



Variation of population exposure to traffic noise in Aosta Valley (Courmayeur): the effect of the opening of the highway last tract towards the Mont Blanc Tunnel

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THE AREA OF INVESTIGATION

The area considered in this analysis is the territory of Courmayeur, the farthest tip of Italy on the way to France by Mont Blanc Tunnel. Until some month ago the main road to the Tunnel ran alongside the town centre. On march 2007 the last section of highway E25 was opened. It connects Courmayeur to the village of Entrèves, one kilometer far from the tunnel entrance, and allows a more fluent traffic: even though the valley in Courmayeur area is quite narrow the highway runs at some distance from the centre and most of it is inside gallery or protected by acoustical barriers.



REFERENCE INDICATORS

To estimate the noise levels in the study area, the indicators taken into account are the two descriptor defined by the 2002/49/EC: the first one, L_{den} , represents noise level during day-evening-night, the latter, L_{night} , takes into account night-time noise.

The European directive allows single member states to define evening period. Italy chose the following intervals (Dlgs 19 agosto 2005 n. 194):

- day : from 6.00 am to 8.00 pm
- evening : from 8.00 pm to 10.00 pm
- night : from 10.00 pm to 6.00 am

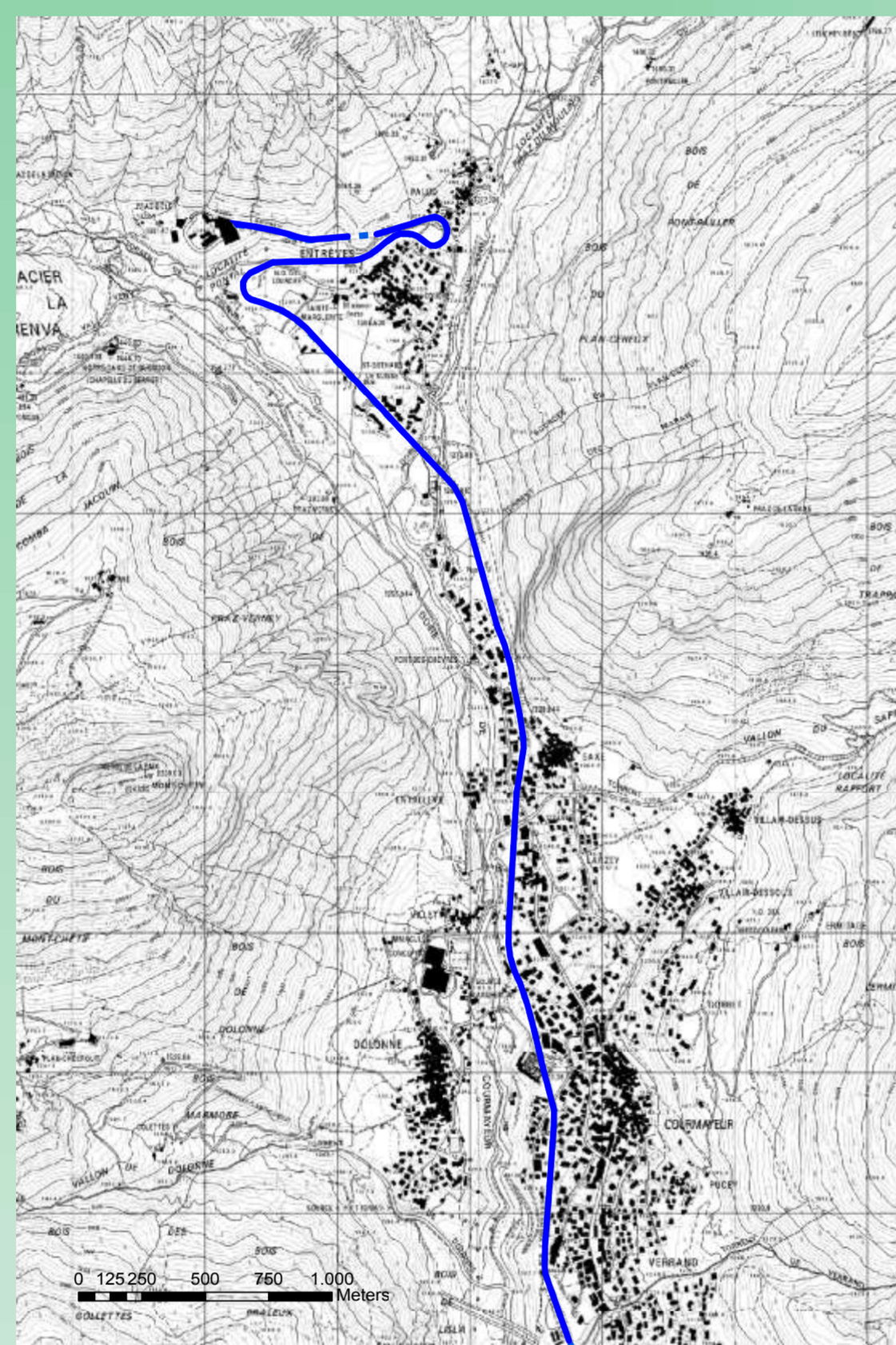
L_{den} is so defined according to the following formula:

