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### NOISE SURVEY IN A HOLIDAY BEACH RESORT

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#### INTRODUCTION

More than 130 million of the people living in OCDE area are exposed to noise levels clearly unacceptable (higher than 65 dBA) and 300 million more are exposed to uncomfortable noise levels (between 55 and 65 dBA). The annoyance produced by road traffic (in general, the main noise source in urban areas) has been recognized as a serious social problem. In many respects, the increase of noise pollution in Spain has followed a similar trend to other technologically advanced countries. The outdoor noise measurements carried out in several spanish cities have revealed that the diurnal equivalent sound levels (from 7.00 to 22.00 hours) are rather high, with mean values about 70 dBA (1)(2)(3). On the other hand, we have not found significant differences among the acoustical situation of big and medium sized cities (4).

As a further contribution to a better knowledge of this problem, we present in this paper the first results of a study carried out in the beach of Gandía, a most popular holidays resort, during the summer periods of 1987 and 1988. The main objectives of our work were: (a) measurement of diurnal noise levels (noise maps) and identification of noise sources to which people are exposed, (b) measurement of noise descriptors over 24 hour periods and analysis of time and day variations, and (c) evaluation of the subjective response of people to environmental noise, in order to determine the relationship between noise levels and average annoyance scores and investigate the effect of personal factors on the individual attitudes towards the noise problem in general and towards the different noise sources in particular.

#### DESCRIPTION OF THE PLACE

The beach of Gandía is situated in the east coast of Spain, about 60 km south of Valencia. It is a important holidays resort spreading along the seaside, 3500 meter

long and 600 m wide, with about 13000 apartments and 1000 hotel rooms. During the summer period, the estimated population is 60000 persons, with another 40000 occasional visitors coming from nearby inland cities. Although some of these people are permanent residents (about 10% of total), the life conditions of this place during the summer are absolutely different to those of an ordinary city.

The beach of Gandía has most of the services usual in these places: shopping centers, supermarkets, yacht club, sport fields, cinemas, pubs, restaurants, discotheques, etc., disseminated all around the place and, consequently, completely mixed with the residences. The traffic of vehicles (cars, heavy vehicles and motorcycles) is disproportionately high in comparison with other cities of comparable size: we have estimated that the flow of vehicles coming to and from the beach is about 40000 veh/day, running continuously at any time of day and night. The social habits of the residents are also singular: abundance of leisure time, very active outdoor life, rather generalized rest period in the afternoon ("siesta"), unusual times of rising and retiring, etc.

#### NOISE MEASUREMENTS

A precision integrating sound level meter (BK2221) was used to measure the equivalent sound level. The microphone was positioned at a height of 1.2 m above the ground and away from the building facades. All measurements were carried out under good weather conditions (not rain or wind). The study covered a total of 65 different sites, regularly distributed over all the port/beach area (one measurement point each 200 m). Three noise maps have been obtained: July/August 1987 from 9.00 to 14.00 hours, July/August 1988 from 9.00 to 14.00 hours and July/August 1988 from 19.00 to 23.00 hours. The mean values of the equivalent sound levels were respectively 67.2 dBA, 67.2 dBA and 68.8 dBA, with standard deviations of 4.7 dBA, 4.5 dBA and 5.7 dBA. The maximum values of the equivalent sound levels were respectively 77.8 dBA, 76.8 dBA and 80.9 dBA, and the minimum values were 55.9 dBA, 51.6 dBA and 43.6 dBA.

In general, the morning noise levels remain practically constant from 1987 to 1988. The differences in the noise levels between mornings and evenings are produced by the differences in the general activities: in the morning, most of the people are on the beach, swimming or sunbathing; in the evening, however, people crowd the streets, walking, shopping or going to the many bars and pubs.

We have observed that the most frequent noise sources (in diurnal periods) are cars (24%), motorcycles (19%), voices of adults (14%), heavy vehicles (13%), voices of children (11%), etc. There is no doubt that the traffic of vehicles is by far the most important noise source in the beach of Gandía (like many other cities of Spain). Actually, the measured equivalent sound levels are very well correlated with the observed traffic volume through the relation  $Leq = 5.06 \log Q + 54.4$  ( $Leq$  in dBA,  $Q$  in

veh/hr). In general, the use of cars and motorcycles in a holiday resort like the beach of Gandía is clearly abusive and some steps should be taken to reduce their very negative contribution to the environmental conditions of this place (for example, through an information campaign).

