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ARTICLE

Appraisal of Urban Road Traffic Noise in tier-II City (Surat City), India

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ABSTRACT

Urban road traffic noise pollution has always been identified as a severe problem that affects urban populants. In developing nation, road traffic noise pollution depends on the composition of heterogeneous traffic composition. These traffic compositions contain vehicles, which have different sizes, speeds variations, a different dimension of vehicles. Environmental noise measurements have been carried out during day-time and night-time in different locations of tier-II city of India. The noise levels have been continuously measured over 24 h periods using kimo DB 300 class-2 noise level meter. The data contained in this research paper represent 768 measurement hours. All the information has been used to investigate the time patterns of the noise levels under a wide range of different conditions and to study the relationships between noise levels and traffic in urban areas. Maximum L_{Aeq} was observed 73.3 dB(A) at B_{14} location and the minimum was recorded 65.7 dB(A) at C_3 location, which was greater than the central pollution control board (CPCB) prescribed limits during night time. A major reason for the generation of road traffic noise is due to the equal composition of 2-wheeler and 4-wheeler on the arterial road and heavy vehicles were recorded during morning peak and evening peak even though they are prohibited during peak hours.

KEYWORDS

Noise monitoring; road traffic noise; traffic compositions; urban context

1 Introduction

Various factors contribute to increase the noise levels in urban areas. One of the factors is the increase in the urban population, which contributes to high traffic volume combined with increased intensity [1]. In most urban areas, the corridors are developed in close proximity where people live and work, which leads to limited space and thus increases the number of high-rise buildings [2]. This type of settlement creates a dense environment in urban areas, thus increasing the traffic volume. Numerous countries have implemented new technologies to control noise pollution in urban areas [3]. For example, low noise generating vehicular engines, changes in quality of tires, changes in road material. These technologies have proven to reduce the noise on an individual scale. However, the overall noise pollution in urban areas is still increasing because of increasing traffic volume.

Road traffic noise is the most significant source of environmental noise pollution in cities. Noise is almost one of the harmful agents for citizenships; therefore, many countries have introduced noise

emission limits for vehicles and issued other legislation to reduce road traffic noise [4]. In recent years, in certain countries, new restricting laws to control civic road traffic noise have been performed [5].

According to the literature available, it has been concluded that a large number of people are exposed to high traffic noise levels in the urban areas. KIMO DB300/2 sound level meter was used for noise data collection. The sound level meter is an acoustic measurement instrument from France with the main features of a conventional and integrating-averaging sound level meter and analyzer with storage.

2 Study Area

The study area selected for noise mapping is Surat City (Fig. 1). The city covers an area about 326.515 sq. km and divided in seven zones. This research is based on the results of noise level measurements and traffic monitoring carried out 31 different locations of tier-II city (Surat City) of Gujarat state, India. Surat is a city located in the western part of India in the state of Gujarat. It is one of the most dynamic city of India with one of the fastest growth rates due to immigration from various parts of Gujarat and other states of India. The modern city of Surat is one of the fastest-growing places in the state of Gujarat. Famous all over the world for its diamond and textile business, Surat is the second-largest city in the state after Ahmedabad. Surat is regarded as 4th fastest developing cities of India with a bustling metropolitan area home to over 6 million people. According to a recent Census of India (2011), Surat has recorded a growth of 63.3% in its population from 2001 to 2011 [6].

