

SOUNDSCAPES AND LIVING SPACES SOCIOLOGICAL AND PSYCHOLOGICAL ASPECTS CONCERNING ACOUSTICAL ENVIRONMENTS

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ABSTRACT

Analysis of soundscapes can lead to a quality improvement in relation to different existing usages in urban environments. Although there is wide consensus that the environment is experienced through all our senses, the acoustic component of the environment has mainly been addressed in relation to noise pollution and in some experimental studies on the influence of sounds on landscape preferences. The living spaces, the structure of residential areas, the combination of noise sources have to be considered. Sociological and psychological aspects will be discussed concerning soundscapes and quality of life.

INTRODUCTION

According to the European Commission around 80 million people are affected by noise levels that experts consider unacceptable where most people become annoyed and sleep is disturbed and where adverse health effects are to be feared. Noisy working places as well as leisure time activities can also produce noise levels potentially damaging to hearing and leading to further health effects. It is estimated that over 500 million are exposed to hazardous levels of noise in the world, with 30 million in Europe being affected by noise in the work environment.

An additional 170 million citizens are living in so called grey areas where the noise levels are such to cause serious annoyance during day time. [1]

All the Member States have similar classifications of the sources of environmental noise related to the different human activities: road traffic, rail traffic, air traffic, industry, civil engineering and building site activities, recreational activities, outdoor equipment (such as gardening equipment). These classes differ from a phenomenological point of view and as the public's attitudes to noise from the different sources vary, are perceived differently.

Many Europeans consider environmental noise, caused by traffic, industrial and recreational activities as their main local environmental problem especially in urban areas. noise sources interact with the specific acoustic and environmental makeup (topography, meteorology, land use pattern, and lifestyle). The higher dissatisfaction expressed with their environment - in spite

of overall satisfaction with personal life quality points to difficulties to control the noise adequately.

NOISY ENVIRONMENTS IN DAILY LIFE

In the European Union about 40% of the population is exposed to road traffic noise with an equivalent sound pressure level exceeding 55 dB(A) daytime and 20% are exposed to levels exceeding 65 dB(A). That means those people suffer from noise levels that scientists and health experts consider to be unacceptable.

When all transportation noise is considered, more than half of all European Union citizens is estimated to live in zones that do not ensure acoustical comfort to residents.

At night, more than 30% are exposed to equivalent sound pressure levels exceeding 55 dB(A), which are disturbing to sleep. Noise pollution is also severe in cities of developing countries. It is caused mainly by traffic and alongside densely-travelled roads equivalent sound pressure levels for 24 hours can reach 75–80 dB(A). [2]

Noise can produce a number of social and behavioural effects as well as annoyance. These effects are often complex, subtle and indirect and many effects are assumed to result from the interaction of a number of non-auditory variables. However, it should be recognized that equal levels of different traffic and industrial noises cause different magnitudes of annoyance. This is because annoyance in populations varies not only with the characteristics of the noise, including the noise source, but also depends to a large degree on many non-acoustical factors of a social, psychological, or economic nature.

Recently, in a representative survey by the Federal Agency Germany, of 2000 adults, almost all German (80%) citizens are affected by some level of noise pollution. As in previous years, the predominant source of noise in residential areas is road traffic, which remains a nuisance for over half the population, and a source of serious annoyance for some 18%. Next to road traffic, air traffic is the most important transport-related source of annoyance in Germany. About a fourth of the population is annoyed by rail traffic noise. Some 30% of the population perceives business and industry as a source of annoyance caused by noise pollution. According to the survey, neighbours are one of the most important sources of noise pollution: 6,5% of the German citizens are highly annoyed by noise of their neighbours (Fig. 1) [3].

