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NOISE IN HOSPITAL AREAS – MEASURE AND EVALUATION

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Abstract

The territory of Palermo will be acoustically subdivided into homogeneous areas. In the present job, our attention is focused on the zones in class I that includes particularly sensitive areas as schools and hospitals. The acoustic climate inside and outside some hospital of Palermo (Italy) is carried out. The hospitals were built in highly urbanized areas. Around the areas important roads are present, with high traffic. With a campaign of measures, in proximity of the roads, in the hospital square, in the parking, and finally inside the hospital areas, the equivalent level and the patients exposure were calculated as Ld, Ln and DNL. Both the impact due to the roads (considered as external source) and due to internal traffic, equipments, tools of waste treatment (considered as internal source), has been analyzed. The comparison between noise values and normative limits allows us to evaluate the entity and the priority of the interventions.

1. INTRODUCTION

According to what has been prescribed by the legislation, the territory of Palermo will be divided into six classes of use destination (tab. 1), associating to each of them limit values of emission, immission and quality. In conformity with the norm UNI 9884, green colour refers to the class I, yellow to the II, orange to the III, vermilion red to the IV, violet red to the V and blue to the class VI.

Table 1. Classes of use destination.

Classe acustica	Valore limite di immissione	
	diurno (6-22)	Notturno (22-6)
Classe I	50	40
Classe II	55	45
Classe III	60	50
Classe IV	65	55
Classe V	70	60
Classe VI	70	70

The acoustic zoning of the urban territory of Palermo is next to be finished. In the present article, we examine the zones in class I, areas in which the sonorous quietness represents a fundamental element for the fruition.

In Table 1, the DPCM 1/3/91 and the DPCM 14/11/97 the limits for each classes are fixed and it includes in this class the hospitals and schools, the areas destined to the rest and leisure, the areas of particular town planning interest and the public green. Among the various zones in class I in the Commune of Palermo, the hospital area has been selected for further analyses and close examinations. Such choice is motivated by some considerations:

1) unlike schools, the hospitals have (generally) more sensitive customer who are exposed to the noise during the whole diurnal and nocturnal period;
2) the presence in the proximities of very chaotic urban roads and technological systems such as the heating centre;
3) to evaluate if such structure responds effectively to the enforced limits, since there is not only an external traffic but also a traffic due to the hospital activity.

2. SITE CHARACTERISATION

A first stage of the study is to appraise the site where the hospital has been built trying to underline those that could be the pros and cons of such choice. Analyzing the aerial photo (fig. n°1) of the zone, it is fundamental to evaluate the impact of the transport infrastructures. In fact, from few meters of the border of the studied area, there are important roads and a railway line.