$$L_{den} = 10 \log \frac{1}{24} \left(14 * 10^{L_{day}/10} + 2 * 10^{(L_{evening} * 5)/10} + 8 * 10^{(L_{night} * 10)/10} \right)$$

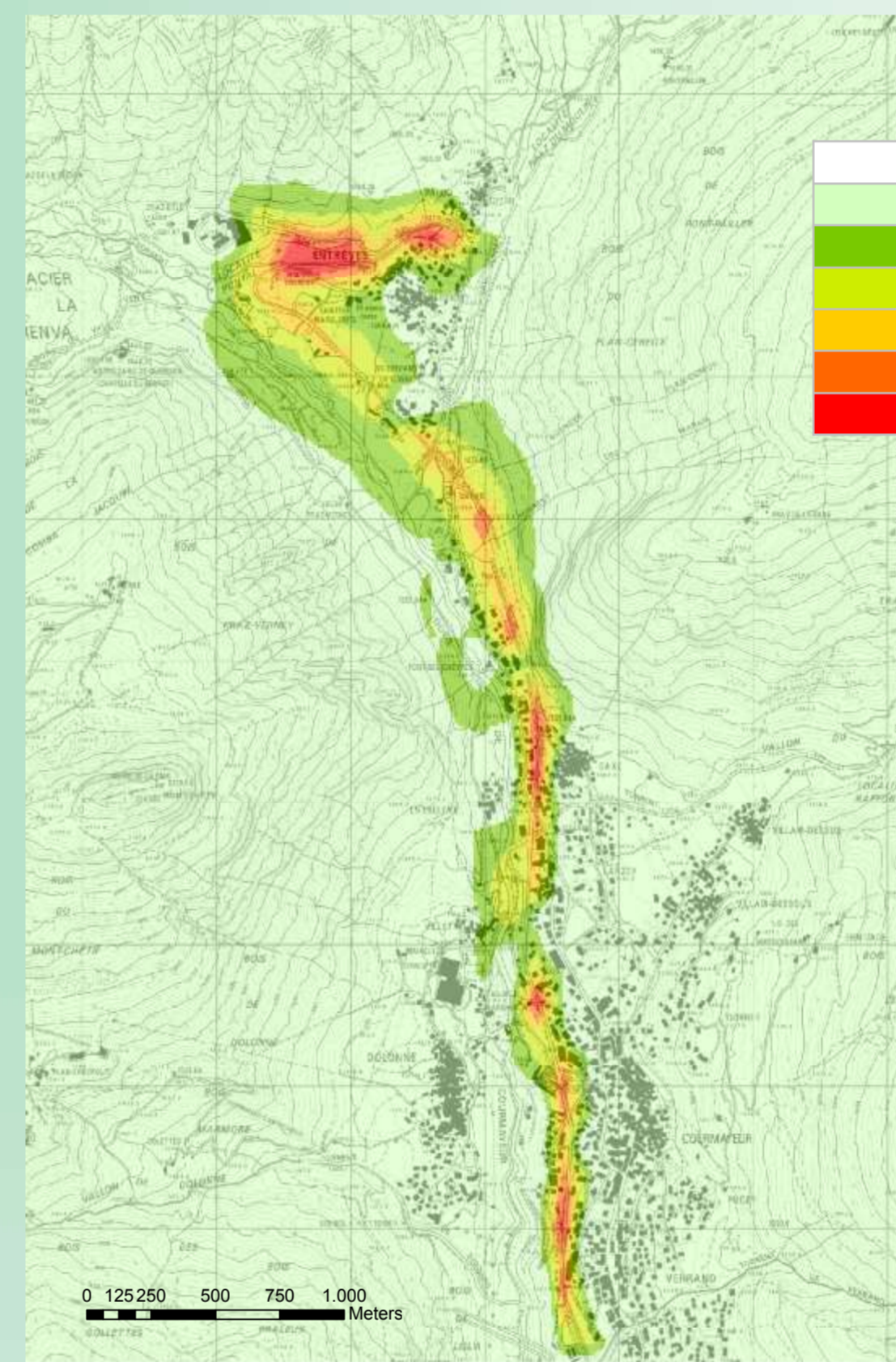
NOISE MAPPING