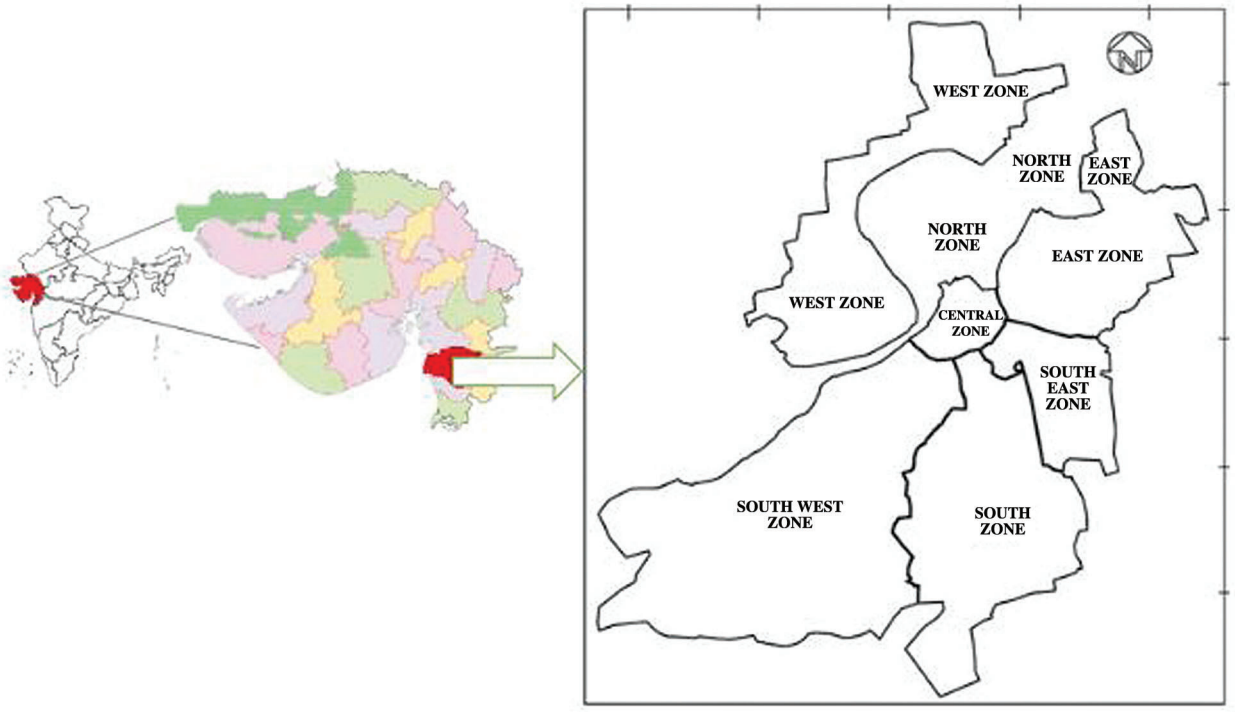

Figure 1: Location map of Surat city

Fig. 2 depics study area selected for noise monitoring. In South-West zone, Selected study area for the survey was 5 km stretch of the Athwa-Dumas corridor and 4 km stretch of udhna-magdalla because these corridors contain all type of activities which can be affected by vehicular noise pollution. Activity refers to schools, colleges, hospitals, commercial areas, and residential areas. Noise monitoring was done at 31 locations in and around these two arterial roads with traffic volume study and traffic speed study.

Survey locations along the left side of the athwa-dummas corridor are named as A_1, A_2…A_8 and along the right side of the Athwa-Dummas corridor are named as B_1, B_2…B_8. In the same way survey location along the left side of the Magdalla-Udhna corridor are named as A_9, A_{10}…A_{14} and along the right side named as B_9, B_{10},…B_{14}. Also the sub-arterial roads connecting this two arterial roads are names as C_1, C_2, C_3 [7].

Figure 2: Map of South-West zone of Surat City showing study area

3 Data Collection

The study was conducted in month of May 2016 and done at 31 locations of South-West zone of Surat City's arterial roads, with traffic volume and traffic speed. Measurements were carried out during Monday to Friday, the working days. Field measurements have been taken by using the KIMO DB 300/2, automatic sound level meter for 24-h duration. Monitoring was divided in two parts as per CPCB guidelines, day time 6.00 am to 10.00 pm and night time 10.00 pm to 6.00 am [8]. The sound level meter is calibrated prior to each measurement using a calibrator. Sound level meter is mounted on a tripod at 1.2 m above the floor level. The counts of number of vehicles that crossed the point of measurement from either direction on the road were recorded by videography. Vehicles were divided into five categories like 2-wheelers (motorcycle, mopeds), 3-wheelers (auto rickshaw), 4-wheelers (cars), bus, and truck. The speeds were also monitored with a hand-held radar gun along with the noise level. Table 1 depicts central pollution control board (CPCB) standards.

Table 1: Noise level standards (Noise pollution rules-2012)

Area code	Category of area	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

3.1 Noise Monitoring

Noise monitoring was done on each location using KIMO DB 300/2 sound level meter. This instrument was set for A-weighting continuous 24 h and all the readings were taken as per CPCB protocol. L_{Aeq} with a 1-s sampling frequency was set in the sound level meter. Hence, for one individual location, 57,600 readings of day time and 28,800 readings of night time were recorded and stored. Hence, for all three zones, 35 lac readings were recorded and stored. Noise descriptors like L_{max}, L_{min}, L_{10}, L_{50}, L_{90}, and L_{Aeq}, were assessed and are given in Table 2 for all locations.

