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VEHICULAR CONTRIBUTION TO ROAD TRAFFIC NOISE IN KARACHI CITY, *Part I. Contribution by Motorcycles, Buses and Rickshaws*

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Studies on road traffic noise carried out in Karachi city shows that the road traffic noise levels in the city are very high and much beyond the acceptable limits. Therefore, in order to investigate the level of noise contributed by different type of vehicles plying on the city roads and to assess their individual contribution to the high level traffic noise, studies have been carried out on the noise emitted by four types of relatively noisier vehicles as they normally move on the city roads. The results are discussed with reference to L_{V90} , L_{V50} and L_{V10} and present existing motor vehicle rules in Pakistan.

Key words: Vehicular noise, Noise pollution, Surface transportation noise.

Introduction

Road traffic noise is one of the most widespread source of noise nuisance in urban areas. The situation is getting alarming with the increased traffic density on city roads, particularly Karachi. The Environmental and Urban Affairs Division has now come up with regulatory standard for 'National Environmental Quality Standards' for Motor Vehicle Exhaust and Noise [1]: according to this standard, the maximum permissible limit for new vehicles (without specifying the types) has been fixed at 85 dB(A). The global concern about noise levels is evident from the different standards that have been adopted by different countries, such as EEC countries [2-5]. In view of the increased concern about noise in Karachi City, a study was initiated by the authors to generate base-line data in 1986 [6]. The present study is a follow-up of the earlier study, and also attempts to give categorywise break-down of the noise emission from different types of vehicles, which may help eventually to develop our national standards in line with international standards for different categories of vehicles.

Earlier studies on road traffic noise [6] shows that in the urban areas of Karachi, the values of recorded minimum noise levels are found in the range of 61-72 dB(A), average background noise levels (L_{V90}) 72.5-77.0 dB(A), average values (L_{V50}) 78.7-85.3 dB(A), average peak values (L_{V10}) 84.5-90.5 dB(A), and with the exception of a few occasional peaks, the values of recorded maximum noise levels are in the range of 93-97 dB(A). Road traffic noise may be regarded essentially as the complex summation of noise produced by individual vehicles in the given traffic stream. The levels of traffic noise at a place vary with given traffic stream. The levels of traffic noise at a place vary with time, and generally depends upon

traffic density, composition, speed, condition of vehicles, reverberation time of the place, road surfaces, etc. Certain types of vehicles make dominant contribution to high level traffic noise. Therefore, in order to have an assessment of the level of noise emitted from different types of vehicles, and help in the formulation of noise reduction programme in the country, it is necessary to collect data on the level of noise emitted from different types of vehicles. For this purpose, there are some standard methods for the assessment of level of noise emitted from vehicles in motion [7,8] and in stationary state [9]. The sample data on the level of noise emitted from different type of vehicles in different conditions, collected earlier [10], by following standard method [7] show that the levels of noise emitted from (i) motorcycles, (ii) mini buses, (iii) buses and (iv) auto-rickshaws vary in the range of 84 - 88, 85 - 88, 85 - 89, and 91 - 95 dB(A) respectively (these do not include the new models of motorcycles, mini buses and auto-rickshaws). This study could not be extended further, as not many vehicle owners would volunteer for making their vehicles available for this purpose. Also, the data generated by these methods give the information on the level of noise emitted under certain specified, but generally unrealistic conditions, whereas vehicles plying on the city roads in real situations generally do not follow these conditions all the time and hence such data do not give a realistic assessment of the contribution of vehicles to traffic noise. Therefore, in order to find the actual contribution to noise from different types of vehicles, particularly the noisier ones, measurements on the noise emission from different types of vehicles plying on the Karachi city roads have been made in their normal running state i.e. irrespective of any specified control on speed, gear, acceleration position, etc. In this study only four types of

TABLE 1. RANGE OF LEVEL OF NOISE EMITTED FROM FOUR TYPES OF VEHICLES PLYING ON CITY ROADS.

