

# An Attempt to Design for an Urban Area Through Its Soundscape

Asli Ozcevik Bilen<sup>1</sup>

Ozlem Kandemir<sup>1</sup>

<sup>1</sup>Anadolu University, Faculty of Architecture and Design, Department of Architecture, Eskisehir, Turkey.

## Summary

Soundscape has been defined as the “acoustic environment as perceived or experienced and/or understood by a person or people, in context” in the ISO 12913. Changing perception priorities (by preferring audial perception to visual) can lead to new perspectives to understand, analyse and design for an urban area and form new ways of thinking and making new connections for its architecture.

This paper is a study to see and reveal the design possibilities of soundscape concept and to investigate new approaches to the architectural design processes and its references. In 2017 during the fall semester in the Department of Architecture at Anadolu University, the Architectural Design Studio III course experimented with this approach and processed in the studio. Binaural sound recordings (15 minutes) taken in situ and the actual sound environment of four urban areas having different soundscapes, were given as the sole and primary design data to a group of twenty students. It was expected that the students create their urban setting which they only heard, then define their main design problems. In this process two gradual surveys were applied to the students. Primarily in general, they tried to understand the recording area by defining the sound sources and to evaluate the sound environments via a semantic differential test including 30 pairs of adjectives. Secondly, they asked to list all soundmarks of the recordings and to define the soundmarks that they referenced while defining their design problems.

The information obtained from this study give some clues that the soundmarks of a soundscape solely comprise the general information guiding design for an urban area. It is also emphasized the importance of listening the environment attentively while designing an architectural environment, by this studio experience.

PACS no. 43.10.Sv, 43.66.Lj, 43.50.Rq

## 1. Introduction

As Schön stated [1], the artistry of designing is similar in important ways to the artistry sometimes exhibited in other fields of professional practice – especially in the indeterminate zones of complexity, uncertainty, uniqueness and value-conflict. So, a good architectural design studio education must cover these bases of design with a well thought content and challenging architectural design problem in which, while the students learn by doing and reflect their own architectural inquiry, they also should expand their thoughts on the features of their

reflective conservation with environment, with materials that make up space, and experiment with creative ideas.

The architectural design studio has to challenge the students in connection with special fields as lightning, acoustics, information technology etc. the studio has to create specialized design problems that focus on both particular technical and complex contextual problems within a larger architectural context. By enabling students to learn, and process different methods of inquiry and phenomena -like soundscape, the students have chance to gain acquaintance with an applied science, not only as a

body of knowledge to be drawn upon, but as a way of inquiring capable of integration with his own reflection in action.

As introduced in the 70's by R. Murray Schafer [2], a soundscape is a complex concept that refers not only to the sound environment surrounding the human, but also the multiple interactions between human, multiple sound sources, properties of the environment/space, actions and the society through perceptions. He classifies the main components of a soundscape as 'keynotes', 'signals' and 'soundmarks'. Through them the 'soundmark' is defined as the sound describing the area identity (phonic identity). Therefore in scientific literature and researches of soundscape, there is a wide range of study explaining the importance and effects of soundmarks on the sound environment evaluation [3-5]; and emphasizing the necessity of preserving and protecting these sounds for sustaining the identity of a space, because of the fact that soundmarks are the sounds that constitutes the acoustical character of an environment (phonic identity) and represent the space, zone, city, society and culture that belongs to [6,7].

In this respect, it can be inferred that a soundscape and its soundmarks comprise basic knowledge about the space, zone, city, society and culture. In order to examine this inference, an architectural design studio experience was made based on "design for an urban area which only heard not seen" proposition, in this study. This is also the aim of this study. In addition, alternative ways of understanding different layers of place perception were revealed.

In the study, 15-minutes binaural sound recordings obtained in four different urban areas were presented to the students as the single main design data. The students were asked to listen to the recordings repeatedly and attentively. Then they were expected to make inferences to understand the recording areas by using the sound sources they listened, and to evaluate the sound environments via a semantic differential test including 30 pairs of adjectives. Following this, the students were asked to determine the soundmarks which they used to create their own original urban settings in their minds and to define their own design problems.

## 2. Soundscape and/in education & design

While the inevitable change occurs in science, techniques and technologies in all fields of inquiry, both architectural practice and architectural education institutes have to evaluate their own ways

and processes of thinking and creating architectural designs, and ways of teaching them. Especially architecture schools have to evaluate their own curricula in order to take account of the changing nature of architectural design with more reflective grasp of the contemporary challenges and new technologies.

