

Urban Noise Characterization in Maringá's Central Area: Subsidy to Construct an Index for the Urban Life Quality

P. F. Soares ^a, K. S. Meneguetti ^b and B. F. e Silva ^c

^a *Departamento de Engenharia Civil, Universidade Estadual de Maringá, Av. Colombo, CEP 87020-900, Maringá-PR, Brasil, pfsoares@uem.br*

^{b,c} *Curso de Arquitetura e Urbanismo, Departamento de Engenharia Civil, Universidade Estadual de Maringá, Av. Colombo, CEP 87020-900, Maringá-PR, Brasil*

ABSTRACT: The urban planning in Brazilian cities has been limited to isolated, fragmented, not updated decisions, and for that, it is not able to handle the space production and usage as a result of the same social and environmental context. It is necessary to review the public policies and urban planning instruments so that they may get closer to the urban needs and changes, as well as their conflicts and potentialities.

This review goes to the use of evaluation methods in the urban index form, which contain an answer of urban quality, able to advance the urban system daily reactions in front of any incentive, facilitating the impacts forecast, sceneries simulation and, to help the desirable performance construction.

In this way, the research proposes to diagnostic the urban noise levels in the Maringá central area and construct a sound map of this area, helping a construction of an indicator and, in the future, an environmental atlas, allowing a continuous monitoring of this impact. In this paper is presented the preliminary analysis and results measures were done.

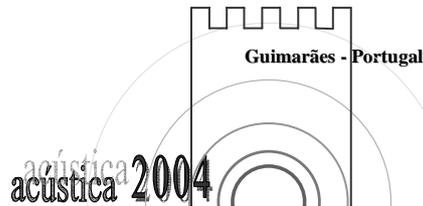
1. INTRODUCTION

Brazil passed by an accelerated urbanization process in the last century. More than 80% of the population lives in the cities today, accelerating the current problems of this growth that at the same time was concentrated, above all in the media and big cities.

Besides the sanitary demands and environmental problems that has been felt, other aspect due to this urban concentration is the sound pollution that is characterized by the noise excess, that is an undesirable sound and cause negative effects on the listeners, with disturbing action depending on the intensity and duration, the people's hearing capacity exposed to the sound, the source, the frequency, the message and it is provoked emotions or not.

The growth and variety of the sound sources make this pollution. These occur mainly in urban areas that had not adapted use planning and occupation of the soil. The way as the constructions are arranged in the city, can contribute to minimize or to increase the urban noise, as well as the increase traffic circulation and conditions, industries and building location.

All these factors that provoke the sound pollution in the cities cause auditory damages known to centuries, but that before were associated to professional groups of industries and some specific services, as metallurgic. Like this for a long time the concerns with the relative damages to urban areas, they were left sideways, so much in relation to the urban legislation



as well as in the field of scientific researches, and that in many cases have been hindering its largest knowledge and quantification while environmental impact.

From 70's because the urban concentration, the concerns around the acoustic comfort left the buildings, and took the streets. The urban noise became focus of studies being included in urban life quality index in some cities.

According to researches accomplished from 1970 by the World Health Organization (WHO), the main Brazilian capitals were among the noisiest cities of the world. Today it is already also part of the daily of the medium Brazilian cities. Most of the people's claim is about noise because this environmental degradation generates discomfort. Besides the deafness and the activity interference, a long time noise exposition to intense level, can cause negative body effects, increasing the stress and reduce job performance.

This way is necessary to know and to measure the noise, one environmental impact due to space production, to anticipate the urban system reactions in front of any stimulus. As these conflicts are due to the continuous activities, the instruments should be of same nature as well as the urban territory, which needs to be treated under new space representation to know and to act in accordance with its particularities.

In this sense, the research proposes to diagnose the urban noise levels in the pilot area of Maringá, to build a sound map of this area, its impacts over urban life and after, to propose laws changes, joining subsidies for a zoning law revision and after that to construct a Urban Life Quality Index considering the noise indicator.

In a second moment, the noise map will also contribute to discuss the urban drawing in this pilot area, as tool in the proposition in urban ways to minimize the impacts due to the noise, taking to the largest environmental quality.

