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Soundscape Support to Health – more than a research program

Kjell Spång^a
KS miltek
Strandskärsvägen 9
SE-42658 Västra Frölunda
SWEDEN

ABSTRACT

Our reaction to sound exposure is not only governed by the mean value and frequency weighting of the sound pressure. Variation in time and space has an influence as well as other factors – e.g. visual – which affect our sensory impressions. A perception based soundscape approach, involving knowledge from acoustics, environmental medicine and psychology, has the potential to take into account the total aspects of sound as a positive or negative factor. Knowledge from these fields has been utilized in the interdisciplinary Swedish research program Soundscape Support to Health. The research has been directed to development and application of methods and models for creation of positive soundscapes in traffic exposed residential and recreational city areas. Large-scale field studies and laboratory experiments have been used in the development and assessment of the methods and models. A communication program has been run in parallel, with the aims that the results from our research program, as well as from research by other scientists engaged in soundscape development, become known and applied in order to give our citizens access to soundscapes supportive to their health and well-being. The results from the research program will also be included in educational material at different levels, available on Internet.

1 CREATION OF POSITIVE SOUNDSCAPES – A WAY TO IMPROVE PUBLIC HEALTH

Traffic noise is a growing public health problem. This is a result of rapidly increasing traffic and concentration of people to densely populated areas. Results from the Swedish research program Soundscape Support to Health show that access to positive soundscapes in and around dwellings and in recreational areas is important for the possibilities of citizens to live a healthy life. Creation of positive soundscapes in densely populated areas is a way to improve public health. The program results show that this can be done by utilizing available tools and knowledge in intervention of present and planning of new residential and recreational areas.

The program started in the year 2000 and will end in December 2007. It has been accomplished by a research team involving scientists from the fields of acoustics, environmental medicine and psychology. The most important results are presented in this session of Inter-Noise 2007 by members of the research team. This introductory paper deals with the aims and some general aspects of the program.

^a Email address: kjell.spang@swipnet.se

2 AIMS OF THE RESEARCH PROGRAM

The research performed within the program Soundscape Support to Health has focused on creating the scientific bases and producing the appropriate tools for creation of soundscapes in residential and recreational areas, which are positive to citizens' health and well-being.

The aims have been:

- To characterize and classify soundscapes with respect to health and well-being
- To develop models and practical methods for application of the soundscape concept and creation of positive soundscapes in densely populated areas, including to demonstrate the effects on soundscapes of various mitigation methods, e.g. use of noise barriers, silent road pavements, absorptive surfaces.
- To communicate the soundscape concept and the research results with the goals to get them implemented in
 - o city and traffic planning, including improvement and development of residential and recreational areas
 - o relevant rules and standards
 - o education and training

Field studies and laboratory experiments have been an integrated part of the research. The benefits of application of the soundscape concept is demonstrated in a full-scale application example, illustrating how improvement of the access to positive soundscapes can go hand in hand with an increase of the number of dwellings through closing of gaps between buildings.

3 KNOWLEDGE OF ACOUSTICAL SOUNDSCAPES IS NOT SUFFICIENT

Until now *acoustical soundscapes*, i.e. soundscapes described with the aid of acoustical variables, assessed by physical measuring instruments, have been used for describing the noise environment. The assumption has been that knowledge of the acoustical soundscapes is sufficient to assess health risks and effects on quality of life. The results of the research by us and others show that this is not the case. The effects on humans are related to the *perceived soundscapes*, i.e. soundscapes described with the aid of perceptual variables, assessed by perceptual scaling methods utilizing persons.

Existing dose-response relationships do not take into account all factors influencing the overall perception and health effects of traffic noise. Our perception of sound exposure is not only governed by the mean value and frequency weighting of the sound pressure. Variation in time and space has an influence as well as other factors – e.g. visual – which affect our sensory impressions.

In addition to developing a method for direct measurement of the quality of perceived soundscapes utilising persons, the links between acoustical soundscapes and perceived soundscapes have been investigated. The aim has been to create a model that allows us to predict perceived soundscapes from knowledge of the acoustical soundscapes.

