

Attitudes of Jordanian Population Towards Road Traffic Noise

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Abstract: Traffic noise concern has recently emerged as an issue affecting urban population of Jordan. A study of road traffic noise along urban arterials of Amman, the capital of Jordan was carried out to examine the magnitude of traffic noise and evaluate its effect on residents and their activities. The study involved two steps: 18-hours noise measurements at seven selected sites in Amman, and an attitudinal survey using questionnaires and involving a sample of 300 people. This paper presents the results of analyses of the noise measurements and completed questionnaires. It was found that the measured traffic noise levels exceed the maximum allowable limits at all survey sites. Traffic noise was also perceived by neighboring residents as a problem that is disruptive to their lifestyles to the extent that over half of the interviewed people consider transferring to a quieter environment.

Keywords: noise pollution; social survey; noise measurement; Jordan.

1. Introduction

In recent years, increasing traffic flow on the nation's roads coupled with growing awareness of environmental issues have established the need to evaluate the noise impact of new or existing roads on neighboring communities.

This study uses the results of a social survey to examine the effects on the standard of living of residents exposed to excessive road traffic noise. It further considers annoyance reaction as a result of these effects.

Two main steps have been conducted: first the measurement of traffic noise levels at selected sites in the urban area of Amman. The measurements were made over 18 hours; and second social survey using Questionnaires,

completed during a home interview with 300 households.

2. Population growth and distribution

Jordan's population and its annual growth rate have both increased rapidly during the past four decades. The population was 1.7 million in 1970 reaching over 5 million in the year 2000 where the annual growth rate has increased from 3.2% to 4.7% during the same period. Table 1 shows the increase in population of Jordan during the period 1961 to 2000. The high rate of population growth was mainly due to reduction in mortality rates caused by improved health care and medical

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facilities coupled with better living standards and high fertility rate of 6.6 lives per married woman, the second highest rate in the world.

In addition, the waves of in-migration due to political instability and military conflicts in the region and the influx of large number of non-Jordanian

Table 1. Jordan population for selected years (in thousands)

Year	Male	Female	Total
1961	469.4	471.4	900.0
1979	1115.8	1017.2	2133.0
1985	1618.5	1475.5	3094.0
1990	1777.0	1676.0	3453.0
1995	2103.0	1995.0	4098.0
2000	2635.4	2403.0	5039.0

Jordan is divided administratively into 12 governorates. The distribution of population between the governorates of Jordan is related to the natural resources of rain and ground water. Table 2 shows that about 90% of population reside in the northern governorates which constitute only 15% of the total area of the country but where more water resources are available. The Jordanian society is a young one where the people under 15 years of age constitute over 48% leading to higher burden of support and lower worker's productivity. The support rate, i.e. the number of family members supported by working member in the family, has increased to 1:6 including the worker himself. This added to the low participation of women in the workforce have led to decreasing the labor force rate to 16.8% of the total population and the consequences

of malnutrition shortage of social services and unhealthy environmental problems.

Table 2. Estimated population by governorate and sex, 2000 (in thousands)

Governorate	Male	Female	Total	% of Total
Amman	1004.1	913.2	1917.3	38.0
Balqa	173.9	156.7	330.6	6.6
Zarka	413.1	379.5	792.6	15.7
Madaba	67.0	61.5	128.6	2.6
Irbid	465.5	433.5	899.0	17.8
Mafraq	121.7	110.6	232.3	4.6
Jerash	77.1	71.0	148.1	2.9
Ajlun	57.0	54.9	111.9	2.2
Karak	106.0	96.7	202.7	4.0
Tafiela	39.8	36.7	76.5	1.5
Ma'an	53.2	45.0	98.2	1.9
Aqaba	57.0	44.3	101.3	2.0
Total	2635.4	2403.6	5039.0	100.0

3. Housing characteristics

Urban population has grown rapidly in Jordan from 59% of total population in 1979 to about 80% in the year 2000. There is a high concentration of population in the major cities of Amman, Zarqa and Irbid. About 38% of the total population resides in Greater Amman where about 35% of total number houses Ex-

ist. The high concentration of population in the major cities of Amman, Zarqa and Irbid has increased pressure on residential and agricultural lands in these cities leading to violation of zoning plans and lack of social and recreational services. Table 3 gives the results of successive housing censuses which reveal concentration of housing in Greater Amman where 38.3% of total number of houses exist and 37.3% in other major cities. It can be seen that around 73% of houses are in urban areas.

