



Acoustic evaluation of leisure events in two mediterranean cities



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ABSTRACT

Nowadays, leisure noise is one of the most important noise pollutants. It is thought that this kind of noise is only present outside bars and discotheques. However, this is not true, especially in Mediterranean cities, because noise is also found in concerts, popular festivities, sport events or religious celebrations. These occasions produce high noise levels; and depending on the kind of event, these are repeated with more or less frequency. Besides, in some cases, they take place at night, so the annoyance is higher for more people. For this reason, people who complain about these circumstances increase every year.

This paper is about this kind of noise in two Mediterranean cities with very different characteristics. In both of them, the most important leisure events that take place along a year have been measured. Binaural measurements have been taken to characterize them from the acoustic point of view and to evaluate the acoustic pollution. Moreover, the potential number of affected residents has been calculated in order to estimate how many people could suffer any annoyance because of this kind of noise. Finally, a comparison of the sound level measured and the potential number of disturbed residents in each leisure event in both cities has been carried out, considering the type of city as another variable in the noise produced by the mentioned leisure events.

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1. Introduction

In Mediterranean countries like Spain, with a warm climate and an enormous social culture, leisure noise is a problem for too many people, both users and people who live close to leisure places.

It is possible to differentiate two kinds of leisure activities: on the one hand, activities that take place every weekend close to leisure areas and, on the other hand, specific events or activities which happen occasionally. These kinds of noise have been hardly ever studied, regulated or controlled, despite producing high noise levels and being a focus of complaints from the neighbours.

Regarding the law, it does not exist a specific regulation for leisure noise. Therefore, this activity is regulated by the environmental noise laws, which are aimed at other noises such as road traffic, train, industrial or aircraft noise. These laws are the European directive about environmental noise 2002/49/CE [3], the RD1513/2005 [1] and its extension RD1367/2007 [2] in Spain, and finally in this case, the local laws of Madrid and Cuenca [4,5]. Some events, such as popular festivities, sometimes do not have limits of emission levels in these laws.

The conditions to celebrate leisure events in the city of Madrid are defined in its last local. This law establishes that this kind of

activities can only be placed farther than 150 m from hospitals or social buildings. Besides, because of the high noise levels produced in the last years, there was an important quarrel between neighbours and people who celebrated these leisure events. According to this law, some stages were moved from its traditional place, but the most populist measure was the use of earphones in a concert inside the Gay Pride event because neighbours complained a lot about the noise generated.

Regarding previous studies, most of them deal with leisure noise produced indoors or at working place because a study of the WHO (World Health Organization) about young people said that the hearing losses in young people are due to the exposure to high noise levels in their leisure activities. These articles have been made in Australia [6], Germany [7,8], Argentina [9], England [10,11] or Switzerland [12] where there was even a proposal to limit the sound levels in this kind of activities [13]. Another important study about leisure events is [14] where the most typical ones were measured and the noise levels were quantified.

However, there are no studies which deal with this kind of noise from the environmental noise point of view that takes into account the fact that not only the users, but also the neighbours suffer from high noise levels during some leisure activities, since they are sometimes exposed to noise levels higher than the level of acoustic quality objectives and could suffer health effects [15].

For these reasons, this paper considers, from the environmental noise point of view, the noise generated in events and leisure

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activities in two Spanish cities, Madrid and Cuenca, with very different demographic, economic and sociocultural characteristics. The main aims are to quantize and depict the potential number of affected residents and the noise levels due to typical events in these cities and find the differences among them. To achieve this objective, binaural measurements have been taken in the most popular events that took place during a whole year in both cities.

2. Methodology

Next, the methodology used is summarized focusing on the instrumentation, the measurements procedure and the type of analysis carried out.

2.1. Instrumentation

Soundwalker measurements have been done following the bibliography recommendations [16]. The equipment used is SoNoScout. It is able to do a binaural recording along a route and to analyse the recorded signals [17]. It has two earphones and two microphones outside; both elements are connected to a PDA with a software to record and analyse the noise. It also incorporates a GPS that can be used to georeference the route.

