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AN HOLISTIC APPROACH TO ENVIRONMENTAL ASSESSMENT

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1 INTRODUCTION

Environmental assessments have been carried out on the effects of development proposals for many decades and noise has often been included in the factors addressed in these studies. Initially these were carried out by the promoter of the development on a voluntary basis, and in some cases sought only to portray the scheme in a favourable light. In 1985 the European Community issued a directive[1] to member states to introduce legislation requiring environmental assessments to be carried out for various types of development. This was implemented in England and Wales in 1988 under the Town and Country Planning Regulations[2], and further guidance was given in a joint departmental statement [3]. These regulations were revised in 1999 and are now implemented under Statutory Instrument 1999 No 293[4].

The regulations specified the types of project for which mandatory environmental assessments were required, laid down procedural requirements for submitting and publicising the ES, but only briefly outlined the topics that might need to be addressed and did not give any guidance on how the assessment should be carried out. Not surprisingly, the quality and value of these assessments could vary considerably and various attempts have been made to standardise the approach and techniques used in preparing the assessments.

The 1988 guidance described the process of environmental assessment as *a technique for drawing together, in a systematic way, quantitative analysis and qualitative assessment of a project's environmental effects, and presenting the results in a way which enables the importance of the predicted effects, and the scope for modifying or mitigating them, to be properly evaluated by the relevant decision-making body.* This description reveals several key points about the environmental assessment process. Firstly, it draws a distinction between an effect and its importance. Secondly, it requires that all significant factors are presented in a coherent and structured manner. Finally, it notes that the assessment is for the benefit of the decision-makers. Thus it should be borne in mind, when preparing the statement, that such people are usually elected council members and would consequently be lay people as far as many of the technical issues are concerned. It is, therefore, necessary to develop methodologies for evaluating the effects caused by a particular factor and describe the importance of these effects in a manner that allows non-specialists to pay due regard to the relative significance of each factor.

An interesting feature of the 1999 regulations is the requirement for an environmental statement to include an outline of the main alternatives studied for the development, together with a description of the environmental and other reasons for selecting the final scheme. This requirement again highlights the need for a systematic assessment framework that enables an equitable and transparent decision to be made.

In the course of preparation of Environmental Statements for a wide variety of projects, we have found that, at the start of any project, it is necessary to establish an understanding between the disciplines of the fundamental terminology to be used within the assessment framework.

2 UNDERSTANDING EFFECTS AND IMPACTS

Before establishing the significance of environmental changes resulting from a scheme we have shown that it is necessary to establish the terms of reference to allow a common terminology to be applied to all factors. The definition of terms such as *effects* and *impacts* needs to be clarified to enable an equal weighting to be applied to all consequences of the scheme.

In this context the term *effects* can be used to describe the physical change affecting a location or an individual. In the case of noise or air quality this physical change is quantifiable, whilst in other disciplines, such as landscape or archaeology, it is likely to be qualitative or subjective and some dispassionate assessment of the change is required. Following on from this, an *impact* can then be defined as the scheme-wide result of effects and be judged in the context of local or national importance, thus introducing the concept of significance.

Once the scope of an EIA has been agreed, the start of an impact assessment is then clearly the quantifying of effects. To facilitate this, a range of descriptors of the physical changes is needed to allow these changes to be presented in a meaningful way.

In this context, there is a danger that the noise policy framework proposed in the European Commission Green Paper [5] providing for the harmonisation of methods of assessment of noise exposure, and the concept of a single EU noise indicator, militate against the flexibility necessary to provide such an assessment of noise issues. Whilst the use of a single indicator may give the impression of an "holistic" approach to quantifying noise, we consider that this is spurious, and there is a danger that it will prevent the differentiation of characteristics and mask otherwise identifiable changes in the noise environment. As Bridget Shield has pointed out in a recently published paper[6], the application of a single unit will mean the loss of useful information about the existing noise climate and the impact of new sources, at a time when advances in instrumentation enable a wide range of descriptors to be easily measured in both the frequency and time domains. Flexibility is needed in terms of the time frame and units used in an assessment to ensure that all the likely noise effects of a scheme can be identified and quantified. The focus of the impact assessment is then the distillation of these effects into a transparent and easily assimilated form enabling the lay person to make a judgement on the overall merits of the scheme.

Perhaps the most striking example of the contrast between the effects and the impact of the noise of a proposed development can be found at Stonehenge, in Wiltshire, where the A303 trunk road has required upgrading to a dual carriageway for many years. This would have resulted in only a 2 or 3 dB increase in noise, a change that is barely perceptible. However, because of the status of Stonehenge as a World Heritage Site it was decided that this small increase in noise and the marginal increase in visual intrusion would be unacceptable, even though no residential properties were affected. A decision has now been made to reduce the existing adverse effects by placing both the existing and the new carriageways in a tunnel. There can be few sites in Britain where such small effects could be deemed to constitute such a major impact.