Table 3. Housing stock in Jordan

Location	Number of units	Percentage
Greater Amman	168252	34.5
Other Urban areas	175682	38.3
Rural areas	124766	27.2
Total	458700	100.0

The National Housing Strategy of Jordan [1] showed relatively healthy housing standards in terms of availability of services compared to those in most other developing countries. Approximately 89.2% of houses are linked to water networks, 93% have electricity and 94.4% have access to sewage network. Despite these facts, the field of housing and environment in Jordan suffer from such difficulties as pressure on public facilities and employment in large population pole center, construction expansion on lands not zoned for housing and slum and squatter settlements [2].

There is a reciprocal relationship between house and environment: Environmental elements such as climate and the surrounding

soil and water affect the house while the environment is affected by the house's existence, age, and length of occupation. The house and the people living in it experience the impact of rain, humidity, winds and solar radiation. Water bodies and green areas exhibit positive effect on the housing environment in terms of solar radiation and surrounding noise while the effect of soil can be seen in climate phenomena and air pollution.

4. Traffic noise measurements and analysis

The purpose of this part is to quantify the levels of noise which are generated from road traffic and compare these measured levels against appropriate standards for noise of this type. Measurements of traffic noise were performed using a noise level meter type 4426. The instrument was calibrated before use, and additional checks were carried out periodically during use. Laser speed detection radar was used to collect traffic speed data.

Measurement sites were located in Amman, and were chosen so as to provide as far as possible a comprehensive coverage over the urban area. The study sites included seven sites away from intersections where the view of the road is substantially unobstructed.

Noise level measurements were made with microphones mounted on a tripod at 1.2 meter above the road surface. The effect of wind was minimized by the use of wind shield at all times. The statistical analyzer used produced the result by hourly measures during the study period (6:00 to 12:00 midnight). The results obtained from noise measurements at the seven study sites given in table 4 showed an L10 (18h) noise level that ranged between 74.4 and 78.5 dB (A).

A feature of all seven sites is the noise levels over the study period show similar pattern where that noise levels are consistent throughout the 18 hours of each day with minor variation of 3-4 dB (A). A drop in noise levels was noticed during the last four hours (8 pm – midnight) due to drop in traffic flow

[3]. These trends of traffic noise agree with those found in an earlier study of traffic noise along urban roads of Amman [3].

The results obtained demonstrate that all levels of noise appear to exceed the maximum accepted limit in the residential areas of 60 dB (A) adopted by the 1995 Environment Protection Law in Jordan. Therefore attenuation measures are needed to lower these levels below the maximum acceptable limit. These measures should be introduced at no cost to residents.

Table 4. Measured noise levels

Site	Noise level dB (A)
Wadi Abdoun	76.6
Swefieh	78.5
Al Bayder	72.7
Al Nuzha	77.8
Al zuhur	75.8
Abu Nuseir	74.6
Wadi Saqra	75.1

5. Effect of traffic noise on people

The impact of traffic noise on people can cause annoyance by disturbing sleep, causing speech interference and interrupting daily activities such as watching TV, reading, studying, relaxing and entertaining. While there is no risk of permanent hearing loss from traffic noise, there is a great deal of evidence that noise generally can cause adverse health effects on people [4, 5].

Two main types of annoyances cause most of disturbances. The first is sleep disturbances caused by preventing people from falling asleep, waking them up and disturbing their sleep pattern. The magnitude of this effect depends on factors such as the variability of

noise levels, duration of exposure; time of night, the amount of sleep person has accumulated in addition to age and sex of the individual.

People who suffer disturbed or interrupted sleep as a result of traffic noise may, over long periods of time, suffer adverse health effects from the stress of sleep deprivation. As a result, the World Health Organization (WHO) recommends an indoor level of 3 dB (A) less to “preserve the restorative process of sleep”.

The second type of annoyance is speech interference by the traffic noise levels which is considered more serious in schools, homes, work places and play grounds. In appreciation to this effect Australian standards, for example, recommend as satisfactory an interior sound level of 42 dB (A) for classrooms and a maximum level of 47 dB (A).

6. Attitudinal survey

The survey method chosen was a direct interview using a questionnaire (Appendix 1), having a total of sixteen straight-forward questions. The respondents were asked about the amount of disturbance which they feel traffic noise causing them. In order to evaluate the effect of traffic noise on the daily activities of residents, a simple five – point semantic scale was used to measure all the effects reported by the respondents. The scale points are, not at all, little, some of the time (a fair amount), most of the time (a lot) and always (a great deal).

The result of analysis revealed the seriousness of the problem where about 70% of respondents reported that they are affected by traffic noise always or most of the time and more than half of all respondents think of changing their place of residence. The two groups of respondents affected “most of the time” and “always” were found to constitute the following percentages of all respondents to the main questions (Figure 1 and Table 5).

