"SoundExplorers" – A Workshop for the Training in the Exploration and the Documentation of the Sonic Environment

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ABSTRACT: The "exploration" of the sonic environment may reveal rare sounds or highlight special acoustic conditions. Geophysical phenomena, biological functions, human activities and machinery operation are becoming the key (f)actors in a sonic scenery. A field survey, which includes listenings, interviews or conversations with the locals and visitors or by simply referring to archival material (e.g. reports, photographs, video, recordings etc.), results into evidences for the structure of present or past soundscapes. Some of them cannot be heard any more, many are still waiting to "speak out". For all of them, someone could "tell" a story. This is the role of "soundexplorers", who either alone or in small groups are exploring the sonic environment and are transforming their experience in free-form texts, technical reports, visual and sonic compositions or other forms of representations towards the understanding of soundscapes. This paper presents the overview and the guidelines of a workshop for the training in the exploration and the documentation of the sonic environment.

KEYWORDS: listening, surveying, recording, analysis, description, representation.

1. Background

After the formation of the first team for the study of the Greek soundscapes (Mniestris et al 2007), researchers from various disciplines have been involved in the exploration and the recording of qualitative attributes of the sonic environment (Bassiouka et al 2007; Matsinos et al 2008; Papadopoulos et al 2012). For many of them, the participation in field work for such purposes has been their introductory experience for the discovery of this unseen aspect of space. Hence, the need for the preparation of personnel prior the surveying campaigns has initially became the basis of a training session for the development of particular skills (listening, recording, measuring, logging and archiving) for capturing the needed data. The repetition of this training over the subsequent years has structured the outlines of a training workshop, named "Soundexplorers".

The workshop was firstly conducted in 2014, during the third biannual conference of the Hellenic Society for Acoustic Ecology, under the title "Soundexplorers: Soundscape Correspondents" (Papadimitriou 2014) and a few months later was repeated with teachers from the primary education, during a dedicated training session, entitled "Sound and Environment in Education", at the Environmental Education Centre of Kalamata, Greece. Since then, it has been performed, on an annual basis, with students at the School of Rural and Surveying Engineering, Faculty of Engineering, Aristotle University of Thessaloniki, Greece (Papadimitriou and Boutoura 2016).

The aim of this training is the familiarization of participants with an applied methodology, which is based on the cartogrpahic representation of the sonic environment (Papadimitriou et al 2009). The results from such methodology are related to a variety of topics and applications ranging from landscape ecology (Mazaris et al 2009; Farina et al 2014; Sueur et al 2014) and environmental management (Paraskevas et al 2011; Votsi et al 2014) to urban geography (Aletta et al 2016; Liu et al 2013; Wissmann 2014), mobility of individuals (Papadopoulos and Barouti 2015) and soundscape compositions (Stratoudakis and Papadimitriou 2009; YouTube 2011).

2. Overview

The workshop of "Soundexplorers" is addressed to a variety of attendants, with a special interest in the sonic environment (from individuals and students to researchers and educators). Whilst, in most cases, participants may have not previously undertook any related course, through this workshop, they are getting in the fields of acoustic ecology by three ways: primary, during an introductory section, by the presentation of key meanings related to the study of the sonic environment (e.g. background/foreground, origins/categories of sounds, intensity, noise, diversity etc.); sequentially, during a survey section, by developing

basic skills on the field (listening, recording, measuring and data logging); and finally, during a data processing section, by analysing and presenting the results of the survey with descriptive text, data tables and thematic maps.

2.1. Learning Objectives

The workshop concentrates on the procedures for the listening, the documentation and the description of the acoustic conditions or the sonic events at an area of interest.

By the end of this workshop participants are expected to:

- locate and record sounds;
- measure the Sound Pressure Level (SPL);
- recognize and log the origin and the meaning of sounds;
- store sound recordings;
- archive and process recorded attributes in data sheets;
- use text, data tables and visual representations (graphs, maps) for the description of soundscapes; and
- share (upload) their results on the web.

2.2. Structure and Duration

The minimum recommended duration of the workshop is 2:00 hours, excluding additional time for transportations or any delays between sequential sections. The structure and the indicative time allocation is described at Table 1.

Table 1. Structure and time allocation of workshop sections.