Above the noise map, the research will lift data for future Environmental Atlas elaboration for this city. In a long-term period, this atlas needs to have the hole environmental aspects of the city, enlarging the knowledge about the city.

2. METHODOLOGY

Above the 75 dB(A) the noise is prejudicial to the body. Cause pain above 120 dB(A) and is fatal in 180 dB(A)[1]. The other noxious effects of the noise include: total loss audition, hypertension, muscular tension, and headache, increase the cholesterol, gastric ulcer, stress. These factors take us the need of the knowledge about urban noise so that there is possible to use control strategies, improving life quality.

DACACH (1983) [2], points out that the cars in normal movement produces 70 to 75 decibels, from motor, the transmission, the differential, the tires and chassis. For heavy truck with big velocity the sound pressure level grows to 90 decibels. Honked, discharges tube without muffler, broken and abrupt departures worsens all those noises.

The traffic noise affects the pedestrians and people inside the building. It is the largest urban problem in medium and big cities. Therefore, the appropriate planning, or its re-direction, based on performance indexes, can carry out a differentiation factor in the effective improvement of the urban quality life and for that the noise map is the first task. The noise maps are the starting point for the accomplishment of a rigorous diagnosis of the sound

pollution impact on the population and, based on these maps, the posterior decisions will take of control and mitigation.

The methodology related to the space sampling [3], in a brief way, consists in establish a mesh, according to the blocks distribution in the city; it can vary from 200mx200m until 500mx1000m, according to the need. The researches needed select a 500mx1000m mesh (see Figure 1).

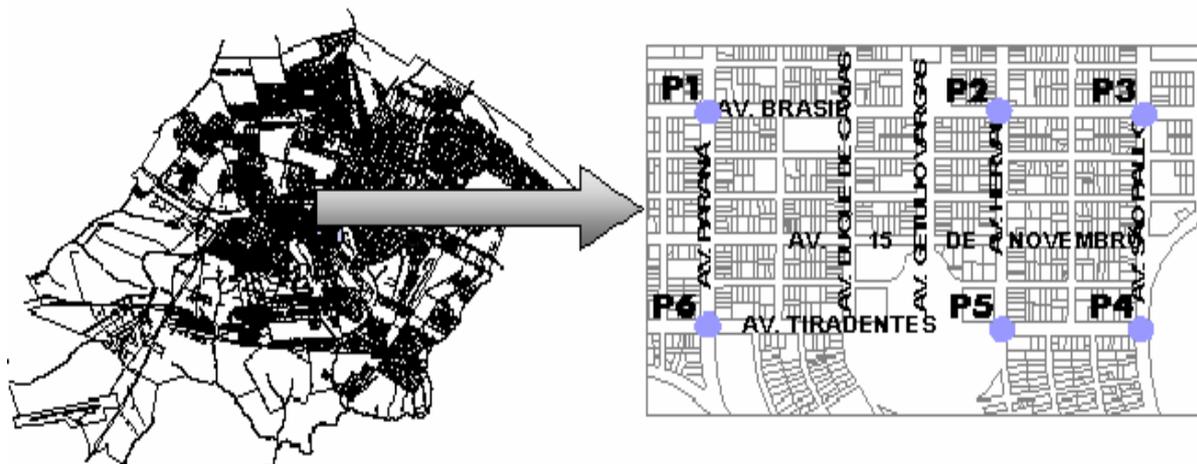


Figure 1 – Sampling macro-localization points – Maringá map and central area map

3. EQUIPMENTS

In our measurements was used SdB+ equipment, from 01 dB-Stell.

Type: filter 1/1octave, type 1 (CET 1260)

Method of Analysis: Chebyshev in 6th order in commuted capacity

Sampling frequency: 27 FO (FO central frequency)

Proportion of frequency: 1/1 of octave = 2

Frequency median (Hz): 31.5, 63, 125, 250, 500, 1K, 2K, 4K, 8K

Level reference in association: 60-120 dB

Level of Reference: 94dB

Reference attenuation: 0 dB

It climbs Lineal: 60 dB

Total Mensuration scale: 30 to 140dB

Reading scale: 00 to 140 dB

Mensuration scale: 30/90 - 40/100 - 50/110 - 60/120 - 70/130 - 80/140



4. RESULTS

4.1 Average Values

Data were collected during November 2003, in the following days: Monday morning and afternoon; Wednesday morning and afternoon; Thursday morning; and Friday morning.

