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A CONTEXT-RESPONSE PARADIGM FOR ENVIRONMENTAL NOISE

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ABSTRACT

Subjective response to any particular noise can be thought of as being determined in part by the physical attributes of the noise, but to a larger degree by the context within which the noise occurs. This principle holds when examining community responses to noise from transportation modes. On that basis this paper calls into question the usefulness of generic "dose-response" or "dose-effect" functions as predictors of community noise disturbance, and thereby challenges the direction the European Commission's noise policy appears to be taking. It proposes a fundamental shift in perspective to a formal recognition of 'context' as a primary determinant of the effects of noise. The implications for the practical management of noise are developed in the companion paper by Flindell and Porter, 'The implications of context based assessment for noise management'.

1 - INTRODUCTION

There is no equivalent in social sciences to the mathematically formulated causal laws of physics. Statistically significant associations between, say, particular behaviour or attitudes and related aspects of the environment, cannot be regarded as demonstrative of underlying laws of behaviour or response. Numerous studies demonstrate associations between physical parameters of noises and negative attitudes or responses to the noises. But in the absence of causal laws they demonstrate no more than the fact that, in any given situation, the louder a noise is the more likely it is to disturb. In fact, so far as noise in the environment is concerned, attitudes like dissatisfaction or annoyance are shown to be more strongly associated with the context in which the noise occurs, than they are with any physical measure of it. For the purposes of this paper a general aim of noise policy is taken to be the reduction of such negative attitudes wherever possible, the premise being that the states of mind that negative attitudes to noise evince are in themselves highly undesirable.

2 - THE DOSE-RESPONSE PARADIGM

'Dose-response' or 'dose-effect' functions are frequently derived from noise and social survey data, and meta-analysis techniques are often applied to derive functions based on large datasets. From the point of view of EC policy the most important functions are those concerned with transportation modes, and the draft framework directives released thusfar make clear the EC's intention to promote common assessment methods based on such functions. The functions are one way of representing the association between noise levels and attitudes such as annoyance in available datasets, but great care must be taken with their interpretation, and the uses to which they might be put.

Most surveys of attitudes to noise are representative of a particular community exposed to a relatively stable noise environment. Dose-response functions are commonly synthesized by combining the data from many such cross-sectional studies in some way and subjecting them to statistical meta-analysis. In statistical procedures of this kind, conditions of equivalence are necessary. That is, for each attitudinal scale point used in one study, an equivalent from the scale points in each of the other studies must be established. Responses on attitudinal scales, however, cannot in any sense be regarded as pure expressions of any underlying attitude. Meta-analyses can in fact only proceed by making arbitrary assumptions about the meaning of ratings in different studies.

Dose-response functions derived in this way can therefore only be interpreted as very general statistical representations of the way in which self-reported community noise annoyance, for example, is partially a reflection of noise exposure. They give no indication of what effects changes to the noise climate may have, and offer no information about what preference any particular community may have for alternative courses of action to abate noise. In short, they cannot be interpreted as a basis for decision making.

3 - CONTEXT

Attitude to any particular noise depends largely on the context in which it occurs. Context can be thought of as a qualitative and collective term, inclusive of all issues germane to the formation of attitudes. It includes, for example:

- Who or what is responsible for the noise;
- Why the noise is being produced;
- Where and when the noise is being received;
- Who the recipient of the noise is;
- What the history of the noise is;
- Whether the noise is increasing or diminishing;
- What activities the noise interferes with;
- The soundscape within which the noise occurs;
- What the economic significance of the source is;
- What the implications of change are.

Each of these (and other) aspects of context are significant, but their relative importance varies widely according to economic and cultural circumstances. So while it's clear that we need to contextualize noise exposure before we can properly formulate policy, any formulation of a contextual model appears to be an overwhelming task.

In fact, in most of the instruments we use in the management of noise, we implicitly try to circumvent the lack of a formal means of contextualization in two ways. Firstly by considering noise in a categorical way, principally by considering noise from different sources separately. In part this is simply a by-product of administrative boundaries, but it is nevertheless a de-facto partial contextualization, since it implicitly takes account of the important contextual component of attitude towards the noise source and those responsible for it. (In fact, although the noise control system in the UK is often criticized for being rather fragmentary, it can be looked at sympathetically from this standpoint.) And secondly, by the use of particular noise indices, like L_{DEN} , which (in this case by differentially weighting day, evening and night) try to contextualize in themselves.

The aim of such approaches is to be sufficiently confident about the effect of noise according to each category, to be able to infer a simple causal relation between intensity of noise and effect; in other words, to apply some kind of dose-response function in a predictive mode. A naive extension of this approach is to suggest that we simply require more and more dose-response functions (or refinements thereof) to deal with more and more different contexts, and that this is simply a matter of progress and better knowledge. To suggest, in other words, that contextualization is amenable to statistical elucidation.

But we should be realistic about how far we can take quantitative methods, and how far we can base policy on statistical inferences. We must acknowledge the qualitative nature of context, and the fact that it is dynamic and changeable. Any causal laws governing response, should they exist, will only do so in vague terms, and serve as an inadequate basis for anything but the most general policy decisions.

4 - CONCLUSION

To be effective, noise policy must be developed in a way that explicitly acknowledges the context-dependency of community response to noise, and not on the basis of statistical associations between noise level and attitude. Only by this means shall any realistic notion be gained of the benefits and disbenefits of alternative courses of action. The companion paper by Flindell and Porter sets out the principles of a system for noise management which takes explicit account of context.