In addition to diurnal measurements, the noise levels have been also measured continuously over 24 hour periods in different selected locations. All these measurements have been carried out using a noise level analyzer (BK4426) and an alphanumeric printer (BK2312). The microphone was always placed close to the exposed facade of a typical dwelling. We have considered five locations in summer 1987 (15 complete days) and eight locations in summer 1988 (39 complete days). In each case, the hourly values of L1, L10, L50, L90, L99 and Leq have been obtained.

The values of equivalent sound levels for 24 hour periods Leq(24 hr) in all locations range from 60 dBA to 69 dBA, with a mean value of 64.8 dBA. The values of Leq for night periods (from 22.00 to 7.00 hours) are comparable to values for diurnal periods (from 7.00 to 22.00 hours) and in some sites they are even higher. In many locations, the highest sound levels through 24 hour periods were measured from 22.00 to 24.00 hours; this trend is specially evident during weekends. In the main arterial roads of the beach (Avda. de la Paz and Paseo de Neptuno) the hourly values of Leq and L1 are never lower than 60 and 70 dBA (day and night), respectively.

#### SOCIAL SURVEY

The subjective response of the residents to the noise exposure has been measured by means of a social survey. This investigation was performed by using the techniques generally applied in other studies of this kind. The questionnaire comprised 27 items and covered many different topics: socioeconomic and demographic data of the respondents, environmental evaluation, social behaviour, noise disturbance, etc.

A total of 400 questionnaires have been collected. The respondents were male (56%) and female (44%), with a wide age range: <20 years (17%), 20-40 years (43%), 40-60 years (30%) and >60 years (10%).

Attitudes towards environmental noise were elicited by means of a five step semantic scale. About 30% of the total sample declare to be "very much annoyed" by the noise, 26% "rather annoyed", 20% "moderately annoyed", 15% "little annoyed" and 9% "not at all annoyed". In opinion of the interviewed people, road traffic is the most important source of noise in the beach of Gandía (46%), followed by discotheques and pubs (32%), building and public works (12%), neighbours and children (9%), and radio and TV (3%).

Our questionnaire also includes some questions on various specific activities disturbed by noise. About 50% of the people declare to be seriously annoyed by noise when watching television or conversating with relatives or

friends at home. In that sense, the sleep disturbance is specially important: 28% of the sample reported to be awakened "often" by the noise, 36% "sometimes" and 36% "never". Most probably, the intense night life of the beach of Gandía contributes significantly to this situation: high traffic of vehicles, abundance of recreation places, wide use of amplified music, etc.

About 22% of the interviewed people say they go to bed later than 2.00 a.m. (during their holidays). We have found that the time of retiring and getting up is negatively correlated with the age of the respondents ( $r=-0.41$  and  $r=-0.46$ , respectively). Not surprisingly, old people are much more sensitive to the nocturnal noise than young people ( $r=-0.35$ ).

### CONCLUSIONS

The noise survey carried out in the beach of Gandía during the summer period of 1987 and 1988 shows that the noise levels measured in many locations of this holiday resort are clearly unacceptable for a residential zone, specially by night, and produce an important annoyance in a high proportion of the residents. A wide majority of the residents have gone to this place searching peace and quietness, but many people also like the recreation sites and night life. Obviously, any provisions designed by the local authorities to abate noise nuisance should achieve an alleviation of disturbance for some without unnecessarily curtailing the enjoyment of others.

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### REFERENCES

- (1) A.García and M.Fajarí.- "Estudio del ruido producido por el tráfico rodado en Valencia".- Revista de Acústica 15 32 (1984).
- (2) J.Pons, J.S.Santiago, E.Mateos and P.Perera.- "Acoustic map of Madrid".- Convegno Internazionale Il rumore urbano e il governo del territorio. Modena (1988).
- (3) R.Alsina.- "Mappe du bruit du centre de la ville de Barcelona".- Convegno Internazionale Il rumore urbano e il governo del territorio. Modena (1988).
- (4) A.García, J.Romero and M.Alamar.- "Traffic noise exposure and annoyance reactions in Spain: a review of three surveys".-Convegno Internazionale Il rumore urbano e il governo del territorio. Modena (1988).