İZMİR KÂTİP ÇELEBİ ÜNİVERSİTESİ
2010
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

An In-depth Evaluation of Urban Soundscape Perception: İzmir Konak Square

Submitted to the Graduate School of Natural and Applied Sciences in partial fulfillment of the requirements for the degree of

Master of Science

in Urban Regeneration

by

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April, 2023

This is to certify that we have read the thesis **An In-depth Evaluation of Urban Soundscape Perception: İzmir Konak Square** submitted by **Bahar Yanık**, and it has been judged to be successful, in scope and in quality, at the defense exam and accepted by our jury as a MASTER'S THESIS.

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Declaration of Authorship

I, **Bahar Yanık**, declare that this thesis titled **An In-depth Evaluation of Urban Soundscape Perception: İzmir Konak Square** and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for the Master's degree at this university.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this university or any other institution, this has been clearly stated.
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An In-depth Evaluation of Urban Soundscape Perception: İzmir Konak Square

Abstract

In urban design, another concept that gains importance as visual perception is auditory perception. To provide acoustic comfort in cities, these subjective perceptions should be investigated and known in depth. Soundscape has been used as a key method to improve sound quality in urban open spaces in recent years. There is no detailed study for the province of Izmir. Therefore, it is of great importance to investigate the soundscape perceptions of Izmir Konak Square users. The aim of the study is to show the importance of soundscape design in public spaces by investigating the perceptions of the soundscape and sound preferences of Konak Square users and the effects of demographic factors. Within the scope of the study, the sounds in the field were examined by literature review and on-site observation, and survey scales were prepared accordingly. A survey was conducted with 385 people in the field. After the survey data were collected, frequency analyses and pairwise comparison tests were conducted. In addition, the equivalent continuous sound level (Leq) measurement was made in the field by using the smart mobile phone application together with the questionnaire. It has been determined that all of the sound levels measured in the square are considerably higher than the sound limit values determined for a healthy environment. The results of this research confirm that the most preferred sounds in the square are natural sounds. Otherwise, the most disturbing sounds are the sounds originating from the traffic.

Keywords: Soundscape, urban soundscape, soundscape perception, auditory perception, acoustic environment, urban squares, Konak Square

Kentsel işitsel peyzaj algısının detaylı değerlendirilmesi: İzmir Konak Meydanı

Öz

Kentsel tasarımda görsel algı kadar önem kazanan bir diğer kavram da işitsel algı olmaktadır. Kentlerdeki akustik konforun sağlanabilmesi için bu öznel algıların derinlemesine araştırılıp bilinmesi gereklidir. İşitsel peyzaj, son yıllarda kentsel açık alanlarda ses kalitesini yükseltmek için kilit bir yöntem olarak kullanılmıştır. İzmir ili için yapılmış detaylı bir çalışma yoktur. Bu nedenle, İzmir Konak Meydanı kullanıcılarının işitsel peyzaj algılarının araştırılması büyük önem taşımaktadır. Çalışmanın amacı, Konak Meydanı kullanıcılarının işitsel peyzaj ve ses tercihleri algılarını ve demografik faktörlerin etkilerini araştırarak işitsel peyzaj tasarımının kamusal alanlardaki önemini göstermektir. Çalışma kapsamında, alandaki sesler literatür taraması ve yerinde gözlem yapılarak incelenmiş ve buna göre anket ölçekleri hazırlanmıştır. Alanda 385 kişiyle bir anket araştırması yapılmıştır Anket verileri toplandıktan sonra frekans analizleri ve ikili karşılaştırma testleri yapılmıştır. Ayrıca anket ile beraber akıllı cep telefonu uygulaması kullanılarak alanda eşdeğer sürekli ses düzeyi (Leq) ölçümü yapılmıştır. Meydanda ölçülen ses düzeylerinin tamamının sağlıklı bir ortam için belirlenen ses sınır değerlerinin oldukça üzerinde olduğu tespit edilmiştir. Bu araştırmanın sonuçları meydanda en çok tercih edilen seslerin doğal sesler olduğunu teyit etmektedir. Bunun dışında en rahatsız edici sesler trafikten kaynaklanan seslerdir.

Anahtar Kelimeler: İşitsel peyzaj, kentsel işitsel peyzaj, işitsel peyzaj algısı, işitsel algı, akustik çevre, kent meydanları, Konak Meydanı

Dedicated to my beloved family and others who supported me morally during the challenges of this period…

Acknowledgment

Before expressing my thanks, I would like to note that it has been a long journey full of difficult times. Throughout this study, many people have supported and motivated me, and I would like to sincerely thank these loving people, as well as those whose names are not listed here.

First and foremost, I would like to express my gratitude to my supervisor, Assoc. Prof. Dr. Ayşe KALAYCI ÖNAÇ, for giving me the opportunity to study together. I would also like to thank her for setting an example for me with her invaluable patience, immense knowledge, and continuous support. It is an honor for me to complete this study under her supervision.

This thesis is supported by Izmir Katip Celebi University Scientific Research Projects Coordinatorship. I would like to thank the institution for providing such an opportunity.

I am especially grateful to my beloved family, who supported and encouraged me throughout my entire education life, and who were always there for me. I am truly thankful for having them in my life.

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List of Abbreviations

Leq	Equivalent continuous sound level
SPL	The sound pressure level
LAeq	A-weighted equivalent sound pressure level
SPSS	Statistical Package for Social Science
ISO	International Organization for Standardization

List of Symbols

dB	Decibel

Chapter 1

Introduction

Since the beginning of urbanization, urban and society are concepts that are in constant interaction. Their change processes affect each other and these changes manifest themselves in urban spaces. Therefore, urban spaces are also accepted as living organisms that can respond to changing socio-economic conditions and the cultural texture of cities [1]. When we examine cities, these spaces consist of private spaces and also public spaces such as streets, parks, squares, market places. Public spaces take on a wide variety of roles such as physical, social, psychological, ecological, political, economic, aesthetic, and symbolic [2].

The relationship of the individual with society is also reflected in the urban spaces [3]. Public spaces are important spaces that enable people to have 'social interaction' with others for their mental and psychological well-being [4]. The gathering of many people at different cultural, social, and economic levels in a common center, that is, in public city squares, has a social communication purpose. Public spaces that are accessible to everyone are seen as places that make it possible to meet and hear from those with different social perspectives, experiences, and belongings [5]. This social interaction allows people to explore themselves, the environment, and others, thus helping to create a sense of personal continuity in a fast-evolving world. Moreover, these areas function as places of relaxation that can take people away from the stress of daily life [4].

Urban squares, the important open public spaces, reflect the identity and past of societies and cities by carrying the traces of the society's culture, economy, beliefs, values and, social changes [6]. Since ancient times, these places have provided an environment for gathering people and creating urban life. These void spaces,

surrounded by buildings and other structures, play a major role in the mass void composition of the city. Therefore, urban public squares have a balancing power function in today's congested and crowded urban fabric [7]. In their original essence, these urban voids literally function as transport nodes, a junction that connects spaces and routes [8].

An ideal square should provide the functions for people to relax, see others, be seen, and communicate with others. Therefore, it is important to consider the environmental conditions of the squares and their effects on attracting users. Today, these void spaces between the buildings of the city are filled by grey ambient noises, thus giving rise to the brownfield of the urban soundscape. However, one of the main ways of perceiving and communicating with the environment is sound. It provides a sense of reality and dynamism, thus helping to perceive the scale of space and the progression of time. Compared to visual perception, auditory perception has poor information but is richer in emotion. Evaluation of urban soundscapes, which is a part of sensory aesthetic research, improves the enjoyment of the sensations one receives from the environment [9].

Soundscape data obtained in the field of design should be integrated with other natural and cultural data. The comprehensiveness of the data reveals that sound is actually a more complex spatial element than previously thought. For this reason, the sound element should be evaluated more effectively in the physical planning and design process [10].

1.1. Aim and Scope of the Research

In soundscape assessments, both the physical environment and psychological, social, and cultural factors create the context. In order to provide acoustic comfort in cities, these subjective perceptions should be investigated and known in depth. The aim of this study is to determine the perception of the soundscape of the square by the users of Izmir Konak Square, and to identify the spatial deficiencies in order to increase the satisfaction level of the users from the experience they have in this area, and to produce solutions.

In recent years, the soundscape has been used as a key method to improve the sound quality of urban open spaces [11]. Although there are studies for different cultures and provinces, there is no detailed study for the province of Izmir. For this reason, it is of great importance to investigate the soundscape perceptions of Izmir Konak Square users. Because squares are important public spaces open to everyone's use, where all kinds of social, cultural, and economic activities are carried out, and where they can be found without any time limit. In addition to trade and socialization, they play an active role in reaching urban awareness and protecting the right to the city. In addition, they contribute to the democratization of society as they provide the opportunity to socialize and be together.

Considering the cultural factor, it is desired to measure the relationship between the amount of time spent in İzmir, demographic data, and soundscape comfort. In addition, the sounds in the area have been observed and it is aimed to determine which sounds are comfortable and which are disturbing. Thus, in order to increase the quality of life, it is aimed to be included in the planning by knowing the things to be considered while providing acoustic comfort in public spaces in Izmir.

1.2. Research Problem

Konak Square is located at the center of Aegean Region İzmir and it is the largest square in terms of surface area. Konak Square, as a “transformed public space” in the reflection of this synthesis and the unity of different cultures that have been going on for centuries in Izmir, both as a Western and an Islamic city, is an important public space that continues to exist from the past to the present, as the most important witness of both political and social transformations. is considered a place.

In urban public spaces, the soundscape is a factor that affects the quality of the experience gained from the space. In this study, it is aimed to examine the soundscape perception of Konak Square users and to develop design suggestions with the obtained data. In this way, it is aimed to increase the quality of the experiences in the square by answering the following question: What is the perception of soundscape in the square by Konak Square users?

The answers to the questions constitute the sub-problems of the study:

1. What is the relationship between demographic factors and acoustic comfort?
2. What is the relationship between the time spent in Izmir and acoustic comfort?
3. What is the relationship between perceived sound level and acoustic comfort?
4. What are the soundscape sounds of Konak Square?
5. How does the soundscape of Konak Square make the users feel?

One of the senses of perception of space is auditory perception. This auditory perception, which can affect the satisfaction of the use of the space, has the potential to meet the needs of public spaces by using it in the design of urban areas.

As a result of the literature review, it is seen that the perception of the urban soundscape changes according to demographic factors, and the responses to the sounds change, especially with the cultural difference [12]. In other words, the soundscape in urban spaces can affect people's behavior [13].

The hypothesis of the study is that the soundscape experience, which occurs due to the auditory sensation, is not outside the urban public space issues and is a concept that will enrich the spatial experience by affecting the satisfaction level obtained from the area.

1.4. Structure of the Thesis

The present thesis is structured into five parts. Each of the 5 parts is summarized in detail below. The parts are divided into chapters, which are divided into sections and subsections. The five chapters are built one after the other, so they must be read in order.

In the Introduction chapter, the importance of public spaces and city squares is mentioned. In addition, the importance of soundscape design in the public sphere is summarized. In addition, the necessity of understanding the soundscape perception in soundscape design is emphasized. The research gap is presented and the requirements for this study are summarized. The purpose of the research and the research questions are formulated. The chapter ends with the structure of the study section.

Chapter 2, the theoretical framework, is broad and divided into many different streams of research. In this section, 4 research subcategories and a literature summary are defined. Concepts consisting of Urban Public Spaces, Perception, and Auditory Perception, Sound Level and Acoustic Comfort Evaluation and The Soundscape Approach are defined respectively. Afterward, previous studies under the subtitle of Literature Review are included. This chapter provides a basis for the study by explaining in detail the concepts of interest of the study. In addition, this section includes discussions of past research on this thesis and proposes directions for future research.

Material and method, which is Chapter 3, the main materials and methodology of the study are explained. First of all, the main material of the study, the study area, namely İzmir Konak Square, was defined. The historical transformation and current situation of the study area are summarized. In addition to its physical characteristics, descriptive information about its soundscape is presented. Under the sub-title of Method, the three-stage methodology of the study has been explained. These consist of data collection, analysis, and evaluation parts. In the data collection part, sound sensory examination in the field, sound level measurements of the field, and survey methods with field users are used.

In Chapter 4 Results section, the findings of the studies conducted in the field are presented. First, the sound sensation and noise measurement data obtained through fieldwork are presented. Then, the analysis of the data collected through the questionnaire is presented. At various times of the day, the sound types examined in the field and the measured sound levels are presented. Then, the analysis of the data collected through the questionnaire is presented. Socio-demographic findings, perceived sound type and levels findings, and statistics test findings are presented in detail.

The last chapter, Discussion and Conclusion, is gathered under 4 sub-titles. In the first part, the general findings of the current thesis are discussed in depth, in the second part the limitations of the study are mentioned, in the third part the results are presented and in the last part suggestions for the field are presented.

Chapter 2

Theoretical Framework

This chapter is broad and divided into many different streams of research. The concepts that will be the source of the study are explained and previous studies are included in the literature review section.

2.1 Urban Public Spaces

Along with urbanization, each individual has affected the city they live in and in the same way, each city has shaped the society it hosts. So cities are like living organisms. The spaces that contribute the most to this transformation are public spaces [1, 14].

According to Arendt, the concept of public has two meanings. Its first meaning is to appear before others, which is the basis of objective reality, and then be seen and heard by all. Its second meaning is defined as the space common to all of us and distinguished by our privately owned place in it [15].

Arendt likens the public space to a table that holds the people around it and relates them to each other. He emphasizes that if the table disappears, the relationship of the people around it will also be cut off. He defines public space as the common world and meeting space shared by people. In this common world, each individual has a different position and an area of communication and action in which he actively participates. This area is the area where individuals see, hear, be seen, and heard each other [15].