The two scenarios before and after the opening of the last tract of the highway are compared:

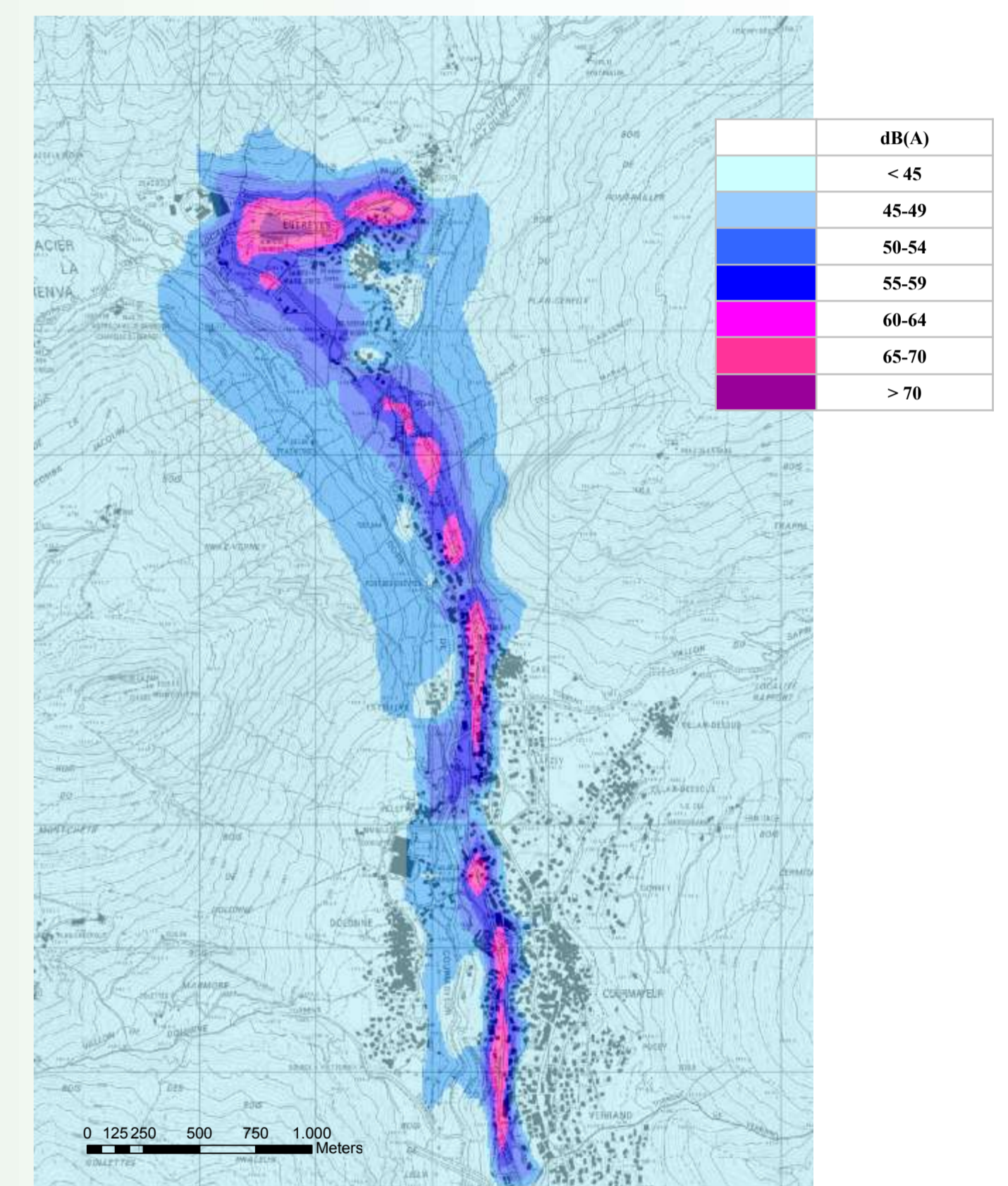
1 - total traffic flowing on the national road 26 (scenario until march 2007, before the highway opening)



