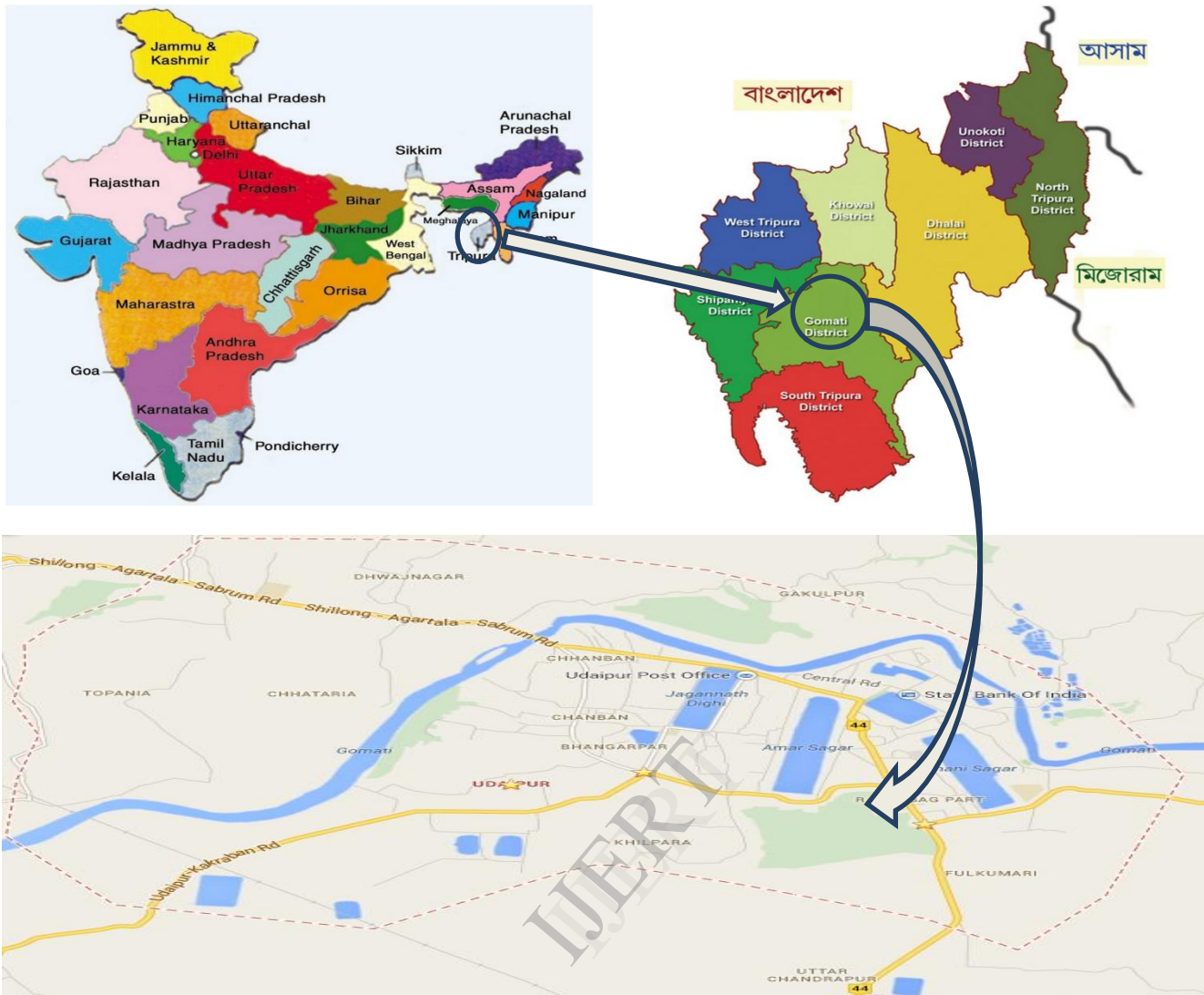


Fig. 1: Locating the Udaipur Town

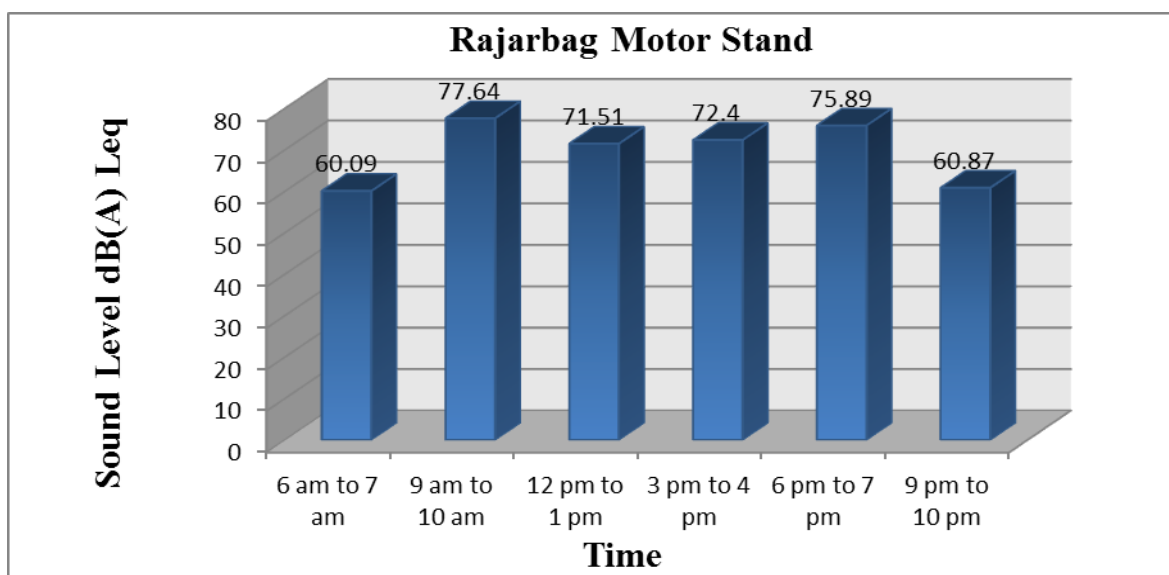


Fig. 2: Temporal distribution of equivalent noise level at Rajarbag Motor Stand