Habermas explains the concept of the public sphere as a space where the public can create and discuss their thoughts, produce experiences, contain public thought and opinion, and can be accessed by all individuals. Both theorists believe in the necessity of face-to-face communication as the basis of public life. The primary factor in the formation of public space is human existence and free actions [15, 16].

In the historical process, the concept differed from its sociological meanings and began to diversify with its physical qualities. Cities contain public spaces that include common activities of people who share their lives together. The public space, which is perceived as an abstract concept, has a direct relationship with the physical space of the city. Public spaces are the most important urban spaces that can be accessed by all citizens, made available to all citizens, laying the groundwork for the formation of a common social life, and keeping a city alive [14].

The social, economic, cultural and spatial diversity of a city develops in parallel with the diversity of the public spaces it has. The existence of the individual in the city and the meaning of the city in the individual is directly related to the activities that take place in the public space. This relationship is strong the more the public spaces in the city support social life and collective activities both physically and socially. Urban spaces should be evaluated as a whole not only with their physical characteristics but also with their social, sociological, and psychological meanings [14].

One of the most common areas used by individuals in urban life is city squares. Square is defined in the Dictionary of Architecture as "the space that separates people from the environment to a certain extent and is suitable for people to continue their actions". In its broadest sense, square means emptiness. In addition to being a common-use area for individuals living in the city, squares also have social, political, and economic functions. Squares, which are places where a sense of belonging to the city is gained and civic consciousness is developed, are areas where urban politics are effectively implemented both in Ancient Greece and Europe. In addition to trade and socialization, city squares play an active role in reaching urban consciousness and protecting the right to the city. Squares, which have an important place in the

urban structure, contribute to the democratization of society as they provide the opportunity to socialize and be together [17].

Squares, which have a long history in all cultures, are the intersection points where the people or visitors of the city meet and come together and are an organic part of the society. Every visual approach in city squares is provided with an attraction or accent element (building, monument, sculpture, fountain, etc.), and when these elements are reached, the perception is directed to another point, space [14]. Squares, which can be of different shapes and sizes in line with their usage purposes, are often located next to a power center within the settlement such as in front of the church, mosque courtyard, government square, or business center [17].

Squares are classified into many categories such as size, use, relations with the street, style, dominant function, architectural form, settlement, function and form. The two most widely used and equally important criteria are function, and form [14]. This formation is a way of sharing life with people. If the square has enough activities, it will be noticed by people. Because the liveliness of a square is for the user group rather than the number of people in the square; It is important to have a good time in the space, visual quality, comfort, variety of functions, and activities where they can spend their spare time and not get bored. Thus, the revitalization of urban life will be in question [1].

2.2 Perception and Auditory Perception

Perception is a phenomenon that forms the basis of the communication process of people with their environment [18]. Psychologist Morgan defines perception as the process of interpreting sensations and making them meaningful. Morgan associates perception with the sensation process [19]. According to Atkinson, who has extensive studies on perception in the field of General Psychology, perception is the process of organization and interpretation of stimulus patterns in the environment [20]. As a result, perception includes two meanings, being aware of the senses and receiving information through the mind [18].

The perception of space is basically; it is about the person gaining short or long-term experience in or around the place and remembering the place accordingly. This experience changes and develops depending on the concept of motion and time. At the same time, it has been observed that the position of the person in the space is also related to the analysis of spatial relations [21].

For a space to be created, it does not necessarily have to be limited by absolute barriers from all sides. The most important difference that separates a space from a volume actually emerges at this point. The limitation that creates the space can be physical in a way that prevents movement, or it can be only visual, such as a texture on the floor, that can only be perceived by other senses. The important thing is that the clear or unclear boundaries of the space are perceptible. While the perception of space is handled, perception is primarily affected by the sense of sight, and other forms of sensation are neglected, but perception is actually affected by all senses at different rates [21].

Sound; today, it can be used to understand the dynamics, perceptions, and sociopolitical characteristics of the city. Especially when sound is a source that is listened to and researched; it can show the invisible and make the inaccessible accessible. When the place is listened to, certain interactions are felt between different areas, people, machines, and even invisible objects [22].

Seeing is a linear phenomenon. A linear line is formed between the visible and the seer. Hearing, on the other hand, takes place through a three-dimensional interaction that includes volume and circular/surrounding. Sound sources located in different layers and in different directions at the same time are felt. When the space is heard and listened to, it releases its spirit, character, and energy in a holistic sense [22].

Therefore, the sound layers in the landscape presented to the individual in an auditory sense in a certain place can determine the mood and feeling of that person, and the soundscape, which is repeated in the long term / presented in a similar character and structure, determines the individual's attitude towards the place and the quality of the bond he establishes with the place. Of course, it is possible for the person using the space to affect the soundscape of the space, to impose himself on

the landscape, to be in harmony, or to create a different auditory space/layer for himself. Thus, the user can also affect the character and energy of the space by talking to the space and interfering with the relevant sound cover [22].

The listening situation creates a two-way, complementary dialogue and bond. Auditory communication with the space develops in this direction. Just like communication between two individuals [22]. Walter Jackson Ong also mentions how the connection and position of a man with the world and objects are shaped through sound and hearing in the statement “Sound places me in the middle of the world” [23].

2.3 Sound Level and Acoustic Comfort Evaluation

Noise is defined as unwanted sounds that negatively affect the hearing and health of individuals and also affect people physically, physiologically, and psychologically. A noisy area negatively affects the people in that area. This effect varies depending on factors such as the frequency of the noise, its intensity, the duration of exposure to the noise, and the distance from the sound source [24].

Noise or volume control; is the process of completely eliminating the harmful effects of the sound or reducing it to a reasonable level by methods such as reducing the noise emitted from any sound source to an acceptable level, changing the acoustic properties, reducing the duration of the effect, masking it with another sound that is less disturbing. It is the most widely used approach in geographies and situations where there is no accumulation and research data related to the soundscape. This approach does not specifically deal with the auditory perception data of the space user and, in this context, the sound sources that he or she finds disturbing/neutral/pleasant/worth protecting. With general rules and principles, the elimination method is used for high-decibel sound sources that may disturb the environment. The disadvantage of this method is the simple elimination of site-specific sounds without determining the quality of the sound source, its contribution to the identity of the place, and its perceptual value within the framework of the user's needs [22].

In the literature, various parameters are used for soundscape evaluations; objective parameters obtained by physical measurements, subjective parameters formed by subjective evaluations of users, and psychoacoustic parameters [25].

Objective parameters that are frequently used in national and international studies on urban acoustic comfort and take into account the sensitivity changes of the human ear; sound pressure level (SPL) and A-weighted equivalent sound pressure level (LAeq). The sound pressure level (SPL) is the logarithmic measure of the sound pressure of a sound relative to a reference value and its unit is the decibel (dB). Equivalent continuous sound pressure level refers to the constant level of energy equivalent to noise, usually measured as A-weighted sound level, whose levels change over a period of time. The equivalent noise level of a noise source that changes over time is found by taking the temporal average of the logarithmic sum of the instantaneous values of the noise levels over time taken into consideration. LAeq, T is used to describe the average sound pressure level over a given time T. Its unit is decibel (dB) [26].

Although objective data give more tangible results, subjective evaluation and perceptual experiences of users also play a very important role in providing information about the sound environment in soundscape studies. Users' environmental sound preferences, sound recognition, and noise annoyance affect subjective evaluations. Sound preference, which is a psychological aspect, is the user's indication of unwanted or preferred sounds in the environment [25]. The relationship between soundscape and sound preferences was examined in detail in the study conducted in Sheffield [9]. Sound recognition refers to the process of recognizing where a specific sound stands in an environment, and what the sound and its source are. This process requires a good understanding of the sound and its relationship with the social context. The Soundwalk method, which is a subjective empirical method, is mostly preferred for this recognition process [25].

Psychoacoustics aims to explain the physiological and psychological responses of users in an environment. It is a science that deals with the relationship between acoustic wave parameters and sound events, and creates a bridge between

measurement methods and sound qualities. Accordingly, its three main sound metrics are sharpness, loudness, fluctuation strength, and roughness [25].

The number of studies with all of these three types of parameters mentioned is limited. The literature review has shown that these parameters are used individually or in pairs such as psychoacoustic-subjective, objective-psychoacoustic, or objective-subjective [25]. Many soundscape studies emphasize that objective data obtained by physical measurements should be correlated with subjective data and that subjective parameters are of great importance [27, 28].

Sound has often been examined as an undesirable element in studies of the physical environment. However, sound is a design element that plays a role in the perception and description of the space, such as visual landscape features. While defining the concept of landscape, attention is drawn to the fact that it is an element perceived by people. Therefore, sound should be considered as one of the features that reveal the character of a landscape. In this context, different methods than sound measurements are needed in physical planning and design studies [10].

2.4 The Soundscape Approach

The concept of soundscape basically refers to the whole of the sounds that reach the human ear in a certain area. The World Soundscape Project initiated by R. M. Schafer and his colleagues at the end of the 1960s, created the concept of soundscape, which was developed to study the acoustic dimensions of an area/environment [29]. A large number of sound sources have been proposed in order to enable the auditory environment, which is formed as a result of the interaction between the people who perceive the sounds and the environment, to be defined without making positive or negative assumptions, and to enable a combined evaluation of how the sound is perceived and environmental, psycho-social and socio-economic data [30].

Unlike the concept of noise, soundscape is not considered as a negative feature, but as an element of the physical environment. Masking or eliminating the sounds in a space is a negative approach, and instead, it will be better understood which sounds

are protected, strengthened, or eliminated by first defining the soundscape of the space. All urban sounds have a determining feature in the formation of the urban phenomenon and the positive or negative perception of urban areas by users [30].

The Soundscape concept, which sits on the main axis of sound and space communication in the literature, has emerged from the English landscape concept, which is also related to the sense of sight. In a definitional sense, it can be summarized as the perception and understanding of an acoustic environment by the individual, group, and/or society [31].

The soundscape consists of events that are heard, not seen. Just as painting is the sum of visual interactions, the soundscape is the sum of audible events. In John Cage's performance "4′33" in 1952, an approach that reverses people's perception of silence (and indirectly noise) was brought to the contemporary art literature, and the concept of the soundscape was examined for the first time [22].

According to Schafer, although the sounds are similar in sonic space, no two sounds are the same. Every sound is different. This feature gives the sound concept its unique value [30].

The soundscape is a phenomenon related to the sense of hearing, which can be measured by auditory perception, and is a broad subject that many different basic disciplines can examine. However, since vision cannot be sampled with visual images, Schafer mentions three methods for displaying the analyzed data in the transmission of the soundscape [32].

1. Acoustic infographics: Visualization of sound waves and frequency data.
2. Phonetic alphabets: Written expressions of the correct pronunciation of speech sounds.
3. Music notation: It is the writing of sounds suitable for creating a musical continuity with symbols.

These methods do not distinguish in which sub-headings and which discipline the perceived sounds can be studied, but are only auxiliary methods used in the

visualization and transfer of the findings and cannot provide the exact equivalent of auditory perception by themselves. Just like in visual perception, auditory perception parameters differ from person to person with subjective parameters as well as general definitions. Schafer says that the classification of auditory analyzes of sounds can not only be a type of detection and identification method but also a database for evaluating the data in the most optimal way for design and production in future studies [32].

In this sense, it classifies sounds according to a few parameters; these are acoustic classifications according to their physical characteristics, psychoacoustic classifications according to their perceived forms, semantic classifications according to their meanings and semiotics according to their functions, and aesthetic classifications according to their emotional characteristics [32].

The acoustic properties of sounds cannot be separated from the environment and spatial properties in which they occur. In this sense, Schafer's classifications according to traditional studies are, in his own words, dysfunctional. Although they are technical criteria for analyzing the qualities of sound, they are subjective values because they are considered independently from each other [32].

Schafer examines the auditory equivalents of the gestalt principles, which is the theory of visual perception. Here, he develops auditory theories on the figure-ground relationship from the gestalt principles he borrows from visual perception, as he puts it. According to this theory, the figure is the foreground and the ground is what is perceived in the background. As a third to the figure-ground relationship, Schafer gives place to the environment in which this relationship takes place, namely the space. In particular, auditory perception is the environment where the sound event takes place, which determines which sounds are perceived as ground/background and which sounds are perceived as shape/foreground. Schafer distinguishes the sounds heard in a soundscape in the form of keynote sounds, signals, and soundmarks [32].

2.4.1. Keynotes

In visual perception theories; in the figure-ground relationship, both elements cannot be perceived at the same time and one of them is perceived as a figure or ground. When this relationship is considered on the basis of hearing; an acoustic figure may become a ground that cannot be perceived or pushed into the background, or it may be perceived as a shape (signal sound) when the intensity of the sound showing the ground characteristic changes [32].

Keynote sound is used to describe the main tonality or main sound in a composition. This sound or tonality always includes its presence, although it is sometimes masked by other sounds. Keynote sound is an ongoing sound phenomenon in a specific context. These sounds are usually formed by a geographical event or changes in the climate, and they always prevail and cover the space. For example; wind, water animals, stone, metal, wood, etc. sounds that determine the outline of the space [32].

Low-frequency sounds, which are usually continuous, are keynotes sounds. However, continuous or rhythmically continuous and high-frequency sounds may also turn into keynotes sounds after a while, in the position of the background of the environmental perception spatially [32].

Sounds that are part of behavioral routines are considered as keynotes sounds in the process. Geographical features and climatic conditions are variables that create spatial keynotes sounds. Sounds such as the sounds of leaves moving with the breeze spreading from the vista with a poplar tree in front of it, the sound of waves heard in a social area by the sea, the sound of an electronic device constantly working can be examples of these keynotes sounds. What makes a keynotes sound worth examining is that it has an unconscious and subtle effect on spatial perception. These sounds, which have become a habit of hearing, can also cause unconscious coding about space [32].