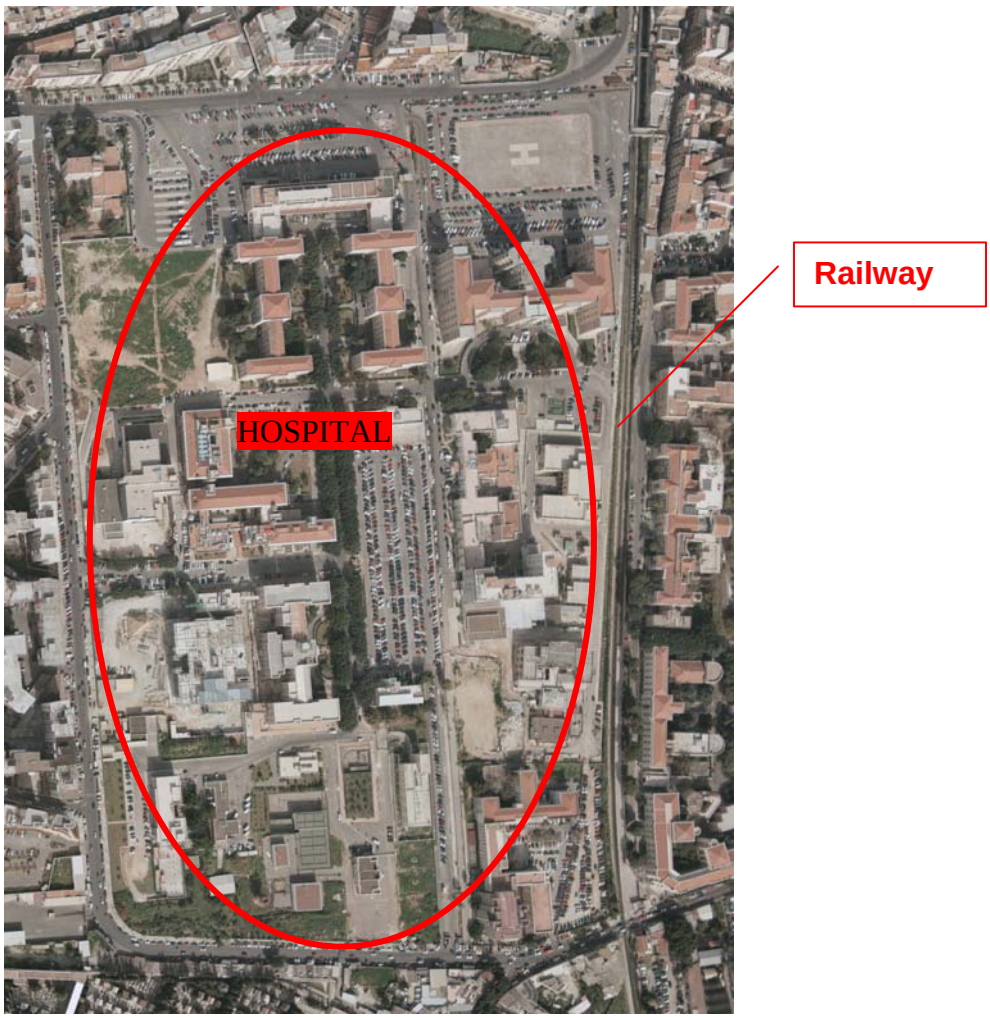

Figure 1. Ortho-photo map of concerned area.

Among the roads and the hospital complex, there is not a sufficient relative distance between buildings and roads. As you can see in fig. n°1, along the border, only in a little area there is a park where is advisable a large arboreal variety of tall stem, that will subsequently limit the due impact to the infrastructures, as calling birds back, bugs etc it will involve an effect of disguising the noise of the road with the noises of the birds that instead have a positive impact on the patient.

3. ACOUSTIC STUDY OF THE AREA

Therefore, the acoustic zoning allows us to get a cartography with the classes and the acoustic allowed limits of immission.

The cartography with the acoustic zoning of the zone will chose that there is a difficulty due to the proximity among the hospital (class I) and the roads (class IV).

The legislation doesn't allow jumps of class major of 5 dB; for this reason some buffer areas have to be inserted. However, in the layout of the zonings, we realize that the brief distance among different acoustic classes makes the realization of the baffer area purely theoretical without the aid of barriers of artificial or natural type. In the present work, we try to evaluate if the distance between the hospital structure and the infrastructures allows us the insertion of buffer areas without acoustic artificial barriers.

The acoustic zoning will take into account the bands of pertinence previewed by a recent Italian decree valid for transport infrastructures.

In order to take a complete acoustic picture, thirty points of measurements have been considered inside the hospital area and along the road; two of them were taken inside the building, one in the part which is mostly exposed to noise traffic and the other to the noise caused by the heating. In each station, a lot of measurements in various days and considering many hourly bands were executed. Besides monitoring the internal part of the hospital area, we needed to study the daily medium levels and the volume of the traffic of roads.

The acoustic measured values point out a Ld between 61,0 dB(A) and 72,5 dB(A). In Fig 2 are showed the acoustic data for each line of roads.

Inside the hospital area there are not really high values. As you can see from the obtained data, the value of the noise produced by the near streets is high at the border of the hospital, and its influence is much more reduced near the buildings at the centre of the area.

Fig. 3 concerns the traffic noise in a room exposed.

