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LISBON NOISE MAP

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ABSTRACT

A noise map for the city of Lisbon was drawn. Only the municipality of Lisbon was considered. This is an area with about 700,000 inhabitants. Different sources contribute for the overall environmental noise: traffic (road, railway, tramway and aircraft), construction and leisure activities. The noise maps were drawn by calculation. Some measurements were made, however, for validation of the model and to account for noise emissions where predictions were not so simple, such as tramway noise and leisure activities (especially at night). The calculations used the traffic data (traffic density, vehicles or aircraft types, speed), ground heights, the location and height of the buildings as well as the sound absorption of their façades. Daytime and night-time L_{Aeq} levels were determined in points of a grid superimposed over the area of the entire city.

1 - INTRODUCTION

A noise map has been produced for the city of Lisbon. Although discussions on method and presentation are currently being held within the framework of the European Commission, namely within its EU Noise Policy Working Group 4, Noise Mapping, the procedure for noise values determination complied with the existing ISO standards.

The Lisbon Municipality felt the need of a noise map for planning purposes as well as for information to the citizens. It was also to help in the task of defining priorities of areas where noise reduction plans were to be applied. Following a general information and educational campaign against noise in the city, Lisbon Municipality put the Group of Acoustics and Noise Control of CAPS/IST (Lisbon Technological University) in charge of drawing a noise map for the city. This should yield the relevant information (overall noise levels and most important noise source levels) both for day and night and was to be an easy to use planning and noise control engineering tool. Updating of the map should also be easy to perform.

Noise contours were plotted in the points of a grid with 5 dB(A) intervals for daytime (07-22h) and night-time (22-07h).

2 - METHOD

A measurement based map is very unwieldy and difficult to generalise and update. Lisbon noise map was done by calculation. Noise measurements were only carried out for validation purposes and for tramways and industrial, construction and leisure activities, for which noise levels were difficult to predict. The calculations for the noise map of Lisbon were produced by using the CadnaA software programme.

Data for the different noise sources, such as road, railway and air traffic, industrial premises and leisure areas and on digitised maps with geographical information was used. Road traffic data included the average hourly daytime flow rate during the week, average speed and heavy-duty vehicle content. Road surface, gradients and geometry were considered as well. For railway traffic, the movements of passenger and goods trains were accounted for. Data on the type of train, length and speed were also considered. Lisbon airport flight data, concerning the number of daily flights, types of aircraft and runway usage were used for prediction of aircraft noise levels.

Digitised city maps provided information on height (ground contours) across the area to be mapped in order to calculate the screening effect of changing ground height between the noise sources and the

receiving points. Location and height of all the buildings in the city as well as the sound absorption coefficients of their façades were also input.

For calculation purposes the city was divided in a grid of 20 by 20 meters. L_{Aeq} values were then calculated in all points of the grid at a height of 1.5 m above ground level.

Owing to the urban noise sources characteristics (train movements and aircraft flights during the night are very scarce), it was decided that separate daytime and night-time noise maps would be produced for road traffic only. Maps showing the overall sound levels, from all noise sources, were produced for day and for night-time. Figures 1 and 2 show samples of the road traffic noise map and the airport noise map, day-time.

The maps were produced based on contour intervals of 5 dB(A), from below 45 dB(A) to above 80 dB(A). The colours associated with each noise band were taken from ISO Standard 1996. In each map, a legend showed the colour code and the associated acoustical classification of the sites, according to the Portuguese Noise Act.

3 - DISCUSSION

A noise map was produced for the City of Lisbon. The map was done by calculations from information on the topography of the area, including buildings, and on the characteristics of the different noise sources. Some noise measurements were carried out at specific locations for validation purposes and to account for particular types of noise emissions such as construction or leisure activities.

The maps are still under completion. It is clear that the single most pervasive source of noise in the city is the road traffic. This will become even more important with the current plans to build a new airport quite far away from the city limits (which is not the present situation). The Lisbon Noise Map can be an excellent tool for planning and for establishing a programme of noise reduction in the city.