2.4.2. Signals

Signals, on the other hand, describe noise or sounds that are suddenly heard prominently in the foreground. Derived from the theory of communication, the term is used to describe sounds that contain a kind of message code, drawing the attention of individuals to themselves. For example bells, sirens, etc. [32].

Signals sounds are sounds that represent the shape in the figure-ground relationship. In this sense, it can be divided into two as consciously focused sounds and sudden signals that can block consciously focused sounds. Consciously focused sounds; Examples such as a music concert, the sound of a speaker can be given. The signals sounds here are the sounds that the auditory sense perceives together with all the other senses and there is continuity in perception. Warning, sudden and high-frequency sounds such as doorbells, alarm clocks, bank sequence number signals, indoor or outdoor announcements, car horns, and thunder are sudden signal sounds. Sudden beeps can be multiple, as well as focused audio can be interrupted by sudden beeps. For example, the conversation of two people sitting in a cafe space is focused signals tones. The high-frequency sound created by the breaking of the glass that slips from the waiter's hand while the dialogue continues is a sudden signal sound [32].

2.4.3 Soundmarks

The term soundmark is used to describe the sounds that belong to a specific place and make the acoustic life of that place special for that community, and it bases its roots on the term landmark [32].

In the case of soundscapes, the sounds in which effect the perception of space is most evident in terms of cognitive and sensory aspects are soundmarks sounds. Soundmarks sounds basically form the database of sound memory in the brain [32].

Each sound is an auditory symbol for the behavior, situation or object it describes. The information that the airplane noise heard as a hum is caused by an airplane flying in the sky is data belonging to auditory memory. However, at this stage of the

subject, it should be stated that the symbol sound expression is used for the sounds that create spatial traces [32].

Soundmarks sounds contain codes of the places they are associated and identified with that space. Codings that are associated with specific memories and acquired through individual experiences, such as the identification of social space sounds such as the school bell, the sound of the ferryboat, the church bell, the clock tower, the call to prayer with the places where they are located; Sounds such as a song reminding a period or event can also be associated with places [32].

Schafer mentions that the perceiver is in a variable position when determining whether a sound is a shape or ground. Learned habits, individual psychological state, interests, and cultural differences; of them are the variables that affect when establishing the auditory figure-ground relationship. At this stage, the physiological nature of the sound has no effect on its psychological effectiveness [32].

Noise pollution occurs when people do not listen carefully. Noises are sounds we have learned to ignore. Today, noise pollution is resisted by fighting noise. This is a negative approach. We need to find a way to deal with environmental acoustics within the framework of a positive work program. What sounds do we want to protect, encourage and reproduce? If we know this, boring or harmful sounds will attract enough attention and we will learn why we have to eliminate these sounds [32].

The concept of soundscape proposes to evaluate all the sounds perceived in an environment with all their complexity. In order to make such an assessment, many different methods are used to collect and measure data on "human perception, acoustic environment, and context", which is called "data triangulation" in soundscape studies. Such a data triad method ensures that the uncertainty in the measurements is reduced and its validity increased when compared to studies based on a single method. In studies within this scope, the primary approach is human perception, followed by physical measurements [33].

2.5 Literature Review

In the soundscape studies that started at the end of the 1960s, the first articles started to appear in 1999 [34] and showed a significant increase in the last 15 years. Special issues for soundscape have also been published in some journals [34, 35, 36, 37].

Although most of the soundscape studies focus on quantitative data, it is known that the soundscape quality does not increase by reducing the sound pressure level or noise level of the space. In determining the soundscape perceptions of the spaces, it is not sufficient to consider the sound only physically. This situation necessitates the importance of not only the physical characteristics of the sound but also the user preferences [38].

In a study [39], in which subjective evaluation was applied only in the laboratory, the audio recordings recorded by the participants were played in a semi-resonance-free environment using a 3D speaker. Sound recordings were taken in 4 urban spaces and the recordings were evaluated with university students and instructors using the semantic separation analysis technique. The results of the study were compared with the results of the survey that Kang used the semantic separation analysis technique and conducted, and similarities were found in the results [40].

Even though laboratories can help to evaluate controlled studies, it may not be possible to create complex sound sources and to ensure the interaction of sound with physical factors such as social and cultural factors. Since it reflects an artificial scenario in this way, it is likely to lack a sense of realism. For this reason, subjective evaluations in soundscape studies are often made with field studies [38].

Soundscape perception was investigated in another study conducted in parallel in two French cities [41]. With the questionnaires applied to the users of the venue, the users were asked their thoughts about the sound environment in the venue, and at the same time, the sound environment was recorded. As a result of the analysis, it was found that the surveys made for the main street and the quantitative data results were in the same direction. A significant relationship was found between acoustic factors and spatial dimension perception.

In the work of the World Soundscape Project initiated by Schafer in the 1970s, soundwalks took their place as an effective experimental method in describing the soundscape. Westerkamp [42], who took part in the project, says that "any kind of excursion for listening to the environment is a sound walk" for soundwalks and mentions that this is an acoustic training by exposing the listeners to the sound composition of the environment. Emphasizing the relationship between the individual and nature, “close contact with nature in urban life has been significantly reduced. While nature is essentially the guide/friend with which man lives and struggles, it has now become a friend that is visited from time to time”. He suggests that soundwalks also significantly re-establish this contact.

In their study, Venot and Sémidor [43] used the soundwalks method to identify the space-related and pleasing elements in the urban sound environment in relation to the activities taking place in space. He restricted the walks to a certain time (for example, half an hour), and recorded the sound with an advanced microphone system during the walk. The study was supported by ethnographic notes and photographs taken during the recording. Thus, in order to evaluate the soundscape, it was able to define the sound cover components more easily.

Venot and Sémidor [43] specifically mentioned tools that could be developed for urban planners interested in the rehabilitation of existing public spaces; these tools allowed the planner to anticipate relevant modifications taking into account the acoustic dimension of the space. Their methodology included soundwalks, which must be performed prior to rehabilitation, as these walks revealed the soundscape that was representative of the original site. Them; the nature of the urban fabric, the morphology of the public space, the texture of the facade materials, etc. They emphasized that elements have a great influence on the distribution of sounds and therefore on the auditory impressions they produce. In the study, in which a stereophonic (binaural) microphone system was used together with the DAT recorder, the researcher himself is a sound walker.

In a case study conducted in Berlin, the soundscape of an urban area was investigated to demonstrate the advantages of the soundscape approach [44]. It was decided to conduct a detailed study on complaints from the region such as sleep disorders and learning difficulties in children. Based on narrative interviews, the study was built on

people's attitudes towards certain environmental stimuli, as well as their assessments and perceptions of territory. The acoustic environment to which residents are constantly exposed was evaluated and recorded. In addition, visual factors that can affect sound perceptions are also included in the analysis. The interviews were analyzed systematically with the sociological analysis method. Thanks to the result data, comments were made about the structure and changing factors in the perception process. Thanks to this information, the factors behind impulse response curves have been determined and furthermore, it has been seen that the decisions about detection have appropriate use in addressing environmental noise problems. This study has shown that the soundscape approach can help overcome sectoral barriers through its multidisciplinary approach.

In the study evaluating the acoustic comfort in 14 different open public spaces in 5 European countries, the survey method was used to cover 4 seasons [31]. 9200 interviews were conducted and objective measurements were made. As a result of the study, it was determined that the subjective assessment of the sound level was associated with an average Leq, especially when it was below the average value determined in this study as 73 dBA. However, differences were found between the subjective assessment of the sound level and acoustic comfort, taking into account the general soundscape and individual sounds. Users tend to be more tolerant in terms of acoustic comfort assessment. Moreover, background noises have been seen as an important cue in public space soundscape assessment. Lower levels of background noise tend to make people feel quieter. In addition, a sound that is perceived as pleasant as a sound source type can increase acoustic comfort even if the level is high. Moreover, there was no significant difference between different age groups in the subjective evaluation of a sound level, but there are significant differences in terms of acoustic comfort.

Aydın et al. [38] discussed the sound elements that define the acoustic heritage in historical urban areas with a soundscape approach. They determined the historical Suriçi region of Diyarbakır as a research area. They determined the sound sources heard by the users using this region and recorded the sound by using a binaural sound recorder in the places where the sound sources are located. At the same time, he applied a survey to the users and tried to measure the noise level and satisfaction

perceptions of the users' areas. According to the results from the audio recordings and surveys; it has been concluded that the high sound pressure levels of the sounds that are important in the Suriçi region do not reduce the satisfaction level of the users. Within the scope of this research, it has been determined that the concept of soundscape makes important contributions to urban design, especially to the historical urban texture.

Özçevik et al. [45] discussed the concept of soundscape with a broad perspective. In the field study conducted for this concept, statistical studies constituted the aim of the research. Using the results obtained from field and laboratory studies, semantic difference test with the help of the SPSS program, analysis of variance between laboratory jury test and regression models between t-test and sound quality metrics supported the research.

Yu and Kang [46] conducted fieldwork in 19 regions in Europe and China between 2001 and 2005. In fieldwork; Questionnaires including the activities and behaviors of people in the region, their social/cultural backgrounds, sound preferences, and descriptions of sounds were applied. These questionnaires were also administered to 56 participants in the laboratory. As a result, the effect of social demographic factors (education level, age, occupation, and gender), the effect of behavioral, physical, and psychological factors on sound preferences, and the status of residences were investigated through questionnaires.

Kang and Zhang [47] created the questionnaires and they applied in 3 stages. The first stage was implemented with 48 university students by making a sound walk in the urban open area. In the second stage, a detailed soundscape assessment was applied to the group consisting of 491 subjects. In the last stage, it was applied to 223 architecture students. As a result of the questionnaires in which semantic separation analyzes were used, it was concluded that demographic factors are important. When design students were compared with the general public, it was found that designers preferred green spaces and natural sounds more.

Another study is to show the importance of soundscape design by investigating people's urban soundscape preferences and perceptions in light of demographic factors [9]. Sound identities and classifications were made as a result of intensive

survey studies conducted in two squares in Sheffield. As a result of the study, it has been shown that natural sounds are preferred to urban sounds. In addition, it was observed that the use of the square changed according to the soundscape. Although there were significant differences between age groups, fewer differences were found between the sexes. In line with these results, urban soundscape suggestions are given.

A study aiming to find out how personal factors affect soundscape perception and preference was also conducted in China [48]. As a result of the survey evaluation made with the users of urban parks, it was concluded that natural sounds are perceived more positively than artificial sounds. It has been found that the five main dimensions of social, demographic, and behavioral characteristics such as age, education level, type of use, gender, and duration of presence in the area are related to soundscape perception and preferences.

As a result of the literature review, it is seen that the perception of the urban soundscape changes according to the demographic factors and the reactions to the sounds change especially with the cultural difference. Although there are studies for different cultures, there is no detailed analysis of the province of Izmir. For this reason, it is of great importance to investigate the soundscape perceptions of Izmir Konak Square users.

2.5.1 Doctoral Dissertations about Soundscape

In a doctoral thesis, the First Kordon, Kültürpark, Karşıyaka, Kemeraltı – Hisarönü, and Konak Square soundscapes in the city of İzmir were tested with phonomnesis and soundwalk methods. It is evaluated by 150 subjects who regularly use these fields through a two-stage survey study. In this context, a comprehensive profile has been created that determines the limits of human interaction with the sound environment and reveals human-oriented auditory preferences. In addition, a comprehensive classification has been carried out, revealing the function of sound energy in acoustic communication, over the sound elements that make up the examined soundscapes [49].

A doctoral thesis study was conducted with the hypothesis that the soundscape quality can be evaluated objectively through the perceptibility of the symbol sound.

Thus, it has been documented that there is a direct relationship between symbol sound and sound environment satisfaction. In order to make the practical application of the established theoretical model, a field applied approach proposal study was conducted for the purpose of the study. The draft proposal was first tested theoretically on the first study areas used in the development process and then applied in the newly determined study areas [50].

With the soundscape approach, a study has been developed to develop a prediction model that will allow the long-time stages to progress faster and systematically in determining the sound environment satisfaction levels of users in urban spaces. The prediction model was developed using fuzzy logic. During the construction of the model, the data obtained from the field and laboratory studies were used. A field study was conducted in the Suriçi region, which represents the city of Diyarbakır very well in terms of social, cultural, and historical aspects. Two-ear sound recordings were made in the study area with the sound walking method. The sound recordings were played to the participants in the laboratory environment and the jury test was applied and statistical evaluations of the analyzes were made [51].

The sounds of Istanbul were examined in the study, which aims to evaluate the culture and traditions of daily life from an auditory perspective, search for ways to preserve the characteristic sounds and sound fields and increase social awareness of urban sounds. These determined sounds were recorded one by one and a sound archive was created in Koç University Suna Kıraç Library that everyone can access. Later, two exhibitions were designed, one interactive and the other experiential. According to the studies conducted during the exhibitions, it was observed that the visitors had an emotional connection with the sounds and they did not realize this before coming to the exhibition [52].

In another study, an attempt was made to produce an integrated framework for soundscape perception and spatial experience within a systematic review of recent developments and adapting the assessment methodology. Conceptual classification models were created. Six soundscape perception factors were created, whereas five spatial experience factors were presented. In this study, 38 offices in Çankaya University were observed and measurements were made by determining 7 measurement points to obtain an indication of the spatial characteristics and sound

sources. In addition, structured interviews were conducted with 20 office users to reveal more details of the soundscape and space factors. In the last stage, a total of 300 office users in six universities in Turkey were reached and the questionnaires developed within the scope of the study were applied [53].