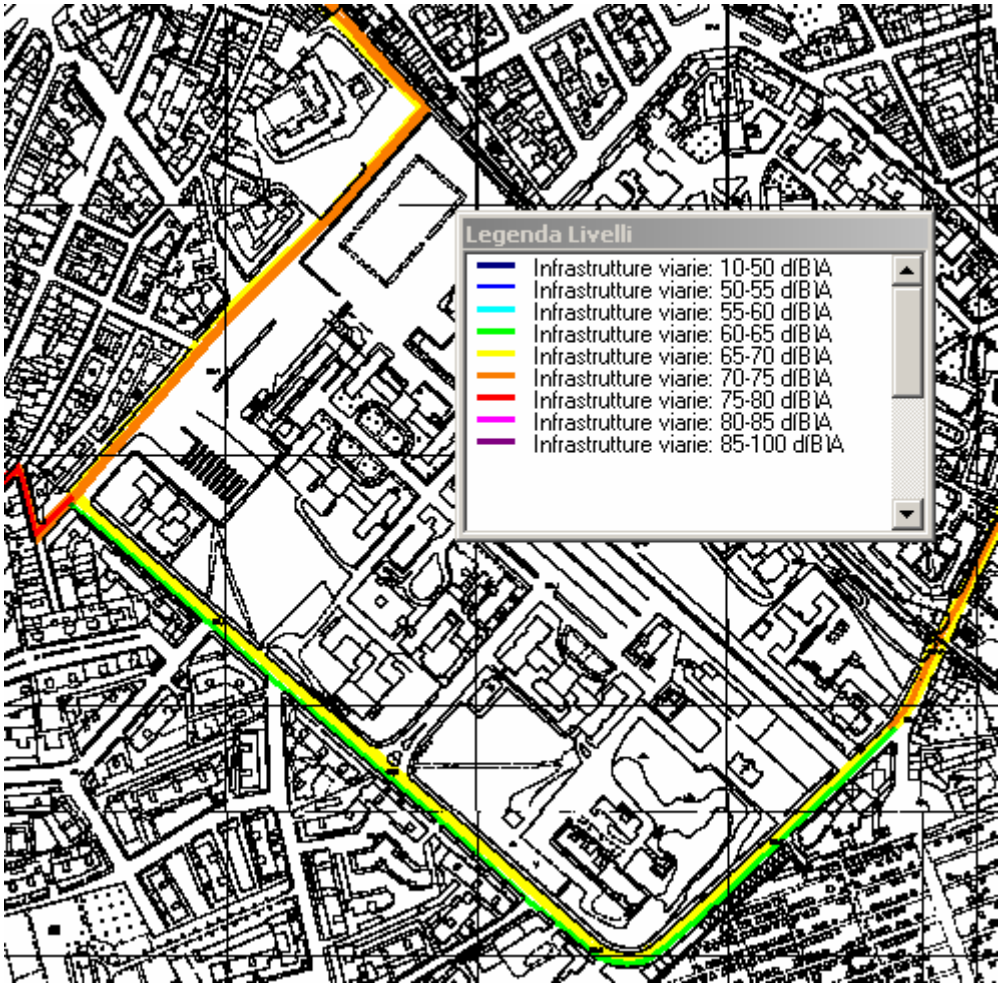

Figure 2. Acoustic characterization of roads along the Hospital area

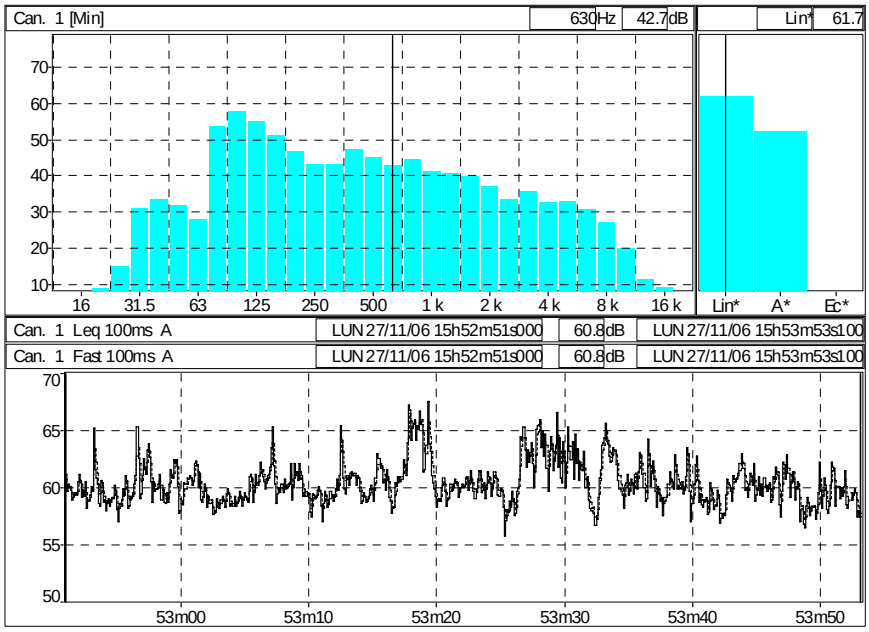

Figure 3. Noise time evolution generated by traffic

The measurements done inside the structure have underlined the usefulness of the windows and the shutters. In fact, the measurements of the points the most exposed to the noise of the heating room and of traffic coming to the near streets are not so important while