Table 2: South-West zone noise level readings

Locations	Day time L_{Aeq} (6.00 am to 10.00 pm)						Night time L_{Aeq} (10.00 pm to 6.00 am)					
	L_{Aeq}	L_{max}	L_{min}	L_{10}	L_{50}	L_{90}	L_{Aeq}	L_{max}	L_{min}	L_{10}	L_{50}	L_{90}
A_1	75.2	97.5	54.1	77.2	73.6	69.8	70.5	91.9	40.4	74.5	63.7	47.7
A_2	73.9	97.1	55.8	76.2	70.6	67.2	70.4	94.0	43.4	73.9	62.8	46.1
A_3	76.1	103.6	37.4	77.6	72.6	68.2	68.9	93.3	36.9	71.8	61.8	47.4
A_4	75.4	98.7	43.3	77.4	72.7	67.6	71.6	99.5	40.0	74.4	59.4	43.1
A_5	75.1	107.0	52.9	77.2	71.9	65.0	67.7	94.3	41.4	71.5	57.7	46.1
A_6	71.9	99.1	46.4	74.2	67.5	59.4	67.4	95.0	45.1	71.3	57.2	46.3
A_7	71.7	99.3	43.7	74.2	67.8	60.8	66.6	92.9	39.6	69.2	59.8	48.6
A_8	73.8	106.0	44.7	74.9	67.2	62.9	66.8	93.5	38.8	68.7	59.3	45.1
A_9	72.0	99.5	44.5	74.5	68.0	62.4	67.4	94.4	38.8	69.6	60.6	45.2
A_{10}	71.9	97.0	46.2	74.6	68.7	61.2	66.5	88.8	48.8	71.1	61.5	55.7
A_{11}	73.1	104.0	46.3	75.9	69.5	62.5	65.8	91.2	39.3	71.2	56.7	48.1
A_{12}	72.3	97.5	43.5	74.8	69.6	63.6	68.2	97.4	37.3	70.8	60.8	48.4
A_{13}	72.5	95.4	51.3	75.4	70.0	63.4	68.0	91.8	39.8	71.3	59.4	44.3
A_{14}	72.8	97.0	52.0	75.2	69.9	63.9	69.4	94.0	39.9	72.8	62.8	48.4
B_1	76.5	102.3	52.7	78.2	73.9	69.6	70.7	99.0	40.5	73.8	63.6	49.6
B_2	73.5	94.0	44.0	75.1	69.2	62.8	70.6	99.4	36.8	73.4	63.6	47.1
B_3	73.6	100.9	36.8	74.8	69.5	66.1	71.3	103.1	39.4	73.8	63.9	47.9
B_4	76.6	111.5	42.7	78.0	72.2	66.7	68.1	101.5	40.3	70.8	59.0	43.3
B_5	74.6	106.4	52.6	76.7	71.5	65.3	67.0	94.1	46.3	74.2	59.1	43.2
B_6	75.2	109.0	45.4	76.8	71.5	66.5	67.2	94.4	41.4	71.1	57.2	46.1
B_7	73.2	98.8	44.1	76.1	69.2	67.8	67.9	92.4	39.0	69.2	60.8	49.1
B_8	76.1	111.2	44.6	78.1	72.9	69.5	68.8	106.0	46.1	70.8	59.1	45.3
B_9	71.7	96.0	43.2	74.1	68.1	61.8	69.6	96.4	45.2	71.2	60.2	49.2
B_{10}	74.5	115.0	46.4	75.9	70.4	67.1	68.1	90.1	49.6	70.5	58.7	52.3
B_{11}	73.9	110.0	44.0	74.7	69.1	66.3	66.6	87.2	38.9	68.3	56.3	51.9
B_{12}	72.8	101.1	47.3	75.1	70.2	65.9	67.4	91.1	38.5	70.3	61.4	48.0
B_{13}	72.3	97.5	41.8	75.1	69.7	69.9	66.6	102.6	39.0	68.4	57.3	43.9

(Continued)

Table 2 (continued)

