



The Soundscape Standard

Bennett BROOKS¹ and Brigitte SCHULTE-FORTKAMP²

¹ Brooks Acoustics Corporation, USA

² Technische Universität Berlin, Germany

ABSTRACT

In 2014 the first ISO Standard in Soundscape ISO 12913-1, 2014 Acoustics - Soundscape - Part 1: Definition and conceptual framework was published.[1] Since then discussions on further development started, and now ISO 12913-2 should bring more information and confirmation about "Data Collection" from which we will learn more about the character of the holistic of Soundscape and consequent judgments. In addition, there is much new work on ANSI standards that consider life in park and wilderness areas. All of these engagements are directed to enhance the quality of life not only for humans but also for non-human beings. The paper will describe and discuss these different approaches that consider sound as a resource and not a waste. Such procedures can guide the process of designing our acoustic environment based on the participation of people involved.

Keywords: Soundscape, International Standards I-INCE Classification of Subjects Number(s): 81.2, 66

1. INTRODUCTION

The work to develop an ISO Standard on the Soundscape method began in 2009. Participants in the Standard Working Group, from many diverse disciplines, first focused on developing a definition of the term "Soundscape". This proved to be a difficult task, as the individual researchers and practitioners who comprised the Working Group had differing understandings of the terminology that they were using and differing visions for the implementation of their studies. However, a common purpose emerged from the deliberations of the Working Group which developed the following definition, given in ISO 12913-1, Definition and Conceptual Framework, Section 2.3: [1]

Soundscape is "an acoustic environment as perceived or experienced and/or understood by a person or people, in context".

So, the perceptions of those that are enveloped and engaged in their environment becomes a descriptor of that environment, as much as the physical attributes of the environment. Indeed, the perception of the sonic environment may be measured and analyzed just as the physical parameters can be.

¹ bbrooks@brooksacoustics.com

² b.schulte-fortkamp@tu-berlin.de

The next step in the development of the Soundscape method is to provide a systemized framework for obtaining and analyzing perceptual data. This framework is needed so that those working in the area may have consistent results in similar environments and contexts, and a basis for comparison between studies performed for differing cases around the globe. This framework is foreseen in the second part of the standard being developed as ISO 12913-2, Data Collection. Having a systemized way to obtain perceptual data will allow design tools and processes to emerge which can be used to improve the perceived sonic environment in a variety of contexts.

The working draft of International Standard ISO 12913-2 is intended provide a comprehensive guideline to conducting data collection for a Soundscape study. The application of these standardized methods will allow researchers and practitioners around the world to conduct and compare soundscape studies in many types of acoustic environments and perceptual contexts. [2, 3, 4, 5, 6]

The future analysis and reporting of these standardized soundscape studies will encourage the development of design tools which may be applied to the creation of improved sonic environments. These improved sonic environment will serve their occupants as a resource, rather than become a burdensome waste. This result will enhance the quality of life for all.

2. RECENT DISCUSSION

Today, the Soundscape Approach combines perceptual and physical evaluations towards a holistic study of the sonic environment. Beyond merely the physical conditions at a particular location — what has previously been termed the “shallow soundscape” [7] — a soundscape also necessarily includes any contributions by an individual, incorporating physical inputs (e.g. footsteps) as well as perceptual ones (e.g. how one experiences a condition based on previous experience, social conditioning, etc.). One’s “acoustic biography” of past experience, which can include questions of aesthetics, semantic values and identities, symbolism, and psychology at individual and societal levels, plays a significant role in one’s interpretation of the physical world. Sound sources thus can have complex associated “meanings” to the individual exposed to them, and can therewith block or enable one’s activities, thoughts, and feelings. Moreover, how people react to or handle sounds depends on the “acoustic coloration” of the larger environment from aspects such as geography, climate, wind, water, people, buildings, and animals [8].

3. EVALUATION

Because of this surfeit of influences on any soundscape, evaluation must be dedicated to a combination of acoustical factors and other sensory, aesthetic, geographic, social, psychological and cultural modalities relevant to human activity across space, time, and society. Taken together, these factors comprise a “deep soundscape” that poses quite a challenge to comprehensive study; the continued refinement of investigative soundscape procedures is critical to advancing our understanding of sound and noise in our built environment.

Soundscape has become a major tool in facilitating people's involvement in decision processes about acoustical environments. Despite recent strides in standardizing research methodologies, it is important to keep in mind that the Soundscape Approach is not a one-size-fits-all methodology. Rather, it establishes a framework from which to draw tools, strategies, and starting points for customized work. This paper calls for the precise crafting of soundscape research at a time when such studies are beginning to proliferate in a number of fields.

4. SOUNDSCAPE RESEARCH METHODOLOGY

Evaluating the acoustic environment calls for interdisciplinary measures. A-weighted sound pressure level (SPL) has dominated measurement practices, there is common agreement that additional parameters are necessary to accurately capture the complexity of a sonic environment. But psychoacoustic parameters such as loudness, roughness, sharpness, and tonality provide an immense contribution towards measuring and assessing environmental sound more accurately regarding perception. The physical conditions of any particular soundscape can be measured using binaural recording devices according to standardized metrics [9, 10]. Recordings using microphone arrays are a further possibility and potential alternative. These are primarily derived from standardized procedures of measurement and analysis [11], and they make it possible to explain annoyance from, and acceptance of, environmental noise more in detail.

Subjective conditions are measured through a combination of evaluations usually involving residents, who are termed 'local experts'. Local expertise in a soundscape is a combination of meaningful knowledge about an area with which an individual interacts directly over time. In soundscape work, local experts generally live in the study area and provide their knowledge through evaluation processes such as soundwalks¹ and various kinds of open interviews. Local expert participation sharply focuses the subsequent analysis of acoustical and perceptual data, as the information provided often enhances the investigator's sensitivity to the subtle particularities of the examined areas.