the windows are closed. Inside some parts of buildings the main sources of noise are the technological systems that provoke vibrations in the false ceiling because of a not perfect isolation. Other important noises are atrophic and due to working activities. Figures 4–6 show the iso-phonic curves calculated in day time. These maps can be a useful support to find the critical points.

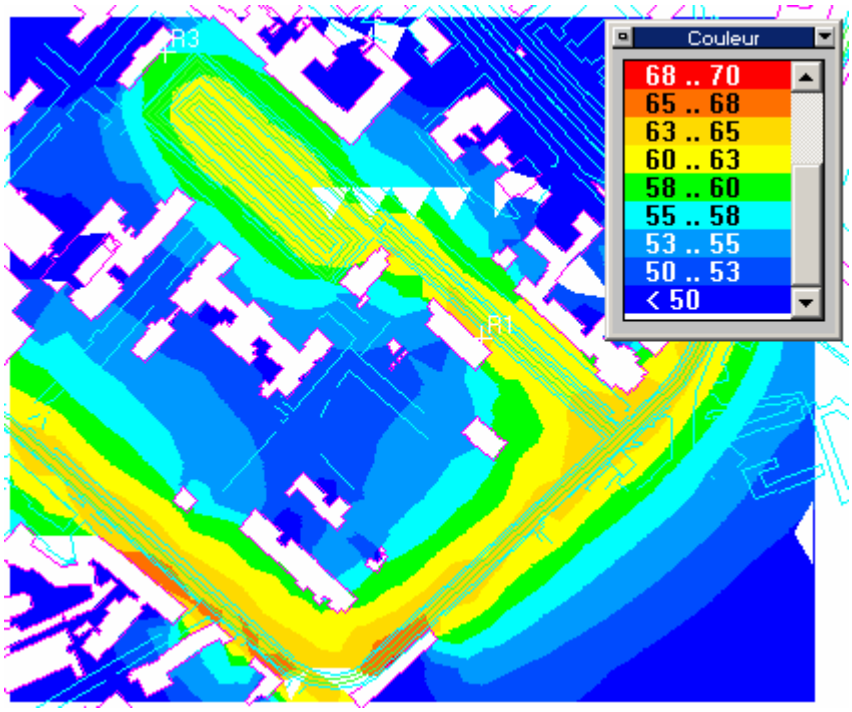

Figure 4. Map of iso-level values in dB(A).