One of these areas of inquisitive research is sonic studies like: acoustics, psychoacoustics, communications and sound recording engineering, aural pattern perception, all of them both related and deals with aspects of world of soundscape, asking what the relationship between man and the sounds of his environment is and when these sounds change. The soundscape studies are the middle ground between science, society, and the arts.

The researches that investigate the relationship between space and its acoustical properties are important and fruitful inquiries that help us to understand and grasp more about the process and thought of design and environment. When we look to these researches focused on soundscape concept in education, we can see formal education of researchers about soundscape, and also there is another matter of using soundscape concept as an educative tool for defining and understanding the aural environment on several levels of education.

Elizondo – Garza [8] emphasized the need of experts and designers of acoustic spaces that be educated in a wide cultural and technological base and discussed educational issues necessary for soundscapes like: engineering, technology, economics, society, diversity, education, psychology, communication, interdisciplinary workgroups, ethics, and other.

Some institutes and working groups started their researches by conducting fieldwork in order to know the local and/or nonlocal subjective sonic environments. For instance; soundscape researchers (architects, musicologists, sociologists, philosophers of aesthetics, environmental scientists etc.) in the Institute of Kanda Soundscape Studies, investigate the concept of soundscape by means of laboratory experiments and field surveys. In this manner, different scientists' outstanding contributions to soundscape studies in Japan have been interpreted in conjunction with a new approach to soundscape study that has appeared in the field of environmental literature [9].

Fiebig and et.al [10] introduces the concept of soundscape to several young researchers with binaural measurement technology, enhanced sound analysis, evaluation techniques – procedures, and

field and laboratory tests. In collaboration with qualified soundscape researchers short case studies including measurement, analysis, evaluation, and classification of defined environmental areas was carried out.

The other workings on soundscape concept focus on integrating the soundscape concept to define and understand the aural environment on several levels of education. The study presented in this paper and a previous one of the authors [11], aimed to make a contribution to these workings which improve as a new and developing area.

As a sound designer Harvey [12] forms the basis of a new pedagogy of sound and listening housed in the Spatial Information Architecture Laboratory's (SIAL) Sound Studios at RMIT University; focusing on relating ideas of interiority, landscape and listening to actual sounding projects has been to show how electroacoustic composition and soundscape design can be applied to influencing and investigating complex aural interactions of people within built or virtual environments, and the role of a sound designer in that endeavor.

Staub and Sanchez [13] made a research targeting secondary education level for geography education in France; about noise and sound recordings for spatial analysis. They used location-based mobile devices like tablets and smartphones to record data during fieldwork courses and to map their localities. The research investigated a better understanding of space navigation for individuals and space modeling with visual and symbolic data, additionally offering new perspectives for spatial analysis within an educational context.

Also an important research focusing on a soundscape intervention, by RMIT University, School of Architecture and Design students, done to transform the acoustic space of the campus site [14]. Students were asked to create a soundscape intervention in the space, in response to an imaginative-artistic approach to acoustic ecology. They proposed live sound-art, musical and electroacoustic performances played through loudspeakers placed adjacently to the exhaust outlet, and transformations of the environment with interactive sound-making artifacts.

Fowler [15] examines the important theoretical concepts of soundscape studies and how these concepts were used to guide a number of design exercises and design projects of the studios; reflecting on the pedagogical aspects of teaching soundscape to design students and the larger

implications of such methodologies for the field of design in the built environment.

Rifqi Ikhwanuddin and et.al. [16] done a research aiming to investigate the soundscape perception in campus library. To achieve appropriate study space based on their impression of the soundscape, first identification of perceptual dimensions has done using semantic differential scales on a questionnaire to adult college students. Noise measurements were also carried out to demonstrate that soundscape method could be more comprehensive in explaining sound field measurement.

As can be seen above, the soundscape researches are done for understanding the urban and rural architectural environments and define them, integrating concept of soundscape on education to make awareness and open new aspects to define. But the research explained in this paper focuses on soundscape as an explorative architectural design tool and approach to create new architectural design methods.

### 3. Architectural Design Studio Experience

In 2017 during the fall semester in the Department of Architecture at Anadolu University, within the Architectural Design Studio III course, the concept of soundscape has been utilized as a design tool for architectural design studio training. Accordingly, when the soundscape of an urban area is used as only data that is referred to design for the area; the things what the soundscape is defined in the design process and the data, which the soundscape is acquired for the design process, are investigated. In this research, sound recordings, which have soundscape information about the urban areas, were utilized as a tool and basic data in the studio.

