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URBAN NOISE CONTROL BY LEGISLATION IN RIO DE JANEIRO

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ABSTRACT

Humid tropical weather, like the one in Rio de Janeiro, demands restrictions concerning general constructions. The need of natural ventilation and small thermal amplitude turns the facades of the buildings permeable. Even in their houses, people are careless in protecting themselves from the noise. Normally, urban legislation tries to limit the immission of noise, instead of the noise emission. The strategy to go from a legislation based on the immission to a legislation based on the emission is presented in this work. The difficulties in the choice of the criteria for maximum noise emission levels and the need to make compatible this legislation with the one on immission are discussed, as well as the way of mediation that must be employed.

1 - INTRODUCTION

In countries of continental dimensions like Brazil, the acoustic, physic, mental and social wellbeing cannot be based on imported standard scheme, for each city must be evaluated within its own region. The adequacy of each region's field to the Brazilian climatology opens a complex study that encloses the testing of three basic elements: origin of noise, the way of propagation and receptor allied to the climatic characteristics, the geography and the urban net.

At a lively street like "Nossa Senhora de Copacabana", one can notice that most of the windows are open the entire day, disregarding the fact that the external noise is really strong throughout the whole day.

A solution to this problem would consist in closing the windows and installing an air conditioning system, but such solution is too expensive to most part of the population whose economical income is rather low. Another solution that was experimented in Rio de Janeiro consisted in controlling the urban noise adopting a legislation limiting the noise at the origin.

To understand the problem of urban noise control it is important to have some information's about Brazilian climates.

2 - BRAZILIAN CLIMATOLOGY

In Brazil there are three basic local climates [1]: **humid tropical**, that is warm, but rainy with abundant vegetation and little or no change in temperature from day to night; **dry tropical**, also warm, yet with little rain, little vegetation, but with significant changes from day to night; **temperate**, that in some parts of the year is really cold, mainly at night.

There are systems specialised in Bio-Climatic Architecture like the Mahoney table that relates local climate to architectonic recommendations (facade characteristics, needs for openings for natural ventilation, etc).

Specifically in Rio de Janeiro, in the hot humid climate, buildings must be orientated longitudinally in the axis east/west with the purpose to diminish the solar exposure. They must have two opposing faces with 40 to 80% of the facade north/south, guaranteeing a good ventilation and have walls, floors and coverings with light material of low thermal inertia. These recommendations most of the time are diverging from that of the classical acoustical quality of the constructions.

It should be also observed that in Brazil there is no acoustic regulation establishing minimum criteria of acoustic quality for any construction. Therefore, all attempts in this direction should take in consideration the climatic characteristics of each region.

3 - BRAZILIAN LEGISLATION

The National Council of the Environment- CONAMA, which is a federal government organ, approved the resolution 001/90 on March 8th, 1990. It concerns the "Evaluation of noises in inhabited areas, seeking the comfort of the community, from the Brazilian Association of Technical Norms- ABNT", in agreement with the levels established by the standard NBR10151 inspired on the Standard ISO 1996.

The emissions of sound from automobile vehicles are regulated by the National Traffic Council- CONTRAN centered on the public organ administrator of this public dominion.

The norm NBR10151 gives "levels of noise for the acoustic comfort" in agreement with a hypothetical zoning of the city (Table 1):

ZONE	NIGHT	DAY
Hospitals	40	45
Urban Residential	50	55
City Centre (business, commerce, administration)	60	65
Industrial Area	65	70

Table 1: Zoning and maximum noise levels from NBR10151.

The Resolution 001/90-CONAMA [2] refers to protection and health, and the objective of NBR10151 is that "any question regarding risks to the health caused by noise are to be studied in specific norms". Since the numbers given by NBR10151 are measured in points of sound reception it could be referred to as norms of immission.

In regard of the constitutional system the resolution CONAMA 001/90 incorporating the values of the NBR10151 [3] are "general norms", agreed with article 24, 1°, from the Federal Constitution, giving states and cities the right to propose more restrictive values. Exists a Departmental Law N°126, dated May 10th 1977 that protects the whole state of Rio de Janeiro against sound pollution, yet it is not used. Rio de Janeiro Municipal Decree n°5412, dated October 24th, 1985 and the Regulation n°15- FROM PROTECTION AGAINST NOISES, gives other solutions [4].

In agreement with the Municipal Decree from Rio de Janeiro, the maximum criteria level for each zone and each period of the day is presented in the Table 2. It can be seen that the zoning of the city is more detailed than the basic zoning proposed by the NBR10151 Standard federal and some residential zones have upper limits of noise levels.

In order to enforce the sound limits imposed by law, the Secretariat for the Environment of Rio de Janeiro runs an average 100 sound measurements each week, covering all regions of the city. From these measurements a sound pollution map of the city has been performed.