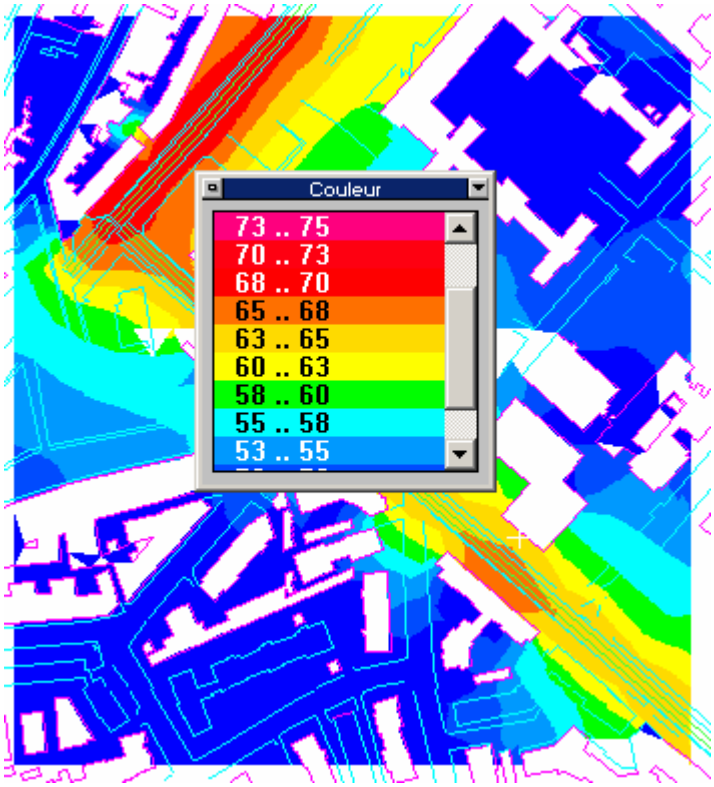

Figure 5. Map of iso-level values in dB(A).

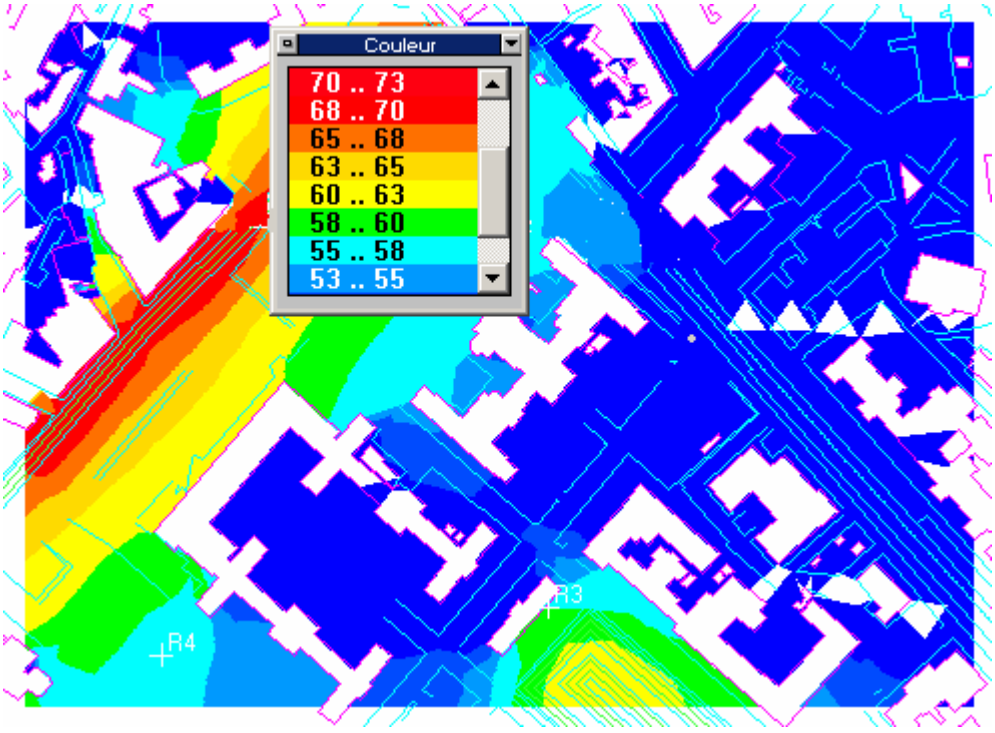

Figure 6. Map of iso-level values in dB(A).

4. CONCLUSIONS

The present study has underlined that:

- the noise due to the infrastructures is more important along the hospital border zone and inside the area near the parking;
- often, noises of the technological systems are not properly considered both for indoor and outdoor spaces; it is useful to carry out an accurate acoustic study, without which the global acoustic climate can be invalidated.

Comparing the enforced limits for the I class with the values of the iso-phonic curves, the acoustic climate is acceptable in the buildings near the centre of the area. Remedial works are useful for the heating rooms and for other similar systems. This consideration is sustained by results of questionnaires about the acoustic climate filled by patients and people working there during the study period.

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