TRAFFIC NOISE POLLUTION IN PESHAWAR CITY, PAKISTAN

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Abstract

A study was conducted in Peshawar city to find out the noise level at 5 selected road crossings viz: Spin Jumat, Stadium, Suikarno square, Qissa Khwani and Firdos Cinema. The results of the study indicate the average noise level at these points is 84 dB(A). Spin Jumat is the worst affected crossing with reference to noise pollution with average noise level at 86 dB(A). The average noise level of other 4 sites ranged between 82-84 dB(A). It is concluded that the noise level in Peshawar city has crossed the permissible limits. Due to high level of noise, traffic controlling staff, pedestrians and people living and working along the roads are liable to be affected by noise induced physiological and psychological health hazards. To overcome this problem, the existing motor vehicles rules should be strictly implemented through the coordinated efforts of traffic police and Environmental Protection Agencies. Trees and shrubs planted in track belts along the roads with a dense foliage can also attenuate traffic noise effectively.

Introduction

Noise is regarded as undesirable and unwanted sound. Noise could be from any source which disturbs, annoys or induces negative responses in human beings. Noise is a type of environmental pollution as a result of industrialization urbanization and technological advancement. Hearing cannot be 'switched off' at will, and man is thus unavoidably exposed to the environmental noise produced by modern society. Noise, as pollutant, produces contaminated environment which become a nuisance and affects the health of a person, his activities and mental abilities.

Sound and noise are synonyms but in our acoustic environment we must differentiate between these two terms. When the effects of a sound are undesirable then it may be termed as noise. The qualification and examples of

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noise levels as characterized by the Organization for Economic Cooperation and Development (OECD, 1988) are from 40 to 75 dB (A).

Street traffic is one of the major noise source in urban areas. Due to rapid increase in traffic, the noise level has gone much beyond the acceptable limits in big cities of Pakistan. The city dwellers are still unaware of the health hazards of noise such as annoyance, behavioral changes, stress effects, hearing damage and other physiological reactions. The main objective of the present study is to assess the traffic noise levels and traffic density at different selected locations in Peshawar city and find relationship between noise level and traffic density and to suggest remedial measures.

Material and Methods

Material

Peshawar is the capital of North West Frontier Province of Pakistan. At present, this city is under heavy pressure of street traffic noise due to high population. The road running from General Bus Stand to Karkhana Bus Stop towards Jamrud, is mostly used for street traffic. This stretch of the road is the part of the Grand Trunk Road extending from Torkham to Karachi and is also under very heavy pressure of traffic.

The main types of vehicles running over these roads are urban transport buses, mini-buses, cars, rickshaws and carriage vehicles. The road from General Bus Stand to Firdos Cinema chowk is double-lane and dual carriageway, Firdos Cinema chowk to FC chowk is double-lane and single carriage and rest of the road that is from FC chowk to Karkhana Bus Stop, is double-lane and dual carriage.

Reconnaissance survey of the Peshawar city/Cantonment area was done, keeping in view the intensity of noise produced by street traffic and busy places. On this road, from General Bus Stand to Karkhana Bus Stop, ten candidate experimental sites (points) were selected. Out of these, 5 experimental sites were finally selected for study on the basis of expected high traffic noise and traffic density. The detail of these study sites is given in Table 1.

Table 1. Numbers and names of the experimental sites

Site No.	Name of The Place
1	Spin Jumat crossing (near Peshawar University)
2	Stadium crossing (near Peshawar Stadium)
3	Suikarno square (near Khyber bazar)
4	Qissa Khwani crossing (Peshawar city)
5	Firdos Cinema crossing (on main GT road)

Methods

The instrument used to measure noise level is called "Noise Level Meter", model 83P, made by "INDU NORM" in accordance with the standards of "International Environmental Council" (IEC). It measures various sounds in offices, cities, factories, vehicles and air traffic etc. with a high accuracy.

Recording of noise level data

A four hours study for noise level measurement was carried out on each site for one day. This study was divided into two stages, each of two hours (0700-0900 & 1200-1400 hours). These two periods were selected because of the most noisy ones in the forenoon and afternoon. Noise level was recorded after every five minutes, making 48 observations for each site.

Measurements were made while standing in the center of square (chowk) and on foot paths (about 3-4 feet away from the outer edge of the road) to see the effects of noise on pedestrians and traffic controlling staff, holding the sound level meter at the position of ear. Observations were made on the working days, keeping in view an anticipated very low noise level on weekends. Number of vehicles passing at 5 minute interval were also counted.