A total of 20 students (2 students were failed) participated in the studio work. 4 randomly determined groups of 5 students in each, were given four sound recordings as the study recordings. No information was given to the students about the recordings except for their quality (binaural recordings). The students were asked to listen to the recordings by using active noise control headphones; to create their urban setting they imagined in their minds; and to identify the design data/inputs leading to their main design problems by the way of defining sound sources (especially soundmarks) they heard.

The steps followed in the studio within the scope of this research are as follows;

- giving binaural sound recordings made in four urban areas in Italy

- listening the recordings repeatedly and listing all the sound sources
- understanding the recording area and evaluating the sound environment via a semantic differential test
- defining all soundmarks and the ones which the students referenced while identifying their design problems.

### 3.1. Selected areas and sound recordings

Binaural sound recordings which lasted approximately 15 minutes and were obtained by soundwalk method in four urban areas having different soundscapes (Via Partenope – Borgo Marinari, Via Partenope, Via Roma and Montesanto) in Italy, were selected for this studio experience as the sole and primary design data. The


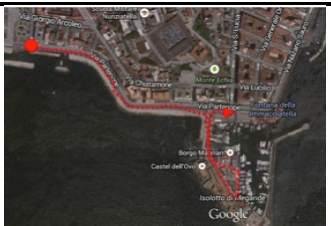



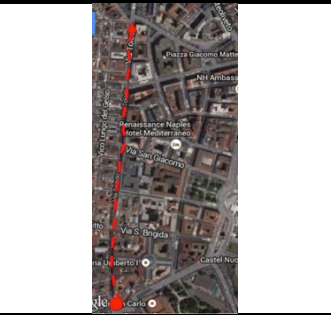
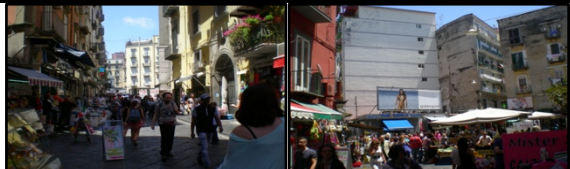
selected areas with their short descriptions, the routes of the soundwalks and the acoustical satisfaction of the areas are listed in Table 1.

### 3.2. Students' study via the sound recordings

#### First part of the study (understanding the sound environments)

In this architectural design studio process, the students listed the sound sources which they only heard via the sound recordings, by explaining in detail on their time-domains and directions information. They wrote what they feel while listening the recordings with a view to understand the recording area, in free technique; and tried to make general evaluation of the listened sound environment (Table 2).

**Table 1.** General information about the selected areas with their acoustical satisfaction status and the routes of the soundwalks [7]

	
<p><b>Via Partenope - Borgo Marinari</b> Coastal walkway and within an small historic marine village with a small port and restaurants/bars</p>	<p><b>Acoustical satisfaction:</b> Satisfactory</p>
	
<p><b>Via Partenope</b> Coastal walkway trough a large street of the waterfront with access restrictions to vehicles</p>	<p><b>Acoustical satisfaction:</b> Satisfactory</p>
	
<p><b>Via Roma</b> Walkway trough a typical commercial street with shops/bars/restaurants and offices</p>	<p><b>Acoustical satisfaction:</b> Unsatisfactory</p>
	

**Montesanto**

Walkway through a typical and narrow street with market/shops/bars (mainly foods) and near to a metro station



**Acoustical satisfaction:**  
Unsatisfactory

**Table 2.** Students' explanation on the main characteristics of the selected areas' soundscapes and general evaluation of the environment