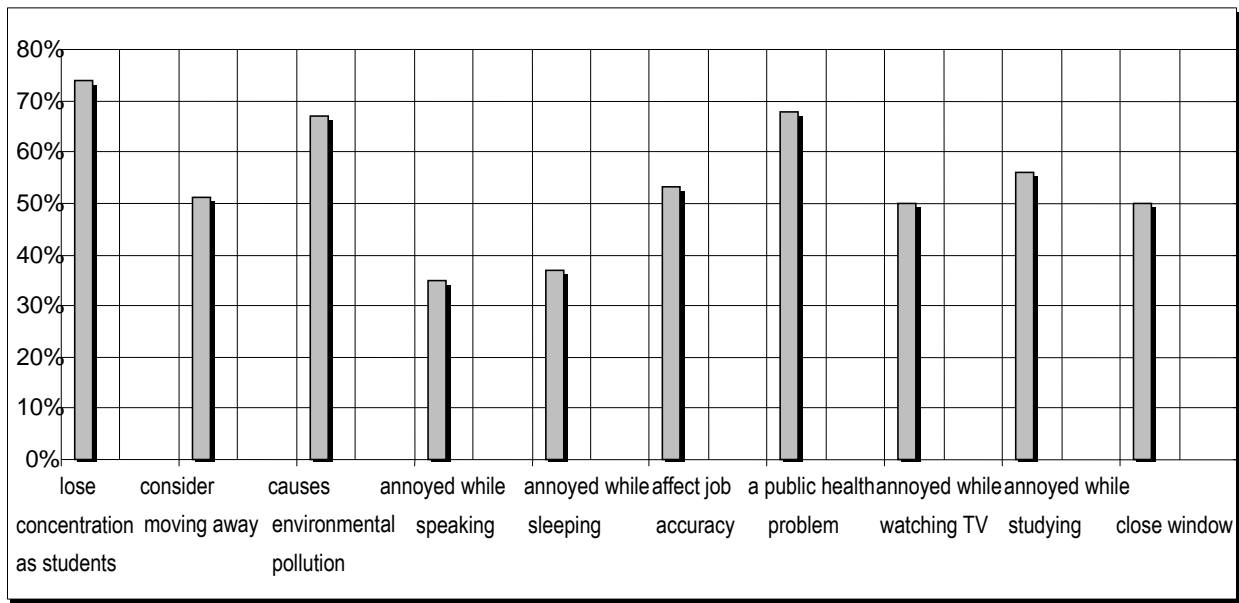


Figure 1. Analysis of the questionnaire

Table 5. Summary of Figure 1

50% close window	37% annoyed while sleeping
56% annoyed while studying	35% annoyed while speaking
50% annoyed while watching TV	67% causes environmental pollution
68% a public health problem	51% consider moving away
53% affect job accuracy	74% lose concentration as students

The above results show that a significant proportion of community seems to be seriously affected by traffic noise while performing their ordinary activities. Further effect of traffic noise in residential areas is that on the estate values. If all other factors and features of residential property are equal, then the difference in noise levels may be reflected on the differences in property values. This effect was reported to be a fall of 0.5 percent of property values for each one decibel increase in traffic noise level [6]. A larger scale and comprehensive study is recommended in order to

evaluate the variants effects of traffic noise and suggest necessary actions and strategies.

7. Conclusions

This study quantifies the social effects of traffic noise in Jordan and in particular within Amman city. It was found that Amman exhibit many of the adverse social effects of increasing traffic noise levels. The study established that residential areas adjacent to the sites where traffic noise was measured are subjected to noise levels of up to 78 dB(A). This doesn't compare favorably with the proposed maximum of 60 dB (A) adopted by the authorities. The effect of these high levels on people was to the extent that over half of the residents adjacent to these sites consider changing their place of residence.

Jordan has not yet produced a national strategy for controlling traffic noise while developed countries consider the issue as an integral part of all road developments. In view of the findings of this study an effective level of noise attenuation at no cost to residents is recommended.

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Appendix 1. A questionnaire on the effect of traffic noise upon population

	Not at all	Little	Sometimes	Most of the time	Always
Do you get annoyed by traffic noise?					
Do you close windows to avoid traffic noise ?					
Do you think traffic noise impacts human health?					
Do you think traffic noise impacts the environment ?					
Do you consider moving to a quieter place because of traffic noise?					
Do you think traffic noise force you to speak louder ?					
Traffic noise annoys me when I:					
Work					
Rest					
Talk to others					
Talk on the phone					
Eat					
Read					
Watch TV					
Sleep					
How do you describe the level you hear traffic noise ?					