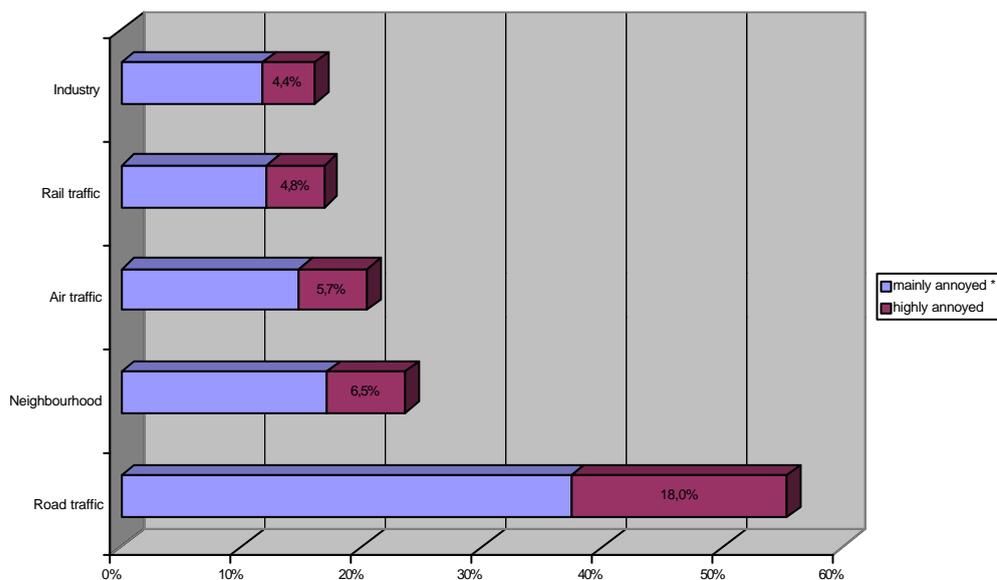


Fig. 1: Noise annoyance in Germany

NOISE ANNOYANCE

Noise annoyance depends on multiple factors like environmental area, noise source, characteristic of noises, number of noise events over a day, subjective experience with noises, the social situation. Judging annoyance includes a wide range of variability, which is highly correlated with the variability of living conditions. Social environment and lifestyle shape up the psychological and social conditions on short as well as long term intervals. The basis for the variability of annoyance reaction to a specific noise event is defined by the subject's social environment and lifestyle. But, the structure of the residential area, the combination of noise sources are for the judgment of annoyance as well important as subjective parameters which are relevant by the people's point of view, moreover the relationship of both define the background for assessments. [4]

ANNOYANCE RESEARCH

Research on Annoyance has to take into account different parameters and can not focus only on one parameter. The assessments of the quality of an environmental area depend on

how long people have been living there, how they define the area in dependency from the infra structure, how much they are involved in the social life in those areas or integrated in their neighbourhoods.

ANNOYANCE AND SOUNDSCAPES

Evidently, there is a link from soundscape to annoyance research that has to take into account different parameters. These parameters, e.g. architecture, natural environment like parks and gardens and also odor and dust, may moderate the annoyance. The raised questions are: firstly, which are the parameters of an environment that constitute the soundscape; secondly, which kind of measurements is needed to evaluate soundscapes; thirdly, can soundscapes work as a moderator concerning noise annoyance?

SOUNDSCAPE RESEARCH

Noise sources interact with the specific acoustic and environmental makeup (topography, meteorology, land use pattern, and lifestyle). The higher dissatisfaction expressed with their environment, in spite of overall satisfaction with personal life quality points to difficulties to control the noise adequately [5]. Results of a study in the area of Kingsford Smith Airport, Sydney suggests that the background factors that influence reaction to noise may be reasonably limited to the soundscape [4]. Subjective evaluation of the landscape integrates visual contributions: a positive evaluation of the landscape reduces annoyance of the soundscapes whereas a negative evaluation of the landscape increases annoyance [6]. Soundscapes may be defined in its effects on man and vice versa and probably acoustical ecology will serve to understand the function of soundscapes.

The interaction of people and sound, the ways people consciously perceive their environment are important to Schafer [7]. Already in the seventies he considered public places and the structure of these places. Recordings to keep the soundscapes available for the future to understand their underlying structure stored the acoustical scheme of the places. Schafer's procedure is a story about people's habit towards natural and self produced sounds. His questions with respect to acoustical ecology gave a systematic to the discussion on the sounding environment.

Ipsen [8] defines three components that are relevant concerning soundscapes: the context, the focus of attention, and personal knowledge/experience. Recently, the results of a study in the area of Kingsford Smith Airport, Sydney, suggest, "that the background factors which influence reaction to noise may be reasonably limited to the soundscape. Nonetheless, further research is required to establish whether other features of the enviroscape and psychscape are relevant to noise reaction" [4]. Lercher et al [5] found that "noise sources interact with the specific acoustic and environmental makeup (topography, meteorology, land use pattern, and lifestyle). The higher dissatisfaction expressed with their environment, in spite of overall satisfaction with personal life quality, points to difficulties to control the noise adequately." Maffiolo et al [6] point

out, that “garden soundscape evaluations integrate subjective evaluation of the landscape visual contributions: a positive evaluation of the landscape reduces annoyance of the soundscapes whereas a negative evaluation of the landscape increases annoyance.”

The factors here - as interaction of people and sound, the ways people are consciously perceiving their environment, habits towards natural and self produced sounds, the context, the focus of attention, and personal knowledge/experience, background factors which influence reaction to noise, topography, meteorology, land use pattern, visual contributions, landscape evaluation - show the close relationship of perceived environmental sounds and the context of experienced soundscapes.

METHODOLOGICAL PROCEDURES

The evaluation of soundscapes needs subject-related methodological procedures. With such suitable measurements a way has to be found that allows to rely on different dimensions on reaction to noise. “Improving the sound quality of an urban environment imposes not only to reduce loudness but also to account for the qualitative appreciation as a cognitive judgment given by listeners and particularly, for the interaction between acoustic dimensions and other sensory modalities in qualitative judgments of urban environments...getting a better understanding of sound quality requires a multidisciplinary research domain connecting various themes: studies on the subject and his capability in perception and interpretation; studies on the subject inside the society and his connection with others via language regarding the construction and the sharing of knowledge; studies on the social and cultural context; as well as field studies including physical measurements” [6].