The machine learning method was used to develop a prediction method by determining the sound contents for use in the soundscape and correlating them with the perceptual responses of the individual. The research focused on the soundscape in museums. The audio contents of soundscapes were classified using Convolutional Neural Networks. An online soundscape perception survey was conducted to measure the emotional responses of individuals to the sound environments of different museums [54].

In another study, a model proposal has been developed with a focus on the soundscape approach for the determination of calm areas within the scope of environmental noise management. In this context, four urban parks in Antalya were selected as research areas and a survey was applied to the users of the area simultaneously with the sound level and air quality measurements in the field. Subjective and objective data obtained within the scope of field studies were evaluated using statistical methods, and a model was developed considering current scientific studies and national and international applications [55].

Within the scope of another thesis, an approach based on the Analytical Hierarchy Process (AHP), which is one of the multi-criteria decision-making methods, and the Weighted Sum Analysis (WSA) based on Geographic Information Systems (GIS) was developed in order to determine the quiet/calm areas in the settlement in accordance with the legislation, and its conceptual model was developed. Explained [56].

In a study aiming to reveal the effect of the sound atmosphere and travel motivation of two important recreation areas of a city tourism destination in Turkey on the emotional state of tourists, 15-minute walking routes were created in Sazova Science, Culture and Art Park and Adalar locality in Eskişehir. Sound pressure measurements and sound atmosphere recordings were made during the soundwalks on these routes. In addition, a face-to-face survey was applied to a total of 794 tourists

simultaneously with the soundwalks. It is aimed to reveal the effect of the sound atmosphere on the mood of the tourists through the survey, to determine the effect of the demographic characteristics and travel motivations of the tourists on their perception of the sounds, and to determine which sounds are more prominent in the sound atmosphere by the tourists [57].

A total of 306 sound measurements were made and sound maps were created in a study selected as the Freedom Park, Eski Kordon, and New Kordon study areas located in the city center of Çanakkale. After the interview with the participants, it was concluded that the quantitative measurement of sound pressure levels alone is not sufficient in terms of the auditory landscape quality or the sound level evaluations of the spaces [58].

2.5.2 Master Dissertations about Soundscape

A study designed to examine the indoor acoustic environment in a metro station selected as a public space was conducted. The aim of the study is to investigate the positive and negative perceptions of metro station users about indoor space. Objective, subjective, and psychoacoustic measurements were made. As a result, the values obtained in the acoustic measurements were above the limit allowed in the regulation. According to the results of the noise nuisance questionnaire, indoor noise nuisance was higher than outdoor noise nuisance. No significant statistical relationship was observed between the demographic characteristics of the subjects, such as age, gender, educational status, and the perception of space [59].

Another master's thesis explores how soundscape perceptions of users on the Mississippi State University Campus might differ from objective measurements. It includes 4 districts: the Colvard Student Union, the Mitchell Memorial Library, the Sanderson Center, and the Bell Island. For objective measurements, the sound pressure levels available in the field were measured. A survey was conducted with campus users to look at it from a subjective perspective [60].

In another study, it was aimed to establish a bridge between the concept of soundscape and the discipline of urban design. A proposed model for urban soundscape analysis, which reveals the sonic character of spatial research and urban

space, has been defined. This model has been tried to be applied in and around Kadıköy Historical Bazaar and the outputs of the study have been revealed [61].

In the thesis study, an urban audio environment research was designed between Gezi Park and Tünel Square. The main method used is soundwalks. Apart from the soundwalks, 10 different recordings were made on the route. According to the information obtained from the questions answered after the sound walk, the most influential sound sources of the audio environment of the route were street artists, garbage/cleaning vehicles, and street vendors [62].

Another study investigated the effect of soundscape on students' perception and mood in high school environments. In this research, the classroom and computer laboratory environments in Private Bilkent High School were compared. The research includes two methods as objective measurements and subjective research. The results showed that music and natural sound sources were mostly preferred over electronic-mechanical sound sources [63].

This research examines the soundscape perception differences between two different cultural groups living in the same city and in similar residential environments. Within the scope of this study, a total of 405 questionnaires were collected and analyzed from Arab and Turkish residents living in Ankara, and the results were analyzed in detail. The findings of the study showed that Arab residents indicated a higher level of satisfaction with the sound environment in their homes [64].

In another study, the aim of designing auditory representation forms using sounds was discussed. From this point of view, as a method that is frequently used in soundscape studies, the method of recording sound with soundwalks and mapping sounds has been tried. included in the scope. The difference and representation of the soundscapes were evaluated by choosing two different urban spaces. Designing sound postcards and sound collages by processing the sound recordings taken from the soundscape with the method of soundwalks as any kind of excursion made for listening to the sounds of the city, within the framework of the conceptual base of the postcard and collage, is one of the final productions of this study [65].

Demographic and morphological research are handled in chronological order in Karaköy's geography, which carries the history of urbanization of the last two

centuries. The daily life experience of Karaköy, which is a cultural, social, and physical movement area of the city, is discussed with soundscapes. In this context, the soundscapes of Karaköy have been evaluated as threshold spaces where the society is being established. By applying accepted methods in urban soundscape studies based on experiences such as soundwalks, survey studies, and sound mapping, the results were evaluated in the analysis of the construction of the social space [66].

A study was conducted to evaluate how it affects the character of the soundscape in Urumiyeh City Park. Along with the sound measurements and sound maps, survey studies were carried out to evaluate user perception. At the end of the study, it was discussed on taking the necessary measures to reduce the noise disturbing the users in Urumiyeh City Park [67].

Within the scope of another study, by making use of the determinants of urban identity; In the sample of Eskişehir, a model has been proposed to select areas where sound identity can be documented in cities with a soundscape approach. It is expected that this proposed model will be the basis for the selection of areas where sound identity documentation will be made and used in studies conducted for the same purpose [68].

Within the scope of another thesis, today's auditory perception potential in the region selected as the case study area of Istanbul Land Walls and its surroundings was studied. The effect of the spatial change detected in the region on the soundscape comfort in the adult user group was investigated. As a result of the study, it is aimed to contribute to the auditory perception and experiences of individuals in the urban historical environment [69].

Chapter 3

Material and Method

3.1. Material

The main material of the study is Izmir Konak Square, which was chosen as the study area. As seen in Figure 3.1, the square is located in the west of Turkey, within the provincial borders of İzmir. Located in Konak district of Izmir and by the sea, the square is one of the most important historical squares of Izmir with its 200-year history.

Konak Square, the first public space of Izmir, has been used as a square since the 19th century. The construction of the Sarıkışla (Figure 3.2), located next to the Government House, was completed in 1829 and thus the first step was taken towards making the area the public center of İzmir [70].

Satellite images obtained from Google Earth for the years 2000, 2004, 2010, 2015, 2020, and 2022 showing the changes in Konak Square and its surroundings are shown in Figure 3.3. In 2003, a renovation project was made for Konak Square and its surroundings, which had undergone many transformations before. The project aimed to be pedestrian-oriented, with wide green areas, to ensure the interaction of the city and the sea, to strengthen the historical identity of the square and İzmir, and its final form is preserved today [71]. When the images are examined, it can be observed that in addition to the changes made within the framework of the project after 2003, the Konak tram stop was added in 2018 and the Izmir Metropolitan Municipality Building was demolished in 2022.

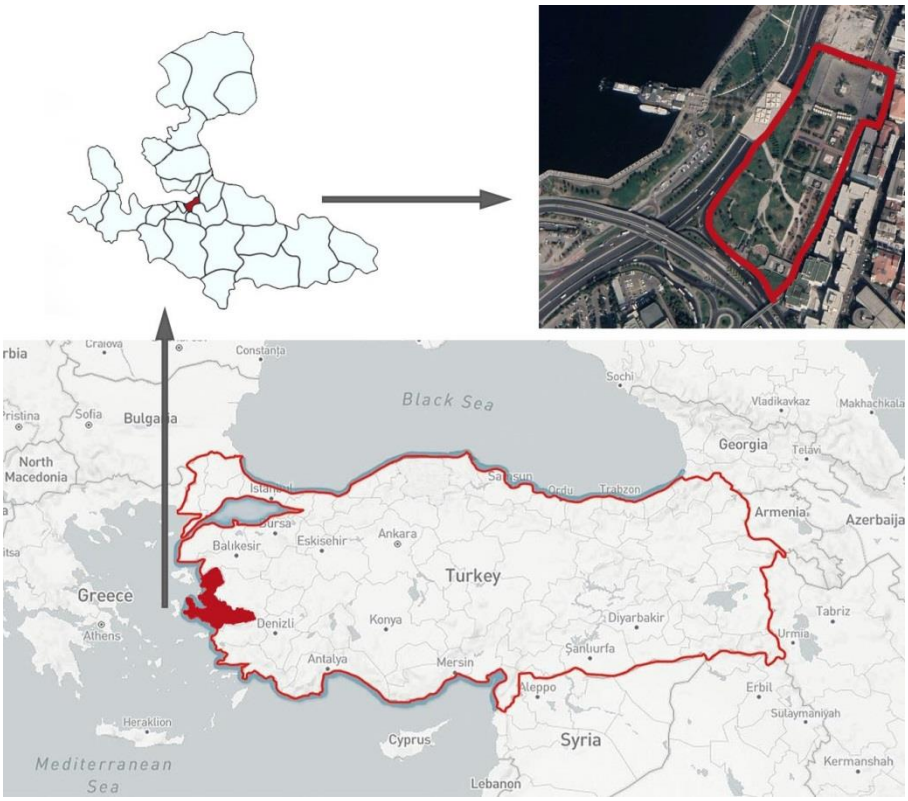

Figure 3.1: Location of the study area

Figure 3.2: Sarıkışla in a photograph dated before 1868 [70]

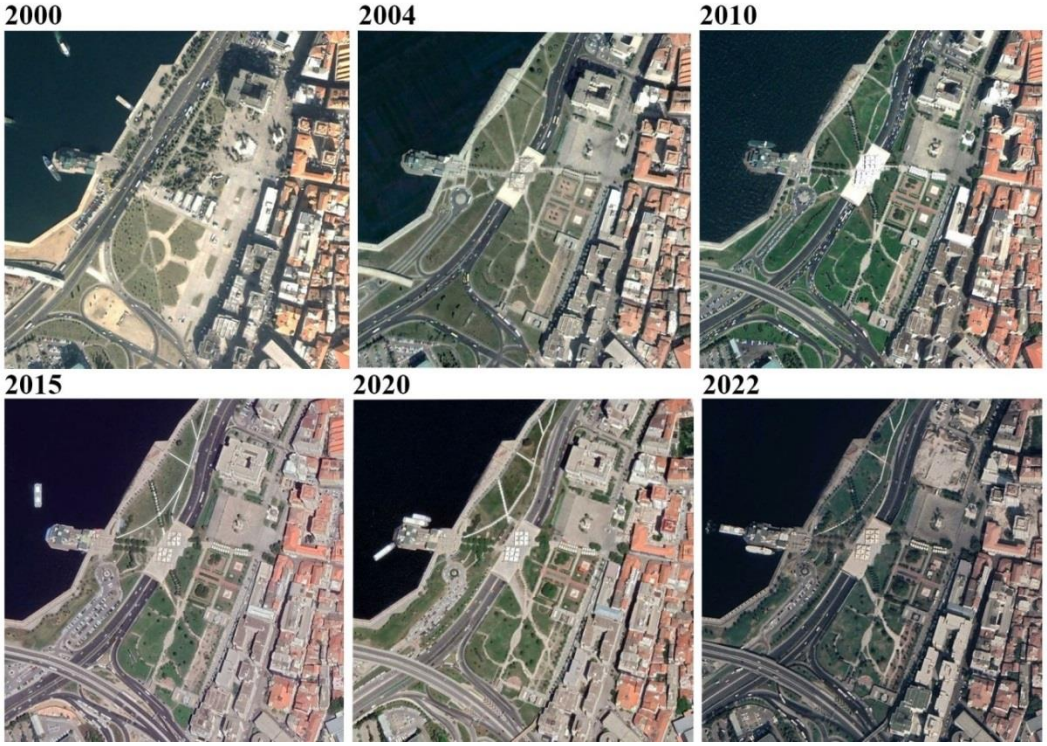

Figure 3.3: Google Earth satellite view of İzmir Konak Square between 2000 and 2022

The square can be expressed as a closed and defined square defined by the historical, administrative, commercial, religious, cultural, and political structures around it. As shown in Figure 3.4, today, there is the Izmir Clock Tower, an Ottoman architectural work, at its center, and the Izmir Metropolitan Municipality Building, which is being rebuilt, to its north. To the east of the square, there is the Kemeraltı historical shopping axis, the Government House, and the Yalı Mosque. In addition, the square has important points of the İzmir transportation axis in the south (İzmir Konak metro, Konak bus transfer center) and west (Konak pier, Konak tram stop). Thus, the square has maintained its feature of being the "center of İzmir" for years, thanks to its intense use and being the first and last point to be reached [71, 72].

