inter.noise 2000
The 29th International Congress and Exhibition on Noise Control Engineering
27-30 August 2000, Nice, FRANCE

I-INCE Classification: 7.9

PSYCHOACOUSTICAL EVALUATION AS A BASIS FOR THE DEVELOPMENT OF METHODS IN PHYSICAL PLANNING AND LANDSCAPE ARCHITECTURE

P. Hedfors

Swedish University of Agricultural Sciences, Dept. of Landscape Planning Ultuna, P.O. Box 7012, SE-750 07, Uppsala, Sweden

Tel.: +46 18 67 19 28 / Fax: +46 18 67 35 12 / Email: per.hedfors@lpul.slu.se

Keywords:
LANDSCAPE ARCHITECTURE, PSYCHOACOUSTICAL EVALUATION, SOUND QUALITY, SOUNDSCAPE

ABSTRACT
The overall aim of this Research is to develop tools to facilitate the inclusion of environmental sounds in landscape planning and design. This paper presents the development of a psychoacoustical evaluation method suitable for field observation. An interview manual concerning sounds and their implications have been developed. Interviews are supplemented with questionnaires treating both the test subjects' comments, and sound sources contributing to the sonic environment. The comments as well as the sites visited may thus together constitute components in planning and design terminology. The method will be developed further through a study of a select group of individuals, with different listening views.

1 - INTRODUCTION

Landscape architecture and planning are guided almost exclusively by a visual thinking. The tools of architecture have traditionally been the pen and the drawing, both of which appeal to the sense of sight. The human species, however, should always − as most other animals − be regarded as a multiple-sensory organism. Schön [1] describes the architect as a reflecting practitioner who, through the daily practice of his profession, builds a repertoire of images, examples, and understanding. This repertoire accumulates through a critical analysis and reflection upon the effects of his own practical plans and solutions. Future results from the psychoacoustical evaluation method (which is presented here) can broaden the repertoire of this reflecting practitioner. When outdoor environments are designed, the practitioner can make note of how the acoustic questions are addressed [2].

1.1 - Concept development

Acoustic conditions in- and out-of-doors are obviously very different. The difficulties can be made concrete through consideration of a concert hall. A concert hall is very like a laboratory environment, in that the greater part of the relevant parameters can be regulated through construction of the space. Open spaces lack ceiling and enclosing walls. The degree of environmental control can never approach that in an enclosed room. Terrain and weather also enter in, and activities can suddenly introduce apparently random elements in the acoustic space. Conceptual tools adequate to describe an outdoor environment must therefore differ from those suitable for enclosed spaces. The psychoacoustic evaluations in coming studies are expected to contribute two types of tool: a) verbal terminology, and b) prototypes in the form of site cases. The verbal terms are developed from interpretations of existing locations with the associated sound environments. The same locations can also be taken to serve as prototype, and become reference objects.

1.2 - Problem presentation

This paper presents the development of a research method for exterior sound environments. The major goals are: to increase awareness and deepened understanding of the role of sound in landscape planning, and the development of an accompanying facilitating terminology. Methodology-focused queries concern what types of character can be perceived. What is it that comprises a soundscape? Moreover, how can

one best describe and evaluate it? Development of a terminology follows as a result of these analyses. The coupling between sound and location is under scrutiny, so the sounds are studied in the geographical context (site soundscape). A central issue is therefore the development of a suitable case study design [3].

2 - METHOD DEVELOPMENT – INTERVIEWS ON SITE

The method used is termed here psychoacoustic evaluation. It has been developed with five interview persons at two locations. One study individual has been interviewed at a time. Three of the individuals have visited both locations. One of the locations is a small garden in an urban environment. The other is a large pasture area on the city fringe. Both of the locations are popular. In a traditional sociological study, the study persons are the stars. In this case, however, the subjects are used as interpreter for the sound environments. The object of interest to the interviewers is on the locations and the associated local sounds.