A questionnaire survey that was conducted in Kyoto City, Japan, by Hiramatsu et al found that response to sound is related to the listener’s mental, social and geographical connection with the sound source.[9] Berglund et al [10] propose structured walks where residents identify sounds discerned in the soundscapes of their residential area indoors and outdoors. Listening places were selected where people had to scale the total loudness, the loudness from traffic noise and other sources. Schulte-Fortkamp et al [11] carried out in a similar procedure a pre-test in the Schlosstraße in Berlin. The road was divided in five sections; the first criterion to differentiate the sections was the visual impression. The Schlosstraße connects two main streets, for four sections a park separates the driveway. At each section the evaluation was done related to noise and visual impression. Evaluation tasks were photo-documentation, noise recording, loudness scaling, and extra comments. Manon analyzed urban scenes to constitute an urban soundscape simulator. In order to calculate acoustical parameters samples of soundscapes were recorded and perceptual attitudes an options using a semantic differential inquiry were evaluated. Results show that five sector –related phenomena could be defined; they ask for a multidisciplinary approach [12].

An adequate procedure should guarantee an evaluation of the complex soundscape. Nitsch et al [13] propose related to an acoustical and ecological procedure that could help to define a sufficient measurement related to soundscapes. They ask for acoustical-ecological reconnaissance in the selected areas, narrative interviews and acoustical journals, and of course for acoustical short-and long-term measurements.

MODERATOR EFFECTS

Recent surveys indicate that the process of noise judgment by the participants in general is non-linear, non scalable and very complex. Job et al (1998) take attitude as a pure modifier of reaction to noise exposure, rather than a part of, or caused by, reaction. Various studies on reactions to noise show similar results.

The door is open to the new concept of the moderator soundscape. Fyhri and Klaboe [14] consider a subjective sound- or urban scape that is dependent on which parts people relate to and how they relate to them. The participants in Berglund’s study [10] characterize the residential soundscapes under four dimensions, namely, *adverse*, *reposing*, *affective*, and *expressionless*. In Schulte Fortkamp’s pretest [11] the test persons focus on the interaction of acoustical and visual impression. The moderating effects of an experienced living area concerning noise annoyance is questioned in some comments. Hohmann [15] has acoustically

developed soundscapes, which demonstrate harmonic and disharmonic effects of an urban environment. Genuit [16] analyses aurally related psychoacoustics to receive a more objective description of the subjectively perceived sound quality. Chtouris [17] considers sounds to be interpreted in urban environments more under the aspect of a high density of activity, than being an element of annoying noise.

Obviously the relationship between visual and acoustical space is important. Probably the analysis of soundscapes can lead to a quality improvement in relation to different existing usages in an urban environment. Although there is wide consensus among researchers that the environment is experienced through all our senses, the acoustic component of the environment has only been addressed in relation to noise pollution and in a handful of experimental studies on the influence of sounds on landscape preferences, Giuliani [18].

Researches concerning the moderator effect of the quality of the residential area regarding annoyance give hints that they may work like a noise exposition equivalent. Evidently, annoyance research has to take into account different parameters and can not focus only on one parameter: while Klabeo looks from an architectural point of view with regard to changes that influence the noise development as well as odor and dust [14]. Lercher asks for natural environments like parks and gardens which may moderate the annoyance. It is his particular point of view that the local traffic is topped by the highway and railroad traffic [5]. When noises from different sources have to be judged, more difficulties arise. Analyses of such a constellation of noise events like road, railroad, and air traffic show something like a spectrum of subjective perception, reaction, and judgment. Although there are various surveys to solve this problem of measurement, there are no models and measurements up to now, which definitively define the procedure [19]. To be effective in estimating combined effects there is the need to provide a better map of the relevant psychscape variables, obtain more precise indicators of the sound – and enviroscape factors and to find out to bind it all together [18].

CONCLUSION

Interaction of people and sound, the ways people are consciously perceiving their environment, habits towards natural and self produced sounds, the context, the focus of attention, and personal knowledge/experience, background factors that influence reaction to noise, topography, meteorology, land use pattern, visual contributions, landscape evaluation, all these factors are related to subjective judgment of the acoustic quality of an urban environment. A better understanding of such factors requires a multidisciplinary research domain.

Different aspects concerning the moderator effect may lead to the question whether a factor soundscape will help to fill the gaps of three uncertainties: firstly, whether residents react more annoyed on road-, rail-, and air traffic noise as in earlier times, secondly, which correlation exists between annoyance judgments and somatic processes, and thirdly, what happens when people give an overall judgment on the degree of annoyance. Up to now soundscape has different descriptions, it is for sure an environment that has its determination in perception of noise. The perception is influenced by visual factors, but the assessment of such an environment is embedded in the complex context of living situations

The concept of noise annoyance needs to be broadened to an integrated environmental, psychosocial, and socioeconomic assessment of the community situation. This may lead to a more realistic basis for environmental impact and health risk assessments. Acoustics, Physics, Psychology, Medicine, and Sociology are needed to co work in surveys on perception of acoustic environments sufficiently.

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