ACKNOWLEDGEMENTS

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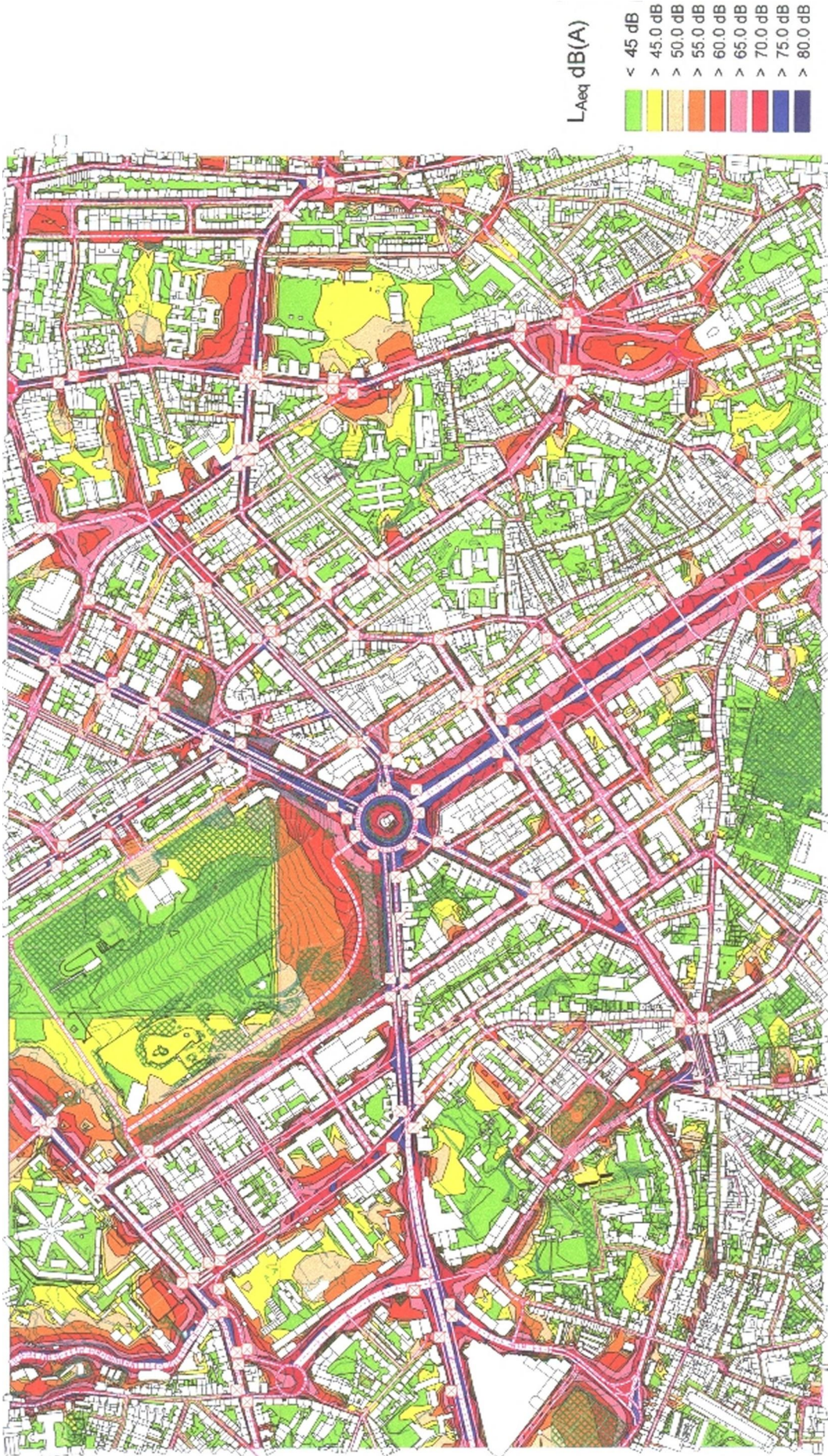


Figure 1: Sample of Lisbon noise map (central area), road traffic noise.

