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# SOCIAL SURVEY ON TRAFFIC NOISE FOR THE CITY OF PORTO ALEGRE, BRAZIL

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## INTRODUCTION

Urban noise, one of the main factors to determine the quality of life for urban populations, has been little studied in Brazil. This paper, that is part of a broader research project, presents the results of the response of a sample of the population of Porto Alegre, southmost capital city of Brazil, to questions related to urban noise.
Porto Alegre has a population of about 1 200 000 inhabitants, and can be described as having around 4 800 streets and a total of 520 000 vehicles (1994 values), these fleet being distributed in 78.26% of automobiles, 7.44% of small trucks, 3.62% of large trucks, 0.66% of buses, 0.16% of mini buses and 6.99% of motorcycles.

## TRAFFIC NOISE IN THE CITY OF PORTO ALEGRE

From a simplified traffic noise survey for the city, based on 560 sampling points, all referring to 6 p.m., Rott [1] found that more than 90% of the values were in excess to 65 dB(A). In all sites the noise level was in excess to 57.5 dB(A), thus well above the WMO [2] reference value of 55 dB(A), defining the daytime limit value for external noise levels, to avoid significant annoyance to the community.
The noise survey, due to personal and equipment constraints, was limited to one sampling time for taking noise measurements, at each site, this being 6 p.m. It is interesting to note that measurements made by Garcia and Faus [3] showed a high correlation between $L_{Aeq}$ values measured between 5 and 6 p.m. and the $L_{Aeq}$ referring to a 24 h period.

For the assessment of the exposure of the whole population to noise, the present work considered the city divided into zones with the same population density (PD zones), as it was verified that people living in zones with similar PDs were also exposed to similar traffic noise levels. Table 1 shows the range of noise level values for each PD zone, in terms of $L_{Aeq,max}$ and $L_{Aeq,min}$ , and the corresponding percentiles of population exposed to these levels.

Table 1. PD zones, population density, noise levels and population exposed to these noise levels.

| Identification of PD zones | Population density (n/km$^2$) | Noise level | | Population exposed (%) |
|---|---|---|---|---|
| | | $L_{Aeq, max}$ | $L_{Aeq, min}$ | |
| PD1 | > 25 001 | 78,9 | 72,0 | 1,07 |
| PD2 | 20 001 - 25000 | 80,6 | 69,7 | 1,78 |
| PD3 | 16 001 - 20 000 | 82,6 | 68,2 | 4,64 |
| PD4 | 13 001 - 16 000 | 80,7 | 59,9 | 9,19 |
| PD5 | 10 001 - 13 000 | 79,4 | 59.6 | 19,47 |
| PD6 | 7 001 - 10 000 | 81,5 | 59,0 | 30,83 |
| PD7 | 4 001 - 7 000 | 79,4 | 57,6 | 17,54 |
| PD8 | 1 001 - 4 000 | 81,6 | 61,2 | 14,53 |
| PD9 | < 1000 | 79,4 | 59,1 | 0,95 |

Some aspects of the noise survey raised some questions, whose response were sought through a social survey: What is the population response to such noise levels? How annoying is traffic noise to the population when compaired to other noise sources?

## SOCIAL SURVEY

According to Rao and Rao [3], studies developed in other countries state the general levels of noise that start determining a particular disturbance, but these are not universally applicable to all and any group of persons; they vary, depending on the ethnic, cultural and economical characteristics of the people.

In order to characterize the response of the population of Porto Alegre to urban noise, a questionnaire was applied to 321 persons. These were interviewed at their homes, from where traffic noise data was also available. The following questionnaire, that is a simplified version of others [4], [5], [6], used in similar surveys, was applied:

1. Do you think noise is harmful to health?
2. If positive, what sort of problem does it cause?
   ❑ irritation ❑ fatigue ❑ insomnia ❑ others: what?
3. Does the noise in your neighborhood annoy you?

4. In what time of the day does the noise in your neighborhood annoy you most?
5. Does traffic noise annoy you?
6. In what time of the day does traffic noise annoy you most?
7. What sort of vehicle annoys you most?
8. Of the following items, how annoyed are you by them?:
- construction noise ❑ very annoyed ❑ medium ❑ little ❑ not annoyed
- people's voices ❑ very annoyed ❑ medium ❑ little ❑ not annoyed
- animals ❑ very annoyed ❑ medium ❑ little ❑ not annoyed
9. Have you ever made a complaint to any official authority, concerning the annoyance caused by noise in your neighborhood?
10. If positive, was the problem solved?

## RESULTS AND DISCUSSION

The results from the social survey, confirming the international trend, revealed that traffic noise is a major source of annoyance to the population. The great majority (75%) identifies noise as causing harm to health. From these, 35% identify noise as a source of annoyance; 38%, as causing insomnia; 3%, as making people feel tired; and 24%, identifying noise as a source of other problems. More than 56% of the interviewed people said they were annoyed by traffic noise, considering the afternoon (49%) as more disturbing, followed by the morning (29%), while 22% considered the night as being the most disturbing period.

With regard to noise generated by neighbors, the afternoon (39%) was considered as being most noisy, when compared to the morning (29%) and to the night (21%).

In relation to traffic noise, buses are considered the major source of annoyance (47%), followed by automobiles (27%), motorcycles (23%) and trucks (3%).

When asked about other sources of annoyance, people identified construction noise (50%), people's voices (40%) and animals (7%) as the most annoying.

From the 321 interviewed people, only 2 made a formal complaint to the authorities concerning noise caused by neighbors. These considered that their complaint did not help solving the problem.

## CONCLUSIONS

The obtained results show clearly that a considerable fraction of the population of the city of Porto Alegre is exposed to relatively high noise levels, interfering in their daily activities and affecting their health.

Traffic noise is the main noise source in the city, this being due both to the large number of vehicles in the streets, but also to high age and poor maintenance of buses, trucks and automobiles.
It is alarming the finding that, from the results of the work, there is a strong indication that the noise climate of the city, as a whole, and not only at the measuring sites, expose the great majority of the population to noise levels in excess to 65 dB(A). Even in residential areas the population are exposed to very high levels. In commercial and residential areas, with a high traffic volume, where people is exposed to high noise levels for long periods, the situation is particularly worrying.
A comparison between the results found in this work and those of developed countries shows the gap separating both realities. It is such that Lang [7] shows concern with the fact that 15% of the population of the European Community is exposed to a noise level exceeding 65 dB(A), that he refers as being considered as an absolute upper acceptable limit. In a more recent paper, Müller [8] refers as being 10% the total of the European population exposed, during the day, to a level in excess to 65 dB(A). Being 10% or 15% the real figure to identify the population exposed to this acceptable limit, it shows a very large distance from the 90% figure found in Porto Alegre...
Although the majority of the population identifies a relationship between noise exposure and health, only a few show a positive attitude to protect themselves against noise. This helps to explain the low priority given by the authorities to noise control.

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