Once primary data has been collected, physical noise criteria can be matched to perceptual descriptors in order to generate comparative data between individuals. Without question, the multidimensionality of human perception cannot easily be simplified to singular numbers. The listener's attitude, expectations, and experiences are all significant parameters that must be considered when performing a full perceptive evaluation of specific stimuli; perhaps the only factor of more significance in such data collection is the knowledge people have about the area in which they live. Combining these collection priorities and strategies enables a more meaningful phenomenological examination of a particular place, supported by multiple disciplines as well as personal perspectives [12].

It should be noted that, with so many strategies of research at work, interdisciplinarity is considered a necessity in the Soundscape Approach. Research tasks are directly related to local individual needs and take into consideration those who are noise sensitive and other vulnerable groups. Research should also account for cultural aspects and the relevance of natural soundscapes, sometimes referred to as

¹Soundwalks are participatory sound and listening walks with respect to the acoustical, visual, aesthetic, geographic, social and cultural modalities. See also [1].

quiet areas. These factors can be the most important issues for the people impacted by a soundscape, and their study requires the insightful tools developed through various fields of study. The Nauener Platz project, for instance, required the direct collaboration of architects, acoustics engineers, environmental health specialists, psychologists, social scientists, and urban developers.

With so much varied information being collected, an appropriate evaluation procedure is needed to integrate contextual and subjective variables and fully account for people's expertise. A standardized procedure is currently under development as Part II of the ISO standard [6], though it is also necessary to develop tailored evaluation procedures that prioritize different points of view [13, 14, 15, 16, 17, 18].

5 REFERENCES

1. ISO 12913-1:2014 -- Acoustics -- Soundscape -- Part 1: Definition and conceptual framework, 2014-08-27, International Organization for Standardization, Geneva, Switzerland. http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=52161 [Accessed 29 Apr. 2016]
2. S. Fidell. The Schultz curve 25 years later: A research perspective. *The Journal of the Acoustical Society of America*, 114(6) 2003, 3007-3015
3. R. M. Schafer, *The Tuning of the World*, University of Pennsylvania Press, Philadelphia, 1977
4. B. Truax. *The World Soundscape Project's Handbook for Acoustic Ecology*, Vancouver, A.R.C. Publications, 1978
5. J. Kang, K. Chourmouziadou, K. Sakantamis, B. Wang and Y. Hao, (ed.), *Soundscape of European Cities and Landscapes*, 1st ed. [online] Oxford: COST office through Soundscape-COST, pp.120-127. Available at: http://soundscape-cost.org/documents/COST_TD0804_E-book_2013.pdf [Accessed 29 Apr. 2016]
6. ISO/NP 12913-2 -- Acoustics -- Soundscape -- Part 2: Data collection, 2013-09-13, International Organization for Standardization, Geneva, Switzerland. http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=63716 [Accessed 29 Apr. 2016]
7. K. Hiramatsu, et al. The concepts of soundscape. Is there shallow and deep soundscape? *Proceedings of InterNoise (2009 Ottawa, Canada)*
8. P. Lercher and B. Schulte-Fortkamp. The relevance of Soundscape research to the assessment of noise annoyance at the community noise level, *Proceedings of the International Congress on Noise as a Public Health Problem (ICBEN 2003 Rotterdam, The Netherlands)* and *Zeitschrift Lärmbekämpfung* 06-2003, Springer Verlag
9. A. Fiebig. The link between soundscape perception and attention processes, *J. Acoust. Soc. Am.*, 131(4) 2012, 3437-3437
10. A. Fiebig, V. Acloque, S. Basturk, M. Di Gabriele, M. Horvat, M. Masullo, et al. Education in Soundscape – A seminar with young scientists in the COST Short Term Scientific Mission “Soundscape – Measurement, Analysis, Evaluation”. *Proceedings of 20th International Congress of Acoustics (ICA 2010, Sydney, Australia)*

11. H. Fastl and E. Zwicker. *Psychoacoustics – Facts and Models*, Springer, 2007
12. B. Hollstein, Qualitative approaches to social reality: the search for meaning, in: J. Scott & P. Carrington (eds.). *Sage handbook of social network analysis*. London/New Delhi: Sage, 2011
13. Schulte-Fortkamp, B., and Dubois, D. [guest editor] (2006). Ed. Special Issue on Soundscapes - Recent advances in Soundscape research, *Acta Acustica* Vol. 92, no. 6
14. Schulte-Fortkamp B., Brooks, B., Bray, W., "Soundscape: An Approach to Rely on Human Perception and Expertise in the Post-Modern Community Noise Era." *Acoustics Today*, v. 3 n. 1, (Acoustical Society of America, Melville, New York, 2007)
15. Schulte-Fortkamp, B., and Kang, J. [guest editor] (2013). Special issue Soundscape, *Journal of the Acoustical Society of America*, vol.134, issue 1, pp. EL1-900.
16. Brooks, B., Schulte-Fortkamp, B., Voigt, K., Case, A., "Exploring our Sonic Environment through Soundscape Research and Theory." *Acoustics Today*, v. 10 n. 1, (Acoustical Society of America, Melville, New York, 2014)
17. Davies, W. et al. Perception of soundscapes: An interdisciplinary approach, *Applied Acoustics* 74.2 (2013), 224–231
18. Bruce, N. and Davies, W., The effects of expectation on the perception of soundscapes, *Applied Acoustics* 85 (2014), 1–11