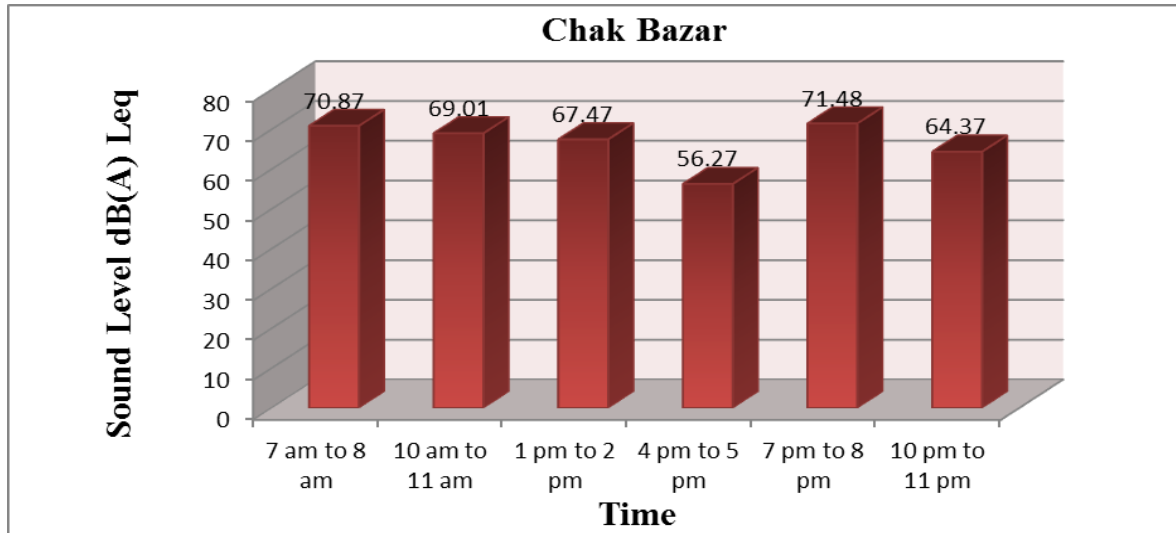


Fig. 3: Temporal distribution of equivalent noise level at Chak Bazar

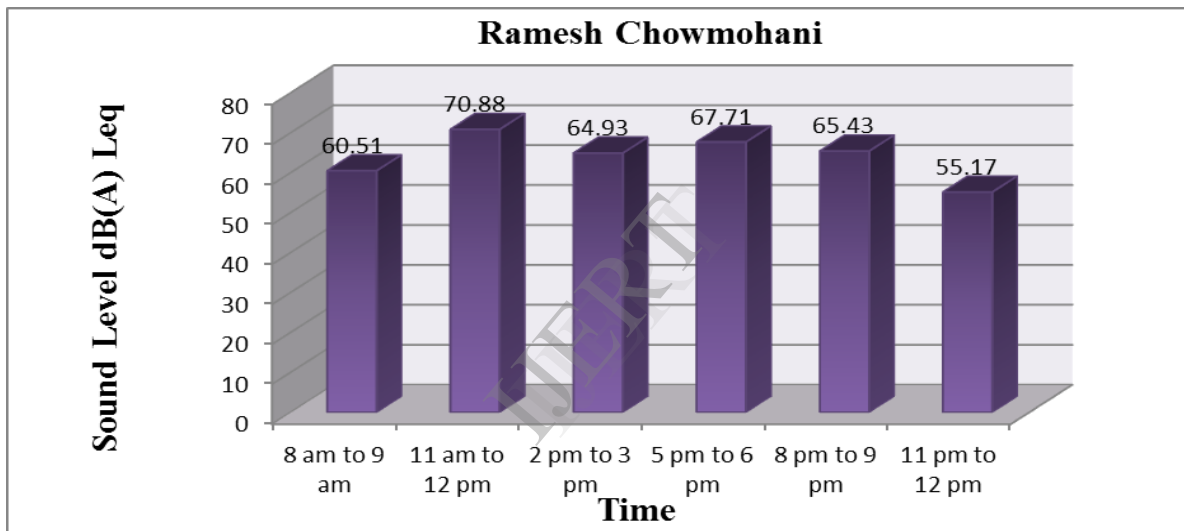


