

Fig. 2. The noise level of different localities of Karachi.

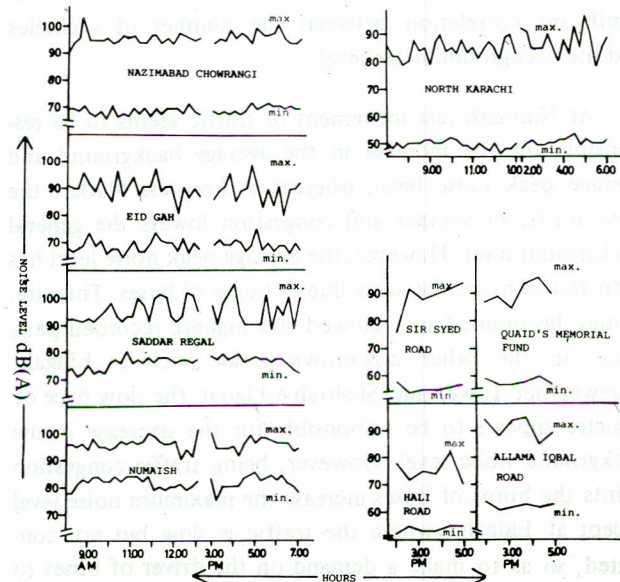


Fig. 3. The noise level of different localities of Karachi.

a period of 3 minutes at intervals of 15 minutes each time at each site. Minimum values, considered as average background noise level, peak values and the vehicles responsible for peak values were noted. The noise level was noted from 7.45 a.m. to 7.30 p.m. at four sites, from 7.00 a.m. to 6.00 p.m. at fifteen sites and from 2.00 p.m. to 5.00 p.m. at another four sites. All measurements were recorded at a distance of 5 meters from the edge of the road [6]. The noise level for Numaish, Eidgah, Saddar Regal and Nazimabad Chorangi 1, were measured prior to, and for the remaining 19 sites they were noted during the holy month of Ramadan. The background noise level was correlated with the number and type of vehicles. The noise level of 50 vehicles each of the three public transport units viz. buses, mini-buses and rickshaws was noted during travel when they had attained an approximate speed of 35-45 Km/hr. The noise level of buses and mini-buses was recorded at the front seats of the gents compartment.

RESULTS

Highest average background noise level was noted at Numaish (81 dB(a)) and Empress Market (80 dB(A)) whereas the lowest average was found at North Karachi (50 dB(A)) and Hali Road (54 dB(A)). Highest average value (96 dB(A)) of noise event was also measured at Numaish and Empress Market and the lowest at North Karachi (86 dB(A)) and Hali Road (75 dB(A)). Recorded highest value (110 dB(A)) of noise events was measured at Empress Market and the recorded lowest value (82 dB(A)) of noise events was at Hali Road. The highest recorded minimum value (78 dB(A)) was noted at Numaish and the lowest (46 dB(A)) at North Karachi.

Horns of buses showed the highest average noise level (97 dB(A)) and those of cars the lowest average (87 dB(A)) (Fig. 5). Location-wise occurrence of noise events due to rickshaws was maximum (90.48 % times) at Tariq Road and due to buses, particularly the one emitted by their horns was maximum 90.48 % times at Empress Market (Fig. 5). In the total scenario the average reached the peak 63 % times by noise emitted by rickshaws, 24 % times by buses and the remaining 13 % times by motorcycles, mini-buses, trucks and cars (Fig. 5).

Correlation of the data suggests that at 15 different signal and non-signal sites the correlation ($r = 0.643$) was highest and most significant between the number of rickshaws and the average background noise level while the lowest and non-significant correlation ($r = 0.309$) was between the number of cars, jeeps and station wagons and the background noise level (Fig. 4). At signal sites, no significant correlation was observed between the type of