In December data were collected to the days: Monday morning and afternoon; Wednesday morning; Thursday morning; and Friday morning.

In these measures were got up the data kind L10, L50 and L90 in the points P1, P2, P3, P4, P5 and P6.

With the found values it could be studied the averages of the measure to find a typical day, shown in the following table.

Table 1 –November and December Typical Day

Measure Type	Average dB(A)
L10	77.92
L50	71.26
L90	66.68

4.2 Averages Values Analysis

After the data collection and tables preparation, it was worked in Surfer[®] software, for graphs edition in two dimensions and, later on, in three dimensions.

The noise variations can be easily seen, even for not habituated glance with traditional graphs and tables.

In advance are presented samples of produced graphs, figures 2 to 5, all of them after NUNES & SOARES (2004)[4].

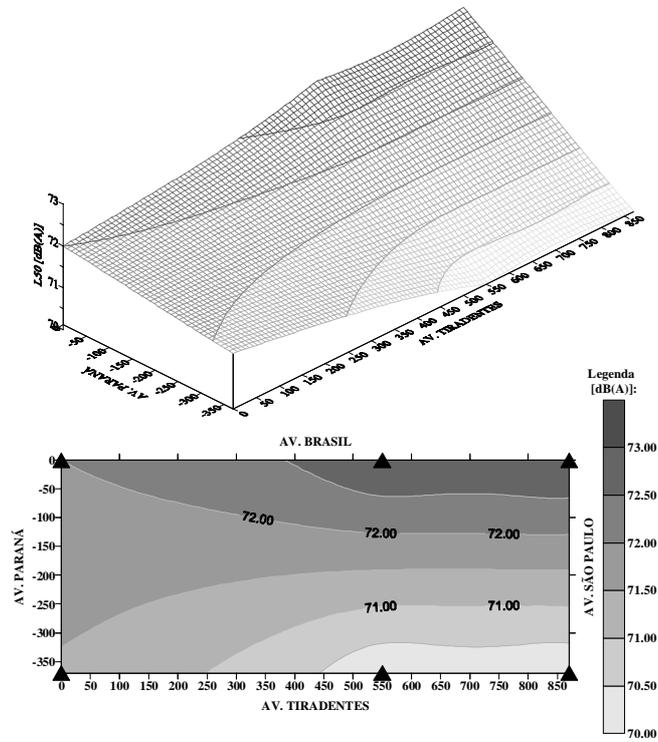


Figure 2 – Graphic sample – L50 – December, Friday morning.

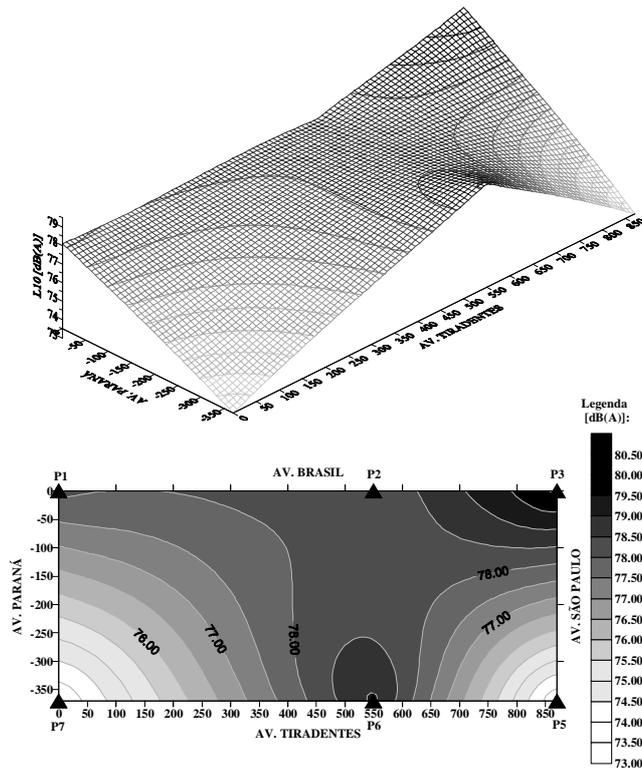


Figure 3 – Graphic sample – L10 – November, Friday morning.