Fig. 4: Temporal distribution of equivalent noise level at Ramesh Chowmuhani

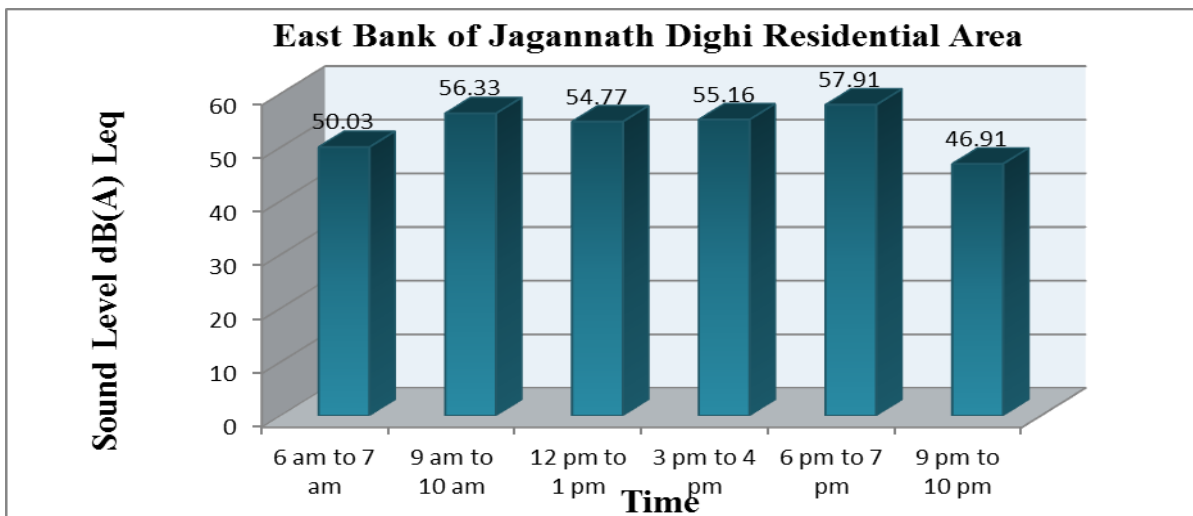


Fig. 5: Temporal distribution of equivalent noise level at East Bank of JagannathDighi