Selected area	Total of the sound sources listed by all students	Common aspects of general evaluation by all students
<b>Via Partenope Borgo Marinari</b>	Steps, human/voices and sport activities (jogging, riding bike) Occasional vehicles (cars, motorcycles and vans) Commercial activities Music broadcast from commercial areas Wind, sea/wave, birds (seagull, sparrow) <i>Sounds from craftspeople of vessels OR Sounds from repair and/or handiwork OR Sounds from coffee machine</i>	Local commerce (restaurant, café, pub) Recreational areas Citizens with Mediterranean culture Habitat on the touristic and historical coastal line
<b>Via Partenope</b>	Steps, human/voices, sport activities (jogging, riding bike) and recreational activities on beach and boats Occasional vehicles (cars, motorcycles and vans) <i>Commercial activities OR Sounds from lightweight construction</i> Music broadcast from commercial areas Wind, sea/wave, birds (seagull, sparrow) Airplane, boat/vessel Fountain	Local dense commercial areas with marine tourism (restaurant, café, pub, tavern) Recreational areas Citizens with Mediterranean culture Touristic and, both historical and modern habitat on the coastal line
<b>Via Roma</b>	Steps, human/voices Rare and low flow traffic (cars, motorcycles and vans), klaxon, siren Commercial activities Music broadcast from commercial areas Birds (philomel, seagull) and dogs Airplane Human movements (taking photo, listening music, bantering, riding bike)	Touristic and, both historical and modern habitat Citizens with Mediterranean culture A crowded commercial street with heavily motorcycle traffic with bars, restaurants, shops and offices
<b>Montesanto</b>	Human/voices Rare and low flow traffic (cars, motorcycles and vans), klaxon Commercial activities Music broadcast from commercial areas Rail station (train siren and public announcements) Birds (sparrow, dove) Wind	Historical and modern habitat Citizens with Mediterranean culture A crowded narrow street with traffic also occupies bazaar with street vendors, shops, bars and restaurants

In addition, they evaluated the sound environments of listened soundscapes in detail, by a semantic differential test including 30 pairs of adjectives, which were determined and used in the authors' previous researches [17,18]. In this test, students were expected to judge the listened sound environments by means of pairs of adjectives using a five points scale. Negative adjective pairs

were indicated by (-2) and the positive expression by (+2). In this paper, the results of 19 pairs of adjectives which were selected from among 30 pairs were presented in Table 3, based on the findings of the mentioned authors' researches is that 19 pairs of adjectives denoted significant statistical proficiency for evaluating a soundscape.

Table 3. Students' evaluation of the listened sound environments via 19 pairs of adjectives

19 pairs of adjectives	Via Partenope - Borgo Marinari	Via Partenope	Via Roma	Montesanto
disturbing-comfortable	0,4	0,2	-0,5	-0,25
unpleasant-pleasant	0,4	0,2	-0,25	-0,25
rough-smooth	0,2	-0,8	-0,75	0,25
loud-quiet	-0,4	-0,4	-0,75	-0,75
discordant-harmonic	0	-0,6	1	0,75
hard-soft	-0,8	-0,6	0,5	-0,75
empty-joyful	-0,2	0,8	1,5	1
gloomy-exciting	0,2	0,2	1,25	0,5
loud-soft	0,6	-0,2	-1	-0,5
heavy-light	0,4	0	-1	-0,75
agitating-calming	0	-0,8	-0,5	-0,25
dark-light	1	0,2	0,5	0,2
not sharp-sharp	-0,2	0,6	-0,75	1,25
disorganised-organised	0,4	-0,6	-0,75	-0,5
common-strange	0,2	0,2	0,2	0,75
far away-nearby	0,6	0,6	0,75	0,5
stressing-relaxing	1	0,2	-0,5	0,25
crowded-uncrowded	0,4	-0,4	-1	-1,25
deserted-lively	0,8	1,6	1,75	1,25

According to the results acquired in this first part of the study;

- All the students defined the sound sources in the recordings as same within the actual sound environments. But all the sound sources in the actual soundscapes were not defined completely by each students.

- Some sources because of the inability to make sense of the sounds it represents, were explained with different expressions. These sound sources are listed as follows;

- in the soundscape of Via Partenope – Borgo Marinari, the “sounds from craftspeople of vessels” (which was defined by 2 students as correctly) was explained differently as the “sounds from repair and/or handiwork” by the other 2 students and as the “sounds from coffee machine” by 1 student.

- in the soundscape of Via Partenope, the “sounds from kiosks” (which was defined by 4 students as correctly) was explained as the “sounds from lightweight construction” by 1 other student.

- The common aspects of general evaluation of the listened environment are consistent with the actual ones. The differences between the students studying on the same sound recording, lead them to create a wide variety of urban settings.

- The acoustical satisfaction of the sound environments in listened soundscapes were described correctly with in the actual ones. The sound environment of Via Partenope – Borgo Marinari and Via Partenope were defined as

satisfactory; the sound environment of Via Roma and Montesanto were defined as unsatisfactory, by the students.

