ISO/TS 12913-2:2018 – Soundscape – Part 2: Data collection and reporting requirements – what's it all about?

By Philip Dunbavin

By the time you read this, ISO/TS 12913-2:2018 should have been published, or at any rate is about to be published. It is notoriously difficult to predict exact publication dates for new ISO documents.

Part 1

Part 1 was published in 2014 [ISO, 2014] and considered to be the definition and conceptual framework. It is a very short standard three pages plus a bibliography. So, what is it all about and what is getting more and more acousticians interested in what is an emerging science?

Soundscape represents a paradigm shift from noise control policies towards a new multidisciplinary approach as it involves not only physical measurements, but also humans and social sciences with a focus on how people actually experience an acoustic environment in context. Soundscape started as a research field in the late 1960s, was defined more specifically by R Murray Schafer in the 1970s [Schafer, 1994 and 1977] and has grown significantly over the past 20 years in the field of community noise and environmental acoustics [Kang, J., and Schulte-Fortkamp, B., 2015; Kang and Aletta, 2018]. More recently it has come to the attention of policy makers [Payne et. al, 2009; Defra, 2010; Easteal et. al, 2014; City of London Corporation, 2017; Welsh Government 2018], as well as practitioners and acousticians in consultancy practices.

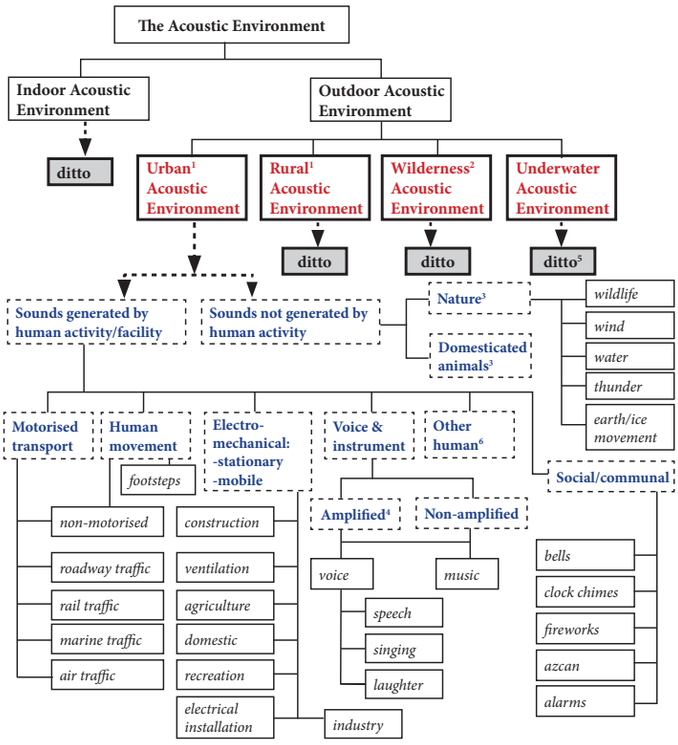
In Part 1, soundscape is defined as 'the acoustic environment as perceived or experienced by and/or understood by a person or people, in context' [ISO, 2014]. Much has been debated in recent years about exactly what 'context' is in the light of BS4142:2014. In soundscape, the context is meant as the physical place where the acoustic environment exists and according to the ISO definition, it 'includes the interrelationship between person and activity and place and time and may influence soundscape through the auditory sensation, the interpretation of auditory sensation, and the response to the acoustic environment' [ISO, 2014].

The main thrust of soundscape is that it is a holistic approach, meaning that it requires assessing the acoustic environment based on the contribution of different disciplines [Kang et. al, 2016].

Part 2

According to Kull [1] a soundscape is the entire acoustic environment resulting from natural and man-made sound sources. To assist in source reporting a classification for all sounds sources should be used. The taxonomy proposed in Part 2 at Annex C, Figure C1 – A taxonomy of the acoustic environment for soundscape studies [2] is shown below [Reprinted from ISO/ PRF TS 12913-2:2018].

Note: Bold boxes = types of places, dashed boxes = types of sound source; italics = sound sources.



Key [Figure and key reprinted from ISO/ PRF TS 12913-2, 2018 Acoustics — Soundscape — Part 2: Data collection and reporting requirements. Geneva, Switzerland: International Organization for Standardization (ISO)].

1. *The urban/rural distinction is not always readily defined but remains useful.*
2. *The wilderness category includes national parks, undeveloped natural and coastal zones and large recreation areas for example, though the wilderness/rural divide is not always clear-cut.*
3. *While 'nature' and 'domesticated animals' sources are shown as being 'not generated by human activity' there are many areas of overlap, e.g. the sounds of running water in constructed water features or the sound of wind on buildings. Domesticated animal sounds are generally from animals associated with a human activity/facility.*
4. *Recording, replay and amplification can occur for any type of sound, e.g. in installations playing nature/wildlife sounds.*
5. *Because of the different acoustic impedances in air and water, many of the terrestrial sound sources would not normally be observed under water, but overall the same classification system is still applicable.*
6. *Coughing for example.*

Measuring a soundscape

The big challenge with respect to measuring a soundscape is that soundscape is a multifaceted phenomenon and hence P56 ▶

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cannot be measured with a few single numbers. In general, soundscape has to be measured, assessed/evaluated through human perception of the respective acoustic environment.