Maps with indication of the access roads to Mont Blanc Tunnel taken into account as noise sources: NR 26 (in blue) and E25 (in red)

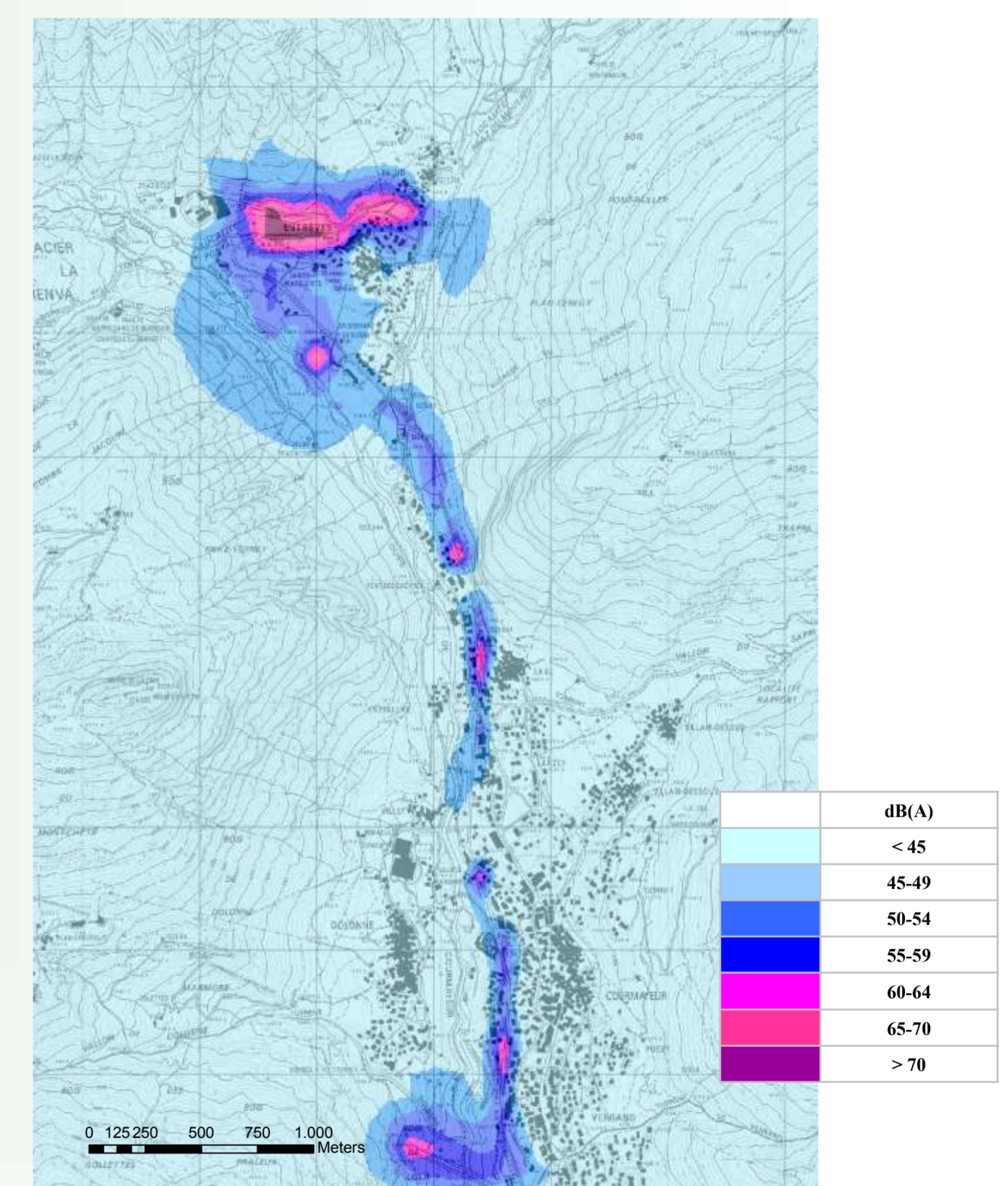