Locations	Day time L_{Aeq} (6.00 am to 10.00 pm)						Night time L_{Aeq} (10.00 pm to 6.00 am)					
	L_{Aeq}	L_{max}	L_{min}	L_{10}	L_{50}	L_{90}	L_{Aeq}	L_{max}	L_{min}	L_{10}	L_{50}	L_{90}
B_{14}	72.3	94.0	51.2	74.1	66.7	68.9	73.3	113.5	33.0	69.8	56.6	40.4
C_1	72.7	106.0	49.1	74.3	67.4	69.1	69.4	94.3	38.8	68.7	54.0	43.8
C_2	71.3	96.4	49.1	72.6	65.9	66.9	70.3	103.2	38.5	72.1	56.7	53.2
C_3	76.4	114.0	42.0	78.5	68.1	72.9	65.7	90.0	33.9	69.7	56.8	41.0

Fig. 3 depicts the day time noise indices viz. L_{Aeq}, of different locations of South-West zone during the working days (Monday to Friday). It clearly shows that the highest L_{Aeq} observed was 76.6 dB(A) at B_4 location. The day time L_{Aeq} observed on all locations of South-West zone was greater than the prescribed CPCB limits during day time, which is 50 dB(A) for silence zone, 55 dB(A) for residential area and 65 dB(A) for commercial area.

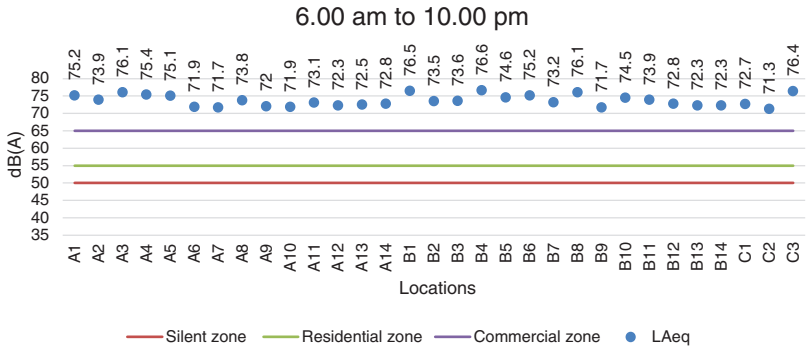

Figure 3: South-West zone-day time L_{Aeq} values at all monitoring locations

Fig. 4 depicts the night time noise indices viz. L_{Aeq}, of different locations of South-West zone. Maximum L_{Aeq} was observed 73.3 dB(A) at B_{14} location and minimum was recorded 65.7 dB(A) at C_3 location at night time, which was greater than the prescribed CPCB limits during night time. All recoded L_{Aeq} values were above the prescribe CPCB limits.

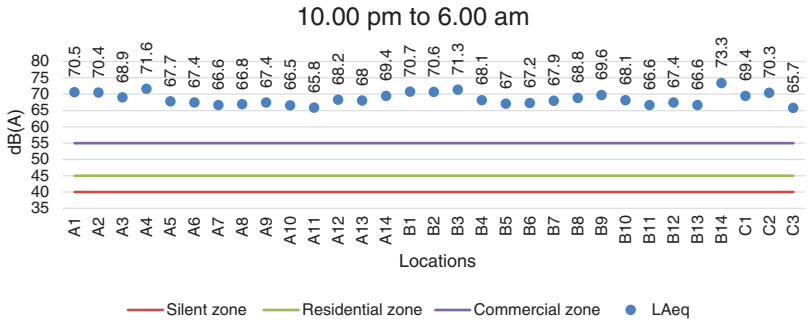

Figure 4: South-West zone-night time L_{Aeq} values at all monitoring locations

3.2 Traffic Survey

Tables 3 and 4 give the classified as well as total traffic volume count at all 31 locations of South-West zone for day time and night time, respectively.

Table 3: South-West zone-day time traffic volume (6.00 am to 10.00 pm)