Types of Vehicles	Range of Noise Level dB(A)
Motorcycle	71 - 93
Mini Buses	76 - 89
Buses	77 - 94
Auto Rickshaws	80 - 96

TABLE 2. CALCULATED L_{V90} , L_{V50} , AND L_{V10} VALUES FROM THE FOUR TYPES OF VEHICLES.

Types of Vehicles	L_{V90} dB(A)	L_{V50} DB(A)	L_{V10} dB(A)
Motorcycles	78.2	82.9	87.9
Mini Buses	80.3	84.2	87.1
Buses	82.4	85.8	89.6
Auto Rickshaws	84.1	87.8	92.2

TABLE 3. PERCENTAGES OF VEHICLES CROSSING SOME SPECIFIED UPPER LIMITS OF NOISE LEVELS.

Type of Vehicles	Percentage of vehicles crossing the following upper limits of noise levels		
	90.0	88.0	85.0dB(A)
Motorcycles	04.5	09.5	30.5
Mini Buses	00.0	06.5	35.5
Buses	08.0	23.0	61.0
Auto Rickshaws	26.0	49.0	83.5

vehicles relatively noisier ones, namely; (i) motorcycles, (ii) mini buses, (iii) buses and (iv) auto-rickshaws, all moving freely as in real road situations, have been considered. Studies on other vehicles are being carried out and will be reported later.

Measuring Instruments and Techniques. The instruments used in this study consisted of a Bruel & Kjaer Impulse Precision Sound level Meter, type 2209, and a condenser Microphone, type 4165. All the measurements were made in dB(A), by keeping the meter at slow response. The microphone was placed at 1.2 meter above the ground level and 3-5 meters away from the building facing road side. The measurements were made at ten sites, namely (i) Jhangir Road, (ii) Sakhi Hasan, (iii) Nazimabad, (iv) Lasbela, (v) Nursary, (vi) University Road, (vii) Rashid Minhas Road, (viii) M.A. Jinnah Road, (ix) Quaid-Abad and (x) Karimabad. At each measuring site the measurement were conducted in selected locations, where the road was double carriage, approximately 100 - 200 ft. Wide reasonably levelled and carpeted and with buildings on its sides and uninterrupted by road junctions, intersections, road lights, etc. All the measurements on individual vehicles were made when traffic density was low at the measuring site - the background noise levels being in the range

of 60 - 65 dB(A). The noise produced by any particular vehicle was measured when it went past the microphone, but within a distance range of 5 - 10 meter in the line of sight of the microphone, assuring at the same time that no other vehicles were moving on the sides of the vehicle under observation and further that no other vehicles were to be found within about 10 meter distance ahead or behind the vehicle under observation.

Results and Discussion

Noise level data were thus collected for 500 individual motorcycles, 250 mini buses, 500 buses and 1000 auto-rickshaws. The ranges of noise levels emitted from these four types or vehicles are given in Table 1. The statistical distributions of noise levels recorded for each of these four categories of vehicles are given in Fig. 1-4. Figure 5 gives the cumulative distribution for the same. L_{V10} , L_{V50} and L_{V90} denotes the levels of noise emitted by more than 10%, 50%, and 90% of the vehicles respectively; for each type of vehicle, their values are shown in Fig.5 and are given in Table 2.

These results show that the level of noise emitted by these vehicles are very high and much beyond the acceptable limits. The reasons for such high level noise may be contributed to (i) little regulatory laws to limit high level motor vehicle noise, (ii) their being old models, (iii) poor maintenance, (iv) use of defective mufflers, (v) rash driving, and to some extent uneven road surfaces. These noise levels are very much annoying and may result in harmful effects to the shopkeepers, hawkers and dwellers staying for longer time hours particularly on busy roads. For new vehicles, National Envi-

