Transitions in Soundscape from Theory to Practice

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Introduction

Soundscape provides a unified theoretical basis to measure, model, evaluate, predict and design indoor and outdoor spaces used by people for a wide variety of functions. The basis of soundscape theory is discussed with case studies of successful applications of this theory for a variety of planning and architectural design projects is presented. Soundscape is at once a theory, a philosophy, a science, a design method, a way of life and most importantly an art. It is an art that seeks out the essential core of human life in a given place, at a given time in a specific context and expresses it poetically to create a genius loci or a sense of place (Siebein, 2009).

Peter McLeary (1983) develops a theory based on Martin Heidigger's ideas presented in *The Question Concerning Technology* that states that the built environment is a way to link people as individual sensory beings as well as cultural beings with the environments in which they dwell through the specific medium of building. He proposes a three layered soundscape planning and design strategy placed in the pivotal role of moderating the relationship people have with the sonic environment through the tectonics of buildings and community infrastructure. Precedence is given to developing an acoustical palette for urban design including reducing, buffering or mitigating potential sources of disturbing noise; preserving and enhancing existing elements of the soundscape; and introducing new sonic interventions to express the goals of the citizens for high quality sonic.

However, new methods to measure sound as it is actually heard by human beings, philosophically conceiving of the ambient sound as a combination of specific acoustic events each with a specific source at a specific location with a specified sound power level or ability to produce sound energy, directional emittance pattern and specific propagation path from the source to potential listeners provide the inputs for advanced computer modeling and simulation methods that allow the soundscape to be mapped as both sound levels (i.e. dB) as well as perceptual phenomena and therefore planned, designed and mitigated in ways that were not possible even a few years ago. Furthermore, these mapping programs can convolve or combine the acoustical response of the environment with the sound source to allow complex sound fields with multiple sources to be modeled and aurally simulated so that planners, community officials, architects, residents and other stakeholders can aurally preview the results of various proposed planning strategies before they are built. This allows people to listen to the effects of alternate design proposals for a community and select those that meet acoustical criteria in addition to meeting traditional sound level limit criteria. Therefore, the stakeholders can become intelligent, active participants capable of providing informed input into decision making in their communities (Siebein and Kinzey, 2009 (1)). A case study of a fleet maintenance facility for a municipality demonstrated how detailed modeling and noise mapping of each of the specific acoustic events associated with the facility could lead to intelligent design for each of the noise sources to reduce potential noise impacts on nearby residents.

Aesthetic judgments can be made after critically listening to calibrated aural simulations where sounds can accurately represent the perceptual attributes of sounds that will be heard by residents at specific locations within their community. One can then consciously design the built environment not just to meet a maximum sound level limit, but also to have the acoustical qualities desired by the inhabitants. A case study of a community design efforts for a large power plant showed how calibrated playback of the proposed soundscape over an entire community for 4 days allowed residents to evaluate the new soundscape as they lived, worked and played in their community day by day.

The Soundscape

Murray Schafer, in his landmark book *The Soundscape: Our Sonic Environment and the Tuning of the World* (1977) states that "sounds of a particular locality like its architecture, customs and dress express a community's identity." From a planning perspective perhaps the inhabitants should be involved with the process of determining this acoustical identity while it is being formed rather than after it already exists.

The notion of ecology refers to the way people individually and collectively relate to the people and sounds around them as well as to the sources of these sounds. Structural relationships are formed among the interactions between people, the activities that they undertake, the sound sources involved with those activities and the physical structure of the community that locates these activities and people in space and time.

Schafer (1977) and Truax (2001) define an acoustic community as a soundscape where information plays an important role in the lives of the inhabitants. The nature of a community is where people live in association with others and develop a common character. In general terms this means that a soundscape can be formed among individuals exchanging information or being involved in communication. Communication, derived from the Latin *communicat*, means to give something intangible to another that can be conveyed in speech, writing or signs according to the Oxford English Dictionary. This acoustic community has a variety and complexity to the patterns and kinds of sounds heard within it. It has a complexity within the sounds and the information they convey and it establishes a functional balance to constrain the variety and complexity of the sounds so that meaning can be determined. Three case studies of indoor environments including a typical elementary school classroom, a music rehearsal room and a neonatal intensive care unit (NICU) illustrate the hidden ecological/ acoustical connections among those using the environments who must communicate in a variety of ways that forms soundscapes in areas of buildings that would not normally be thought of as suitable for soundscape analysis.

Acoustical consultants, architects and musicians understand the ways that the interior surfaces of a concert room “color” the reflected sounds. Truax (2001) argues that the perception of acoustic color in urban and natural environments provides important information to human and animal listeners and should be preserved so that the subtleties and nuances of communication in the soundscape can be appreciated. A case study in a natural area demonstrated the application of impulse response techniques and critical listening to identify acoustical rooms in deep natural settings.

Conclusions

Soundscape design and assessment methods including soundwalks, meeting with focus groups to gain qualitative understandings of acoustical and noise issues of interest to various stakeholders, long term measurements of community [9] sound levels, short term, detailed measurements of specific acoustic events as they are heard by human listeners, calibrated sound recordings, computer modeling and simulations of design alternatives and evaluation of the design alternatives by stakeholders provided insights into each project that were not available through typical noise control design processes. Innovative solutions for noise mitigation through multi-tiered solutions rooted in long term ecological benefits were reached using the soundscape methods. Residents, developers, city and county staff and other participants were engaged in each step of the design, construction and planning process. The time varying nature of entertainment, industrial, transportation and other community noise sources was illustrated showing the need to address the ambient noise as a series of specific acoustic events with a rhythm, level, frequency content, etc., that vary over time and may bring varying noise concerns to neighbors as opposed to the current paradigm of long term average assessment of noise that represents a conceptually homogeneous sound source.

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