

# NOISE MAPPING AS A TOOL FOR THE DEVELOPMENT OF URBAN AREAS

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## ABSTRACT

The planning of a new bridge crossing the Tagus river in the Lisbon area has called for a noise study to evaluate the changes in the sound environment due to this new project, which includes new roads and railway lines.

Noise maps were drawn for two corridors located in each of the river margins: North and South. The noise study was based on the predictions of a noise model considering the different noise sources that contribute for the overall environmental noise (road, railway and aircraft) in urban areas. A set of measurements was made in order to verify and validate the model.

The new Portuguese Noise Act restricts noise emissions for  $L_{Aeq} > 55$  dB(A) and 45 dB(A) during day-time and night-time, respectively, in areas where activities sensitive to noise exist or are planned for, namely residential areas, schools or hospitals, considering the values of 65 dB(A) and 55 dB(A) in areas with other land uses. Noise contour maps were drawn considering only these intervals. The population exposed to each interval of noise levels was then calculated by counting the number of inhabitants from the latest census.

## INTRODUCTION

A noise study was conducted to assess the increase in the environmental noise due to the new bridge that will cross the Tagus River, in the Lisbon area. The proposed project includes new roads and railway lines.

To evaluate the existing noise situation, noise maps were produced for the two corridors that lead to the bridge, in the North and South margins of the Tagus. The maps were drawn by calculation. The contribution of the prevailing sources in each of the corridors was modelled by using prediction software. Noise measurements were carried out to assess the validity of the calculations. This technique will allow the impact noise assessment in the urban areas involved, by comparing the existing noise situation with the noise level predictions after the completion of the project.

Although discussions on method and presentation of noise maps are currently being held within the framework of the European Commission, the procedure for noise values determination

complied with the existing ISO standards. The requirements laid down in the New Portuguese Noise Act were accounted for in the noise zoning.

## METHOD

The noise maps for the two corridors were drawn by calculation. The prediction of noise levels took into account the contribution of the existing sources in the areas covered by the study, namely air traffic, road traffic and railway traffic in the North corridor and road traffic, railway traffic and industrial activity sites in the South corridor. Digitised maps provided information on height across the areas to be mapped, road and railway geometry and building location.

For calculation purposes, the corridors were divided in a grid of 20 x 20 m.  $L_{Aeq}$  values were then calculated at a height of 1.5 m above ground level. Noise contours were plotted in 5 dB(A) intervals from below 45 to above 80 dB(A), using the colour code recommended by ISO 1996 standard, for two periods: day (07h00-22h00) and night (22h00-07h00). Since train movements and aircraft flight during the night are very scarce, these sources were not accounted for in the overall noise levels calculated for the night period.

A set of measurements was carried out in the two corridors, in the day and night periods, in order to compare the measured and predicted values.

The new Portuguese Noise Act (D.L. n° 292/2000) restricts noise emissions for  $L_{Aeq} > 55$  dB(A) and 45 dB(A) during daytime and night-time, respectively, in areas where activities sensitive to noise exist or are planned for, namely residential areas, schools or hospitals, considering the limits of 65 dB(A) and 55 dB(A) in areas with other land uses.

Noise maps were then produced presenting only two noise zones, below and above the  $L_{Aeq}$  limit values established by that document. The extent of the noise exposure was then assessed by counting the number of people living in the noise zones where the limit values are exceeded. The results are summarised in the table below.

Table I – Population living in the noise zones where the limit values are exceeded (%)

$L_{Aeq}$ dB(A)	North Corridor		South Corridor	
	Daytime	Night-time	Daytime	Night-time
> 45		28		32
> 55	64	6	19	5
> 65	6		4	

Figures 1 and 2 show the noise maps for the South corridor in the day and night periods. Figures 3 and 4 show the noise zones, for the same corridor, considering the limit of 55 and 45 dB(A) for the same periods.

## DISCUSSION

The planning of a new bridge across the Tagus river has called for a noise impact assessment. Noise maps showing the existing noise situation in each of the corridors that lead to the new bridge were drawn.

The population living in the urban areas where  $L_{Aeq}$  limit values, defined by the new Portuguese Noise Act was calculated. Noise impact will be assessed by comparing the existing noise situation with the predicted levels after the completion of the project.