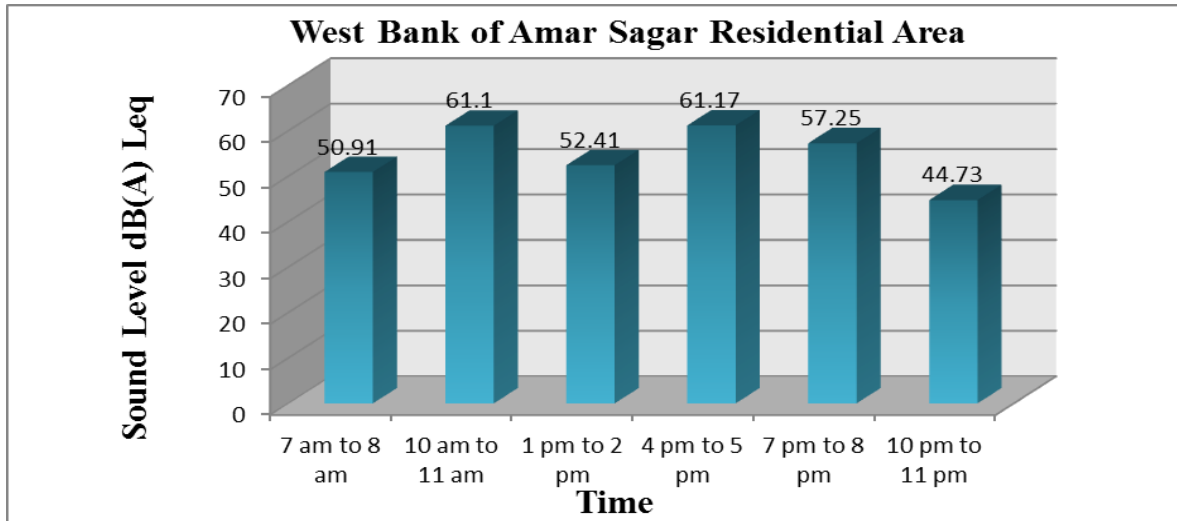


Fig. 6: Temporal distribution of equivalent noise level at West Bank of Amar Sagar

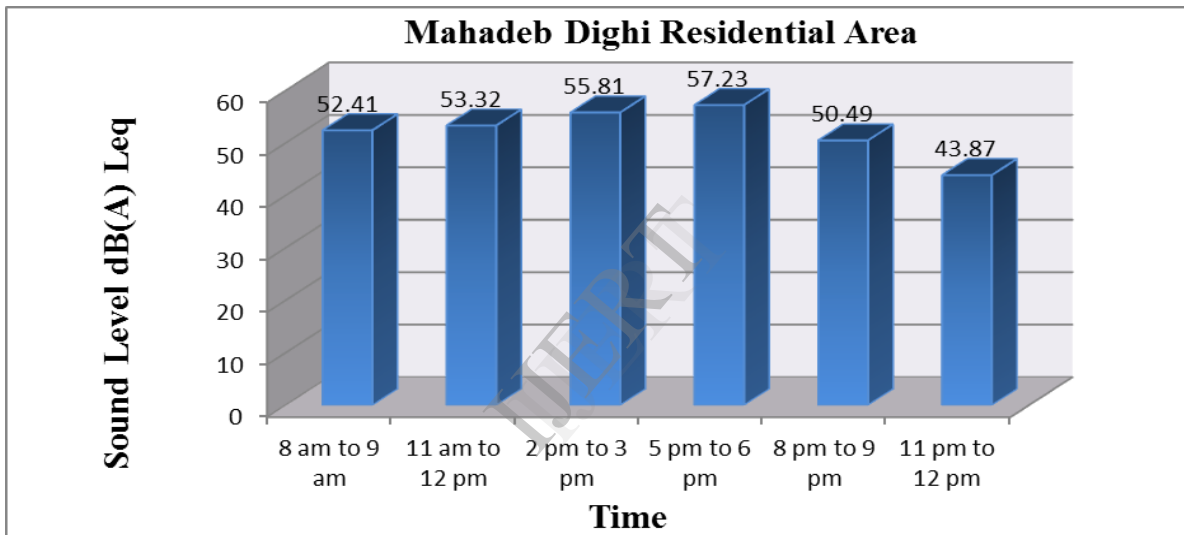


Fig. 7: Temporal distribution of equivalent noise level at MahadebDighi residential area