But the most important is that for the measurement of noise produced by an activity, the sound level meter must be placed in a distance **at least 1.5m from the boundary of the building which contains the source of sound or noise.**

The solution to perform the measurements near the source, at 1,5m, is controversy because it can bring many advantages for the urban noise control.

ZONE/ USE/CODE		DAY	NIGHT
Residential Zone 1/Residential only one family/	ZR-1	55	50
Residential Zone 2/Multifamily middle school teaching/	ZR-2	55	50
Residential Zone 3/Commercial constructions and services/	ZR-3	60	55
Residential Zone 4/Two families, commerce and services/	ZR-4	60	55
Residential Zone 5/Multifamily, commerce, services, small industries/	ZR-5	60	55
Residential Zone 6/Residential and agricultural/	ZR-6	55	50
Central Area 1/Services, diverse commerce, multifamily/	AC-1	70	60
Central Area 2 /Services and diverse commerce/	AC-2	70	60
Tourist Zone 1/Multifamily, commerce related to tourism/	ZT-1	65	60
Tourist Zone 2/Multifamily, commerce related to tourism/	ZT-2	65	60
Port Zone/Wholesale commerce/	ZP	70	60
Industrial Zone 1/Compatible industrial activities, residential/	ZI-1	70	60
Industrial Zone 2/Industrial activities with dangerous characteristics/	ZI-2	70	60
Industry commerce Zone/Industry, commerce, multifamily/	ZIC	70	60
Special Zones/Special characteristics of zoning for each/	ZE/Zes	55	50
Centre of neighbourhood/Commercial/	CB de ZR-1	60	55
Centre of neighbourhood/Commercial/	CB de ZR-2	65	55
Centre of neighbourhood/Commercial/	CB de ZR-3	65	55
Centre of neighbourhood/Commercial/	CB de ZR-4	65	60
Centre of neighbourhood/Commercial/	CB de ZR-5	65	60
Centre of neighbourhood/Commercial/	CB de ZR-6	60	55
Centre of neighbourhood/Commercial/	CB de ZT	65	60
Centre of neighbourhood/Commercial/	CB de ZI-1	70	60
Centre of neighbourhood/Commercial/	CB de ZI-2	70	60

Table 2: Zoning and maximum noise levels for the city of Rio de Janeiro.

4 - URBAN NOISE CONTROL

In order to solve a noise problem three basic elements must be studied: where the noise comes from (origin), how it propagates (mean) and how it affects the receptor or listener (what can be done).

The solution of the noise problem may demand changes in one or in all basic elements: changing the origin to reduce the noise production; changing or controlling the way of transmission and the environment (acoustic barriers, vegetation, etc) to reduce the noise level that reaches the receptor; and/or giving the receptor the mechanisms of blocking the sound (close windows, mechanical ventilation systems or air condition).

The conception of urban sound pollution control in means of a planing consists in registering the relationship between the most important causes of change and establishing a hierarchy between the different causes.

Although in agreement with the Brazilian climatology showed before, dealing with sound pollution has become extremely difficult. In virtue of the difficulty to adapt the thermal comfort with the acoustic comfort, the climatic comfort is many times achieved with a loss of acoustic comfort or vice-versa.

Brazil do not have resources to establish a controlled urban planing. The same happens with the infrastructure essential to the city: vehicles, roads, public ways, taking in consideration the sound and climatic impact.

In agreement with the Municipal Legislation of Rio de Janeiro, it is interesting to define a maximum level of noise at the "emission", bringing advantages to the urban noise control. It should characterise directly the origin, mainly important in cases of multiple origins, and limit the maximum noise level in the city.

However, the results of measurements performed near a source cannot be used to verify whether the noise of a specific source is annoying, for it is not included the attenuation or amplification of the noise through the means of transmission.

5 - CONCLUSION

The solution adopted by the city of Rio de Janeiro has been very effective to reduce the emission of noises coming from places like bars, religious temples and funk balls.

As observed above, this kind of legislation is from a different nature of the federal legislation. But, the adoption of a legislation limiting the noise at the emission need to defined. New values of noise level limits should be set in order not to create controversy between the owners of sources of noise and the complainers. Studies must be performed through simulations in order to relate the maximum levels of the emission and of the immission in different forms of urban tissue. Also acoustic regulation establishing minimum criteria of acoustic quality for any construction is needed.

Once the problems exist for a long time and is centralised in the system depending on a series of political, economical and social interests, a deeper studied regarding the most common architectonic conditions should be made for a long-term solution. Cooperation, economic support, understanding, and a strict control it will be favourable for the community and in some source to the economic groups and politicians.

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