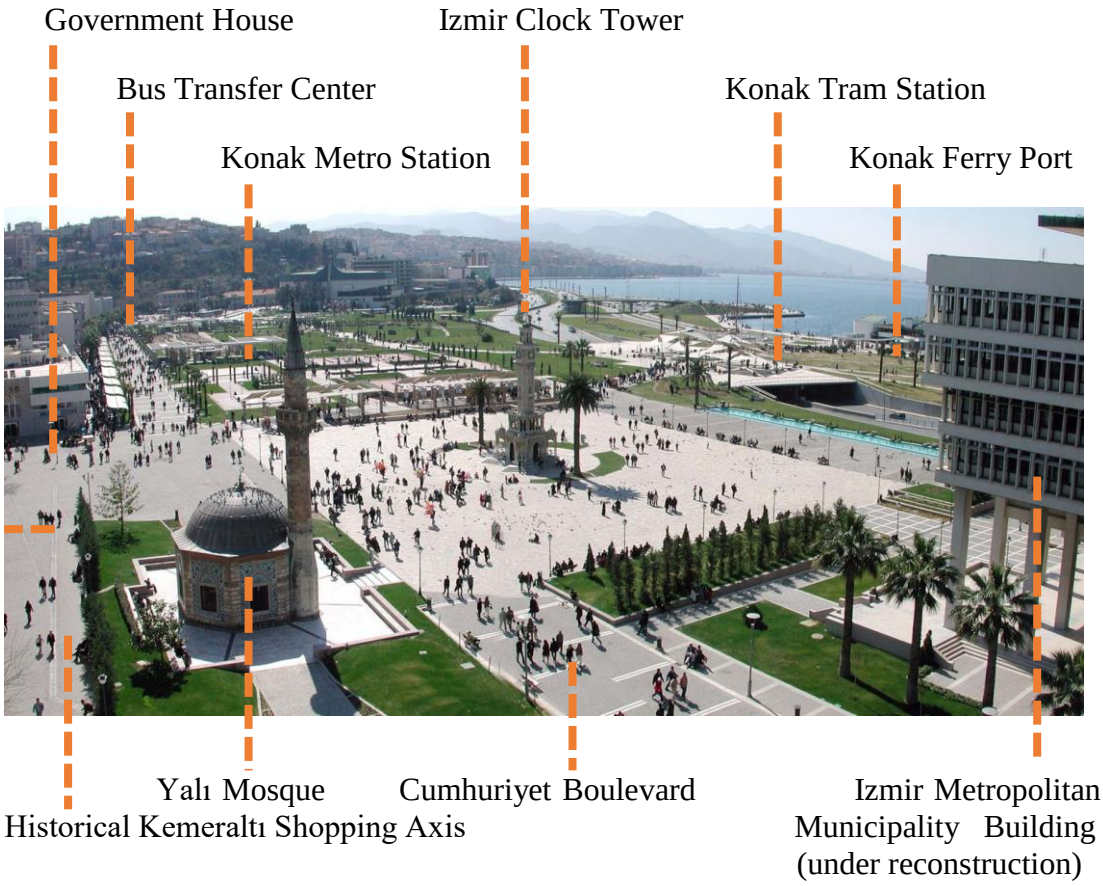

Figure 3.4: İzmir Konak Square [73]

Due to these features, the area is one of the important nodes of the city and is rich in sound diversity. This area has many important sounds that reflect the identity of İzmir, such as the sounds of the sellers heard like "gevrek" (Turkish bagel), "çiğdem" (sunflower seeds), “boyoz” (pastry) and “kumru” (sandwich). Because these sounds are completely unique to Izmir. When these sounds, which carry identity or symbol qualities, are listened to, it can be determined to which city or area the sounds belong, and since such a square is not elsewhere in Izmir, these sounds can identify Konak Square. In addition to these symbolic sounds, the sounds of heavy traffic, ferryboats, crowds, birds, and the sea are the sounds of İzmir. Thus, it can be said that Konak Square represents the city of Izmir. Moreover, in the studies carried out, it was concluded that the sounds reflecting the Izmir identity mainly emerged from the sounds of the Konak Square. Therefore, it was chosen as the study area because it can reflect the sounds of the city in a comprehensive way [74, 75].

3.2. Method

In this study, a three-stage method consisting of data collection, analysis, and evaluation was used (Figure 3.5).

In the data collection phase, which is the first stage of the study, a literature review on the soundscape, space perception, and auditory perception was made and the hypothesis and research questions were formed. Since the soundscape of Izmir Konak Square has not been examined before and is rich in sound sources, it has been chosen as the study area. Then, data collection tools were determined thanks to the information obtained in light of the literature review. In Soundscape Studies and Data Collection Methods published by the International Organization for Standardization (ISO), "soundwalks, questionnaires, short interviews" were determined as minimum reporting standards [76]. In light of these standardizations, the project tools were determined as İzmir Konak Square, sound sensory examination in the field, sound level measurement of the field, and survey with field users.

While sound measurements were made in the area, the sound types in the area were also examined on Tuesdays and Thursdays on weekdays and Saturdays on weekends. After the afternoon and evening walks in the area, 18 types of sounds heard in the area are listed and survey questions were designed according to the sounds in this list.

In the second stage, the analysis stage, the number of users of the area where the survey was planned to be applied was determined. The universe of the research consists of Konak Square users and it is planned to apply a face-to-face survey. The sample size was determined as 385 at the 95% confidence interval. The sounds in the field were examined by literature review and on-site observation, and survey scales were prepared accordingly. After the survey data were collected, frequency analyzes and pairwise comparison tests were made.

The results obtained in the evaluation stage, which is the last stage of the study, were evaluated and interpreted. Suggestions were presented for the improvement of the soundscape of Konak Square, which is an important public space in Izmir.

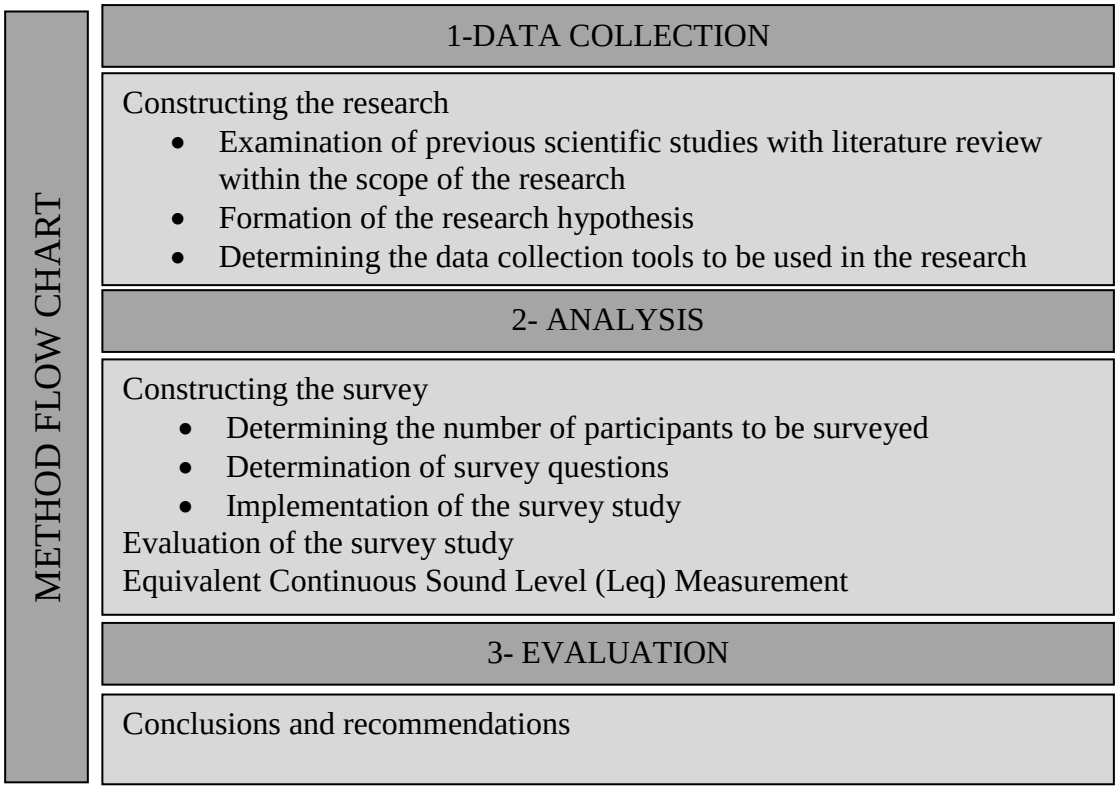

Figure 3.5: The method flow chart of study

Chapter 4

Results

In the results section, first of all, the sound sensation and loudness measurement data through the field work carried out in Konak Square, and then the analysis of the data collected through the survey are presented.

4.1. Auditory Analysis of İzmir Konak Square

Just as sound types affect the soundscape perception of the environment, the sound level is considered as one of the important acoustic parameters that can affect this perception. Therefore, sound measurements were made while examining the sound types in the field. In this section, after the sound types are presented, sound measurements are given.

The auditory sensation in the area at various times of the day was examined and 18 sound types in the area were determined. These 18 sound types were divided into 4 categories as human sounds, natural sounds, mechanical sounds, and instrumental sounds. Among the sounds evaluated in the category of human sounds, 3 sound types were heard as speech, child, and seller sounds. Moreover, bird, dog, cat, wind, and water sounds were detected in the area and included in the category of natural sounds. In the group of mechanical sounds, which was more crowded than the others, car, motorcycle, tram, horn, ferry, and bicycle bells were heard. Finally, street artists, car music, azan, and bell sounds are listed in the instrumental sounds category.

While examining the sound types in the field, sound level measurements were also made during the weekdays (Tuesday-Thursday) and weekend (Saturday). These 5-

minute measurements were repeated during the midday and evening hours of the day. Equivalent continuous sound level (Leq) measurements were made using the free sound level meter app from Splend Apps. As a result of the 5-minute measurements made with the application, the minimum sound levels, maximum sound levels, and average sound levels were determined over time as the outputs of the application were determined in dB. These determined measurements are given in Table 4.1.

Table 4.1: Equivalent continuous sound level (Leq)

	Midday			Evening		
	Min.	Average	Max.	Min.	Average	Max.
Tuesday	62 dB	69 dB	85 dB	63 dB	70 dB	84 dB
Thursday	65 dB	70 dB	86 dB	65 dB	69 dB	82 dB
Saturday	68 dB	74 dB	86 dB	70 dB	77 dB	88 dB
Average	65 dB	71 dB	86 dB	66 dB	72 dB	85 dB

It has been determined that all of the sound levels measured in the square are higher than the sound limit value of 65 dBA (Regulation on the Evaluation and Management of Environmental Noise) and 55 dBA (World Health Organization) [77]. It is seen that the measurements made on Saturday are above the average. In addition, while the measurements were made, it was observed that the number of people using the area on Saturday was higher than on other days. The fact that Saturday is a holiday may be one of the important reasons affecting this situation.

4.2. Data Obtained by Questionnaire Analysis

The data collected by the questionnaire method and transferred to the Microsoft Excel program were organized, cleaned, and made suitable for analysis. Explanatory Factor Analysis, Confirmatory Factor Analysis, Reliability Analysis, Mann Whitney U Test, Kruskal Wallis Test, and Spearman Correlation Tests were used in the analyses. Data analyzes were tested using the IBM SPSS Statistics 26.0 (Statistical Package for Social Science) package program.

The total number of valid questionnaires (385) was taken into account for each question. In each table, answers not given by the participants for each question are indicated as ‘not given’.

4.2.1. Findings on Socio-Demographical Characteristics

First, it is crucial to examine the demographic outcomes of the sample group. The demographic data of the participants included in the study, such as gender, place of birth, age, education level, and residence length in Izmir, were examined. Table 4.2 presents the data that were obtained via Frequency analysis on the socio-demographical scale of the questionnaire.

Table 4.2: Demographic characteristics frequency table

		N (%)
Gender	Female	198 (%51.4)
	Male	187 (%48.6)
Birthplace	İzmir	172 (%44.7)
	Other	213 (%55.3)
Age	<18	71 (%18.4)
	18-24	81 (%21.0)
	25-34	70 (%18.2)
	35-44	69 (%17.9)
	45-54	49 (%12.7)
	55-64	39 (%10.1)
	>64	6 (%1.6)
Education	Literate	2 (%0.5)
	Primary education	98 (%25.5)
	High school	142 (%36.9)
	Undergraduate	125 (%32.5)
	Postgraduate	18 (%4.7)
Residence Length	Visiting	41 (%10.6)
	0-5	73 (%19.0)
	6-15	105 (%27.3)
	16-25	68 (%17.7)
	>25	98 (%25.5)
	Total	385 (%100.0)

According to the data obtained via the questionnaires, 51.4% of the respondents were women, 44.7% of the respondents were born in İzmir, 57.6% of the respondents were under the age of 35, 37.2% of the respondents had undergraduate and higher education, 25.5% of the respondents have been living in İzmir for more than 25 years and 10.6% of the respondents are in İzmir for visiting purposes.

4.2.2. Findings on Perceived Sound Types and Levels

According to the data obtained from the responses of the participants to the sounds in the categories of human sounds, natural sounds, mechanical sounds, and instrumental sounds, the distribution of the sounds heard in Konak Square is shown in Table 4.3. In this part, the participants were allowed to choose more than one option while they were asked to mark which of the sounds they perceived under the categories.

Table 4.3: Distribution of the sounds heard in the square

	N (%)
Speech sound	370 (%96.1)
Automobile sound	324 (%84.2)
Wind sound	308 (%80.0)
Street artist	288 (%74.8)
Bird sound	273 (%70.9)
Horn sound	214 (%55.6)
Child sound	191 (%49.6)
Motorcycle sound	144 (%37.4)
Water sound	112 (%29.1)
Seller sound	78 (%20.3)
Tram sound	68 (%17.7)
Car music	36 (%9.4)
Bicycle bell	26 (%6.8)
Azan sound	24 (%6.2)
Steamboat sound	23 (%6.0)
Dog sound	21 (%5.5)
Cat sound	5 (%1.3)
Total	2505 (%650.6)

It was observed that the most perceived sounds in Konak Square were “speech sound” (96.1%), “automobile sound” (84.2%), and “wind sound” (80.0%). As the rates decreased, it was concluded that “water sound” (29.1%) and “tram sound” (17.7%) were perceived at a level that could not be ignored.

In order to determine the dominance level of the sounds perceived in the square, the participants were asked to rank the first 5 sounds they heard from the most dominant to the least dominant. The data obtained are presented in Table 4.4.