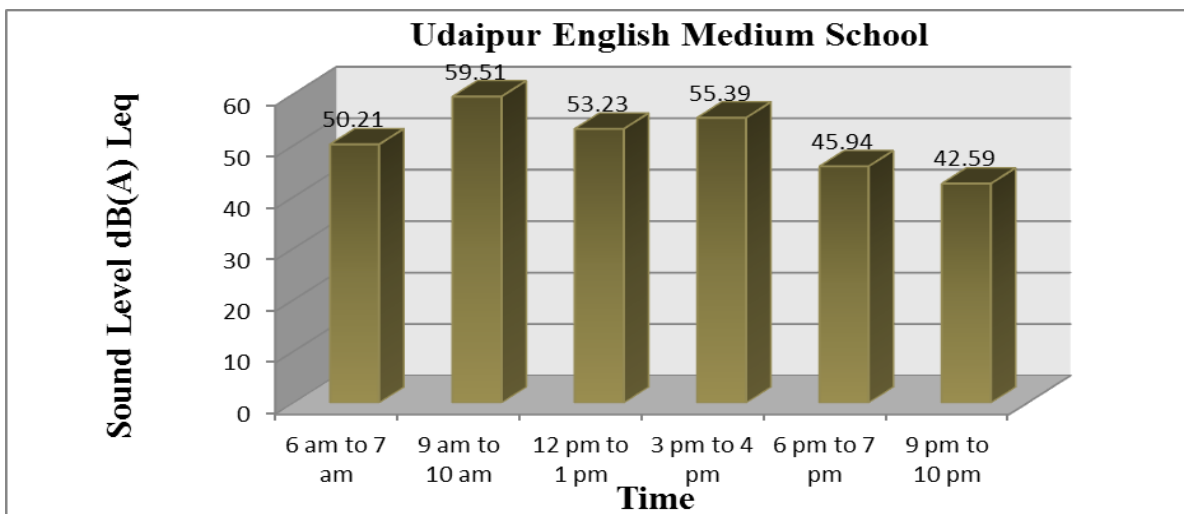


Fig. 8: Temporal distribution of equivalent noise level near Udaipur English Medium School