Noise level differences may result due to a number of factors, such as distance from the source, road surface, type of vehicles, number of vehicles, speed of vehicles and the nature of area etc. The effect of distance from a road to measurement spot is complicated by the multiple and moving sources of noise.

Data analysis

Simple Arithmetic means and standard deviations were calculated for the data collected on each experimental site by using standard formulae. The relationship of time and traffic density, traffic density and noise level and time of the day and noise level was also shown graphically (fig. 1 to 3).

Results and Discussion

The results of the street noise level study in Peshawar city are given in Table-2. This table shows the Noise level and Traffic density at all the test sites alongwith the minimum, maximum and mean values and standard deviation.

At Spin Jumat crossing the average noise level is 86.35 dB(A) with average traffic density of about 75 vehicles per minute. Here the minimum noise level is 73 dB(A) with average traffic density of about 75 vehicles per minute and maximum noise level is 103 dB(A). The average traffic density observed at this test site is also comparatively high, about 75 (45-95) as compared to the rest of the four test sites.

The average noise level at Peshawar Stadium crossing is 84.5 dB(A) with a minimum value of 70 and maximum of 103 dB(A). At this point the average traffic density is 72 with a minimum of 36 and maximum of 92. Both, noise level and traffic density at this test site are less than the Spin Jumat crossing.

From the remaining three test sites, Suikarno square is comparatively more effected by the noise pollution, having an average noise value of 84.7 dB(A) and a traffic density of 73 vehicles per minute. Here the maximum noise level recorded is the highest i.e. 108 as compared to all the other four test sites.

The graphical relationship between Time & Noise level, Time & Traffic Density and Traffic Density & Noise level for Spin Jumat crossing, which is the highly noise affected test site, is shown in Fig. 1 to 3 and discussed as under. Same type of relationship exists for rest of the test sites as well.

Table 2. Noise level and Traffic density at various test sites in Peshawar

Name of Site	Noise Level in dB(A)			
	Min.	Max.	Mean	S.d.
Spin Jumat Chowk				
- Noise Level	73	103	86.35	05.68
- Traffic density	45	95	74.8	12.12
Stadium Ckowk				
- Noise Level	70	103	84.50	05.75
- Traffic density	36	92	72.0	14.00
Suikarno Chowk				
- Noise Level	72	108	84.7	06.34
- Traffic density	18	57	73.0	11.00
Qissa Khwani Chowk				
- Noise Level	65	102	83.5	05.70
- Traffic density	08	33	24.0	06.00
Firdos Chowk				
- Noise Level	70	98	82.7	04.60
- Traffic density	10	55	37.0	12.50

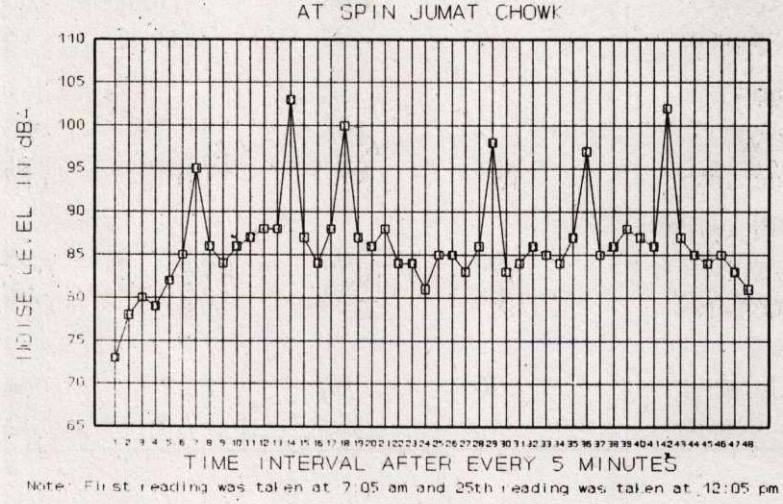
Time and Noise level

The graph between time and noise level (Fig.1) shows that in the morning hours i.e., 0700, the noise level was minimum. As the time passed the noise level also increased gradually, except some higher levels of noise, which were due to pressure horns or defective silencers. Maximum noise levels were observed during 0745-0845 hours, the reason was increase of traffic flow due to school and office hours. After this traffic flow returns to normal and noise level becomes constant around 85 dB(A). In the afternoon between 1300-1345 hours, traffic flow increases due to closing hours and noise level again jumps to high values and drops down later on.