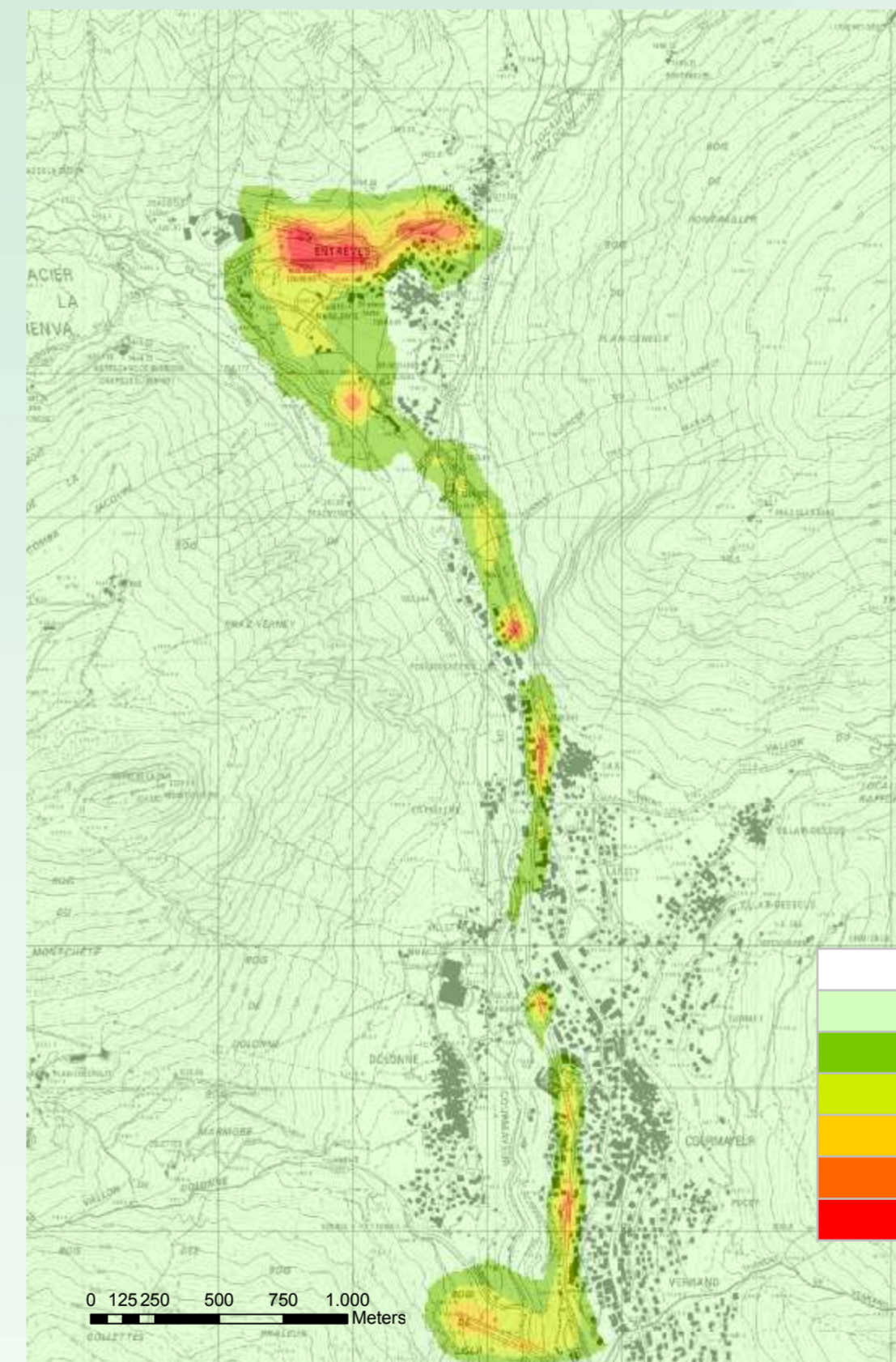
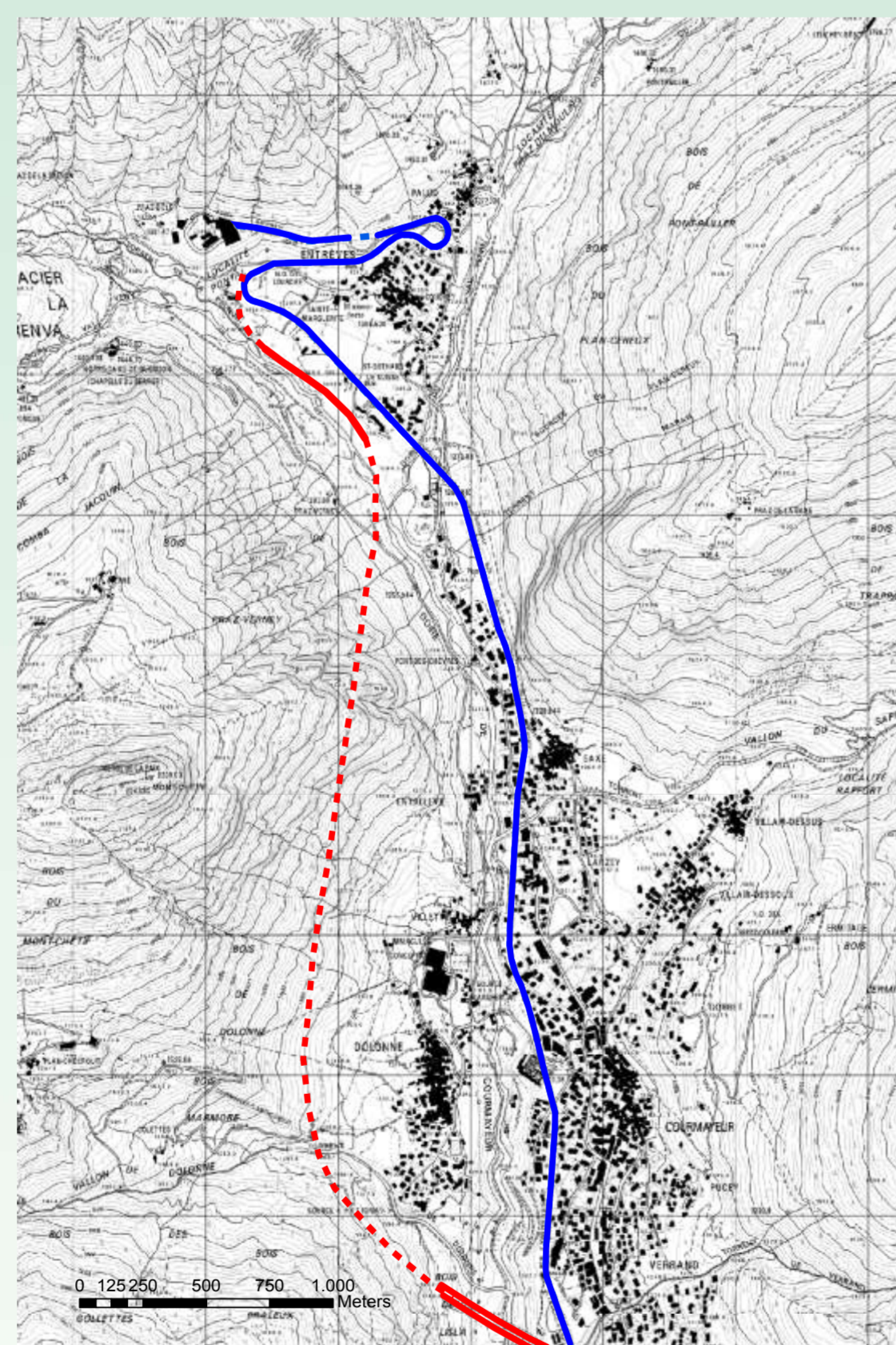