Table 4.4: Dominance order distribution of sounds

	Dominant Sound 1	Dominant Sound 2	Dominant Sound 3	Dominant Sound 4	Dominant Sound 5
Speech sound	69 (%17.9)	47 (%12.2)	67 (%17.4)	62 (%16.1)	64 (%16.6)
Automobile s.	71 (%18.4)	95 (%24.7)	56 (%14.5)	40 (%10.4)	28 (%7.3)
Street artist	138 (%35.8)	30 (%7.8)	32 (%8.3)	29 (%7.5)	31 (%8.1)
Wind sound	17 (%4.4)	39 (%10.1)	50 (%13)	62 (%16.1)	74 (%19.2)
Bird sound	10 (%2.6)	42 (%10.9)	41 (%10.6)	55 (%14.3)	51 (%13.2)
Horn sound	18 (%4.7)	19 (%4.9)	51 (%13.2)	36 (%9.4)	24 (%6.2)
Child sound	10 (%2.6)	38 (%9.9)	24 (%6.2)	31 (%8.1)	40 (%10.4)
Motorcycle s.	5 (%1.3)	28 (%7.3)	24 (%6.2)	21 (%5.5)	23 (%6)
Water sound	33 (%8.6)	21 (%5.5)	9 (%2.3)	12 (%3.1)	16 (%4.2)
Seller sound	-	11 (%2.9)	9 (%2.3)	8 (%2.1)	12 (%3.1)
Tram sound	1 (%0.3)	3 (%0.8)	7 (%1.8)	10 (%2.6)	9 (%2.3)
Car music	2 (%0.5)	6 (%1.6)	6 (%1.6)	7 (%1.8)	3 (%0.8)
Azan sound	11 (%2.9)	1 (%0.3)	2 (%0.5)	2 (%0.5)	2 (%0.5)
Bicycle bell	-	-	3 (%0.8)	4 (%1)	6 (%1.6)
Dog sound	-	3 (%0.8)	4 (%1)	3 (%0.8)	2 (%0.5)
Steamboat s.	-	2 (%0.5)	-	2 (%0.5)	-
Cat sound	-	-	-	1 (%0.3)	-
Total	385 (%100)	385 (%100)	385 (%100)	385 (%100)	385 (%100)

Street artists (35.8%), automobile sounds (18.4%), and speech sounds (17.9%) were the most perceived sounds as the first dominant sounds. The second dominant sound was the car sound (24.7%), the third dominant sound was the speech sound (17.4%), and the fourth dominant sounds were the speech sound (16.1%) and wind noise (16.1%). Finally, as the fifth dominant sound, wind noise (19.2%) was the most perceived sound. When the general dominance percentages were examined, it was seen that the most dominant sound was the street artist sound (35.8%).

In order to measure the sound level perception and satisfaction level of the participants, 4 sound categories were presented to them. The data obtained for the categories of human, natural, mechanical, and instrumental sounds are presented in Table 4.5.

Table 4.5: Level perception and satisfaction level of sound types

Sound Types	Human	Natural	Mechanical	Instrumental
Satisfaction level				
It doesn't bother at all	82 (%21.3)	229 (%59.5)	4 (%1)	99 (%25.7)
It doesn't bother	120 (%31.2)	98 (%25.5)	5 (%1.3)	84 (%21.8)
Neutral-Medium	106 (%27.5)	53 (%13.8)	36 (%9.4)	140 (%36.4)
Bothers	60 (%15.6)	4 (%1.0)	139 (%36.1)	46 (%11.9)
It is very disturbing	17 (%4.4)	1 (%0.3)	201 (%52.2)	16 (%4.2)
Perceived sound level				
Very Quiet	49 (%12.7)	104 (%27)	-	16 (%4.2)
Quiet	89 (%23.1)	146 (%37.9)	5 (%1.3)	44 (%11.4)
Neutral-Medium	132 (%34.3)	112 (%29.1)	24 (%6.2)	170 (%44.2)
Noisy	83 (%21.6)	21 (%5.5)	123 (%31.9)	105 (%27.3)
Very noisy	32 (%8.3)	2 (%0.5)	233 (%60.5)	50 (%13)
Total	385 (%100.0)	385 (%100.0)	385 (%100.0)	385 (%100.0)

According to the survey data, it has been determined that the most disturbing sound category is mechanical sounds (52.2%), and the sound category that does not disturb the users at all is natural sounds (59.5%). Similarly, when the perceived sound levels were examined, it was seen that the category of sound perceived as the noisiest was mechanical sounds (60.5%), and the category of sound perceived as the quietest was natural sounds (27%).

In this part of the survey study, there are 36 proposal scale questions presented to the participants. The expressions are formed by combining certain sounds with the adjectives "disturbing" and "too dominant". The participants were asked about their level of agreement with various proposals and the distribution of the answers is given in Table 4.6.

Table 4.6: Propositions regarding perceived sound levels

	Absolutely disagree	Disagree	Undecided	Agree	Absolutely agree
Child sounds are disturbing	(%16.9)	(%30.1)	(%14.3)	(%21.6)	(%17.1)
Water sounds are too dominant	(%23.9)	(%35.3)	(%17.4)	(%15.6)	(%7.8)
Tram sounds are disturbing	(%18.2)	(%36.4)	(%17.9)	(%21)	(%6.5)
Speech sounds are too dominant	(%14)	(%23.6)	(%13.5)	(%31.9)	(%16.9)
Dog sounds are disturbing	(%56.9)	(%29.1)	(%8.6)	(%2.9)	(%2.6)
Street artists sounds is too dominant	(%12.7)	(%24.9)	(%20.8)	(%23.6)	(%17.9)
Wind sounds are disturbing	(%30.4)	(%30.1)	(%15.6)	(%12.5)	(%11.4)
Seller sounds are too dominant	(%20.5)	(%26.5)	(%22.6)	(%20.8)	(%9.6)
Motorcycle sounds are disturbing	(%4.9)	(%14.3)	(%10.9)	(%30.9)	(%39)
Azan sounds are too dominant	(%43.9)	(%17.4)	(%17.4)	(%7.8)	(%13.5)
Cat sounds are disturbing	(%69.6)	(%22.1)	(%4.7)	(%2.1)	(%1.6)
Child sounds are too dominant	(%20.3)	(%24.9)	(%19.7)	(%21.8)	(%13.2)
Speech sounds are disturbing	(%16.4)	(%21.3)	(%21.8)	(%22.1)	(%18.4)
Bird sounds are too dominant	(%35.8)	(%22.3)	(%11.9)	(%16.6)	(%13.2)
Bicycle bell sounds are disturbing	(%35.1)	(%33.5)	(%20.5)	(%7)	(%3.9)
Automobile sounds are too dominant	(%3.9)	(%6)	(%4.4)	(%24.9)	(%60.8)
Water sounds are disturbing	(%60.3)	(%26.2)	(%6.8)	(%5.5)	(%1.3)
Bell sounds are too dominant	(%55.6)	(%21)	(%20)	(%2.3)	(%1)
Seller sounds are disturbing	(%22.9)	(%23.6)	(%20.5)	(%20.5)	(%12.5)
Cat sounds are too dominant	(%67)	(%24.2)	(%6)	(%1.3)	(%1.6)
Street artist sounds are disturbing	(%29.6)	(%32.2)	(%20.5)	(%11.2)	(%6.5)
Steamboat sounds are too dominant	(%26.2)	(%31.2)	(%25.2)	(%10.9)	(%6.5)
Bird sounds are disturbing	(%64.4)	(%23.9)	(%8.3)	(%2.1)	(%1.3)
Bicycle bell sounds are too dominant	(%36.6)	(%31.4)	(%18.7)	(%10.1)	(%3.1)
Bell sounds are disturbing	(%54)	(%22.6)	(%17.9)	(%3.4)	(%2.1)
Dog sounds are too dominant	(%51.9)	(%28.1)	(%12.2)	(%5.2)	(%2.6)
Automobile music is disturbing	(%15.1)	(%10.9)	(%10.9)	(%31.7)	(%31.4)
Horn sounds are too dominant	(%7.8)	(%3.9)	(%9.6)	(%32.2)	(%46.5)
Automobile sounds are disturbing	(%2.9)	(%2.1)	(%3.6)	(%26.2)	(%65.2)
Tram sounds are too dominant	(%14.3)	(%22.1)	(%21)	(%21.3)	(%21.3)
Horn sounds are disturbing	(%2.9)	(%6.2)	(%9.4)	(%27.3)	(%54.3)
Wind sounds are too dominant	(%20.3)	(%21.3)	(%19)	(%18.7)	(%20.8)
Steamboat sounds are disturbing	(%21.6)	(%27)	(%23.1)	(%18.4)	(%9.9)
Motorcycle sounds are too dominant	(%6.8)	(%11.7)	(%17.1)	(%30.1)	(%34.3)
Azan sounds are disturbing	(%47.8)	(%19.7)	(%17.7)	(%6.5)	(%8.3)
Automobile music is too dominant	(%12.2)	(%14)	(%22.6)	(%26)	(%25.2)

According to the proposition data, the proposal that was answered as "Strongly agree" at the highest rate is "Automobile sounds are disturbing" (65.2%), the second highest rate is "Automobile sounds are too dominant" (60.8%), and the third is "Horn sounds are disturbing" (54.3%).

On the other hand, the proposal that was answered as "Strongly disagree" with the highest percentage is "Cat sounds are disturbing" (69.6%), the expression with the second highest percentage is "Cat sounds are too dominant" (67%), the third percentage is "Bird sounds are disturbing" (64.4%) and the fourth rate is "Water sounds are disturbing" (60.3%).

4.2.3 Findings on Statistical Tests of the Scales

When the 36 propositional scale questions asked to the participants were analyzed by explanatory factor analysis, it was determined that there were questions that should be grouped and excluded. After the remaining propositions were tested in confirmatory factor analysis in the SPSS AMOS program, they were modeled according to the modification indices as in Figure 4.1.

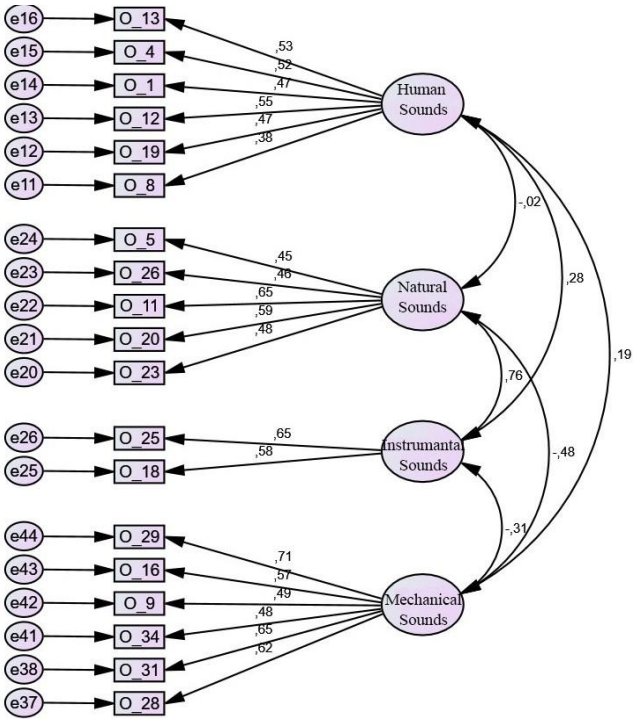

Figure 4.1: Confirmatory factor analysis AMOS model

According to the model, the questions with very low factor correlations were removed from the model and the final model above was reached. Here, the covariance coefficients between the factors vary between -2% and 76% within the tolerance limits. Factors and variables are shown in Table 4.7.

Table 4.7: Factors and variables

Factor	Variable	Variable Code
Human sounds	Seller sounds are too dominant	O_8
Human sounds	Seller sounds are disturbing	O_19
Human sounds	Child sounds are too dominant	O_12
Human sounds	Child sounds are disturbing	O_1
Human sounds	Speech sounds are too dominant	O_4
Human sounds	Speech sounds are disturbing	O_13
Natural sounds	Bird sounds are disturbing	O_23
Natural sounds	Cat sounds are too dominant	O_20
Natural sounds	Cat sounds are disturbing	O_11
Natural sounds	Dog sounds are too dominant	O_26
Natural sounds	Dog sounds are disturbing	O_5
Instrumental sounds	Bell sounds are too dominant	O_18
Instrumental sounds	Bell sounds are disturbing	O_25
Mechanical sounds	Horn sounds are too dominant	O_28
Mechanical sounds	Horn sounds are disturbing	O_31
Mechanical sounds	Motorcycle sounds are too dominant	O_34
Mechanical sounds	Motorcycle sounds are disturbing	O_9
Mechanical sounds	Automobile sounds are too dominant	O_16
Mechanical sounds	Automobile sounds are disturbing	O_29

As a result of the Confirmatory Factor Analysis, when the model fit indexes were examined, as seen in Table 4.8, it was found that GFI, AGFI, and CFI values vary between 0.88-0.92, while RMR and RMSEA values are within normal limits.

Table 4.8: Confirmatory factor analysis model fit index

Goodness of Fit Indexes	Value
CMIN/DF	2.01
RMR	0.07
RMSEA	0.05
GFI	0.92
AGFI	0.90
CFI	0.88

The results of the reliability analysis applied for all 4 factors are presented in Table 4.9. When the results are examined, it is seen that the values vary between 0.54 and 0.75. Thus, the reliability of the scales is medium-high.

Table 4.9: Reliability analysis of scales

	Cronbach's Alpha
Human sounds	0.649
Natural sounds	0.652
Instrumental sounds	0.544
Mechanical sounds	0.753

As seen in Table 4.10, according to the results of Kolmogorov Smirnov distribution for normality tests, it is seen that all 4 factors do not exhibit normal distribution (H0 rejection: $p<0.05$), therefore non-parametric tests are used preferred in the analysis of the data.