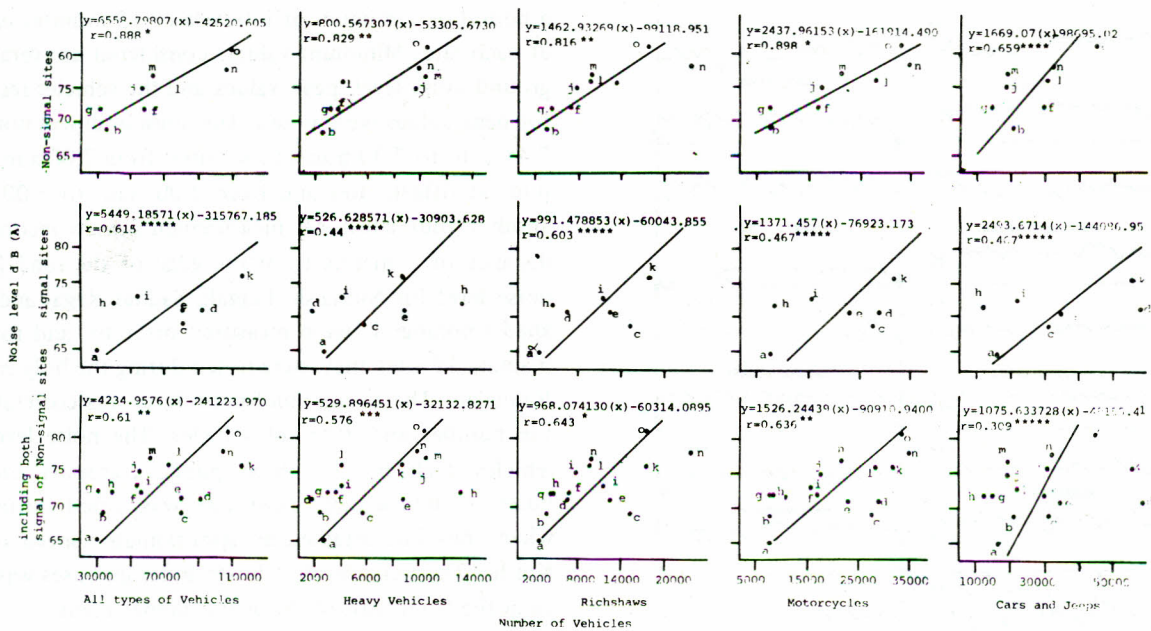


Fig. 4. Scattered diagrams showing the correlation between the average background noise level and the number of different types of vehicles. a. Queen's Road; b. Tariq Road; c. Nazimabad Chowrangi No. 1; d. Sharea-e-Faisal; e. Ghalib Library; f. Hasan Square; g. Jail; h. Mereweather Tower; i. Lasbella; j. Shahrah-e-Liaquat; k. Seventhday Hospital; l. Nazimabad No. 7; m. Grumandir; n. Super Market (Liaquatabad); o. Numaish.

* $P > 0.01$, ** $P > 0.02$, *** $P > 0.05$, **** $P > 0.1$, ***** $P > 0.5$.

vehicle and the background noise level (Fig. 4). At non-signal sites, however, the highest and most significant correlation ($r = 0.898$) was found between the number of motorcycles and the background noise level while the lowest and non-significant correlation ($r = 0.659$) was obtained between cars, jeeps and station wagons and the background noise level (Fig. 4). Individual objective measurements of noise level of three public transport systems showed that the average noise level of rickshaws was highest i.e. (99 dB(A)) and that of the mini-buses was lowest i.e. (83 dB(A)) (Table 1).

DISCUSSION

The suggested outdoor threshold or background noise level for the assessment of noise, above which a particular noise event may be considered annoying is (50-60 dB(A)) [2]. The results of the survey indicate that in Karachi the background noise level is far greater than desirable. Out of the 23 sites surveyed, there were only four for which the background noise level was below the threshold limit. These four sites were incidentally side streets. At most of the sites of the survey the noise level has been found to be above (70 dB(A)), although, the traffic volume has increased during recent years. Rickshaws and motorcycles are the major contributors to the background noise level followed by heavy vehicles (those with more than four tyres), cars and jeeps. This is borne out from the significant positive

correlation found between the number of rickshaws and motorcycles and the background noise level and non-significant correlation between cars, jeeps and station wagons and the background noise level. It may also be noted from the data that at non-signal sites, there was significant positive correlation between the number of different types of vehicles and the background noise level except between cars, jeeps and station wagons and background noise level. At signal sites, however, there was non-significant correlation between the number of vehicles and the background noise level.

At Numaish fast movement of traffic seems to be responsible for the increase in the average background and average peak noise level, whereas at Empress Market the slow traffic movement and congestion lowers the general background level. However, the average peak noise level has been found to be the same due to horns of buses. This site, it may be pointed out showed the highest recorded peak value. In the other downtown areas, such as Eidgah, Mereweather Tower and Shahrah-e-Liaquat, the slow pace of vehicles appears to be responsible for the decrease in the background noise level. However, being traffic congestion points the horns of buses increase the maximum noise level except at Eidgah where the traffic is slow but not congested, so as to make a demand on the driver of buses to blow horn or for the rickshaws to pick up speed.