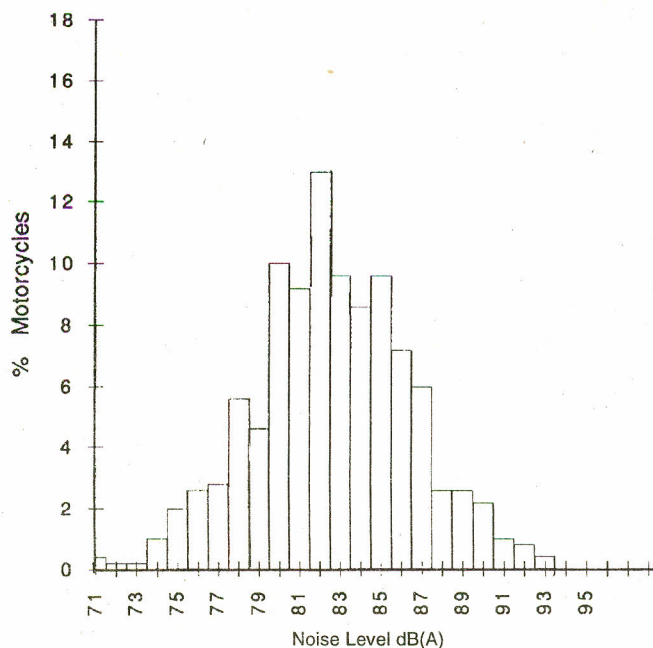


Fig. 1. Statistical distribution of noise due to loaded motorcycles.

ronmental Quality Standards for Motor Vehicle Exhausts and Noise [1] has allowed maximum permissible limit of 85 dB(A) at a distance of 7.5 meter from the source. If the cut off limit for noise emission, from these four types of vehicles (in use vehicles) namely, (i) motorcycles, (ii) mini buses, (iii) buses, and (iv) auto-rickshaws are also put at 85 dB(A), then as given in Table 3, 30.5% motorcycles, 35.5% mini buses, 61.0% buses an 83.5% auto-rickshaws will have to go out of

road. As 83.5% of the auto-rickshaws produces noise exceeding 85 dB(A), one has to do something in this respect rather urgently, for they seem to outclass all vehicles responsible for noise pollution. Regulatory law to control motor vehicles noise within the acceptable limits need to be implemented seriously, perhaps a phased programme to ensure that the noise emission from individual vehicles does not exceed the upper limit of 85 dB(A) may help to reduce the noise levels

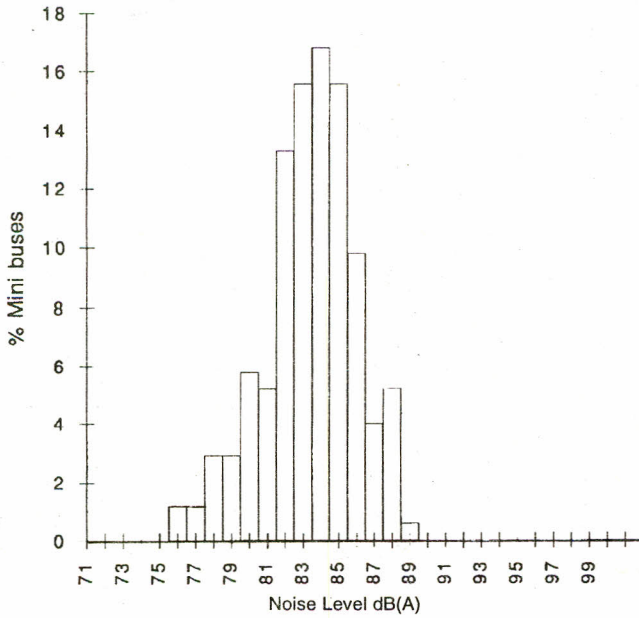


Fig. 2. Statistical distribution of noise due to mini-buses.