4 CHARACTERISTICS OF POSITIVE SOUNDSCAPES

Research with the goal to determine what constitutes positively perceived soundscapes has played a central role in the program as well as the importance to citizens' health and well-being of having access to such soundscapes in residential and recreational areas. One task has been to investigate the importance of access to quiet sides of residential buildings for obtaining positive perceived soundscapes. The results show that access to quiet sides of high acoustical and visual qualities is a prerequisite for creation of positive soundscapes in traffic exposed residential areas. The results have been implemented in recommendations issued by the National Board of Housing, Building and Planning. Orientation and design of buildings in relation to ground traffic is increasingly utilized in order to create access to a quiet side and area outside the building.

The research results also show that in residential areas which are exposed to high level traffic noise creation of quiet sides of high acoustic quality may not be feasible or not sufficient to offer an acceptable housing environment. It is necessary to include actions for reducing the noise emission from the traffic. Although the research program has been concentrated to actions and mitigation methods on the immission side, some resources have been allocated to investigating how application of presently available methods for reduction of the emission can contribute to creation of positive soundscapes in residential and recreational areas.

5 MORE THAN A RESEARCH PROGRAM

The program is mainly financed by Mistra – the Swedish foundation for strategic environmental research. Mistra programs shall contribute to solving important environmental problems and to form strong research teams. The research shall be at a high international level. It is realized that a sustainable development can only be achieved through solutions which have a good scientific basis. Mistra also requires that the research programs supported by them include strategies for creating a bridge between the scientists on one side and the problem owners and relevant decision makers on the other side. In addition to development of scientifically well supported solutions, the success of a Mistra program depends on the quality of this strategy and its implementation. In parallel to the research projects, the program Soundscape Support to Health includes communication activities and activities for influencing international, national, regional and local bodies responsible for rules and guidelines concerning environmental noise.

The task to make relevant decision makers aware of noise as a public health problem and aware of how the problems can be managed in city and traffic planning is very complex. Figure 1 illustrates the degree of efforts involved in a program for achieving the attention of decision makers at all relevant levels. The overview has been used in the planning and prioritisation of communication activities linked to the research program. It is not an exhaustive illustration of decision makers and does not include those directly responsible for the emission – the producers and users of cars and tyres.

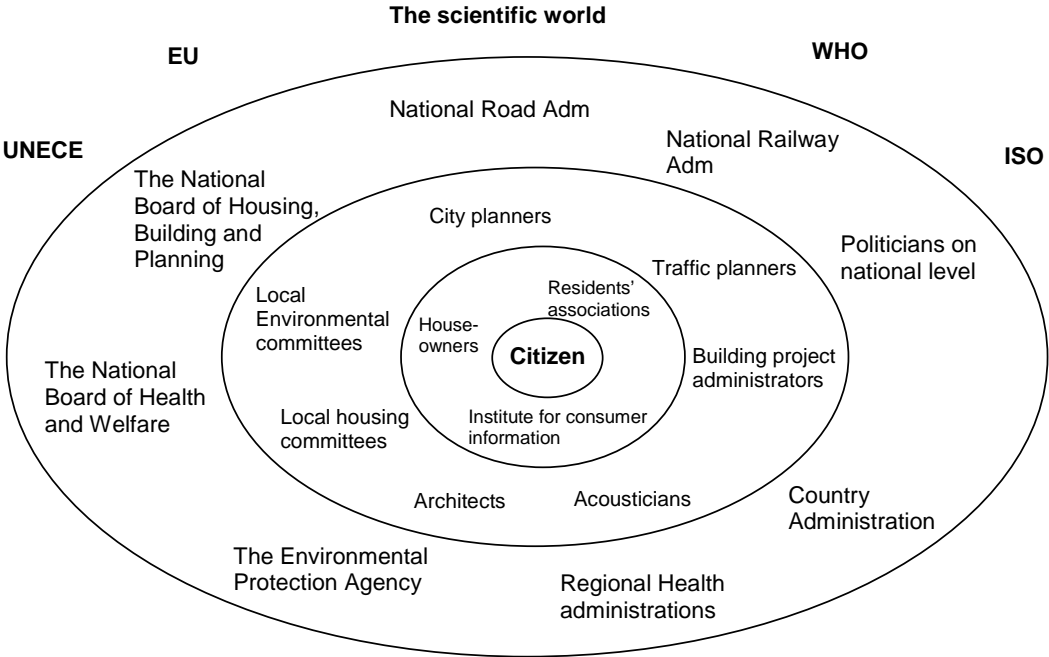


Figure 1: “Planetary system” illustrating the large number of organizations and decision makers, responsible for or influencing the management of the traffic noise environment in residential and recreational areas.