## ACKNOWLEDGEMENTS

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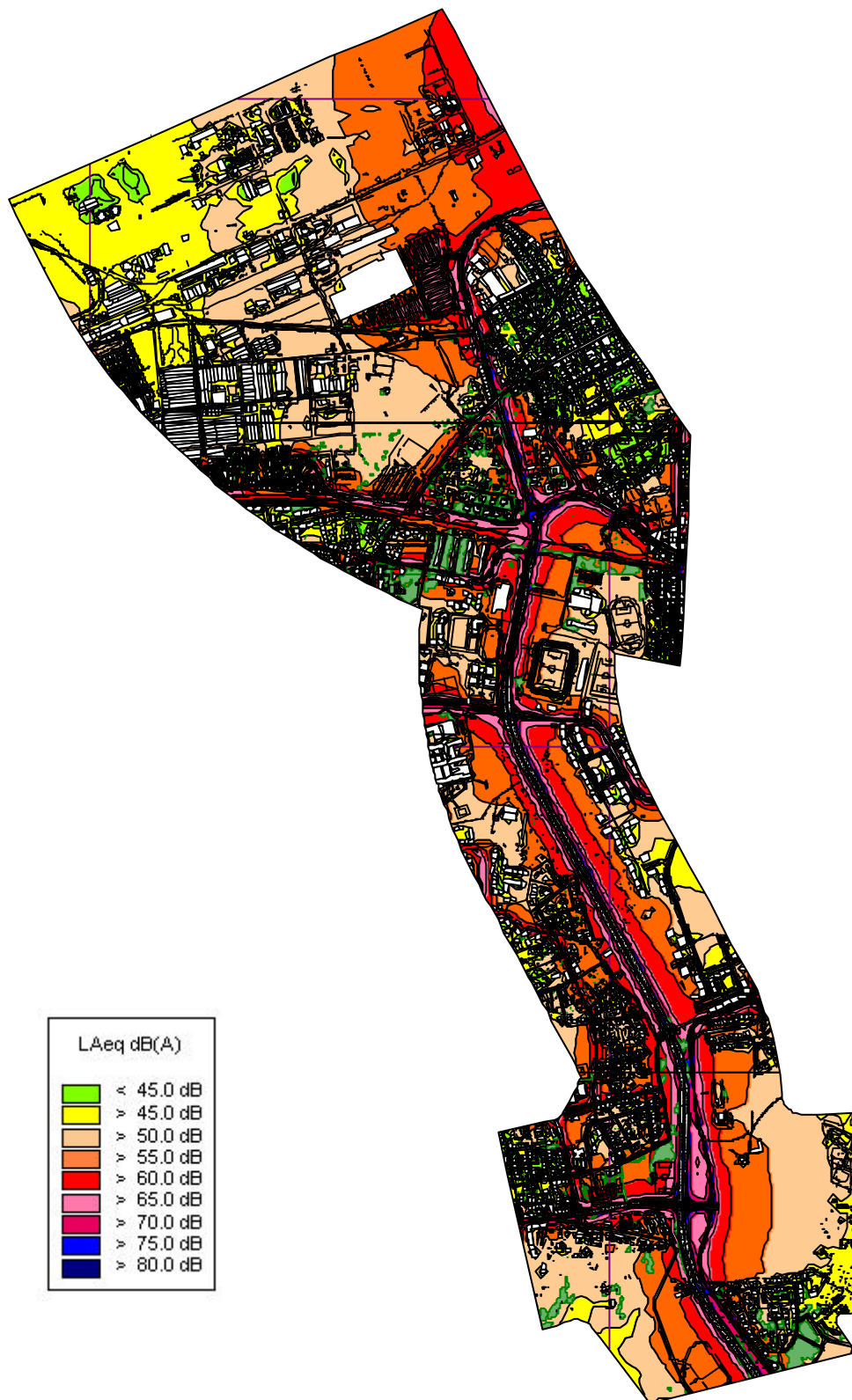


Fig 1. Noise map of the South Corridor, day time



Fig 2. Noise map of the South Corridor, night time



Fig. 3. Noise zones for the South Corridor, considering the 55 dB(A) limit, day time



Fig. 4. Noise zones for the South Corridor, considering the 45 dB(A) limit, night time