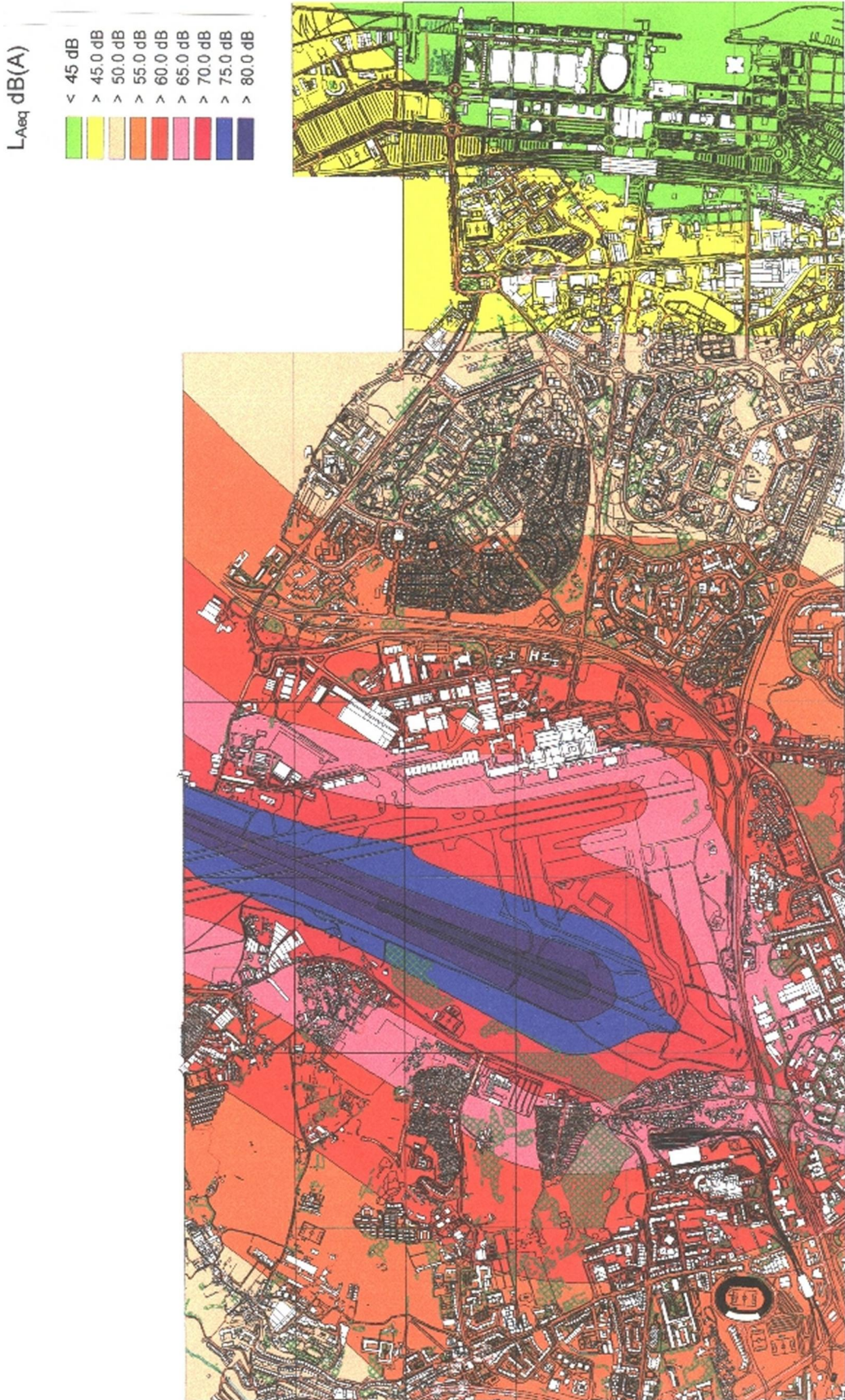


Figure 2: Sample of Lisbon noise map, airport noise.