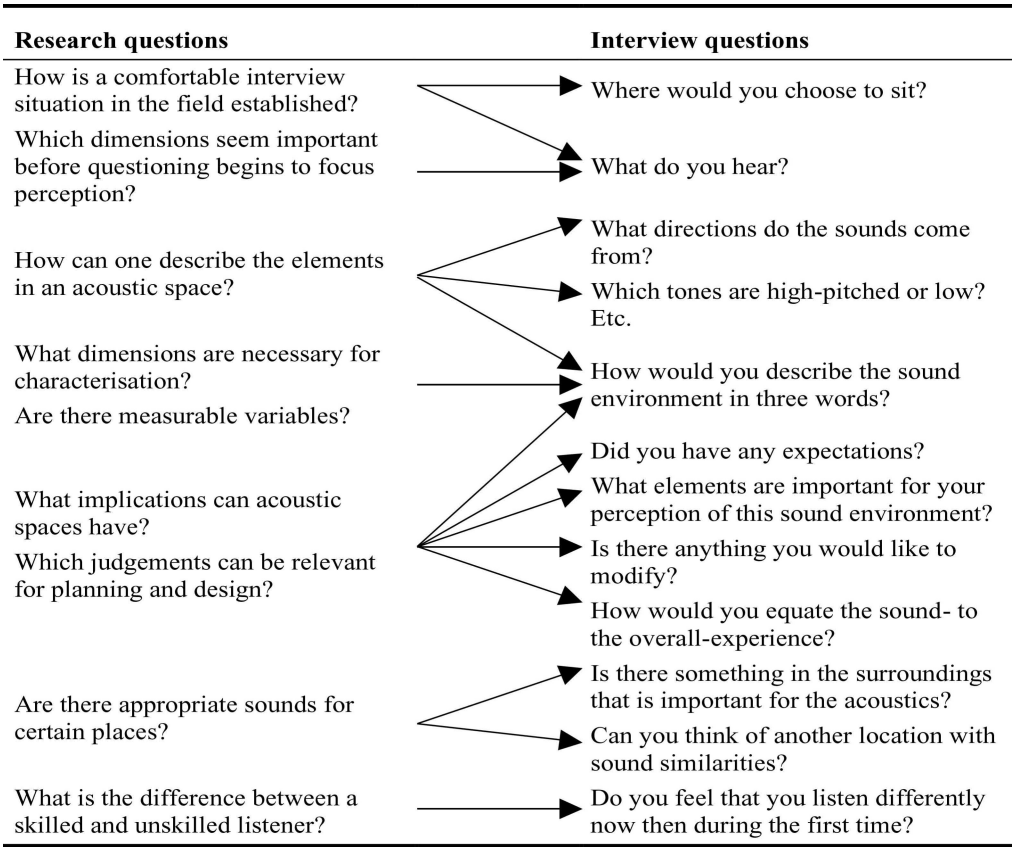

Figure 1: Some Research questions and interview questions.

We are using observational field interviews to help understand locations. The interview subjects observe and interpret their sonic environment. Interview questions have evolved from research questions (fig. 1), [4]. After tackling the interview questions, subjects respond to a questionnaire [5], which concerns: a) characters of soundscape, and b) contributing sound sources. The subject is encouraged to think aloud while filling in the questionnaire, to allow the recording of both the subjects answers and interpretation of the questions. The questionnaire provides in this way both a quantitative and a qualitative value. Finally, the study leader notes weather conditions and activities occurring on site during the observation period. In order to establish an easy rapport between the researcher and subject, all questions of a more personal nature are presented towards the end of the interview. These are questions concerning topics such as the interviews mood. After visiting the site, the physical environment is meticulously described. Descriptions include *e.g.* information about topography, vegetation, and constructions (site situation). These descriptions are a necessary element in clarifying the relation between a physical site and its soundscape.

3 - DISCUSSION

The questionnaire helps reduce the number of factors to a manageable number of dimensions. However,

a plenitude of descriptive words is also desirable for the development of a planning- and design language. The sound source questionnaire is a logical step in the study's overall goal of coupling to landscape architecture and planning. The practitioner is accustomed to the objects that generate sound in the landscape, even if he may not view them as sound sources. Sound aspects in planning and design can be easier to understand through a discussion of sound sources, which are tangible and a more natural tool. The practitioner can thus learn to recognize just those auditory characteristics for the type of land use he is planning, and subsequently be able to predict to a certain degree the consequences of various planning alternatives for the sound environment.