Table 4.10: Normal distribution tests of scales

Factor	Statistics	sd	p
Human sounds	0.072	385	0.000*
Natural sounds	0.171	385	0.000*
Instrumental sounds	0.217	385	0.000*
Mechanical sounds	0.137	385	0.000*

*Statistically significant at the 0.05 level.

H_0 : The distribution of the data conforms to the normal distribution.

H_1 : The distribution of the data does not fit the normal distribution.

In Table 4.11, the results of the Mann-Whitney U test applied according to gender are presented. The results show that the rate of only mechanical sounds differs statistically at a meaningful rate ($p<0.05$). That is, female participants are more disturbed by mechanical sounds than males.

Table 4.11: Statistical analysis by gender (Mean ± Std. Deviation)

	Human sounds	Natural sounds	Instrumental sounds	Mechanical sounds
Female	17.68 ± 4.79	7.54 ± 2.43	3.37 ± 1.52	25.31 ± 3.99
Male	17.15 ± 4.86	8.19 ± 3.22	3.62 ± 1.67	24.04 ± 4.86
p	0.281	0.146	0.155	0.006*

*Statistically significant at the 0.05 level.

Mann Whitney U results applied according to the place of birth are presented in Table 4.12. The results show that only the rate of mechanical sounds differs statistically at a meaningful rate ($p<0.05$). That is, participants born outside of İzmir are more disturbed by mechanical sounds than those born in İzmir.

Table 4.12: Statistical analysis by place of birth (Mean ± Std. Deviation)

	Human sounds	Natural sounds	Instrumental s.	Mechanical s.
İzmir	16.84 ± 4.95	8.06 ± 3.32	3.64 ± 1.75	24.02 ± 4.75
Other	17.90 ± 4.68	7.69 ± 2.41	3.37 ± 1.45	25.24 ± 4.17
p	0.064	0.730	0.262	0.006*

*Statistically significant at the 0.05 level.

According to the results of the Kruskal-Wallis test depending on age, as seen in Table 4.13, human sounds and mechanical sounds rates differ statistically at a meaningful rate (p<0,05).

Table 4.13: Statistical analysis by age (Mean ± Std. Deviation)

	Human sounds	Natural s.	Instrumental s.	Mechanical s.
18	17.21 ± 4.84	8.44 ± 3.83	3.66 ± 1.8	23.17 ± 4.89
18-24	18.63 ± 4.67	8.31 ± 2.99	3.69 ± 1.63	24.86 ± 4.81
25-34	17.93 ± 4.96	7.84 ± 2.57	3.36 ± 1.61	24.91 ± 4.34
35-44	17.25 ± 5.04	7.97 ± 2.90	3.52 ± 1.52	24.68 ± 4.40
45-54	17.31 ± 4.95	7.00 ± 1.78	3.16 ± 1.28	26.45 ± 3.18
55-64	15.36 ± 3.81	6.92 ± 1.51	3.44 ± 1.62	24.64 ± 4.25
>64	14.17 ± 1.94	6.83 ± 1.72	3.00 ± 1.55	24.00 ± 3.10
p	0.014*	0.099	0.581	0.003*

*Statistically significant at the 0.05 level.

When the results are examined, depending on the human sounds, >64-25-34 (p=0.047), >64-18-24 (p=0.020), 55-64-<18 (p=0.047), 55-64-35-44 (p=0.041), 55-64-25-34 (p=0.008) and 55-64-18-24 (p=0.001) age groups differ statistically at a meaningful rate. (p<0.05). As a result, the discomfort of the over 55 age group from human sounds is significantly lower than the other groups. Therefore, young people are more disturbed by human sounds than the elderly (Figure 4.2).

According to the results depending on mechanical sounds, <18-35-44 (p=0.043), <18-25-34 (p=0.02), <18-18-24 (p=0.005), <18-45-54 (p=0), 55-64-45-54 (p=0.034), 35-44-45-54 (p=0.02) and 25-34-45-54 (p=0.039) age groups differ statistically at a meaningful rate (p<0.05). Therefore, while the discomfort of the age group under 18 from mechanical sounds is lower than the other groups, the discomfort of the age group "45-54" from mechanical sounds is significantly higher than the other groups (Figure 4.2).

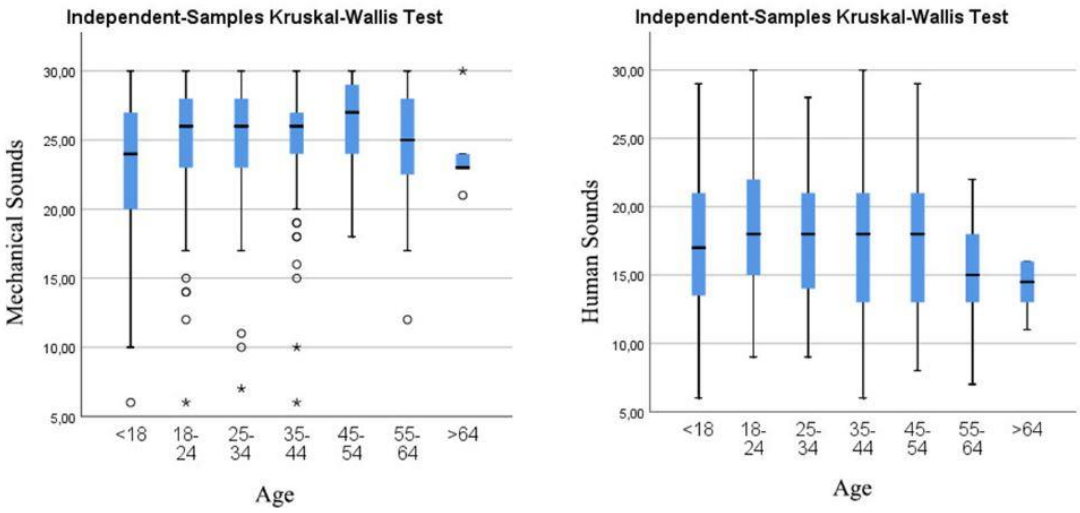

Figure 4.2: Mechanical sounds and human sounds by age (Average)

According to the results of the Kruskal Wallis test depending on residence length in İzmir, as seen in Table 4.14, the rates of human sounds and mechanical sounds rates differ statistically at a meaningful rate (p<0,05).

Table 4.14: Statistical analysis by residence length in İzmir (Mean ± Std. Deviation)

	Human sounds	Natural so.	Instrumental so.	Mechanical so.
Ziyaret	18.05 ± 4.98	7.90 ± 2.39	3.46 ± 1.72	23.83 ± 5.02
0-5	18.58 ± 5.41	7.89 ± 2.35	3.49 ± 1.43	25.75 ± 3.17
6-15	17.32 ± 4.28	7.50 ± 2.70	3.33 ± 1.57	24.56 ± 4,31
16-25	17.88 ± 4.60	8.79 ± 3.86	3.85 ± 1.75	23.24 ± 5.35
>25	16.09 ± 4.76	7.54 ± 2.62	3.42 ± 1.59	25.42 ± 4.30
p	0.015*	0.148	0.322	0.015*

*Statistically significant at the 0.05 level.

When the results are examined, depending on the human sounds, >25-6-15 (p=0.046), >25-16-25 (p=0.016), >25-Visit (p=0.026), and >25-0-5 (p=0.002) groups differ statistically at a meaningful rate (p<0.05). As a result, the discomfort of people living in Izmir over 25 years from human sounds is lower than the others (Figure 4.3).

According to the results depending on mechanical sounds, 16-25-0-5 (p=0.008), 16-25->25 (p=0.004) and Visit->25 (p=0.05) groups differ statistically at a meaningful rate (p<0.05). As a result, while the discomfort of mechanical sounds in the group who living in Izmir for 16-25 years is lower than the groups living in İzmir for 0-5

and >25, the discomfort of mechanical sounds in the visiting İzmir group is significantly lower than the group living in İzmir for more than 25 years. (Figure 4.3).

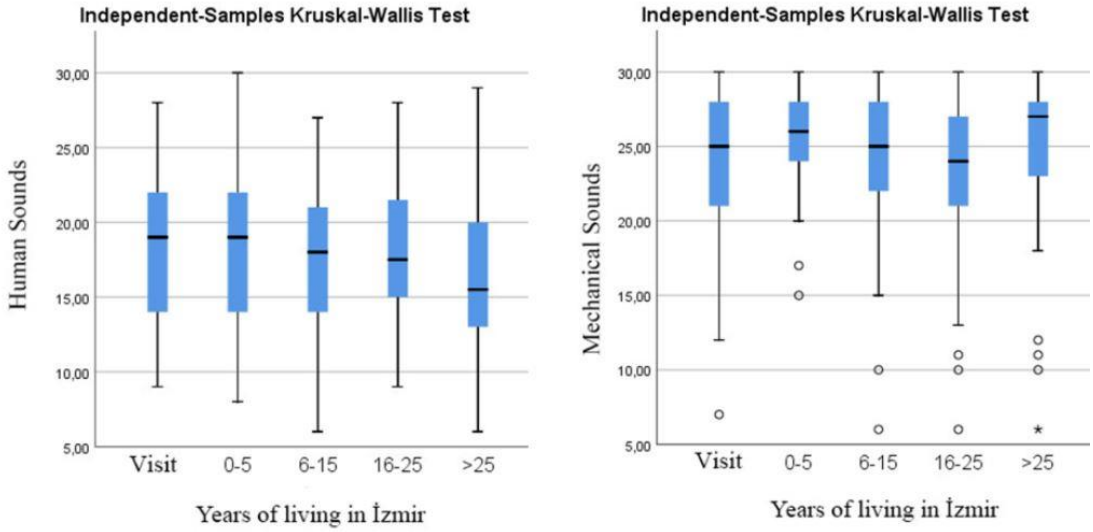

Figure 4.3: Human sounds and mechanical sounds by residence length in İzmir

As seen in Table 4.15, according to Kruskal Wallis results applied to education level, only mechanical sounds rates differ statistically at a meaningful rate (p<0,05).

Table 4.15: Statistical analysis by educational status (Mean ± Std. Deviation)

	Human sounds	Natural so.	Instrumental so.	Mechanical so.
Literate	24.00 ± 2.83	8.00 ± 1.41	3.50 ± 2.12	26.00 ± 4.24
Primary educa.	17.31 ± 4.53	8.59 ± 3.81	3.67 ± 1.76	23.83 ± 4.75
High school	17.30 ± 4.77	7.85 ± 2.68	3.59 ± 1.71	24.89 ± 4.44
Undergraduate	17.28 ± 4.96	7.44 ± 2.18	3.24 ± 1.34	24.75 ± 4.42
Postgraduate	19.28 ± 5.54	6.83 ± 1.47	3.44 ± 1.34	27.33 ± 2.06
p	0.229	0.251	0.557	0.014*

*Statistically significant at the 0.05 level.

According to the results depending on mechanical sounds, the rates of Primary-Postgraduate (p=0.001), Undergraduate-Postgraduate (p=0.009), and High School-Postgraduate (p=0.012) groups differ statistically at a meaningful rate (p<0.05). As a result, the rate of being disturbed by mechanical sounds in the postgraduates group is significantly higher than primary school, high school, and undergraduate groups (Figure 4.4).

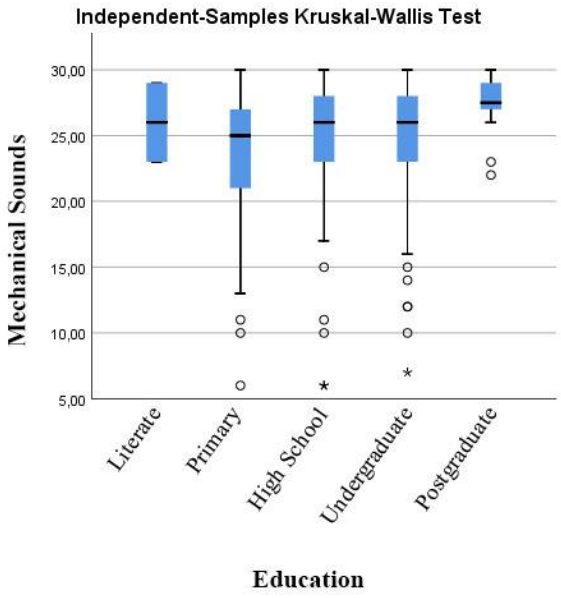

Figure 4.4: Mechanical sounds by education (Average)

Finally, Spearman Correlation Test was applied to the factor rates data in order to examine the relationship between sound types. According to the test result seen in Table 4.16, it has been determined that there is a relationship between all variables except the nature sounds and human sounds ($p < 0.05$).

Table 4.16: Relationship between sounds types (Spearman Correlation Test) r(p)

	Natural sounds	Instrumental sounds	Mechanical so.
Human sounds	0.02 (p=0.627)	0.17 (p=0.001*)	0.10 (p=0.040*)
Natural sounds		0.36 (p=0.000*)	-0.16 (p=0.002*)
Instrumental so.			-0.13 (p=0.009*)

*Statistically significant at the 0.05 level.

When the relationships between them are examined in detail, it was seen that there was a weak positive relationship (r=0.17) between human sounds and instrumental sounds, and a weak positive relationship (r=0.10) between human sounds and mechanical sounds (p<0.17). 0.05). Moreover, it was determined that there was a weak positive relationship (r=0.36) between natural sounds and instrumental sounds, and a weak negative relationship (r=-0.16) between natural sounds and mechanical sounds (p<0.05). In addition, it was concluded that there was a weak negative relationship (r=-0.13) between instrumental sounds and mechanical sounds (p<0.05).

Chapter 5

Discussion and Conclusion

5.1. Discussion

It is important to determine how any space is perceived by users, and it is even more important for public spaces because public spaces must provide sustainable usage and adapt to user diversity. Therefore, soundscape is an important concept that affects the perception and usage preferences of users depending on the space, and should be used in the design phase.

