

inter.noise 2000

*The 29th International Congress and Exhibition on Noise Control Engineering
27-30 August 2000, Nice, FRANCE*

I-INCE Classification: 0.0

URBAN PLANIFICATION AND GENERATION OF DIVERSE AREAS OF ACOUSTIC SENSIBILITY

R. Alsina

AJUNTAMENT DE BARCELONA, TORRENT DE L'OLLA, 218-220 2º, 08012, Barcelona, Spain

Tel.: 93-291-40-08 / Fax: 93-291-40-32 / Email: ralsina@mail.bcn.es

Keywords:

ACOUSTIC, ZONING, NOISE, CITY

ABSTRACT

This paper is about the new noise by-law of Barcelona and one of its most important consequences: the acoustic zoning of the city. The regulation gives guide levels of environmental noise not to be exceeded in the different zones as a function of their definitions, and other factors, as acoustic insulation of buildings depends on these guide levels. Consequently, the following step after the publication of the by-law, has been the zoning of the city, which has been done taking into account the acoustic reality of the city, given by the acoustic map, and the definitions of the acoustic zones, given by the by-law.

1 - INTRODUCTION

More and more the preoccupation for noise as a pollutant element is increasing in all European cities. Whereas classical environmental topics such as water or air have had community initiatives for many years, in the case of noise pollution an overall consensus is needed.

In 1996 the Green Paper of noise was published by the European Community [1]. In it there are diverse aspects for future reference for creating a new Community Directive in noise regulation. The Green paper shows the following needs:

- The priority of giving more importance to environmental noise and make it an indicator of the quality of life.
- Doing campaigns to raise public awareness of noise pollution
- To share legislative responsibility, control, and vigilance between all the diverse levels of the Administration (from EU, State members, to regional and local Administration).
- To propose new Directives to create a new frame for the action against noise pollution.

As a consequence of the application of this Community will, 5 Working Groups (WG) were formed in 1998 and which were later increased to 9 WG.

These groups are in charge of harmonization; sharing knowledge, procedures and legislation of noise matters. These WG are:

WG in perception	WG in noise emission
WG 1 Indices	WG 6 Road transport
WG 2 Dose-Effect	WG 7 Outdoor machinery
WG 3 Computation and measurement	WG 8 Railway
WG 4 Noise maps	WG 9 Aircraft
WG 5 Abatements	

Table 1.

The efforts made by the Community State members also reflect the administration's co-responsibility on the matter of environmental noise.

At present, at the level of Spanish State a new noise regulation is being prepared.

In Catalonia the Autonomic Government has also been working in this direction.

At local level, the big cities, as in our case Barcelona (BCN), working with control and vigilance of noise matters has been applied as of a few years.

2 - THE BY-LAW AND ZONING OF BARCELONA

The Barcelona noise by-law was revised in 1999 and approved in June of the same year. Between other things the regulation gives guide levels of environmental noise not to be exceeded in the different zones as a function of their definitions.

The zones and guide levels are:

Zone	Definition	Daytime 7-22 h	Night 22-7 h
I	High acoustic quality territorial sectors	60 dBA	50 dBA
II	Housing and residential use sectors	65 dBA	55 dBA
III	Housing, residential, commercial and service use sectors	70 dBA	60 dBA
IV	Industrial use sectors	75 dBA	65 dBA
V	Special acoustic zones	-	-

Table 2.

The regulation specifies that the guide levels will be increased by 5 dBA in cases of traffic of more than 25.000 vehicles per day, and pedestrian areas must have a 45 dBA level at night.

The intention of the zoning has been to adapt the acoustic reality of the city, showed in the acoustic map, and the council's decision to limit the environmental noise levels which are represented by the council by-law.

The Barcelona acoustic zoning is based on four tools: the acoustic map, the by-law, the "traffic spider" and the building height map of BCN completed with the aerial photograph.

The acoustic map was made between the years 1995 and 1998, and includes more than 4.700 short-time measuring points and 100 long-time measuring points [2]. The long-time measures were used to determine that the noise was constant in the daytime and as a consequence the short-time measures can be taken at any time during the day. They can also be used to determine the differences between daytime and night measures to estimate the night noise map.

As a resume the obtained results show that 50 % of Barcelona streets are between the levels of 60 dBA and 70 dBA and only 7.8 % are above the level of 75 dBA. But the typical distribution of the extensive central zone of BCN called "el Eixample" presents big blocks with a big interior area not exposed directly to the street noise. This means that the percentage of population exposed to high noise levels is always less than streets exposed to the same level of noise.

For this reason, the percentage of population exposed to between levels of 60 dBA and 70 dBA is 40 % and only 2.7 % is exposed to superior levels of 75 dBA.

For example the average of the day time levels in the interior areas of these blocks is only 54.2 dBA.

The "traffic spider" is the map of the average vehicle flow per day which circulate on Barcelona streets and was used to locate the streets with more traffic than 25.000 vehicles per day and to introduce the correction of 5 dBA taking into account the by-law.

The building height map of BCN together with the aerial photograph permitted the localization of the interior areas of the blocks and were zoned with the data provided by the acoustic map. All the incoming data was integrated into one computer program to enable a better and quicker access to information and greater facilities for future updating.

The zoning has been completed taking into account the measured levels of the acoustic map and the definition of the zones according to the by-law.

For example a street with the level of 68 dBA would be classified as zone III, but a residential street with a measured level of 72 dBA would not be classified as zone IV because the definition of zone IV is of industrial use.

The guide levels above-mentioned are values which can not be surpassed. For this reason no one can set-up an activity that increases the environmental noise level more than the guide level. On the other hand the guide levels for the interior of houses is the same for the whole city. This means that the isolating

level of the houses will depend on the exterior level. As a consequence, for the effective application of the by-law, the city zoning is essential so that an activity can find out its emission limit and can determinate the necessary isolation in the new houses to be built. The by-law and the zoning have looked for the equilibrium between the acoustic reality and the possibility to improve the acoustic conditions of the city.

3 - CONCLUSIONS

The acoustic zoning of BCN city (Fig. 1) permits defining which is the maximum emission level of any activity and the isolation level in the new houses to be built as a function of their location in the city. At the same time, by combining zoning and acoustic map data, we can extract a deviation map (Fig. 2) of the measured levels by referring to the guide levels, indicating the areas that have surpassed the guide levels and work on improving the acoustic quality of these areas as a priority.

BCN is a consolidated city with all it's territory occupied. The zoning is a tool even more important in the expanding cities if it is included in the territorial planning, specifying areas that want to comply with the determined guide levels. By doing this aspects such as traffic flow, building type, occupation density, etc. can be defined as a function of the acoustic quality of the zone.



Figure 1: Example of different acoustic zones in Bcelona center.



Figure 2: Deviation map.

REFERENCES

1. **European Union**, *Future noise policy - European Commission Green Paper*
2. **Alsina, R.**, Analysis of environmental noise in Barcelona, In *Barcelona seminar urban noise in european cities*