In contrast, the roads building programme has numerous examples of new roads being built where large adverse effects are caused at individual properties or even communities, but are permitted, as it is in the national interest to improve the transport infrastructure. It is this need to consider the

effects of a scheme in the context of both its immediate surroundings and the wider issues, that informs the approach to evaluating the relative importance of the various individual effects of a development. As an example, Table 1 gives an assessment framework for defining the significance of individual factors and, by using this system, the study team can be confident that the widely differing topics covered in the assessment will be given their due weight in the decision making process.

Table 1: Scheme Significance Criteria

Significance	Criteria
Severe	Only adverse effects are assigned this level of importance, as they represent key factors in the decision-making process. These effects are generally, but not exclusively associated with sites and features of national or regional importance. A change in a site or feature at regional or district scale may also enter this category. Typically, mitigation measures are unlikely to remove such effects.
Major	These effects are likely to be important considerations at a local or district scale but, if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision making process. Mitigation measures and detailed design work are unlikely to remove all of the effects upon the affected communities or interests.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.
Minor	These effects may be raised as local issues but are unlikely to be of importance in the decision making process. Nevertheless, they are of relevance in enhancing the subsequent design of the scheme and consideration of mitigation or compensation measures.
None	No effects or those which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

The above significance criteria are independent of discipline and provide a classification framework within which specific effects can be rated. The principle is to provide a coherent and objective scaling for the various degrees of significance. Within each discipline the effects of the scheme would be ordered using a suitable quantitative scale or subjective descriptor to determine its significance in a manner that is compatible with those of other disciplines.

As an example the following quantitative criteria have been found to be particularly apposite to determine the significance of the noise impacts of motorway and trunk road widening schemes.

Table 2: Noise Impact Significance Criteria

Significance	Noise Impact
Severe Adverse	Noise levels increased to a point where continued residential use of a group of over five properties or the use of a community building is inappropriate.
Major Adverse	Noise levels increased to a point where continued residential use of individual properties is inappropriate or where the use of a community building could be inappropriate. Increases in ambient noise levels of 10dB or more at large communities or increases of 15dB or more at smaller dispersed communities.
Moderate Adverse	Noise levels requiring mitigation by acoustic insulation of residential properties on a widespread basis in a community. Increases in ambient noise levels of 5-10dB at large communities or 10-15dB in smaller dispersed communities or individual properties. Increases in noise in outdoor recreation areas in close proximity to the scheme to levels where continued use may be inappropriate.
Minor Adverse	Increases in noise levels by 3-5dB at large communities or 5-10dB at smaller communities or where acoustic insulation is required for individual properties. Increases in noise of 3-5dB at outdoor recreational areas in close proximity to the scheme.
Not Significant	Changes in noise level of less than 3dB in large communities or less than 5dB at dispersed communities or individual properties. Increases in noise level of less than 3dB at outdoor recreational areas in close proximity to the scheme.
Minor Beneficial	Reductions in noise levels at individual properties to below the threshold for acoustic insulation. Reductions in noise level of 3-5dB at large communities or 5-10dB in dispersed communities.
Moderate Beneficial	Reductions of noise levels at settlements to below the threshold for acoustic insulation. Reductions of more than 5dB in large communities or more than 10dB in dispersed communities.
Major Beneficial	Reduction of traffic noise to a level which does not contribute significantly to the ambient noise in an area.

This approach, applied across all disciplines, allows the various impacts of the scheme to be normalised, and hence the cumulative impact to be assessed in a consistent manner.

3 CONCLUSIONS

The importance of differentiating between the individual effects of a scheme and the assessment of their overall impacts with respect to the scheme has been discussed. A representative and well tried common framework for the assessment of impacts in each discipline has also been presented.

This methodology has been found to provide an easily assimilated format for the evaluation of the often disparate environmental effects of development and infrastructure schemes, thus enabling lay people to make informed and balanced decisions on the merits of schemes.

REFERENCES

1 European Community Directive No 85/337/EEC (OJ No. L175, 5.7.85. p. 40)

2 Department of the Environment (1988) *Statutory Instruments, 1988 No. 1199, Town and Country Planning, England and Wales, The Town and Country Planning (Assessment of Environmental Effects) Regulations 1988,* HMSO, London

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5 European Commission (1996) *Green Paper on Future Noise Policy,* COM (96) 540 final, European Commission, Brussels

6 Sheild B (1999), European Noise Policy – Some Reservations, *Acoustics Bulletin* **24** (4) 5–9