Locations	Number of vehicles					Total number of vehicles
	2-Wheeler	3-Wheeler	4-Wheeler	Bus	Truck	
A_1	18113	4633	12713	388	225	36072
A_2	19280	4726	15167	326	199	39698
A_3	18209	4944	16306	389	167	40015
A_4	15558	3299	10869	334	167	30227
A_5	11566	2999	11418	276	182	26441
A_6	6773	1751	6671	171	230	15596
A_7	5311	1338	5830	174	146	12799
A_8	5981	1630	6193	181	132	14117
A_9	3561	930	4280	102	223	9096
A_{10}	4643	888	4191	136	207	10065
A_{11}	4772	1226	5826	110	384	12318
A_{12}	4849	1245	6121	109	334	12658
A_{13}	5130	1318	6194	108	291	13041
A_{14}	5256	1363	6433	100	231	13383
B_1	19029	5267	15075	451	174	39996
B_2	18779	5943	15497	422	192	40833
B_3	19247	6575	16576	387	242	43027
B_4	19623	8194	11950	379	217	40363
B_5	19600	9046	17042	403	277	46368
B_6	5248	1430	4511	175	209	11573
B_7	4648	1074	5288	160	147	11317
B_8	4690	1077	5110	139	147	11163
B_9	4917	854	4699	128	290	10888
B_{10}	5536	687	5682	112	277	12294
B_{11}	5487	606	4969	113	330	11505
B_{12}	5889	690	6013	136	226	12954
B_{13}	5932	576	5562	91	285	12446
B_{14}	5934	541	5645	114	239	12473
C_1	4299	521	4278	10	165	9273
C_2	3622	457	2627	40	61	6807
C_3	4807	838	5542	13	60	11260

Table 4: South-West zone-night time traffic volume (10.00 pm to 6.00 am)

Locations	Number of vehicles					Total number of vehicles
	2-Wheeler	3-Wheeler	4-Wheeler	Bus	Truck	
A_1	2649	365	2029	5	11	5059
A_2	2528	377	2229	6	10	5150
A_3	2993	336	2628	14	15	5986
A_4	2232	199	1991	8	15	4445
A_5	2195	201	1971	4	13	4384
A_6	1117	174	1507	6	29	2833
A_7	1132	173	1456	9	35	2805
A_8	1179	157	1477	8	50	2871
A_9	1429	66	1193	6	157	2851
A_{10}	1487	86	1240	9	128	2950
A_{11}	2148	172	2150	5	184	4659
A_{12}	2422	169	2082	7	221	4901
A_{13}	2290	164	2028	5	215	4702
A_{14}	1516	32	1386	0	211	3145
B_1	3623	379	3718	6	16	7742
B_2	2965	561	3113	18	32	6689
B_3	3131	440	4111	9	18	7709
B_4	2797	490	2817	6	9	6119
B_5	2982	470	2742	5	9	6208
B_6	2725	524	2702	29	22	6002
B_7	2622	461	2702	24	19	5828
B_8	2748	432	2655	26	31	5892
B_9	922	24	744	8	172	1870
B_{10}	929	49	787	10	177	1952
B_{11}	1475	74	1197	2	166	2914
B_{12}	1573	85	1253	2	168	3081
B_{13}	1447	64	1165	1	167	2844
B_{14}	1403	90	1478	3	197	3171
C_1	602	19	386	0	1	1008
C_2	591	41	478	0	7	1117
C_3	1791	85	969	1	6	2852

The traffic volume composition for day and night time at different locations of South-West zone in the study stretch was evaluated from the classified vehicular count data. Figs. 5 to 8 depict the composition of all category of vehicles for Athwa-Dumas and Magdalla-Udhna road, both for day time and night time.