This equipment gives sound levels, spectra, time evolution, georeferenced route and average speed during the route. Besides, it provides a high quality .wav signal that was used to do a more complex post-processing with the software Pulse.

The configuration used for SoNoScout is as follows:

- Dynamic range: 30–120 dB.
- Bandwidth: 1/3 octave. 20 Hz–20 kHz.
- Frequency weighting: A, C and L.
- Time weighting: fast.

In addition, a sound calibrator is used to check that the equipment measures properly. Calibration is done before and after measurements.

2.2. Choice of leisure events and measuring procedure

The most representative leisure events have been selected taking into account the characteristics of both cities. Table 1 summarizes the measurements taken.

Different kinds of events have been chosen: sport, religious, for children, popular and traditional in order to try to include as many scenes as possible.

Following, a short explanation about each of them is included, focusing on the most relevant characteristics from the noise point of view; the procedure employed for each measurement is also commented.

- Sport events

The football events are meetings with a big social repercussion in Madrid because this city has two big teams that are playing in the Premier League: Real Madrid and Atlético de Madrid:

Specifically, measurements have been taken in the following matches:

 - Atlético de Madrid 3 – Osasuna 0.
 - Real Madrid 4 – Villareal 2.

Both measurements have been taken at the end of the match by touring around the stadium: first while the supporters were inside the stadium, and then while they were going out, because this is usually the noisiest moment, especially in cases like these, in which the local team won the match.

- Concerts

Among all the outdoor concerts in Madrid, it can be highlighted those performed in “Los veranos de la Villa” activities and in “Orgullo gay (Gay Pride)” festivities. Besides, these concerts were played within Madrid city center, close to residential areas.

In particular, two measurements were taken in a pop concert performed in the Sabatini gardens. One of them touring around the concert place and the other in a very close point to the concert.

In Gay Pride activities, a measurement was taken during one of the concerts in Callao Sq. Specifically, it was toured around the streets close to the square; the aim was to know the acoustic pollution that the neighbours suffered due to this concert. A tour around this square was also included to know how much noise this activity produced.

- Christmas events

The Christmas surround in Madrid is defined by the Christmas street markets, the commercial activities and audiovisual spectacles. For this reason, a measurement was taken touring the most typical places of the city center at Christmas to catch the typical surround.

The second measurement was taken in “Cortylandia”. It is an animation of puppets singing and dancing. It is organized by a big department store each year. In this case, a binaural measurement was taken in a fixed point, because it is a static activity.

Finally, in the epiphany parade, two measurements were taken; on the one hand, the surround during part of the procession, and on the other hand, a tour following the Three Wise Men.

- Religious events

Spain is a country with a big religious character and a long Christian tradition, especially in Holy Week time in some cities.

In Madrid “Palm Sunday” procession has been chosen. A fixed point in the tour was chosen to take the binaural measurement. This was taken while the procession was passing in front of the point. It is a typical procession where the silence that dominates the event is occasionally interrupted by the music band playing processional marches.

In Cuenca, a small city with a big religious feeling and whose Holy Week processions are declared of international tourist interest, two processions have been chosen. On the one hand, the “Maundy Thursday” procession: a measurement was taken while the procession was passing in front of the measurement point. It is similar to the Madrid procession.

On the other hand, a measurement in “Turbas” procession was taken. The penitents carry bugles and drums and play these instruments during all the route from 5:00 a.m. to 12:30 p.m.; they only stop during the Miserere prayers, when there is absolute silence. In this procession, a measurement was also taken in a fixed point, concretely near the church where the Miserere is prayed and sung.

- Traditional events and popular festivities

Carnival has been chosen because it is a traditional event that is repeated yearly as a popular festivity. The carnival tradition is not a remarkable one in these cities. This event is bigger in Madrid due to the higher size of the city and the population; for these reasons the measurement was taken in Madrid in a fixed point of the path.

About popular festivities, measurements were taken in two festivities in Madrid: “St. Isidro farmworker” and the “Paloma Virgin”.

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