The soundwalk method is an empirical method for identifying a soundscape and its components and is the most frequently applied method to collect data to explore areas of human response to an acoustic environment. The essential purpose of a soundwalk is to encourage participants to listen discriminately and to make judgements about the sounds heard [3], but the protocols can vary and Part 2 presents three different approaches to this.

The more observant reader will have noted that Part 2 is an ISO/TS. A TS (Technical Specification) is a device used where a science is emerging and further research is required to provide the evidence that will result in it becoming a full ISO in due course. In the case of soundscape there is currently no "reference method" and logically then a TS is the right basis for Part 2. The lifespan of a TS is that it is reviewed after three years and then again at the six-year point. At either of those reviews it can be upgraded to a full ISO providing the evidence to do so is available.

Annex C of Part 2 describes three methods of data collection [Reprinted from ISO/ PRF TS 12913-2:2018]:

Soundwalk Method A [Figure reprinted from ISO/ PRF TS 12913-2:2018]:
This uses a questionnaire to collect data on how people perceive an acoustic environment in situ, e.g. in a soundwalk.
[See references 4, 5, 6, and 7.]

The questions are presented and the participants mark their perception using a five-point ordinal-category scale. A simple example is shown below:

Overall, how would you describe the present surrounding sound environment?

Very good	Good	Neither good nor bad	Bad	Very bad
☐	☐	☐	☐	☐

Soundwalk Method B [Figure reprinted from ISO/ PRF TS 12913-2:2018]:
Method B is very similar but uses five-point unipolar continuous-category scales with additional verbal labelling ranging from 'not at all' to 'extremely'. A simple example is shown below:

How loud is it here?
Mark your impression at any location on the scale below.

not at all slightly moderately very extremely

Method C [from ISO/ PRF TS 12913-2:2018]:
Method C is not an actual soundwalk but is instead, a narrative interview and is based on COST TD0804 STSM [8]. The guidelines refer to satisfaction with the living space, residential experience, experiences with/relation to sounds in daily life, daily routines, co-inhabitants, neighbours, spatial identification of sound effects within residences, effects of various kinds of sounds, assessment of the effect that varying sounds have upon overall sound exposure and actions to improve residences with regard to sound exposure.

In COST TU0901 [9] an attempt was made to produce a questionnaire that was harmonised and common for use in 29 European countries plus three countries outside of Europe. We came to the conclusion that one size fits all was not possible. Selecting the wording of the questions used for a questionnaire is a delicate task. The meaning and weight of some words would simply not translate adequately into other languages. The critical message is to design your questionnaire with great care.

As an aside, ISO TC 43/SC1/WG62 [ISO. 2018. ISO/TC42/SCI/WG62] is about to start on the task of revising ISO/TS 15666 Acoustics [ISO, 2003] – Assessment of noise annoyance by means of social and socio-acoustic surveys.

Physical measurements

So, what about physical measurements? Annex D of Part 2 [ISO/ PRF TS 12913-2:2018] specifies how to perform binaural measurements by means of an artificial head measurement system. In contrast to recordings based on a monaural microphone, binaural acoustic measurement systems record sound as if a human listener is present in the original; sound field, maintaining all spatial information.

Statistical analysis of responses from questionnaires can test the reliability of the responses and examine the relationship between subjective responses and objective measurements. Analysis of the results has frequently been performed using linear regression. Other correlation methods may be considered as well, e.g. multivariance analysis. The analysis of the data will be the subject of Part 3 of the standard and work on that will start later this year.

During the development of Part 2, there was much comment and debate over whether binaural measurements should be 'normative', which means they are mandatory, or whether monaural recordings would be adequate. This is one of the many areas in which research is required.

While it is understandable that researchers would like to use monaural recording, because it has much lower costs associated with it, there is no substantial evidence to demonstrate that no important information would be lost by using monaural recordings instead of binaural.

Having good recordings means that researchers can analyse them using a range of metrics depending on the nature of the sound sources. Classical acoustic indicators are to be measured and reported in accordance with ISO 1996-1. Psychoacoustic parameters play an important role with respect to auditory sensation. Such parameters as sharpness, tonality, roughness and fluctuation strength can yield information with greater differentiation than the consideration of sound pressure alone. [Fastl, H., Zwicker, E., 2007]

What next?

The European Environmental Agency in its Good Practice Guide acknowledges 'soundscaping' as one of the P60 ►

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strategies to identify and manage quiet areas [10], thus a lot of research efforts are focused on this one particular soundscape: quietness and tranquillity.

Much more effort should be directed to developing predictive models for the perception of the acoustic environment starting from physical features of the environment. This might provide 'tools' to link soundscape research, policy making and design practice.

Overall, soundscape research needs more scientific evidence of its potential to promote healthy urban environments. This will eventually integrate this emerging science into the broader framework of policy making and urban planning.

Author

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