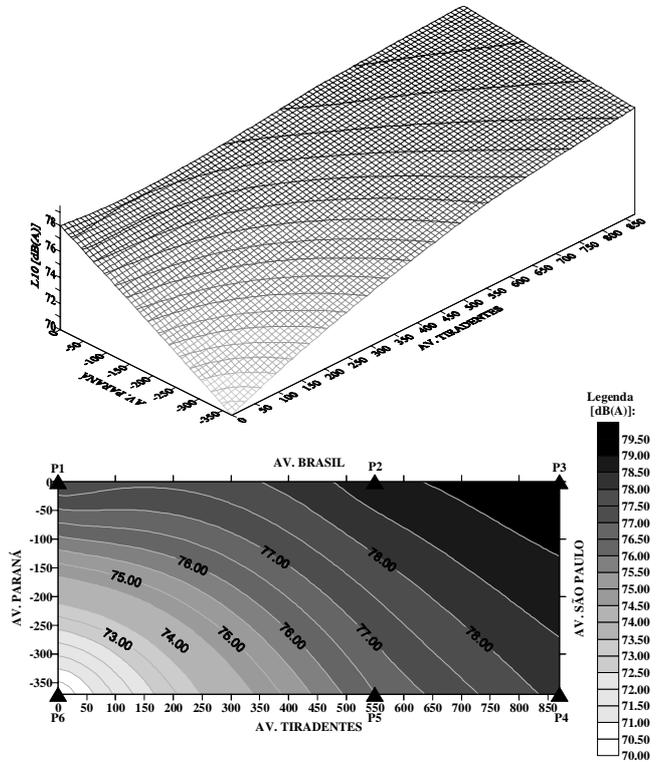


Figure 4 – Graphic sample – L_{10} – November, Thursday morning.

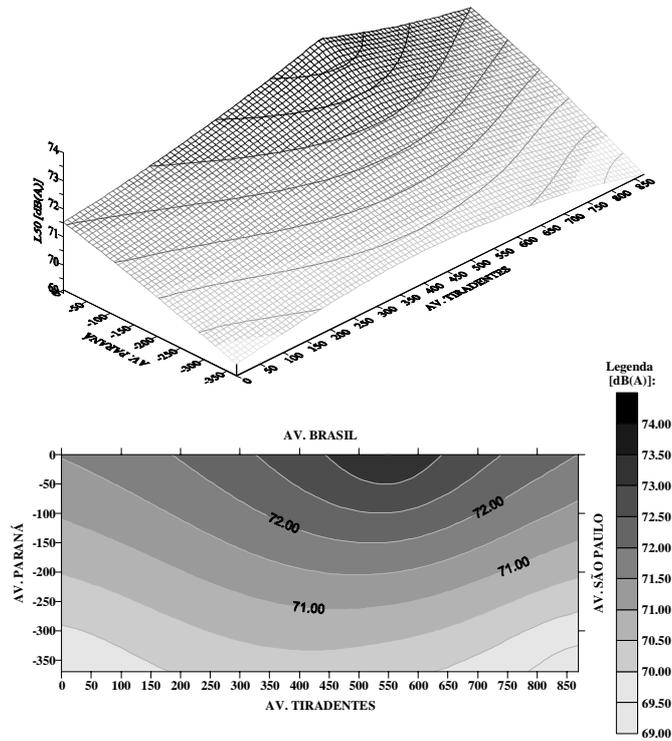
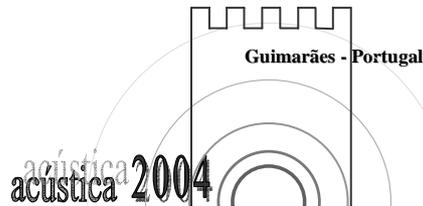


Figure 5 – Graphic sample – L_{50} – December, Monday afternoon.



5. DISCUSSION AND CONCLUSIONS

The daily exhibition to the urban noise in Maringá central area, is not harmful to the health to the pedestrians and workers, according to NR 15 criterion [5]; to the inhabitants, however, it can cause problems, because in some days the noise - as verified in the P4, crossing among the São Paulo and Tiradentes avenues - can reach 85 dB(A), and the exhibition at this noise level can last up to 8 followed hours, according to Brazilian Roles. The workers will be exposed to the urban noise for 8 hours a day because they work only during this time. The workers would be limited to the allowed time. Even so the inhabitants of the area, if exposed more than 8 daily hours at this noise level can present health problems.