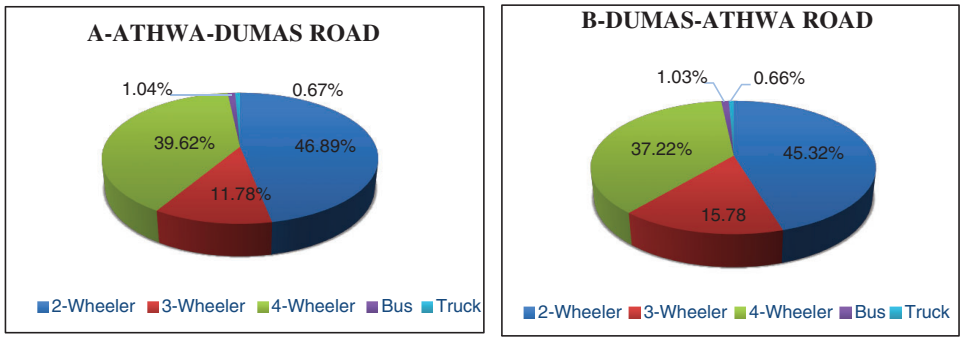

Figure 5: Day time traffic composition data on Athwa-Dumas road

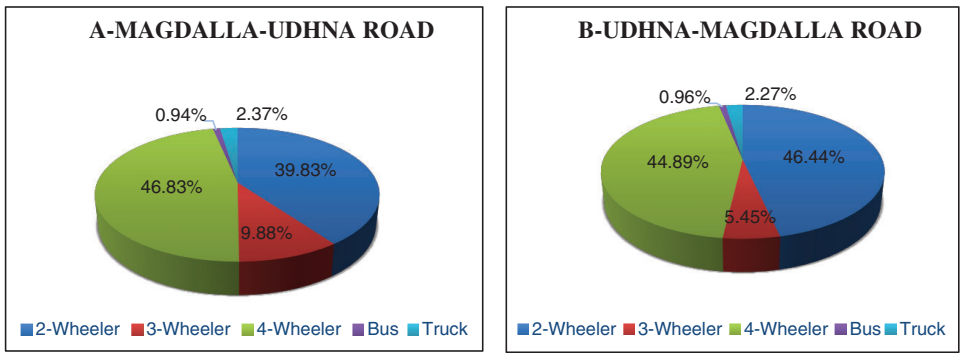

Figure 6: Day time traffic composition data on Udhna-Magdalla road

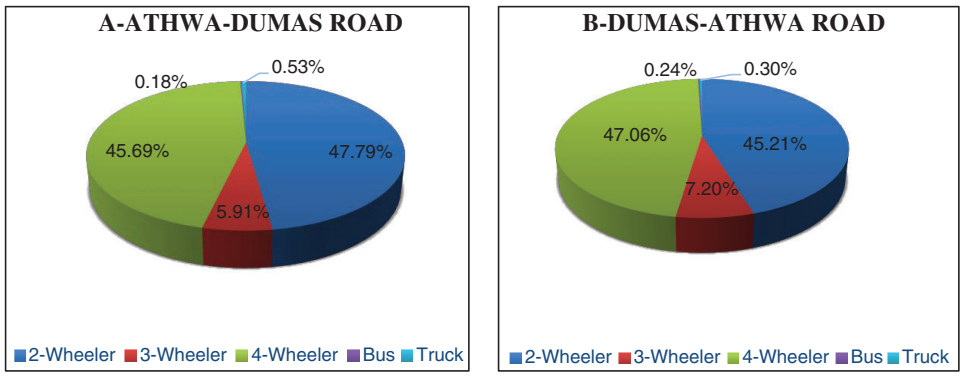

Figure 7: Night time traffic composition data on Athwa-Dumas road

All the traffic volume count, collected on arterial roads of South-West zone are shown in Figs. 5 and 6, which depicts that the composition of 2-wheelers and 4-wheelers was more on arterial road during day time (almost equal). 3-Wheeler had the least share 10% to 20% amongst the selected categories of vehicles. Since, the selected streets are arterial roads, heavy vehicles, i.e., buses and trucks are banned in municipal corporation limits during morning 9.00 am to 1.00 pm and again during evening 5.00 to 9.00 pm. This is the major reason for buses and trucks count being low as 1% to 2%. The 2-wheeler and 4-wheeler frequency were more during day time. Figs. 7 and 8 depict that on Udhna-Magdalla corridor during night time the truck frequency is slightly more, when compared to morning time, which is major reason for high levels of night time noise.

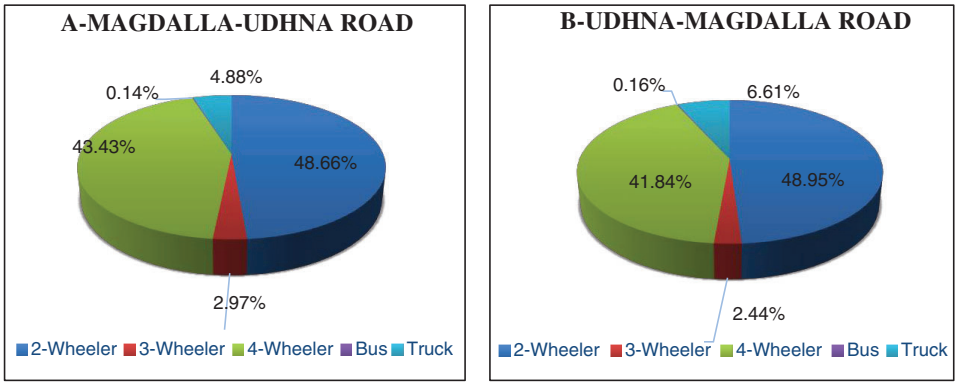

Figure 8: Night time traffic composition data on Udhna-Magdalla road

3.3 Spot Speed Survey

Spot speed survey was carried out using Falcon Radar guns. Two radar guns were employed to collect the spot speed data of the vehicles. This survey helps in determining the approach speed of vehicles. This survey was carried out on a working day. The spot speed of different vehicular categories was collected for every 15-min, 5 sample of each category vehicles. Readings of average spot speeds of individual vehicles for all zones sampling locations are given in Tables 5 to 6.