3.1 - Some potential difficulties

The method facilitates the analysis of short sequences within a continuous sound environment, and can be compared to a photograph. The photograph is an optical representation, a segment from a never-ending film that we call reality. Interpretation is dependent in part, upon what the photograph is intended to portray, and what has been emphasized either intentionally or otherwise. The site visit represents a clip of reality. We presume the short duration of the visit will not influence the effectiveness for terminology development. A disadvantage is the possibility of missing some highly characteristic sonic elements of the particular site cases, which may not present themselves during such short exposure periods.
It can be difficult to determine how much of the interview situation to reveal in advance, before the interview subject arrives. The subjects relation to the interviewer, site and sounds can also introduce bias in the subjects perception. Unfamiliarity with the artificiality of a staged visit with strange questions concerning apparently foreign events can overshadow the ability to interpret and describe spontaneous reactions in words. To overcome these difficulties there is a need for a certain degree of experience on the past of the interviewer and a familiarity with the location that is to be evaluated. Is an educational step for the subjects appropriate, with the aim of increasing their aural awareness? Already after the occasion of the first interview, when an additional environment is to be analyzed, the interview subject displays a different preconception than compared with that prior to the first interview. The subject is then familiar with the interview procedure and has had an opportunity to digest the questioning.

3.2 - Motive for the methodology

Schön's reflective practitioner [1] works partly in the field. We use a field method, which is related to the practitioner's fieldwork. The study emphasizes acoustic issues while interpretations made by the interview subjects are simultaneously influenced by other sensory impressions. Consequently, the results will not address the different senses' internal significance. The subject can only attempt to describe his own subjective impressions of which senses he relies upon, and to what degree. Winkel [6] cast light upon typical circumstances surrounding field research settings and questions concerning validity.

3.3 - Validity

The creation of a comfortable interview situation strengthens the validity of the method. Questions are sorted so that the interview subjects own opinions are given priority. Leading control-questions in the latter part of the interview allow the subject to confirm or deny the interviewer's interpretations. The validation procedure is a component of the questionnaire. Questions are answered while the subject thinks aloud. Sound recordings allow an after-the-fact control of individual's use of terminology. It is even possible to attempt to hold weather and traffic relatively constant during the various interview episodes by *e.g.* visiting sites during similar wind conditions and the same time of day and week.

4 - FUTURE RESEARCH

The ability to selectively ignore sounds is important in many circumstances, but can also be regarded as a lack of aural awareness. During pilot studies, interview subjects tried to ignore sirens from emergency vehicles, and refused to be interrupted from their visits. A related situation is the *cocktail effect*. This sort of sound discrimination is physically demanding. Borrowing Kaplan and Kaplan's [7] terminology, this action of selective exclusion starts out as a state of *soft fascination*, and instantly changes to *directed attention*. The park visitor is consequently forced to concentrate and focus his experience in order to avoid interruption. This theory can possibly gain support in these continued studies.
In follow-up studies, a few subjects with specialized listener perspectives will be selected for repeated qualitative interviews. The listener perspective could *e.g.* be that of musicians, acousticians, composers, ornithologists, landscape architects, telegraph operators, blind persons etc. It is also possible to conduct group visits on site, so that a number of individuals can be simultaneously exposed to experience the same sound sequence, without the distraction of internal discussions. This procedure requires a development of more sophisticated questionnaires. Another variant is the selection of focus groups where subjects

with particular listener perspectives can inspire their group to deeper insights. Finally, additional site cases will be studied in order to broaden the practitioners' repertoire.

ACKNOWLEDGEMENTS
This study was supported by research grants from the Swedish Council for Building Research and the Swedish Council for Forestry and Agricultural Research. The author wishes to express sincere thanks to Per G. Berg, Clas Florgård and Patrik Grahn for valuable discussions and Cheryl Gay for linguistic revision.

REFERENCES

1. **D.A. Schön**, *The reflective practitioner: How professionals think in action*, Arena, 1983
2. **P. Hedfors and P. Grahn**, Soundscapes in urban and rural planning and design, *Yearbook of soundscape studies*, Vol. 1, pp. 67-82, 1998
3. **R.K. Yin**, *Case study research: Design and methods*, Sage, 1994
4. **S. Kvale**, *InterViews*, Sage, pp. 131, 1996
5. **P. Hedfors**, *Psykoakustiska utvärderingar (Swedish), unpublished*
6. **G.H. Winkel**, *Ecological validity issues in field research settings*, In A. Baum and J.E. Singer (eds.), Advances in environmental psychology, Lawrence Erlbaum, pp. 1-41, 1985
7. **R. Kaplan and S. Kaplan**, *The experience of nature*, Cambridge University Press, 1989