The measured level doesn't presents large variations between measured points and days of the week. According to the measure during November and December 2003, the worse period was Friday morning, which presents the largest values of Sound Pressure Level (SPL).

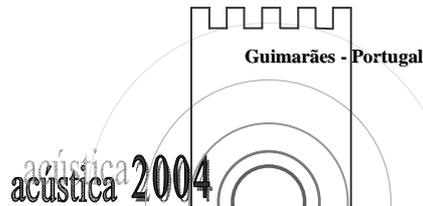
Analyzing tables and graphs was obtained the representative typical day for the months in analysis, which has a tolerable noise for exhibition according legislation. In November the typical day can be represented by Thursday, in which the levels of noise is approached to the found averages for typical day; in December this day can be represented by Monday, for the proximity of values.

According to the Maringá legislation, the sounds and noises in central zone has limited 60 dB(A). Being compared to the typical day, the found noise levels are above the 60 decibels allowed by the legislation. In this case, was verified that the noise is excessive in this area and some reduction measures should be taken, so that the Municipal Law 218/97 can be respected [6].

Is worthwhile to remind that these are preliminary results, once the data were analyzed referring only to November and December. Subsequent stages are being accomplished of noise measures that will increase larger information so that a more detailed diagnose the noise in this area of the city can be done.

6. ACKNOWLEDGMENTS

To achieve the monitoring was necessary to mobilize a big academics group from Architecture and Urbanism and Civil Engineering undergraduation courses in the periods from 17/11/03 to 12/12/03 and from 09/02/04 to 19/03/04. To those students, whose names are listed, our gratefulness: Rafael A. Pereira; Ricardo Thiesen; Patricia Bruder Barbosa; Mariane Sant'Anna of Oliveira; Mayara Talita Camargo Galhera; Vania Costa Gusmão; Tadeu Gonsales Galvão; Lucila M. Beltrame; Gisele Godoi; Bianca Kimie Yoshida; Carla Fernandes Sander; Aline Lisot; Paulo R. Reschetti Júnior; Daniela Brunet Marques; Letícia Borges Reis; Rodrigo M. Gimenez; Yutaka Mario Kobayashi Jr. Brian Randal Brümmer; Jaqueline Thiesen; Julio César Macedo Rodrigues; Marcos Antonio Ruiz Filho; Sidnei Camacho Ramos; Roberta Mertz Rodrigues; Janaina M. de Oliveira; Marieli Azoia Lukiantchuki.



The authors are thanks to academic Layane Alves Nunes (PIBIC fellowship), which worked in data and graphs systematization.

We also thanked the logistic support of the Environmental Comfort and Ergonomics Laboratory (LACAE) of the Civil Engineering Department, in the name of Professor Aline Montagna da Silveira and Architect Irene de Freitas Mendonça.

BIBLIOGRAPHY

- [1] MILLER JR., G. T. *Living in the environment: an introduction to environmental science*. 6th ed. Belmont: Wadsworth, 1990.
- [2] DACACH, N. G. *Saneamento ambiental*. Rio de Janeiro: Guanabara Dois, 1983.
- [3] CELMA, J. C.; LUZÓN, M. A. *Actuaciones estratégicas contra el ruido en zaragoza*. Zaragoza: Unidad de Medio Ambiente del Ayuntamiento de Zaragoza, 2001.
- [4] NUNES, L. A.; SOARES, P.F. *Mapeamento e análise do ruído na região central de maringá*. Maringá: Departamento de Engenharia Civil/CTC/UEM, 2004. – (Relatório semestral/PIBIC).
- [5] ABNT. NBR 12179: 1992. *Tratamento acústico em recintos fechados*. Rio de Janeiro: Associação Brasileira de Normas Técnicas, 1992. – (NB 101).
- [6] CÂMARA MUNICIPAL DE MARINGÁ. *Lei Complementar nº 218/97*. Maringá, Câmara Municipal de Maringá, 1997.