L_{den} sound levels territorial distribution



L_{night} sound levels territorial distribution

2 - the same total amount of traffic flowing partly on the new highway, in red, (heavy and light traffic to and from TMB) and partly on the national road (local traffic). The dotted tract of the new highway is underground



The numeric estimate of sound levels has been carried on applying the French model NMPB-ROUTES-96 algorithms

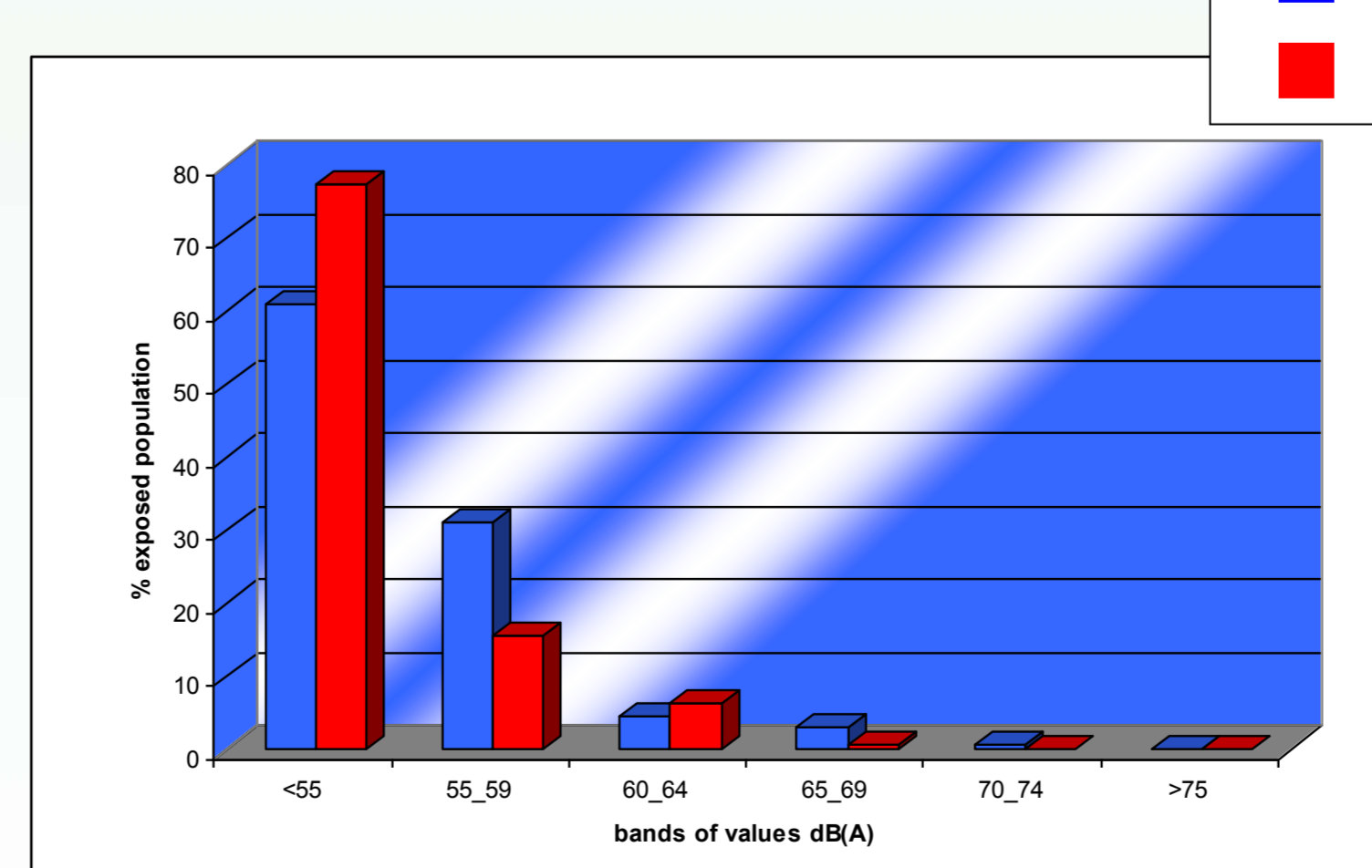
POPULATION EXPOSURE

The EC directive also requires the quantification of population exposed to noise as an important descriptor for the protection of the people health and for determining the priority of noise abatement measures too.

The estimation of the population exposure was carried out by calculating the percentage of people living in buildings exposed to the intervals of noise values defined by the directive 2002/49/EC. The exposure of each building must be referred to the most exposed façade at a height of 4 m on the ground.