Section	Title (duration)	Topics
Introduction	Presentation (00:30')	terms, methodology and equipment
Surveying	Preparation (00:15')	groups formation, tasks delegation and equipment use
	Field Work (00:15')	listening, recording, SPL measurements and data logging
Processing	Analysis (00:20')	data preparation and processing
	Results (00:30')	description, representations
	Discussion (00:10')	workshop review and conclusions

Those sections can be performed on different dates or places but the sequence should stay intact. The duration of each part can be increased based on the judgement of the coordinator by considering the extend of the study area, the number and the relevant experience of the participants, the complexity of the equipment to be demonstrated and used, as well as the depth of analysis that will be performed with the captured data.

2.3. Training Material

The minimum required training material for the performance of the workshop are a pencil with a blank piece of paper. A print-ready worksheet is provided (Papadimitriou 2016a), in order to be used for data logging and basic analysis on the field. Additionally, the relevant set of empty spreadsheets (Papadimitriou 2016b) is also available for digital archiving and processing of data.

Recommended material, which is not provided by the coordinator but facilitates the performance of the workshop is:

- slate or hard-cover folder for writing;
- timer or watch for time tracking;
- sound recorder or smart phone with recording software;
- SPL measurement instrument (soundmeter) or smart phone with recording software;
- fine scale map of the area and GPS device or smart phone;
- computer and software for tabu data processing and sound editing;
- email account and Internet access for data sharing.
- Reading or media material that is related to this workshop includes:
- the article "An Introduction to Acoustic Ecology" (Wrighston 2000);
- the booklet "Basic terms of acoustic ecology for children and adults", available online (Etmektsoglou, 2014);
- the film "Soundscapes, A Documentary about Acoustic Ecology", directed by Constantinos Stratoudakis (2007);
- the track "Secret Coast" composed by Apostolos Loufopoulos" (YouTube 2011); and
- the "Handbook of Acoustic Ecology", available online (Truax 1999).

2.4. Considerations

The maximum recommended ratio for one coordinator is 30 participants per class. This ratio can be increased with one or more coordinator assistants. In any case it is advised to form small classes, up to 30 individuals each and work in small groups. For more participants and without assistants, consider dividing the class.

The workshop is usually conducted at open spaces. Environmental conditions and participants' safety are of primary concern for the performance of the workshop. Taking into account the outdoor conditions or the special interests and needs of the participants, the workshop can be performed in covered spaces as well. Quality sound recordings or descriptive texts (e.g. short stories) with references to geographic locations (e.g. place-names, maps) can either be used for the reconstruction of soundscapes and in order to be studied by the attendants.

The use of sound-recording and sound-meter devices is considered essential for the familiarization of participants with the presented methodology. If this kind of equipment is not available, the use of portable devices (smartphones or tablets) with appropriate software,

can be demonstrated as alternative material, mentioning in advance the impact on the expected data quality. In any case, the coordinator is advised to describe the proper use of a sound-recording system (microphones and logger) and a sound-meter. When using smart phones during field-work, remind the participants to turn on flight mode, in order to avoid biased propagation of sounds.

3. Guidelines

3.1. Introductory Section

During the introductory section, are presented the terms, the methodology and the equipment that relate to the performance of the workshop.

The coordinator describes and gives examples for the interactions between landscape's features (e.g. geomorphology and climate, biological and human activities, operation of infrastructures and technology) that produce sounds, as well as explains the terms of background, foreground and sound-marks for characterizing their meaning. A sound-recording device can be presented and selected recordings may be reproduced, in order to practice sound recognition from the participants.

The categorization of recognizable sounds based on their origin (from geophysical phenomena, biological or human activities and technological-machinery operation) is explained relatively to the mentioned interactions between landscape features. Prior the presentation of the thematic categorization of sounds, the coordinator may ask the participants to propose alternative thematic categories. Participants may practice by categorizing previously mentioned or played-back sounds. The empty worksheet facilitates the process.

Sound intensity is presented primary as a perceived (subjective) value. Participants are using the same worksheet to estimate a value (by assigning one number of a scale from 1 to 3) in order to quantify the perceived (subjective) intensity. Sequentially, the intensity is presented as a measurable (objective) value, by demonstrating the use of a sound-meter device and by comparing the estimated (subjective) and measured (objective) values.

3.2. Surveying Section

The aim of a field survey is the collection of data that describe the attributes of the sonic environment. Those are captured by listening, data logging, sound-recording and sound-metering. The result from a field survey is the documentation material, which will be used for the processing.

Preparation

Although the survey may be short in duration, it requires some preparation for the formation and coordination of field-work teams, the delegation of tasks and the familiarization with

the use of special equipment. Each field-work team can be composed by no more than four individuals: one for the sound-recording device; another for the sound-meter device; one for the logging of data on the worksheet; and one coordinator. In case of less individuals per field-work team, participants have to plan in advance their actions. After the delegation of tasks, participants should check the proper set-up and operation of equipment. Occasionally, the selection of the site(s) to be surveyed may be decided in advance, which requires additional time for planning. The print-ready worksheet may facilitate the organization of the team, as well as the meta-data logging and pre-processing of data (prior digital archiving).