The sample size was random and was adopted depending on the traffic count. The speed survey was carried out for the day time 6.00 am to 10.00 pm and night time 10.00 pm to 6.00 am. This spot speed data can be used in adopting the speed distribution for different vehicular categories to be considered in noise model.

Tables 5 and 6 give vehicles speed at all 5 locations of West zone during day time and night time respectively. These Tables depict the average speed of categorize vehicles. 2-Wheelers average speed ranged between 33–40 kmph during day time and 35–45 kmph during night time. Similarly, 3-wheeler average speed ranged between 30–35 kmph during day time and 30–40 kmph during night time. The average speed of 4-wheeler ranged between 30–40 kmph during day time and 35–45 kmph during night time. The average speed of bus and truck ranged between 35–45 during day and night time.

Table 5: South-West zone-day time average speed (6.00 am to 10.00 pm)

Locations	Average speed of vehicle (km/hr)				
	2-Wheeler	3-Wheeler	4-Wheeler	Bus	Truck
A_1	49.48	28.72	52.12	34.73	36.22
A_2	50.40	31.07	40.64	39.34	35.11
A_3	47.46	35.72	50.00	41.30	39.92
A_4	48.46	34.01	51.48	37.68	35.12
A_5	49.88	35.32	51.52	38.67	36.86
A_6	48.58	34.09	50.28	37.72	35.80
A_7	49.98	35.18	52.21	38.32	37.15
A_8	49.51	34.95	50.44	37.21	35.90
A_9	48.59	35.17	49.71	40.38	43.23
A_{10}	44.59	35.03	47.68	43.58	45.45
A_{11}	48.16	35.16	55.84	52.41	52.64

(Continued)

Table 5 (continued)

Locations	Average speed of vehicle (km/hr)				
	2-Wheeler	3-Wheeler	4-Wheeler	Bus	Truck
A_{12}	55.50	35.50	58.19	53.03	49.89
A_{13}	51.29	34.37	55.38	50.91	51.83
A_{14}	55.68	35.32	53.66	52.88	54.23
B_1	43.89	35.16	47.63	38.32	35.81
B_2	42.64	31.68	42.64	34.83	35.10
B_3	45.56	36.38	46.19	40.80	41.84
B_4	42.34	35.98	43.35	39.18	38.60
B_5	64.95	35.03	45.43	42.97	42.87
B_6	42.04	35.13	42.06	41.69	43.29
B_7	40.53	33.82	42.12	63.80	41.64
B_8	40.23	33.63	42.32	41.69	41.82
B_9	42.94	34.08	45.20	40.09	39.41
B_{10}	45.91	34.64	44.20	39.41	39.68
B_{11}	43.28	35.02	44.64	39.95	42.85
B_{12}	42.72	33.43	43.14	39.93	42.16
B_{13}	41.32	35.01	43.06	39.84	42.36
B_{14}	42.03	34.94	43.03	40.03	42.04
C_1	53.70	35.65	55.72	51.80	53.53
C_2	53.22	34.71	57.23	55.51	54.61
C_3	47.93	35.43	52.11	41.38	43.03

Table 6: South-West zone-night time average speed (10.00 pm to 6.00 am)

Locations	Average speed of vehicle (km/hr)				
	2-Wheeler	3-Wheeler	4-Wheeler	Bus	Truck
A_1	48.82	36.66	44.20	36.00	45.09
A_2	45.10	35.45	52.04	43.17	50.40
A_3	47.78	35.10	52.63	43.43	46.80
A_4	50.94	37.47	54.86	44.38	50.93
A_5	51.82	40.48	58.56	43.75	52.15
A_6	53.26	43.48	58.61	50.67	52.00
A_7	45.68	39.53	49.23	47.89	55.53
A_8	47.13	38.58	48.09	49.00	55.10
A_9	43.59	37.40	44.76	46.50	46.69
A_{10}	42.83	35.42	45.03	48.89	46.62

(Continued)