In this study, which aims to examine the perceptions of soundscape, it has been observed that the perceptions of users can change in the context of demographic characteristics. Data from 385 participants in Konak Square were included in the analysis. The results show that the perception of human sounds and mechanical sounds show significant differences in terms of demographic factors.

When the differences by gender were examined, it was concluded that females were more disturbed by mechanical sounds than males. A study measuring overall perception of loudness found that females showed higher sensitivity and lower tolerance than males [48]. Therefore, it makes sense that females are more sensitive to mechanical noises than men and feel more discomfort. Another study found that compared to males, females are more favorable to sounds such as water, church bells, street music, clock chimes, and children's shouts. It seems that the emotional impact is a common feature of these sounds [9]. However, in a study conducted to determine the soundscape satisfaction of users in the Suriçi region of Diyarbakır

province, it was concluded that males feel more unpleasant than females [78]. Gender-related differences appear to be influenced by location and culture.

Considering the perception of soundscape in terms of age, it is seen that young people are less tolerant of human sounds than the elderly. In addition, while the discomfort of the group under the age of 18 from mechanical sounds is lower than the other groups, the discomfort of the age group "45-54" from mechanical sounds is higher than the other groups. As the age increases, the discomfort caused by mechanical sounds increases and the tolerance to human sounds also increases. It is supported by many studies that there is a positive increase in general soundscape enjoyment with the increase in age [12, 78]. Kang and Zhang [47] concluded in their study that with increasing age, people are more positive or tolerant of sounds related to nature, culture, or human activities, on the other hand, young people are more positive or tolerant towards street music and mechanical sounds. Therefore, it is very important to consider age differences when designing in a public space.

Another issue that affects the perception of soundscape is whether the users are local or not and how long they have lived in the city. Visitors in Izmir feel less discomfort from mechanical sounds than people who have been in Izmir for more than 25 years. However, the mechanical sounds in the square bother non-local users more. Moreover, as residence length increases in İzmir, the discomfort from human sounds decreases. Likewise, Yang and Kang [9] concluded that non-local users are more disturbed by human sounds. As the years of living in the city increase, the sense of belonging to the region increases, and thus the tolerance towards the human sounds of the society increases.

When the education level is evaluated in the context of mechanical sounds, it is seen that the graduate group is more disturbed by mechanical sounds than the other groups. Likewise, Kang and Zhang [47] concluded in their study that as the level of education increases, the discomfort with mechanical sounds increases, while the tendency to prefer natural sounds also increases. In the study conducted by Fang et al. [48], it was concluded that people with higher levels of education found the general soundscape more annoying, that is, with the increase in education level,

people's tolerance for sound satisfaction decreased. Therefore, as the education level of people increases, their perception of the environment also changes.

As a result of the study carried out to determine the sound types in the Konak square, the sound types belonging to the square were determined. According to distribution percentages, these are speech sound, automobile sound, wind sound, street artist, bird sound, horn sound, child sound, motorcycle sound, water sound, seller sound, tram sound, car sound, bicycle bell, Azan sound, steamboat sound, dog sound, and cat sound. In another study on the sounds of Izmir, sounds reflecting the identity of Izmir were identified [74, 75]. This area has many important sounds that reflect the identity of İzmir, such as the sounds of the sellers heard like "gevrek" (Turkish bagel), "çiğdem" (sunflower seeds), “boyoz” (pastry) and “kumru” (sandwich). In addition to these symbolic sounds, the sounds of heavy traffic, ferryboats, crowds, birds, and the sea are the sounds of İzmir. Thus, it can be said that Konak Square represents the city of Izmir. Moreover, in the studies carried out, it was concluded that the sounds reflecting the Izmir identity mainly emerged from the sounds of the Konak Square.

When the sound sources are examined, the street artist sound is the most perceived sound in the square after speech, automobile, and wind sounds. Considering the level of discomfort, it was seen that this dominant sound was less disturbing than the others. Another study aims to reveal the soundscape characteristics of the Gezi Park, Taksim Square, Galatasaray Square, and Tunel Square routes [79]. The most effective and most positive sound on this route was determined as the street artist sound.

When there is live music, people are not only interested in the music but also in the activities of the musicians. The genre of music is less important in this case. Considering active soundmarks, it is important to design areas where people can generate activity. Live music is a good example of this. Passive soundmarks are deliberately designed items with pleasant sounds. Fountains, green spaces, and sonic sculptures can be given as examples [9].

In terms of using water elements to create a sound barrier, The Sheaf Square design in England is a successful example [80]. Due to the fact that the square is located on

the ring road, it has been exposed to high noise levels, especially from the highway. In this context, a barrier was constructed along the road to reduce traffic noise in the square. This barrier is also a wall of water flowing down from the top and ending in the water pool formed at the point near the station entrance. A large water fountain has also been added to the lower part of the structure, which is intended to mask most of the traffic sounds.

5.2. Limitations of the Study

The scarcity of studies on the contribution of the use of soundscape design in urban design to architecture and sustainability is striking. In the survey method, which is the method of the study, there is a possibility that people do not give correct answers to the questions. Another limitation of the study is that the sound types and measured sound pressure heights in the area vary according to seasons, days, and hours. This possibility can provide motivation for comparing the findings of similar studies to be conducted in different seasonal and temporal periods.

5.3. Conclusion

Within the scope of this study, the results of the study carried out in Konak Square, which is located in the city center of Izmir and has different usage patterns, are presented. The results of the survey data made with 385 people in the field and the results of loudness measurements made on different days and times of the week were examined.

It has been concluded that all of the sound levels measured in the square are considerably higher than the sound limit values determined for a healthy environment. On Saturday, the use of the area increases and the sound level reaches the maximum level as 88dB.

According to the survey results, the most dominant sounds in the square are street artist, car sound, speech sound, and wind sound respectively. Among these sounds, the discomfort rate of the automobile sound is very high, while those of the other sounds are low. In addition, according to the propositions, mechanical sounds such as

horn sounds, motorcycle sounds, and automobile music sounds are perceived as sounds that cause a lot of discomfort. On the other hand, it has been concluded that natural sounds such as cat, dog, bird, and water sounds are perceived as not disturbing to a large extent.

The results of this research confirm that the most preferred sounds in the square are natural sounds. Otherwise, the most disturbing sounds are the sounds originating from the traffic. In terms of the effects of demographic factors, differences between age groups are quite important in the perception of sound satisfaction. Older people and young people may have some fundamental differences in evaluating soundscape. In general, young people are more tolerant of mechanical sounds. But with an increase in age, people become more favorable or tolerant of sounds related to nature and human activities.

Before making a soundscape design, it is important to examine the users' perception of the soundscape and to design according to their needs. This study is important because a study that reveals the perceptions of Izmir Konak Square users has not been done before. Such studies should be done for public spaces because it increases the use of spaces.

As long as the sound level is not high, various landscape elements, noise barriers, and urban furniture can be used for soundscape design. Thus, the squares designed by taking into account the soundscape design are more useful and effective.

The most important aim of this study is to show how important the soundscape design is in square design and how it can affect users. The study wishes to emphasize that auditory perception is as important as visual perception in the use of squares.

5.4. Recommendations for Study Area

Soundscape is important for an identified space, as the preferences of soundscape elements influence the choice of people to use an urban square. A more aesthetically appealing soundscape will draw more users into a frame. Knowing the soundscape satisfaction levels of citizens with different demographic characteristics before the urban planning process will make a great contribution to creating sustainable cities.

In the context of Konak Square, the traffic axis to the east of the area negatively affects the soundscape of the square. Therefore, a sound barrier should be created between this traffic axis and the square. The barrier created by the existing water pool is insufficient and a new sound barrier should be designed with strong water sounds that do not block the sea view.

Since the elderly are less tolerant of traffic noises, it is recommended that the western side of the square should be designed for the elderly and the eastern side should be designed to encourage the use of children and young people. For this design, children's playgrounds with special sound insulation can be designed.

Considering that there are too many street artists in the area and that the users of the square are generally not disturbed by this dominant instrumental sound, special areas for street artists should be designed. Thanks to this design proposal, it will allow street artists to be protected from external factors such as rain and wind and to exhibit their art more comfortably. With the comfort offered by this design, it will be possible to increase the sounds of street artists, which is a popular and desired sound in the square.

Although the seller sound is not a very dominant sound in the field, it has been concluded that there are people who are uncomfortable with this sound. Therefore, specially reserved zones for sellers should be designed in the area. And it is suggested to create sound barriers around this area by using plant and water figures.

The fact that the data obtained from the users is so extensive reveals that sound is actually a more complex spatial element than it is thought. Therefore, the element of sound should be evaluated more effectively in the physical planning and design process of public spaces. In this context, there is a need for more studies based on both subjective and objective parameters on how to integrate acoustic character studies in planning-design processes.

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Appendices

Appendix A

User Survey Questions

KONAK MEYDANI KULLANICI ANKETİ

Cinsiyet	(1) Kadın	(2) Erkek		**Doğum yer**	(1) İzmir	(2) Diğer	
Yaş	(1) <18	(2) 18-24	(3) 25-34	(4) 35-44	(5) 45-54	(6) 55-64	(7) >64
Eğitim	(1) Okuryazar	(2) İlköğretim		(3) Lise	(4) Lisans	(5) Lisansüstü	
İzmir'de yaşama yılı	(1) Ziyaret	(2) 0-5		(3) 6-15	(4) 16-25	(5) >25	

Meydanda hangi sesleri duyuyorsunuz? (Birden fazla işaretleyebilirsiniz.)

İnsan Sesleri		**Doğal Sesler**		**Mekanik Sesler**		**Enstrümantal Sesler**	
Konuşma sesi		Kuş sesi		Otomobil sesi		Sokak sanatçısı	
Çocuk bağırma		Köpek sesi		Motor sesi		Araba müziği	
Satıcı sesi		Kedi sesi		Tramvay sesi		Ezan sesi	
		Rüzgar sesi		Korna sesi		Çan sesi	
		Su sesi		Vapur sesi			
				Bisiklet zili			

Duyduğunuz sesleri baskınlık sırasına göre sıralayınız.
1. En baskın ses 5. En zayıf ses

1	
2	
3	
4	
5	

	Memnuniyet seviyesi **Ses Türü**	1 Hiç rahatsız etmiyor	2 Rahatsız etmiyor	3 Nötr-Orta	4 Rahatsız ediyor	5 Çok rahatsız ediyor
1	İnsan sesleri					
2	Doğal sesler					
3	Mekanik sesler					
4	Enstrümantal sesler					

	Algılanan ses seviyes **Ses Türü**	1 Çok Sessiz	2 Sessiz	3 Nötr-Orta	4 Gürültülü	5 Çok gürültülü
1	İnsan sesleri					
2	Doğal sesler					
3	Mekanik sesler					
4	Enstrümantal sesler					

	Önermeler – Seslerin memnuniyet seviyeleri ve algılanan ses seviyeleriyle ilgili	Kesinlikle katılmıyorum (1)	Katılmıyorum(2)	Kararsızım (3)	Katılıyorum (4)	Kesinlikle katılıyorum (5)
1	Meydandaki çocuk sesleri rahatsız ediyor					
2	Meydandaki su sesleri çok baskın					
3	Meydandaki tramvay sesleri rahatsız ediyor					
4	Meydandaki konuşma sesleri çok baskın					
5	Meydandaki köpek sesleri rahatsız ediyor					
6	Meydandaki sokak sanatçılarının sesi çok baskın					
7	Meydandaki rüzgar sesleri rahatsız ediyor					
8	Meydandaki satıcı sesleri çok baskın					
9	Meydandaki motor sesleri rahatsız ediyor					
10	Meydandaki ezan sesleri çok baskın					
11	Meydandaki kedi sesleri rahatsız ediyor					
12	Meydandaki çocuk sesleri çok baskın					
13	Meydandaki konuşma sesleri rahatsız ediyor					
14	Meydandaki kuş sesleri çok baskın					
15	Meydandaki bisiklet zil sesleri rahatsız ediyor					
16	Meydandaki otomobil sesleri çok baskın					
17	Meydandaki su sesleri rahatsız ediyor					
18	Meydandaki çan sesleri çok baskın					
19	Meydandaki satıcı sesleri rahatsız ediyor					
20	Meydandaki kedi sesleri çok baskın					
21	Meydandaki sokak sanatçılarının sesleri rahatsız ediyor					
22	Meydandaki vapur sesleri çok baskın					
23	Meydandaki kuş sesleri rahatsız ediyor					
24	Meydandaki bisiklet zil sesleri çok baskın					
25	Meydandaki çan sesleri rahatsız ediyor					
26	Meydandaki köpek sesleri çok baskın					
27	Meydandaki araba müziği sesleri rahatsız ediyor					
28	Meydandaki korna sesleri çok baskın					
29	Meydandaki otomobil sesleri rahatsız ediyor					
30	Meydandaki tramvay sesleri çok baskın					
31	Meydandaki korna sesleri rahatsız ediyor					
32	Meydandaki rüzgar sesleri çok baskın					
33	Meydandaki vapur sesleri rahatsız ediyor					
34	Meydandaki motor sesleri çok baskın					
35	Meydandaki ezan sesleri rahatsız ediyor					
36	Meydandaki araba müziği sesleri çok baskın					

Curriculum Vitae

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E-mail (1) : -

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Education:

2004–2008	Malatya Anatolian High School
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2020–……	Izmir Katip Celebi University, Urban Regeneration – Master's Degree

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2017 – 2019	Otuzbes Yapı Denetim – Architect
2020 – 2022	İzmir Gelişim Yapı Denetim – Architect
2023 – …..	Çankaya Teknik Yapı Denetim – Architect