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COMMUNITY RESPONSE TO RAILWAY NOISE IN GREAT BRITAIN

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The Institute of Sound and Vibration Research at the University of Southampton has concluded a four year study of reactions to railway noise in residential areas. The study was carried out using a combined social survey and noise measurement programme in which residents' reactions and railway noise levels were measured in 403 neighbourhoods along 75 sections of railway routes in Great Britain. The reactions of 1453 residents were measured in 45-minute interviews. The descriptions of railway noise levels were based on complex computer analyses of tape recordings of over 1,700 pass-bys from the 403 measurement sites. The use of a probability sample design has enabled statistics to be computed which are statistically representative of the British population near railway lines. For full details see Fields and Walker (1980).

MAJOR FINDINGS FROM THE STUDY

1. Railway Noise Index

The 24 hour Leq dB(A) noise index appears to be the most practical choice of indices for representing railway noise. The noise and number trade off implicit in Leq fits the data better than any of the other established indices tested. There appears to be an additional duration effect which Leq does not account for. Linear, D and B weightings are slightly more highly correlated with annoyance than the 'A' weighting. The 'A' weighting appears to do less well than a linear weighting in weighting some acoustical aspects of overhead electrified routes.

2. Relation of Disturbance to Noise Level

Different measures of railway noise impact are related differently to noise level. General railway noise annoyance increases as noise level increases (see Figure 1). As a result, there is no particular 'acceptable' or 'target' noise level. In general the lower the noise level, the less the annoyance. The rate of increase in annoyance is less steep below 40 to 50 dB(A)Leq.

3. Extensiveness of Railway Noise

It is estimated that about 40,000 to 80,000 dwelling units in Great Britain are at noise levels above 65 dB(A)Leq.

4. Intensity of Response to Railway Noise compared to other sources

Some people are annoyed by railway noise. The railway noise disturbs sleep, conversation and television viewing. It sometimes startles people.

The comparison of these railway data with three aircraft surveys (around Heathrow) and two English road traffic surveys, suggests that, at least above 60 dB(A)Leq, railway noise is less annoying than noise from these other sources

(see Fig.2). The estimated size of the difference in reactions depends upon the survey with which the comparison is made as well as the noise level. As noise level increases the gap between reaction to railway and other noise sources increases. At railway noise levels equivalent to 74 dB(A)Leq the same level of annoyance is reached with the other sources at a noise level of 6 dB lower in one case and at least 10 dB lower in other cases.

5 Relation of Traction Type to Annoyance

At high noise levels people alongside overhead electrified routes report less annoyance than people near third rail or diesel routes. In the 55-75 dB(A)Leq range the difference in general annoyance is equivalent to at least a 10 dB(A) difference in noise level (see Fig.3). This difference cannot be explained by differences in noise levels, presence of jointed rail, proportion of freight traffic, ambient noise level, population density, train speed, number of trains, region of country, visibility of railway structures, fear of the elettrified third rail, annoyance with fumes, or annoyance with dirt from the railway. The difference in reaction is greatly reduced if the less common linear frequency weighting network is used (see Figure 4).

6 Factors which do affect Annoyance with Railway Noise

Even after the measured noise level of moving through-trains has been taken into account, there is evidence that annoyance is considerably increased by more freight traffic, and the nearness of residence to railway. People in more recently constructed houses are more annoyed. This holds even after adjustments are made for the fact that older people are less annoyed. Fear of danger from the railway and the belief that it is feasible to reduce railway noise both increases annoyance.

7 Factors which do not affect reactions

Reactions to the noise from railways appear not to be increased by lowered ambient noise levels, living in less densely populated areas, having more education, or having a higher occupational status. People's reactions to the railway noise in their neighbourhood do not appear to be affected by their opinions about the railway as a transportation system or by any personal benefits they may derive from the railway. Though a pass-by at a given noise level may be more annoying in the evening or night, there is no evidence that increasing the number of railway pass-bys at night increases night time annoyance. Annoyance with train noise is only marginally affected if at all by section of country.

8 Place of through train annoyance in total railway environmental impact

Noise from railways is rated as the most important impact of a railway in a neighbourhood. Vibration is the most important non-noise impact. Of the various noises associated with a railway's operation, maintenance is rated as the worst, even more of a problem than the noise from through trains.

REFERENCE

1. J.M. FIELDS and J.G. WALKER 1980. ISVR Technical Report 102. Reactions to railway noise: a survey near railway lines in Great Britain.