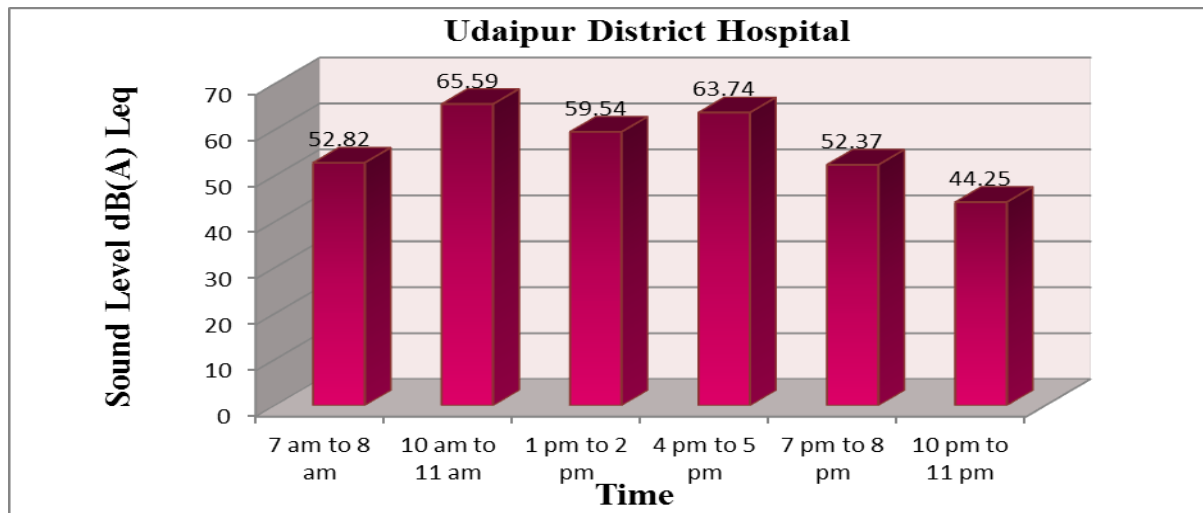


Fig. 9: Temporal distribution of equivalent noise level near Udaipur Hospital

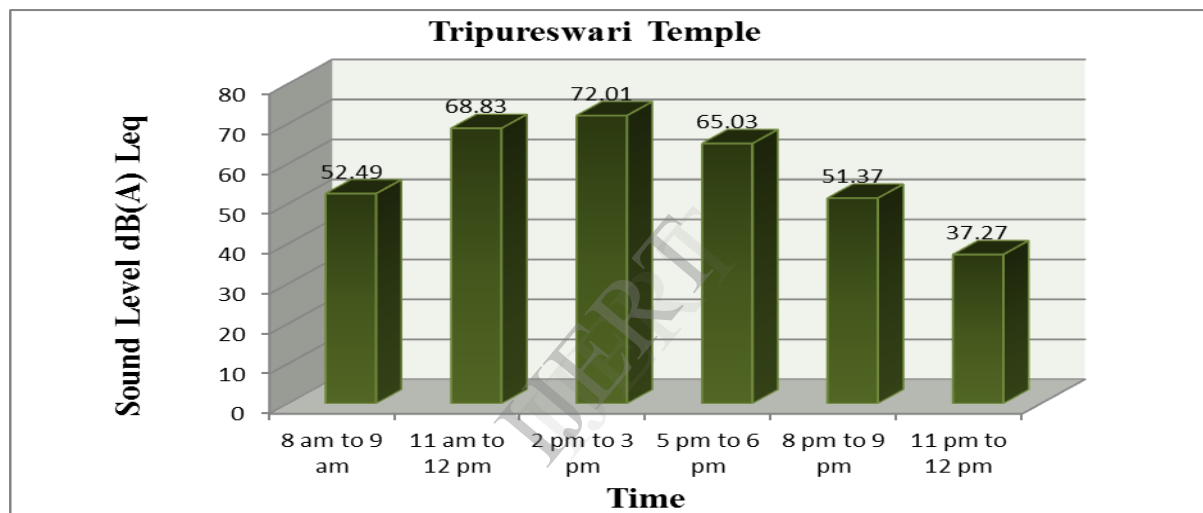


Fig. 10: Temporal distribution of equivalent Noise level near Tripureswari Temple

4. RESULT

The study is conducted over nine important stations, which are located in different parts of Udaipur town. Table 2 shows the minimum and maximum ranges of equivalent noise levels of all the commercial areas. Commercial areas include Rajarbag Motor Stand, Chak Bazar and Ramesh Chowmuhani. Similarly, Table 3 indicates the minimum and maximum ranges of noise level of purely residential areas of the town, which includes East Bank of Jagannathdighi, West Bank of Amar sagar and Mahadebdighi residential areas. Table 4 is related to the Silence Zones of Udaipur town. The District Hospital, Udaipur English Medium School and Tripureswari Temple areas are considered for monitoring of noise under the category of Silence Zone.

Table 2: Status of Equivalent Noise Levels at Commercial areas of Udaipur Town

Sl. No.	Sampling Station	Sound Level dB(A) L_{eq}		CPCB Standard
		Day Time	Night Time	
1.	Rajarbag Motor Stand	60.09 to 77.64	-	65
2.	Chak Bazar	56.27 to 71.48	64.37	65
3.	Ramesh Chowmuhani	60.51 to 70.88	55.17	65

Table 3: Status of Equivalent Noise Levels at Residential areas of Udaipur Town

Sl. No.	Sampling Station	Sound Level dB(A)		CPCB Standard
		L_{eq}		
		Day Time	Night Time	
1.	East Bank of JagantahDighi	46.91 to 57.91	-	55
2.	West Bank of Amar Sagar	50.91 to 61.17	44.73	55
3.	Mahadebdighi Residential Area	50.49 to 57.23	43.87	55

Table 4: Status of Equivalent Noise Levels at Silent Zones of Udaipur Town

Sl. No.	Sampling Station	Sound Level dB(A)		CPCB Standard
		L_{eq}		
		Day Time	Night Time	
1.	Udaipur English Medium School	42.59 to 59.51	-	50
2.	Udaipur District Hospital	52.37 to 65.59	44.25	50
3.	Tripureswari Temple	51.37 to 72.01	37.27	50