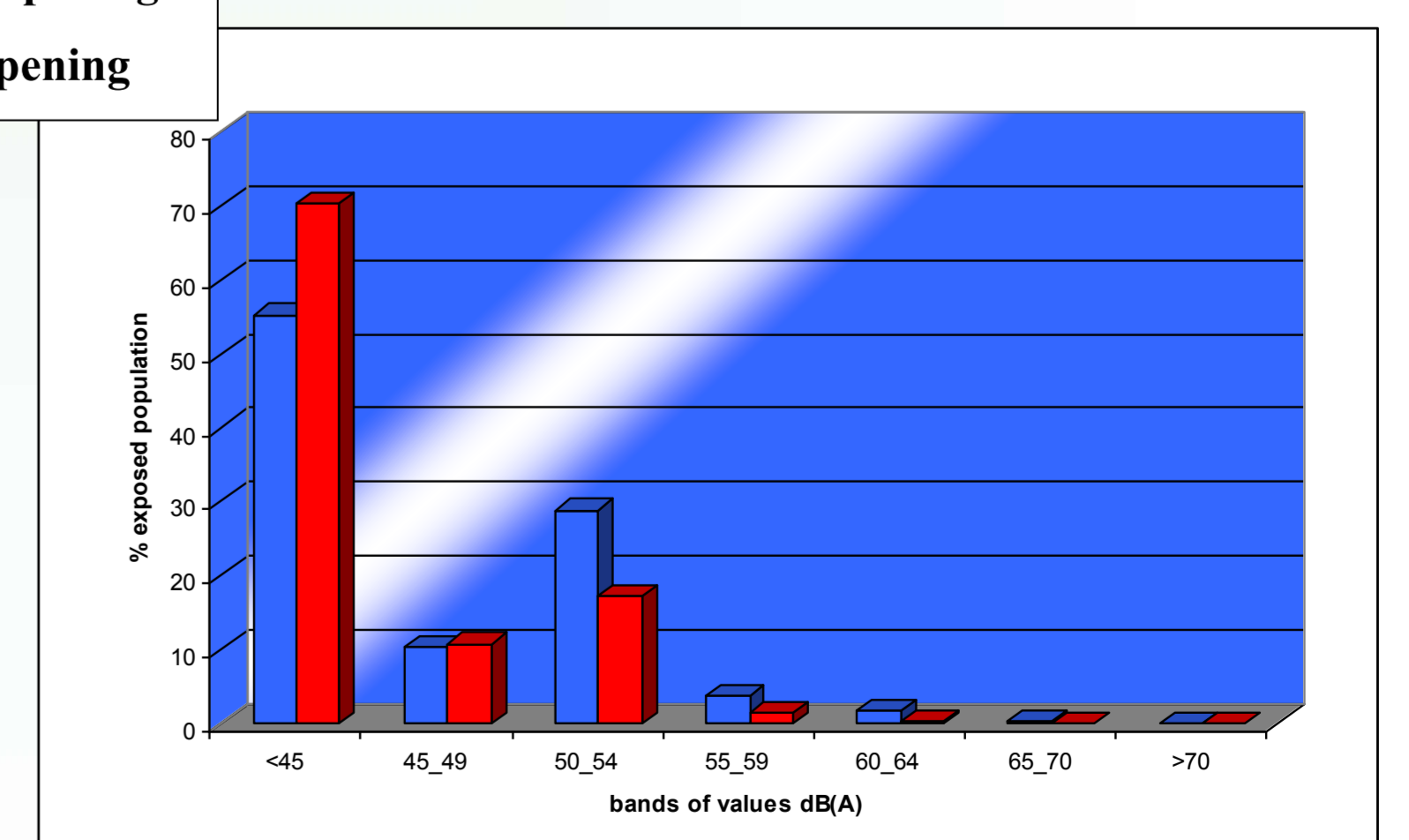
The opening of a new highway that takes away cross-border traffic from the national road running alongside the town building has reduced the noise exposure of population of the area studied in this work. This result is clearly shown by the territorial distribution of the noise indicators L_{den} and L_{night} , and by the histograms of the exposed population.

Percentage of exposed population for L_{den} bands of values



Exposed population (%)	Bands of values of L_{den} (dBA)					
	<55	55-59	60-64	65-69	70-74	>75
Before	61	31	4	3	1	0
After	77	16	6	1	0	0

Percentage of exposed population for L_{night} bands of values



Exposed population (%)	Bands of values of L_{night} (dBA)						
	<45	45-49	50-54	55-59	60-64	65-70	>70
Before	55	10	29	4	2	0	0
After	70	11	17	2	0	0	0