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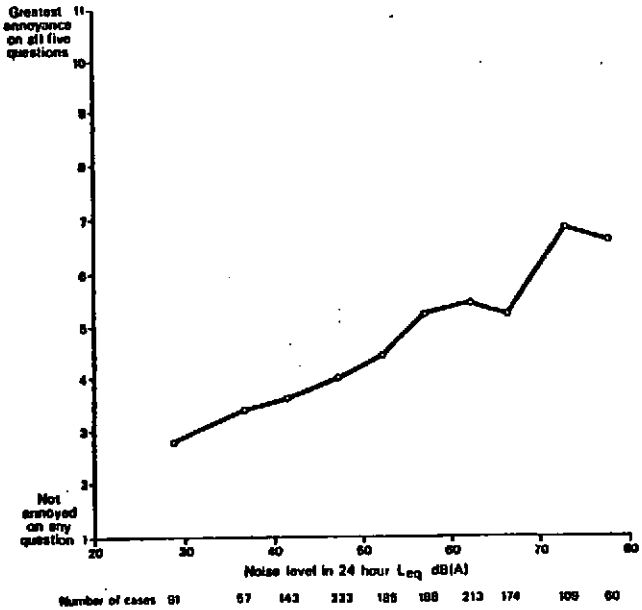
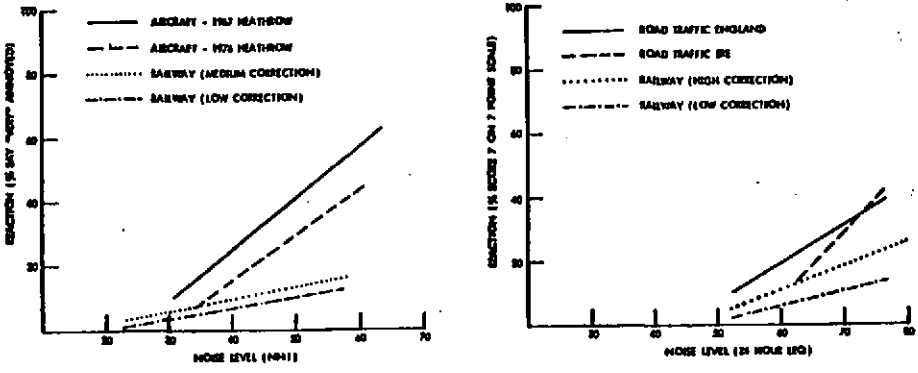


Figure 1 - General annoyance index by noise level.



(a) (b)

Figure 2 - Response to railway, road traffic and aircraft noise
a) Railway and 1967 and 1976 Heathrow reactions.
b) Railway and BRE and England road reactions.
(The railway data are corrected to attempt to compare equivalent conditions) (see Fields and Walker, 1980).

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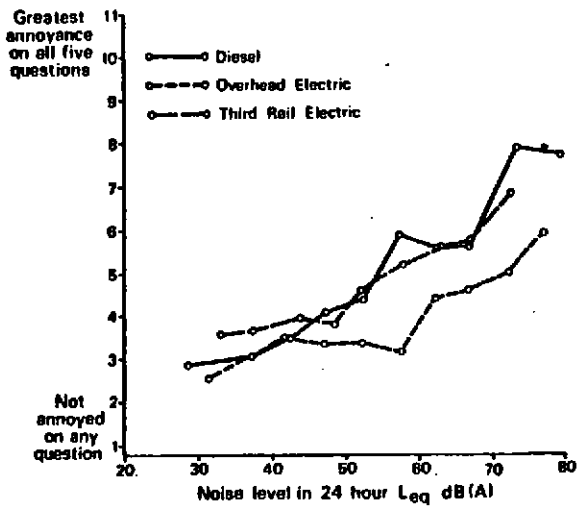

Figure 3 - Effect of traction type on annoyance (Noise level in dB(A)).

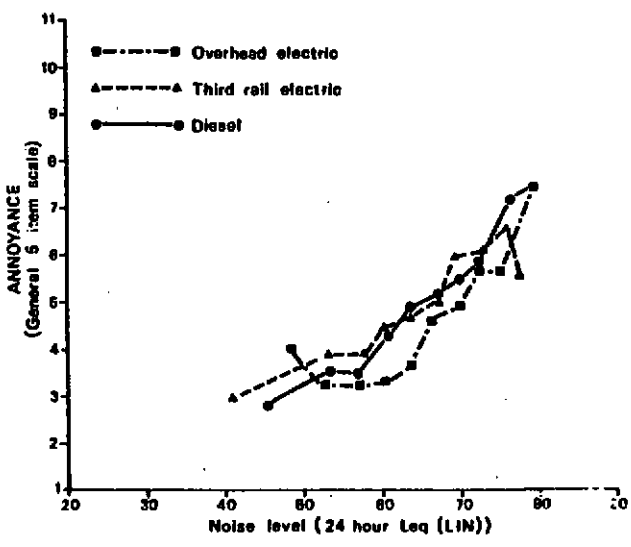

Figure 4 - Effect of traction type on annoyance (Noise level in dB(LIN)).