Time and Traffic Density

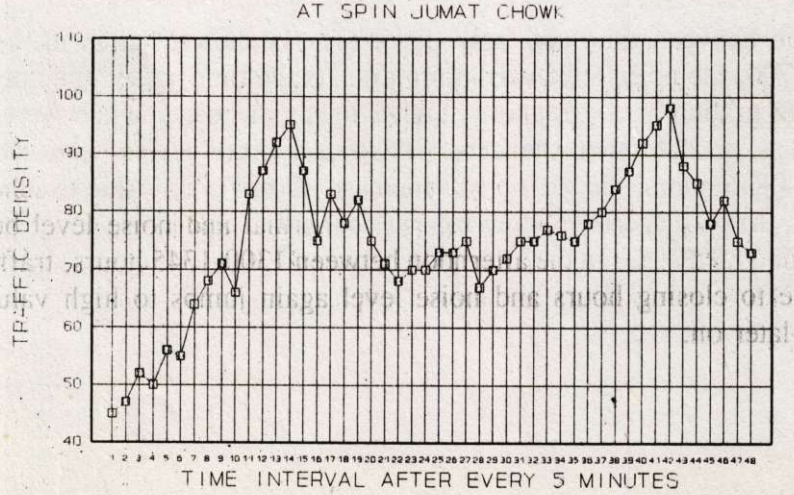
The graph between time and traffic density (Fig.2) shows that in the beginning of study, the number of vehicles passed/minute are less but as the time passes, the traffic density also increases and reaches its peak at 0745-0835 hours and then again decreases with the passage of time. In the afternoon, traffic density between 1305-1350 hours descends to about 70-75 vehicles per minute. The reasons of these fluctuations in the traffic density have been discussed earlier.

FIG. 1. TIME VS NOISE LEVEL



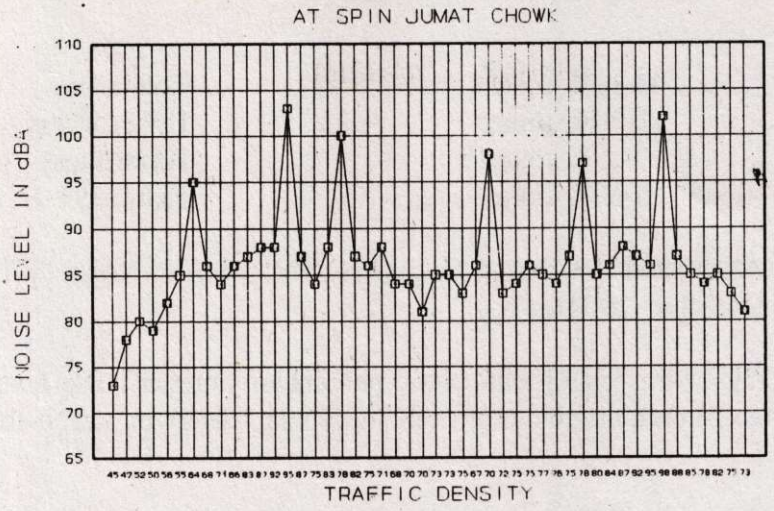
Note: First reading was taken at 7:05 am and 25th reading was taken at 12:05 pm

FIG. 2. TIME VS TRAFFIC DENSITY



Note: First reading was taken at 7:05 am and 25th reading was taken at 12:05 pm

FIG. 3. TRAFFIC DENSITY VS NOISE LEVEL



Traffic Density and Noise level

It is obvious from the data and graph (Fig.3) level that as the traffic density increases, the noise level also increases and vice versa.

After comparing the results of all the test sites, overall picture about the noise level and traffic density in Peshawar city is summarized in the Table 3.

Table 3. Noise level and traffic density in Peshawar city

	Min.	Max.	Mean	S.D.
Noise level in dB(A)	65	108	84.3	5.6
Traffic density	08	95	56.0	11.0

It is obvious from the Table 3 that the average noise level in all the study sites is found to be 84.3 dB (A). Average minimum noise level is 65 dB(A) and average maximum noise level observed is 108 dB(A).

The impact of noise from the traffic also depend on the percentage of time a certain noise level remains dominant. The criterion of noise level dominance is more realistic than the one based on average values. The average values for peak

noise levels are classified in the following manners depending upon the percentage of time that noise level remains dominant.