- The results obtained through the semantic differential test, supported the description of acoustical satisfaction and were similar to the situation of actual sound environment (which will be explained in another paper). All soundscapes were evaluated as *loud*, *exciting*, *light*, *strange*, *nearby*, *lively* and *joyful* (except Via Partenope – Borgo Marinari) based on the sound sources heard in related soundscapes. The satisfying sound environments in Via Partenope – Borgo Marinari and Via Partenope were evaluated as *comfortable* and *pleasant*; though the others (Via Roma and Montesanto) were evaluated as *disturbing* and *unpleasant*, parallel to the unsatisfactory assessment of their sound environments.

#### Second part of the study (evaluating and defining the architectural design problems)

In this process, the students created their urban settings which they only heard then defined their main design problems. Therefore, they tried to gather proper data/knowledge based on the descriptions of sound sources, in order to create their urban setting in their mind; and described all soundmarks and the soundmarks that they referenced while defining their design problems (Table 4).

**Table 4** – Students’ design problems determined based on the soundmarks of listened soundscapes, which were defined/listed by students.

Selected area	Student	Common soundmarks listed by all students	Soundmarks used for defining design problems by students	Students’ design problem
Via Partenope Borgo Marinari	Stu.1	Voices and sounds from sport activities Sounds from restaurants and bars Sounds of sea/wave, birds <i>Sounds from craftspeople of vessels OR Sounds from repair and/or handiwork OR Sounds from coffee machine</i>	Voices <b>Occasional vehicles (cars, motorcycles and vans)</b> Sounds from repair and/or handiwork	Wood art workshop
	Stu.2		Voices and sounds from sport activities Sounds of sea/wave Sounds from craftspeople of vessels	Urban development cooperative
	Stu.3		Voices and sounds from sport activities (riding bicycles)	Local bicycle federation
	Stu.4		Voices (especially from children) Sounds from restaurants and bars Sounds from repair and/or handiwork	Recreational center
	Stu.5		Voices and sounds from restaurants and bars Sounds from coffee machine	Barista academy
Via Partenope	Stu.6	Voices and sounds from sport and recreational activities Sounds of wind, sea/wave and water/fountain Sounds from restaurants, bars and kiosks <b>OR</b> <i>lightweight construction</i>	Voices (especially from children) and sounds from recreational activities <b>Music broadcast from commercial areas</b>	Children’s art and education center
	Stu.7		Voices <b>Occasional vehicles (motorcycles and vans)</b> Sounds of sea/wave and water/fountain	Fisheries cooperative
	Stu.8		Voices and sounds from recreational activities <b>Music broadcast from commercial areas</b>	Art bar
	Stu.9		Voices Sounds from lightweight construction	City hotel
	Stu.10		Sounds from restaurants, bars Voices	Culinary arts academy
Via Roma	Stu.11	Voices Traffic (cars, motorcycles and vans) Sounds and music from restaurants, bars and shops Human movements (bantering, riding bike)	Voices Sounds and music from restaurants, bars and shops	Architectural design, restoration and application company
	Stu.12		Voices Traffic (cars, motorcycles and vans), Sounds and music from restaurants, bars and shops Human movements (bantering)	City club
	Stu.13		<b>Steps</b> , voices (especially from children) <b>Sounds of birds and dogs</b>	Bio-clinic
	Stu.14		Voices Traffic (motorcycles)	Custom Chopper Club
Montesanto	Stu.15	Voices and running steps Sounds and music from bars and shops/sellers Sale approach (commercial hails) Traffic noise (especially motorcycles)	Voices and running steps Music broadcast from commercial areas	Music and dance training center
	Stu.16		Voices Sale approach (commercial hails)	Leather accessories design and production workshop
	Stu.17		Voices and running steps Music broadcast from commercial areas	Fashion institute
	Stu.18		Voices Sounds and music from bars and restaurants	Culinary institute

In the studio, the common soundmarks listed by all students are same within the actual sound environments. All the students – including those studying on the same sound recording – formed

different area, scenario and design problems. In line with the students’ different design problems, as can be seen in Table 4, the students produced a wide variety of project subjects.

Some students utilized soundmarks of his/her own as different for the others -studying on the same sound recording-, with a view to define their own design problems. These soundmarks are; occasional vehicles (cars, motorcycles and vans) for Student 1 and 7; music broadcast from commercial areas for Student 6 and 8; steps and sounds of birds and dogs for Student 13.