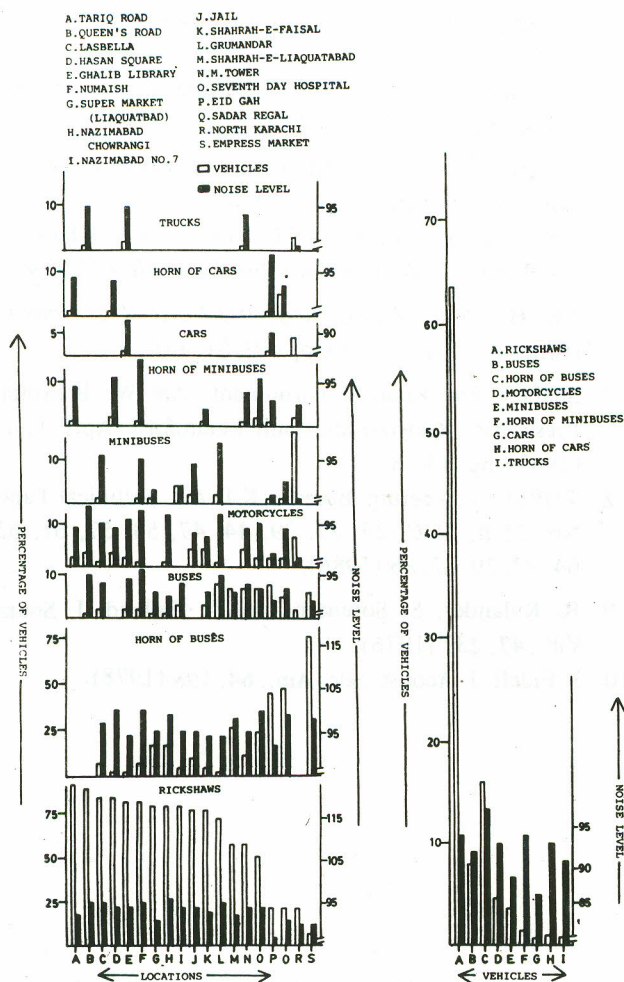


Fig. 5. Percentage of vehicles causing noise events and their average noise level (a) Location-wise (b) Total sum.

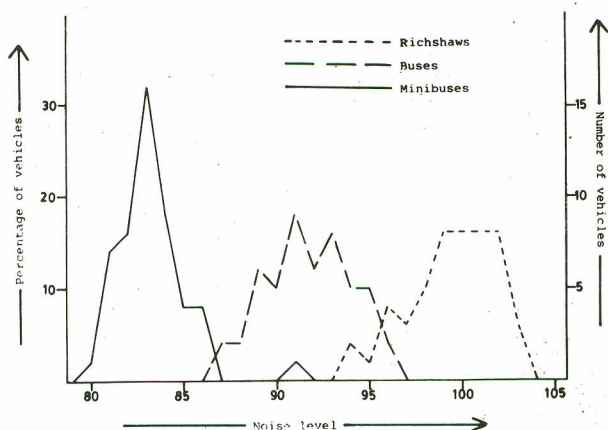


Fig. 6. Frequency-distribution of 50 vehicles each of three public transports i.e., buses, minibuses and richshaws.

At signal sites, the background noise level is found to decrease when the traffic stops and when it starts, the maximum noise level is noted to increase again to the same level. This event is mostly caused by rickshaws and some-

Table 1. The noise level of different public transports in Karachi.

Sr. No.	Vehicle type	Number of vehicles	Arithmetic mean of noise level dB(A))
1.	Rickshaws	50	99.46 ± 2.34
2.	Buses	50	91.72 ± 2.33
3.	Mini-buses	50	83.24 ± 1.85

Table 2. Traffic noise level at different locations in Karachi.

Sr. No.	Location	Average background level dB(A))	Average peak noise level	Recorded minimum value dB(A))	Recorded maximum value dB(A))
1.	Numaish	81	96	78	101
2.	Empress Market	80	96	76	110
3.	Super Market (Liaqatabad)	78	92	75	97
4.	Grumandir	77	95	73	99
5.	Saddar/Regal Cinema	76	95	71	105
6.	Nazimabad No. 7	76	94	72	97
7.	Seventhday Hospital	76	93	73	105
8.	Shahrah-e-Liaqaut	75	93	67	105
9.	Lasbella	73	95	70	99
10.	Mereweather Tower	72	94	67	99
11.	Jail	72	94	69	98
12.	Hasan Square	72	94	68	100
13.	Ghaiib Library	71	94	68	100
14.	Shahrah-e-Faisal	71	93	65	96
15.	Eid Gah	69	90	65	99
16.	Nazimabad Chowrangi	69	94	66	104
17.	Tariq Road	69	92	56	97
18.	Queen's Road	65	95	61	100
19.	Allama Iqbal Road	63	91	61	95
20.	Sir Syed Road	56	87	54	94
21.	Hali Road	54	75	52	82
22.	Qaid's Memorial Fund	58	90	57	96
23.	North Karachi	50	86	46	97

times by motorcycles. In Oslo, Gottenberg, Copenhagen, Geneva and Helsinki, heavy vehicles dominate the upper noise level range [3]. The maximum noise level of heavy vehicles is 10 dB(A) above the maximum noise level of light vehicles and the noise level of the light vehicles is below the general background level or threshold [9]. In Karachi the situation is quite different as would be noted

from the individual objective measurements recorded in Table 1 and depicted in Fig. 6. The maximum noise is found to be dominated by rickshaws, followed by buses and only occasionally by cars and jeeps.

A study of the subjective effect of noise shows that the maximum noise level is the major determinant for annoyance [3]. The use of higher quantities of lubricants in petrol and the tinny exhaust pipes cause unretarded flow of gases being discharged which results in air as well as noise pollution [1] and hence rickshaws are the major polluters. Survey reported [7] in 1987, has revealed that out of 1450 private sector buses plying on 100 different routes of Karachi, approximately 40 are between one to seven years old and the rest of them are from 8-27 years old. They, therefore, are only next to the rickshaws and motorcycles in creating noise pollution.

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