Field Work

The process for the documentation of the sonic environment includes sound-recording, sound-metering, listening and logging data on the worksheet. During a primary investigation of the survey site, the members of the field-work team are able to familiarize with the study area, locate sonic sources and recognize sounds. Often, a field-work team could act as an intruder at a study area and trigger sound-producing interactions. It is recommended to allow some time of stillness from all members before the performance of the survey and in order to avoid biased results. In turn, this provides additional time for the preparation of a survey.

In order to combine the data from the sound-recorder, the sound-meter and the worksheet, there is a need for a common reference in time. This is the role of the team's coordinator, who is in charge to define the allocation of equipment, to keep track of time and to tune the field-work team (as a maestro).

Sound-recording can be performed either with a dedicated system (microphones with data logger), or alternatively with any portable device (tablet or smart-phone) with adequate software for exporting sound data files. The quality of sound-recording depends on the hardware (microphone) and on the exported file format. When using a non-dedicated sound-recording device, it is suggested to set the sampling rate at 22kHz-16bit and use the WAV/PCM format for file export. During recordings, it is essential that team members remain silent and support the microphone at the height of a normal human (e.g. on a tripod).

The logging of qualitative attributes of the sonic environment is facilitated by the use of the worksheet. Before the beginning of logging, sonic sources can be located and prevailing sounds are recognized.

Sound intensity can be measured with a calibrated sound-meter, or alternatively with a mobile device (tablet or smartphone) with an application for SPL logging and data exporting. The silence from the team members and the stability of device are the main concerns towards reliable measurements.

During a logging period the recognized sounds (occurred within every fifteen seconds) are characterized as background or foreground and a value is estimated, ranging from 1 (just

heard) up to 3 (high intensity). Those values, for any recognized sound, are describing the perceived intensity and in conjunction with an abbreviation or a symbol, are assigned to each sound in order to facilitate data logging on the worksheet.

3.3. Processing Section

The processing section includes the analysis of data and the output of results followed by a discussion.

Analysis

The list of recognized sounds represents the diversity of the sonic environment whilst the summaries of values for each recognized sound, during the five minutes logging period, are expressing the impact on gained experience from each one. Moreover the number of occurrences is an index of persistence of recognized sounds.

Lower values represent rare or low impact sounds, wheres higher values indicate prevailing or high impact ones. By combining the scores of all recognized sounds it is produced a profile for the composition of the sonic environment at each site, which describes the overall sense that an individual is getting from the sonic environment at a selected site.

The characterization of recognized sounds, based on their meaning for a listener, allows the calculation of two summaries for the perceived intensity. One for the background and a second for the foreground. The comparison between those two values is describing whether a site is mostly receiving or producing sounds. Additionally, the categorization of recognized sounds based on their origin (geophysical phenomena, biological or human activities and technological–machinery operation), allow the calculation of another set of summaries that describe the formulating factors of the sonic environment.

Qualitative information cannot be measured with an instrument and thus logged data (from a listening) may be considered subjective. On the other hand, this kind of "subjective" data can be evaluated (in comparison to the sound–recordings) and be coupled with the measured data (from a sound–meter), resulting in a data–set that documents the attributes of the sonic environment.

Results

A sonic environment can be described in many ways. Keynote texts, technical reports, graphs or charts are some evident ones, from a mainly "scientific" approach. Story telling, sonic or visual compositions and performances are providing some audience–oriented alternatives, from a more "artistic" approach. Cartography is originating from and targeting to both of those approaches. Thus, thematic mapping is providing a common medium for the representation of qualitative or quantitative attributes of the sonic environment.

Discussion

At the final part of the training, after the processing section and the presentation of results, follows the review of the workshop and a discussion with the participants.

4. Summary

The purpose of the workshop, entitled "Soundexplorers", is the training in the exploration and the documentation of the sonic environment. The presented overview and guidelines of this workshop are addressed to anyone who is engaging in the study of soundscape.

It has mentioned that "long-term monitoring of the sonic environment appears a new and promising approach" for the understanding of "the dynamics of natural and human-modified systems and represents an important tool to create efficient practices to protect and preserve valuable areas" (Farina 2014). In this context "Soundexplorers" are expected to support this monitoring and moreover, advocate the build up of a balanced relation between the environment and humans.

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