The students were able to interpret the information of their urban settings and design problems with detailed descriptions of the soundmarks. For instance, the information connected with the “voice” (as the common soundmark which is utilized by all students) were used based on the answers of questions about who talks (gender and age information), which languages he/she speaks, where he/she talks, what he/she tells, what he/she was doing while he/she was talking etc.

#### 4. Findings and Discussions

Urban soundscape is an important part of the phonic identity of a city, as sounds are crucial for creating a sense of place, including the soundmarks, which are the sounds that make the acoustic life of the community unique. The soundscape approach, which considers environmental sound as a resource, can be most effective when applied in design process. This paper aimed to apply the soundscape approach in order to design for an urban area, by changing perception priorities (by preferring audial perception to visual) in an architectural design studio experience. It explores how the sound impact on thinking, understanding, defining and designing of urban area, which only heard not seen. This paper presents the initial findings of an applied attempt to understand integration of soundscape as an effective, explorative and productive concept to architectural design studio education. This study enables students to enrich and enlarge their creative horizon and to understand the importance of analyzing phase of architectural environment which unavoidable component of architectural design. Also it emphasizes the importance of listening the environment attentively while designing an architectural environment.

#### References

- [1] D. Schön: The Design Studio: An Exploration of its Traditions and Potentials. RIBA Publications Limited. London, 1985.
- [2] R.M. Schafer: The soundscape: Our sonic environment and the tuning of the world. Rochester (NY): Destiny Books, 1977.
- [3] A. Ozcevik, Z. Yuksel Can: Subjective Assessment of the Noisy Urban Areas. Internoise 2010.
- [4] A. Ozcevik, Z. Yuksel Can: A Comparative Analysis Between Field and Laboratory Studies on Soundscape. Euronoise 2012a
- [5] A. Ozcevik, Z. Yuksel Can: A Field Study on The Subjective Evaluation of Soundscape. Acoustics 2012b.
- [6] J. Drever: Soundscapes and Acoustic Ecology – Origins and Prospects. The World Forum for Acoustic Ecology, University of London, London, UK. 2005; 1–12.
- [7] A. Ozcevik, Z. Yuksel Can, M. Masullo: An attempt on the globalization of the soundscape studies for the evaluation of the urban sound planning. Internoise 2016.
- [8] F.J. Elizondo – Garza: Educating for soundscape design. The journal of the acoustical society of America (2013) 134, 4022.
- [9] K. Hiramatsu: A review of soundscape studies in Japan. Acta Acustica united with Acustica. 92: 6, (2006) 857-864(8).
- [10] A. Fiebig, V. Acloque, S. Basturk, M. Di Gabriele, M. Horvat, M. Masullo, R. Pieren, K.S. Voigt, M. Yang, K. Genuit, B. Schulte-Fortkamp B: Education in soundscape - A seminar with young scientists in the COST Short Term Scientific Mission “Soundscape - measurement, analysis, evaluation”. Proceedings from ICA 2010.
- [11] Ö. Kandemir, A. Özcevik: The Architectural Design Studio Experience: Focused On Soundscape. International Conference on Design Principles and Practices – A Common Ground Conference, 2016.
- [12] L. Harvey: The Aural Eye: Soundscape Practice and Pedagogy in Design Education. IDEA Journal, Brisbane: Australia (2005) 129-137
- [13] J. Staub, E. Sanchez: Mapping Space Through Sounds and Noises – An Innovative Approach for Geography Education. GI\_Forum 2012: Geovizualisation, Society and Learning, 2012.
- [14] J. Lacey: Revoicing the Urban Soundscape: a Case Study of Student Soundscape Design Interventions at RMIT University. Proceedings of Cumulus 2012.
- [15] M.D. Fowler: Soundscape as a design strategy for landscape architectural praxis. Design Studies. 34, (2013) 111-128.
- [16] R. Ikhwanuddin, J. Sarwono, A.S. Sudarsono, S.S. Utami: Library Soundscape: Higher Education Students' Perception. Internoise 2017.
- [17] A. Ozcevik, Z. Yuksel Can: A Field Study on the Subjective Evaluation of Soundscape. Acoustics 2012c.
- [18] A. Ozcevik: An Approach On The Evaluation Of Urban Acoustical Comfort With The Soundscape Concept', Doctorate Thesis, Yildiz Technical University, Graduate School of Natural and Applied Sciences, Architecture/Building Physics Doctorate Program, İstanbul, Turkey, 2012d.