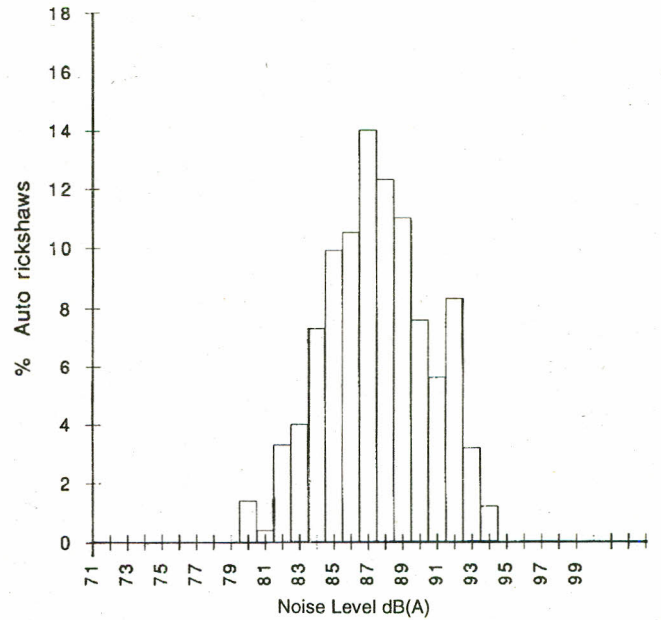


Fig. 4. Statistical distribution of noise due to loaded auto-rickshaws.

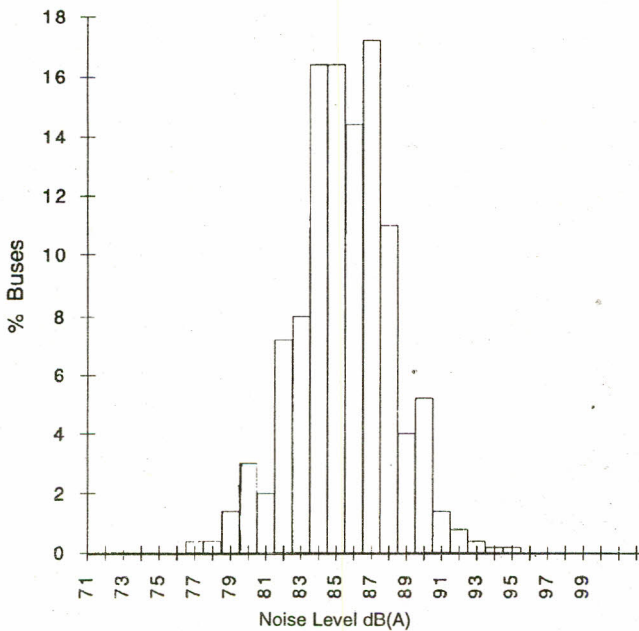


Fig. 3. Statistical distribution of noise due to loaded buses.

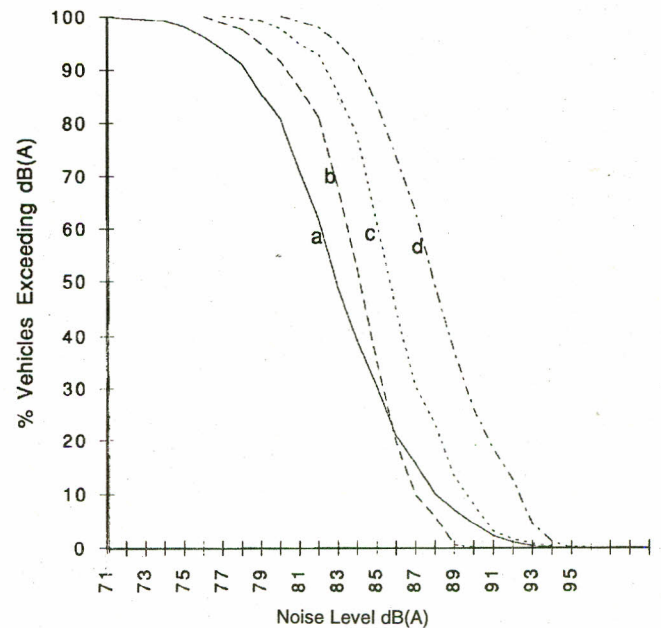


Fig. 5. Cumulative distribution of (a) motorcycles, (b) mini-buses, (c) buses and (d) Auto-rickshaws as a function of noise.

considerably. Eventually one may hope to set our national standard close to international standards.

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