00-10% times	Tolerable
11-20% times	Under stress
21-25% times	Hazardous
26-30% times	Extremely Hazardous

Source: Associated Consulting Engineers. The Study of Noise Pollution In Karachi. (1994).p-6

According to this classification the percent of times a noise level of 80 dB(A) and above remain dominant at each study site, are given in the following table.

Table 4. Percent time dominance of noise level of 80 dB(A) and above, at all experimental sites

Location	Percent of time
Spin Jumat crossing	90 %
Peshawar Stadium crossing	87 %
Suikarno Square	87 %
Qissa Khwani crossing	87 %
Firdos cinema Chowk	81 %

Comparing with the standards mentioned earlier, all the sites studied in Peshawar are found extremely hazardous.

Noise Level dB(A)	:	**Qualification**
77.5-82.5	:	Extremely hazardous
72.5-77.5	:	Hazardous
70-72.5	:	Under stress
< 70	:	Tolerable

Source: Associated Consulting Engineers. The Study Of Noise Pollution In Karachi. (1994).

Considering this classification, based on average noise levels, the Peshawar city as a whole and all the sites in particular are extremely hazardous with respect to noise pollution because the average noise levels on all the sites is higher than 82.5 db(A).

If the average noise level is compared with the permissible limits fixed by EPA [85 dB(A)], the average noise level in Peshawar lie in the safe range, but the average noise level at Spin Jumat chowk is higher than the permissible limit, and hence is categorized as hazardous. More over the noise levels of other four sites studied are also approaching to 85 dB(A) and as the number of vehicles on the roads are increasing day by day, therefore, after some years the noise levels of other four sites will also cross the safe limits.

Here in peshawar, thousands of people are living and working along the roads. The noise emitted by street traffic can also be compared with the acceptable noise level for community set by USA (67 dB), Sweden, Germany and Denmark (50 dB) and for Netherlands (45 dB). Tables 2 and 4 indicate that the noise level in Peshawar is much higher than the permissible limits set by these countries. According to OECD (1988), any sound louder than 75 dB(A) is categorized as "very bad". Taking this noise classification, it can safely be concluded that Peshawar has "very bad", with reference to noise pollution.

Conclusions

Based on the results of noise level study in Peshawar

1. The street traffic noise is much higher than the permissible values set by different countries and organizations. Higher levels of noise are due to improper maintenance, defective silencers of automobiles and frequent use of horns.

2. Among all the sites studied, Spin Jumat Chowk is the worst affected with reference to street traffic noise. Suikarno Chowk is categorized as No. 2 in the grading sequence (based on average noise level) .

3. The maximum noise level observed in Peshawar city is 108 dB(A), at Suikarno chowk. The minimum noise level observed is 70 dB(A), measured both at Firdos and Stadium chowk.

4. Among all types of vehicles, rickshaws are responsible for producing very high level of noise as compared to others. Whenever a rickshaw passed, the noise level jumped to >100 dB(A).

5. With few exceptions i.e. smooth traffic flow, properly maintained vehicle etc., noise level is directly proportional to traffic density.

6. Traffic controlling staff and other people working along the road are the most affected of noise pollution. They are under a constant threat of noise pollution, causing hearing loss and other physiological and psychological ill-effects.

Recommendations

Noise can be controlled by adopting structural as well as non-structural measures. To control street traffic noise in Peshawar city, following structural and non-structural measures are recommended.

Non-structural measures

1. The existing motor vehicle rules should be fully enforced through coordinated efforts of Traffic police and EPA. West Pakistan Motor Vehicle Ordinance, 1965 and subsequent rules under the name of Motor Vehicle Rules, 1969 to regulate the use of;

   * Defective silencer (Section 154 and 227)
   * Restrict use of pressure horn (Section 154,226 and 252)
   * Control playing of music in public vehicles (Section 226)
   * Regulate location of transport and goods vehicles stand (Section 255).

2. Re-routing of traffic should be made.

3. Public awareness should be created through mass media about the ill-effects of noise produced by horns and defective silencers.

4. Better management of traffic should be made.

5. Ear-Plugs and Ear-protectors should be provided to the traffic controlling staff.

6. Taxies must be encouraged instead of rickshaws.

7. 2-Stroke engine automobiles produce high level of noise, hence, should be phased out.

8. Quieter vehicles must be manufactured/imported.

Structural measures

1. Trees and shrubs can be used effectively as noise reducing structure. The planting should be dense,of medium-height trees having greater leaf surface area.

2. Elevated bridge ways and by-passes must be constructed for spreading and smooth running of traffic flow.

3. Roads should be maintained properly.

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