5. DISCUSSION

The minimum and maximum equivalent sound pressure level of all the commercial areas ranges 55.17 to 77.64 dB(A). Out of all the commercial areas, Rajarbag Motor Stand is found to have the maximum equivalent noise level 77.64 dB(A) during day time, which is more than the prescribed standard limits. Chak Bazar situated between the new town road and central road of Udaipur also shows a maximum of 71.48 dB(A) during day time, which is also beyond the prescribed standard limits. Similar noise trends also found in the Ramesh Chowmuhani area with a maximum of 70.88 dB(A). Heavy vehicular movement, huge crowd, reckless use of horns etc. are responsible to make such deterioration of noise.

In Residential areas, minimum and maximum equivalent sound pressure level ranges between 43.87 dB(A) to 61.17 dB(A). As it is the city of lakes, human settlement on the bank of lake is quite high. Both the banks (east and west) of

Jagannathdighi are thickly populated residential areas. The average measured noise level is 55.16 dB(A) in east bank of Jagannathdighi during day time. Similarly, in West Bank of Amar Sagar Residential Area, a maximum of 61.17 dB(A) has been observed during daytime. The main reasons of noises in residential areas are sound coming out from household equipment's and appliances, some construction works, shouting of hawkers, playing of children, general life and activities etc.

Tripureswari Temple, Udaipur English Medium School and District Hospital area are considered to be silent zones in the town. The maximum noise level observed within 50 meter of educational institution is 59.51 dB(A) during daytime. Udaipur Hospital area, the most sensitive area in the town, found to have a maximum of 65.59 dB(A) during day time, which is also beyond the prescribed limits of CPCB. Heavy crowd, congested traffic flow, vehicular horns etc. are the main reasons of noise in that area. The famous and oldest temple namely Tripureswari Temple is one of the religious and tourist place in the town. The temple area is considered as silent zone. It has been observed during monitoring that a maximum equivalent noise level of 72.01 dB(A) is arising out from the temple during day time. Heavy crowds, use of loud speakers, shouting of hawkers have been observed in and around the temple area.

Chauhan et al. [8] reported that the industrial, commercial, residential and silent zones noise level in Moradabad city was higher than the prescribed limits of CPCB. Chauhan and Pande [9] monitored noise pollution at different zones of Dehradun City. In this study it was found that the noise level in residential, commercial and silent zones are much higher than the CPCB standards. Automobiles specially three wheelers are the main reasons behind the cities noise pollution. Mangalekar et al. [10] conducted a study to assess noise level at Kolhapur City, Maharashtra. From that study it was concluded that average noise level at all the eight different sites of Kolhapur was found to be above the prescribed limits of CPCB and also concluded that increased use of vehicles is the main cause of increased noise level in the Kolhapur city. The research paper of Tiwari et al. [11] shows that the noise level in residential and commercial zones of Amravati almost 1.5 times more than the permissible limits of CPCB which is recorded during the passage of train through the level crossings. Hunashal and Patil [12] studied noise pollution indices in Kolhapur city. From that study it was observed that equivalent noise level in educational areas/silent zones was above the statutory limits. Sagar [13] studied noise pollution levels in Visakhapatnam City. In that study residential and ashram areas are found within the limits of noise levels but in commercial and silent

zones are slightly higher values than the prescribed limits of ambient air quality noise standards (AAQNS).

6. CONCLUSION

It is clear from the present study that the different zones of Udaipur town are highly exposed to noise pollution. Rapid urbanization and rapid increase of vehicular population are the main reason that poses noise pollution in the town. Besides, unplanned urbanization is also responsible for environmental degradation in the town. Hence, proper planning like eco-city planning etc. will be a possible solution for redressing such type of noise pollution problem. Apart from the Eco-City planning, people participation in the matter of environment will also seek a solution of noise pollution problem. Mass environmental awareness generation may play an important role in the matter of prevention and control of noise pollution. At the same time, necessary preventive measures must be taken by the appropriate authority to implement the Noise Pollution (Regulation and Control) Rules, 2000 in time bound manner. As it is a short term assessment of noise pollution problems in the town, further study may also be required to address the chronic effect of noise pollution in the Udaipur town.

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