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1. See: http://ec.europa.eu/environment/noise/directive.htm

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Noise exposure estimation methods compared

It is difficult to compare estimates of noise exposure across EU Member States because the methods used to produce the data vary between countries. A new study has investigated five methods of estimating noise exposure and identified some of the reasons for variation in the data they produce.

In order to comply with the European Noise Directive (END)[1], EU Member States have produced strategic maps of noise exposure. These estimate the level of noise inhabitants are exposed to and they are used to plan effective noise mitigation actions. However, different methods for producing these maps are used by different Member States, which can produce contrasting results and complicates cross-country comparisons.

The study explored what might be causing the differences in estimates produced by five methods of noise mapping, by comparing their results for the Pisa municipality in Italy. The results could help inform efforts to help harmonise procedures for producing strategic noise maps across the EU.

The five noise mapping methods were END, VBEB, NEAREST, ALE and CLOSEST. These all aim to estimate the percentage of people exposed to a range of noise levels, but they vary in their calculation and assumptions. For example, in END the noise exposure for inhabitants in a building is assumed to be the maximum value of sound calculated at the outer building façade, whereas CLOSEST assumes all inhabitants in a building are exposed to the sound level measured outside the building at the geographical grid point (in terms of longitude and latitude co-ordinates) closest to the building facade. CLOSEST then reduces the sound level by 3 decibels (dB) to account for reflections from the façade. Another major difference is that END and CLOSEST provide a single value for all the inhabitants living in the same building, whereas VBEB, NEAREST and ALE provide a range of noise exposures for inhabitants in the same building.

The analysis revealed that the END method tends to overestimate the level of noise exposure compared to the other methods. The VBEB method produces the lowest estimate of noise exposure. The difference between these two methods depends on the level of noise. There is little difference in results of the two methods at low and high noise exposures, but there are large differences in results for the mid-ranges i.e. between 55 and 62 dB for L_{den} (weighted average levels for day, evening, night) and between 45 to 53 dB for L_{night} (night time exposure).

The CLOSEST method presented similar estimates to the VBEB on a large geographic scale, but the differences between the methods were greater when measuring noise exposure for a small area. The difference between the results of the methods also depended on the source of the noise. For example, there was very little difference between END and VBEB when the noise was from an airport, probably because airports produce a more homogenous noise than road traffic. Another factor that influences the variation in results was whether only main roads were considered or the entire road network. If only main roads were included in the analysis, then both END and VBEB tended to produce lower estimates than other models.

There is clearly a large variation in how the different methods estimate noise exposure and it is difficult to nominate one as superior since their accuracy depends on context, for example whether the noise map is for road traffic noise or airport noise. For transparency and effective communication, the study recommends the use of CLOSEST, which is a simple method that measures noise at the geographical grid point closest to the building and is suitable for informing the public about noise exposure.