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Measuring the Total Noise Environment

Colin G. Gordon
Wolfson Unit, ISVR, University of Southampton

My major purpose in this paper is to encourage free discussion and argument. Therefore the suggestions and opinions that I put forward are not entirely divorced from a desire on my part to be mildly provocative.

The real environment in general cannot be simply stated as due to traffic, aircraft, train or industrial noise alone. Most situations involve the combination of a wide variety of different noise intrusions of different intensities and changing characteristics from time to time during the day and night. Yet it is clearly necessary that such environments must be measured and quantified and of course in the long term one must try to predict these levels also.

The subject of the measurement of the total noise environment is still a relatively new one, although it is one that is increasingly occupying the minds of "noise environmentalists" today. In the United States there are already measurement standards and procedures that profess to measure the total noise environment. A variety of single number indices have been promoted as providing such an environmental measure in the United States, in Britain and in a number of European countries. The question now is "where do we go from here?"

Let me in a few paragraphs present some thoughts on the matter:

1. We are gradually approaching a situation in which all the major contributory sources of environmental noise can be legislated and controlled individually or collectively. The Land Compensation Act (1973), for instance, places traffic noise within the regulatory process of local and national government. Aircraft noise - if the UK follows the American lead - may soon follow suit. Thus we can say with some confidence that, whether we like it or not, there will be increasing pressures upon us to assess by measurement or prediction the total noise environment.

2. As environmental noise assessment comes more and more fully under the regulatory influence of "statutory instruments", and the like, we can expect that, whatever processes of assessment derive from the recommendations of groups like the Noise Advisory Council, they will certainly become the more cumbersome and time-consuming

in execution as a result of legislation. The process for the measurement of the 18 hour L_{10} level, for instance, is threatening to absorb a level of effort on the part of local authority officials and acoustical consultants which would seem to far outway the usefulness of the unit.

3. The problem of course is one of reconciling the known deficiencies of currently used indices of noise assessment with the precision that any regulatory (and planning) process must demand. One, of course, might avoid the worst of the problems if the process of compensation were put on a "sliding scale" basis with a slope sensitivity commensurate with known sensitivity to environmental change, and taking the accuracy of measurement into account also.

4. This however does nothing to neutralise the influence of inadequate indices of noise assessment, and since a British index for the total environment has yet to be defined we must be especially careful that our choice is a sensible one both as regards its ease of measurement (and prediction) and its usefulness. Ideally one must hope to devise an index which can be handled adequately by the local authority planner or public health inspector - with a reasonably modest investment in equipment.

5. The Community Noise Exposure Level (CNEL) of California, devised particularly for assessing community disturbance around airports, is perhaps well enough suited to form the basis for a measure of total noise environment. The measurement process however requires a sophisticated monitoring system and an extensive survey would be extremely expensive. One might also question the validity of the index which is, in essence, a weighted energy summation giving little attention to short term high intensity sources.

6. The validity of a single number index for total environment assessment might indeed be seriously questioned at this time, especially in the light of the relatively sophisticated systems of noise measurement that are now available to those responsible for environmental assessment. I am increasingly of the opinion that the search for a single number index of noise assessment which will deal effectively at all times with all sources in all situations is an exercise in futility.

7. In a paper presented at the 7th ICA the late Peter Franken suggested goals for environmental acceptability based on the full statistical time distribution curve, using the time domain in somewhat the same manner as we use the frequency domain in the tangential fitting of NC and NR curves. This approach makes a lot of sense since it is quite clear that environmental acceptability in terms of the total environment cannot be wholly measured in terms of one point on the distribution curve alone.

8. The method of assessing the environment over a twenty four hour period day must also be open to serious question. There is a certain implication in the use of single number indices that either the "swings and roundabouts" principle applies or that the principle of similarity is universally true. Yet we know for a fact, in the case of the latter principle, that there can be a radical difference between the day/night noise relationship in the vicinity of motorways (and certain airports) and in suburban and rural areas far removed from national and international transport routes.

As members of the acoustics profession we must not underestimate the influence that we have upon public and political attitudes and actions in respect of noise legislation. Whilst we must welcome the advent of noise legislation we must be careful that the legislation is not bad in the sense that it is cumbersome, expensive, impracticable or inadequate. The "reverse" and "forward" gears of the regulatory process are probably equally hard to set in motion - we may have to live with our mistakes for many years to come.