HOW TO PREDICT FUTURE ANNOYANCE IN PLANNING?

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Introduction When planning the development of traffic facilities like airports, roads, and railway tracks, acoustic calculation procedures are used in order to predict the noise load in the vicinity of the new or changed facility, especially in residential areas nearby. With large developments, the delay between the planning and the opening of the new or changed facility may take up to ten years. In predicting the effects of the future noise, it is often assumed that (1) annoyance does not change over the years, and (2) annoyance is not affected by the change itself. Both of these assumptions can be questioned.

Does annoyance change over the years? When planning noise restrictions or abatement programs, the current procedure usually takes existing dose-effect relationships like the well-known curves from the TNO data set (e.g. Miedema & Vos 1998). This data set comprises annoyance and disturbance data from studies which have taken place between the late 50s and the early 90s of the last century. The mean age of data is 23 years. In the mean time, the structure of the noise load has changed – even with equal energy noise levels – for many noise sources, especially for aircraft and road traffic noise: the average noise level of individual vehicles decreased, but the number of events increased considerably. Until now, it is an open question whether the dose/response relationship between noise level and annoyance has changed over the years, or has remained constant.

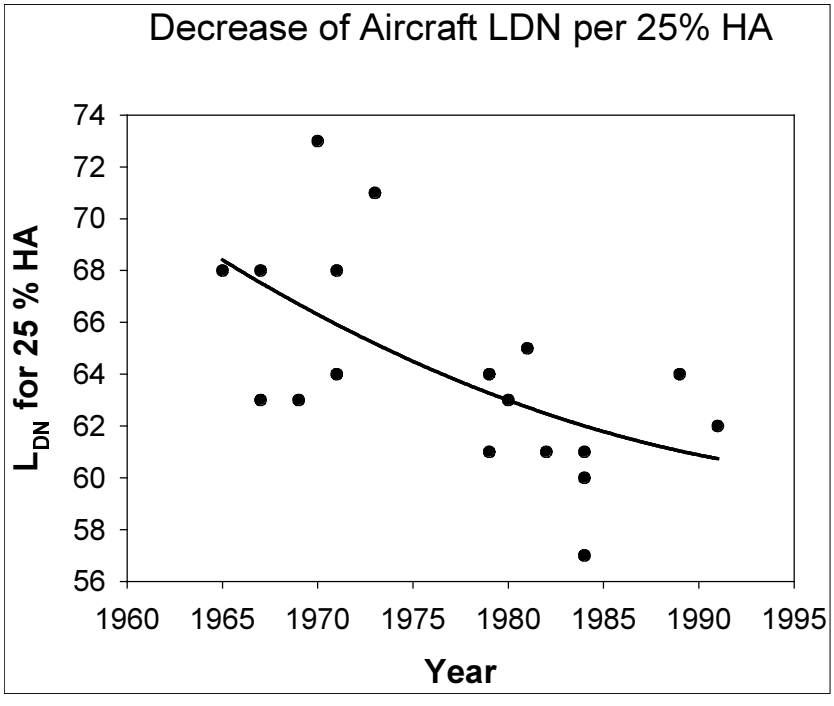

Fig. 1: Decrease of aircraft noise level for a constant percentage of highly annoyed residents. Data from Miedema & Vos (1998)

Inspecting the dose/response relationship for aircraft noise given by Miedema & Vos (1998), we find a decrease of the day/night level necessary for evoking a constant percentage of 25% respondents being highly annoyed (Fig.1). This figure is derived from the graphs given by the authors, and the regression line is calculated without weighting the number of respondents in each of the studies included. This may bias the result, and a closer look into the data may be necessary, but the first impression is that the anoyance of residents exposed to aircraft noise increased over the years. The annoyance change may amount up to 6 dB DNL between 1965 and 1985 for aircraft noise. When planning a noise situation that will be effective in several years, it may be necessary to calculate the annoyance trend over the last 20 years, and provide for a potential change of annoyance in the future – e.g., by extrapolating the statistical trend.

Annoyance in changing noise situations When a noise situation is abruptly changed (e.g. by opening or closing a road, or by opening a new airport runway) the annoyance of residents usually changes in a way that cannot be predicted by steady-state dose/response relationships (cf. Fidell et al. 2002; Raw & Griffiths 1990): Most studies show an „over reaction“ of the residents, i.e., with an increase of noise levels, people are much more annoyed than would be predicted by steady-state curves, and with a decrease of noise levels, people are much less annoyed. The amount of „overshoot“ depends on the way the change is introduced or negotiated with residents in the neighborhood (Fields et al. 2000) and the amount of change at each location (Fidell et al. 2002). At present, the duration of overshoot reactions cannot be predicted, due to a lack of long-term follow-up studies, but Raw & Griffiths (1990) claim that some effects can be seen up to 9 years after the change.

Conclusion Predicting future annoyance should include possible statistical trends of the annoyance reactions over the years – even for steady-state noise loads, and with changing state situations, the effects of the change are also to be accounted for. This could mean that many current impact assessments of future noise situations underestimate the actual annoyance of the residents.

Keywords: noise annoyance, community response, changed noise levels, annoyance prediction

References

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