One important task is to make the citizens aware of the adverse health effects of traffic noise and the fact that there are ways to improve the soundscapes in residential areas. Their reactions in terms of complaints and market behaviour (e.g. choice of dwellings and dwelling areas) determines the priority to management of traffic noise given by politicians, city planners, building project administrators, and other important decision makers. A somewhat less complex but very wide task is to reach and influence politicians, organisations and decision makers at all relevant levels.

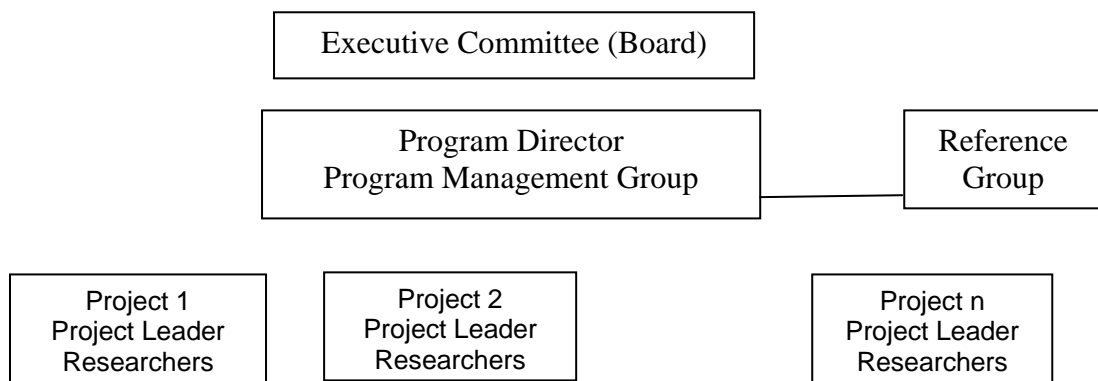
In our program we have been successful so far in catching an interest by media (television, radio, news magazines etc.) for our research results and in getting our program cited and some of our results implemented in Swedish regulations and goals and in guidelines to city planners. We have been less successful so far in our attempts to influence politicians on the national level. This is a very important group to reach and we are at present giving priority to this in our communication program.

The general goal of the communication program to get the research results known by those who have an influence on management of traffic noise environments in residential and recreational areas and applied in regulations and in practical city planning is very ambitious. The experience is that it takes long time and a large amount of efforts and resources to approach this goal.

An important question for us has been how to ascertain that the knowledge and further development of the healthy soundscape concept is kept alive and transformed to experts and user groups after the present program is finished. One important element in the program has been to develop education material on the soundscape concept for use by students at different levels. This material will be available on internet and successively updated by members of the research team.

6 PROGRAM MANAGEMENT

The general structure of a Mistra supported research program is illustrated in Figure 2.



For the research program Soundscape Support to Health, the chairman of the Executive Committee is a former General Director of the National Board of Health and Welfare and a present member of the Swedish Parliament. Other members of the Executive Committee represent the National Board of Housing, Building and Planning, The Swedish National Road Administration, and the City of Örebro. The Reference Group includes people from the Environmental Protection Agency, local environmental committees and experts in city and traffic planning. The project leaders, assistant project leaders and researchers come from Stockholm University and the Karolinska Institute, from Göteborg University and from Chalmers in Göteborg. The project leaders and assistant project leaders are members of the Program Management Group.

7 CONCLUSIONS

The research team involved in the program Soundscape support to health has included scientists in the fields of acoustics, environmental medicine and psychology. This has been of vital importance for the success of the research. Two-way communication activities, running in parallel with the research and directed to decision makers and user groups at various levels, has been found very beneficial for the continuous research planning and priorities and for the applicability of the research results in practical city and traffic planning.

8 ACKNOWLEDGEMENT

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9 INFORMATION ABOUT THE PROGRAM

Information on the research program and a comprehensive list of all publications from it, including abstracts, can be found on internet under the address www.soundscape.nu.