Table 6 (continued)

Locations	Average speed of vehicle (km/hr)				
	2-Wheeler	3-Wheeler	4-Wheeler	Bus	Truck
A_{11}	44.31	33.56	44.33	45.80	44.65
A_{12}	43.72	32.57	44.84	46.24	46.92
A_{13}	43.89	34.59	45.01	47.94	47.74
A_{14}	45.16	33.64	44.21	0	47.79
B_1	47.43	36.57	47.19	39.33	43.38
B_2	48.66	32.93	45.74	42.67	44.19
B_3	46.54	33.75	46.38	45.22	41.00
B_4	45.27	33.59	47.10	39.67	39.89
B_5	45.63	33.90	46.14	40.80	37.89
B_6	46.05	33.47	45.56	40.99	39.55
B_7	46.28	33.09	46.61	42.08	39.86
B_8	45.78	34.53	46.51	41.35	39.34
B_9	45.49	34.58	45.46	40.87	43.23
B_{10}	45.75	36.11	45.66	41.40	42.92
B_{11}	47.66	36.07	45.84	38.50	42.86
B_{12}	47.74	37.25	46.13	40.50	40.50
B_{13}	47.56	37.30	46.23	41.00	39.79
B_{14}	45.69	36.63	47.09	40.33	40.17
C_1	43.48	33.47	43.94	0	53.00
C_2	46.19	32.27	46.68	0	48.14
C_3	47.52	36.61	45.38	41.00	41.33

4 Result and Discussion

In South-West zone, 31 locations were monitored. Among them 16 locations were on Athwa-Dumas arterial road, 12 locations were on Udhna-Magdalla arterial road and 3 locations were on sub-arterial road connecting above two arterial roads. These triangular closed loops, which is formed by 31 locations, has an approximate area of 9 sq. km.

In this study, noise level data and road traffic data were recorded. There were total 31 locations for monitoring among that 16 locations were on Athwa-Dumas arterial road, 12 locations were on Udhna-Magdalla arterial road and 4 locations were on the sub-arterial road connecting above two arterial roads. This triangular closed loop, which is formed by 31 locations, has an approximate area of 9 sq. km. The numbers of vehicles categorized as 2-wheelers, 4-wheelers, 3-wheelers, bus and truck were counted manually.

Data in Figs. 3 and 4 depicts the average L_{Aeq} for 31 locations at various time intervals (i.e., day time-6.00 am to 10.00 pm and night time-10.00 pm to 6.00 am). It clearly shows that the highest L_{Aeq} observed during the peak hours was 75.8 dB(A) during the time period 9.00–10.00 am. Similarly, the average LAeq observed was 76.00 dB(A) during the evening period 7.00–8.00 pm, indicating the high levels of traffic

noise. Minimum 62.6 dB(A) was observed during night time from 3.00–4.00 am, which is more than the permissible night time residential area norms of 55.00 dB(A).

On Athwa-Dumas road, the composition of vehicles namely: 2-wheeler is about 45–50%, 3-wheeler is about 10–15%, 4-wheeler about 35–40%, and bus & truck both are about 1% during day time. During night time, the composition of vehicles namely: 2-wheeler is about 45–50%, 3-wheeler is about 5–10%, 4-wheeler about 45–50%, and bus & truck both are about 1%. On Udhna-Magdalla road, the composition of vehicles namely: 2-wheeler is about 45–50%, 3-wheeler is about 5–10%, 4-wheeler about 45–50%, and bus & truck both are about 1% to 3% during day time. During night time, the composition of vehicles namely: 2-wheeler is about 45–50%, 3-wheeler is about 1–5%, 4-wheeler about 40–45%, bus is about 1%, and truck is about 5–10%. So, it is concluded that, compared to traditional Indian traffic scenario of high (70–80%) 2-wheeler counts, on these two study arterial roads, count of 4-wheeler is almost equal to count of 2-wheeler. This can be the major reason for generation of road traffic noise. Another reason for high day time noise levels can be that even though heavy vehicles (bus and truck) are not permitted between morning 9.00 to 1.00 and evening 5.00–9.00, have been recorded in traffic count.

Spot Speed Study concentrates on measuring the speed characteristics at predetermined area under the natural conditions.The present spot speed studies are coordinated to assess the movement of rates of vehicles in a surge of activity at a particular region on a roadway. In this present study, the average speed of various category of vehicles are determined and analyzed.

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