

Searching for Acoustic Quality Spaces Between Quiet/Calm Areas and Soundscape Concepts

Hanife Ayca Dogan Iseri^{1*} Asli Ozcevik Bilen²

^{1,2} Department of Architecture, Eskisehir Technical University, Eskisehir, Turkey

ABSTRACT

It is known that physical noise management based on limit values is insufficient for acoustic environment research by itself. As cities become more populated and complex, researchers need to more rigorously examine the soundscape that perceptually approaches this management. The European Environmental Noise Directive directs researchers to the concept of “quiet/calm areas” constituted depending on the quantity of sound. In researches, it is seen that acoustic quality spaces have significant potential to increase the quality of life. For this reason, researchers have been directed to investigate concepts such as "soundscape", "quiet/calm areas" and "acoustic quality". However, it's observed that there is a semantic confusion between these concepts, which are used for similar purposes in the literature. In addition, the concept of acoustic quality has an inclusive feature. However, what makes a place of acoustic quality is still not clearly defined. In this case, it should be understood what an acoustic quality space is.

This study was conducted with the aim of understanding the general framework of the concept of an acoustic quality spaces. Based on the literature data, a comparison was made between a quiet/calm area and an acoustic quality space.

Keywords: *soundscape, quiet/calm areas, acoustic quality space, noise management*

1. INTRODUCTION

The soundscape is an important element of the perception of the urban environment. As urban environments become more crowded and complex, researchers need a more rigorous examination of the soundscape and its perception [1-2]. In the standardization of the soundscape, it is pointed out that it is necessary to create a series of 'soundscape indexes' in order to switch from the noise control method to the soundscape perception and to measure and evaluate the soundscape perception [3]. However, the literature on soundscape perception mainly focuses on examining the perceived affective quality of the soundscape [4]. Soundscape is interpreted as the acoustic equivalent of a landscape, and the concept of the soundscape is often attributed to Schafer's studies of acoustic ecology [5]. The approach to characterizing the soundscape seeks to capture the generous complexity of the variables that contribute to the soundscape experience. The positive and negative qualities of the concept, which is often called 'environmental noise' by researchers, are emphasized. This broad philosophy applies to health [6-8] and architectural development [9-10], among other areas, and has spread beyond the field of acoustic ecology. At the intersection of health and architecture in the acoustic environment, there is a common concern about the social well-being of those living and working in towns and cities. Researchers lack reliable tools to determine and measure acoustic quality, and therefore there is no necessary guidance on how best to improve environmental quality [9]. Although urban planners, architects, and acoustic experts emphasize the importance of human evaluations for acoustic quality, subjective evaluations are not systematic enough in legal regulations. 'A-weighted sound pressure level' remains the most common measure of acoustic quality and/or overall noise problem. It is widely known that simply reducing the sound pressure level in an urban space relative to the noise map doesn't increase a listener's acoustic comfort and doesn't definitively improve acoustic quality. Researchers

*Corresponding author: haycadogan@gmail.com

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try to establish a systematic order to identify the factors that influence individual experiences of a soundscape. This approach accepts the multifactorial nature of the soundscape, which includes the characteristics of the dominant sound source, the meaning of the sound interpreted by the listener, and the context in which the sound is heard [9]. In this multifactorial nature, reducing sound levels from certain sound sources may not result in high acoustic quality spaces, because features such as the type of sound source, duration of hearing, and acoustic and psychoacoustic properties are seen as important in acoustic quality spaces [11-13].

Environmental sounds, such as the sounds of road traffic, nature, or people, provide information about the soundscape. While some sounds in the soundscape have a positive effect, others have a negative effect regardless of sound pressure levels. Although the soundscape may seem like a simple phenomenon, new thoughts and perspectives are required to understand and examine the situation regarding how much information is hidden in this formation [14]. In order to decide which acoustic environments have acoustic quality, the activities and contexts they may provide should be considered [15]. Since the concept of the soundscape emerged, researchers have wondered how acoustic environments will affect the quality of cities and how sounds can be used in urban planning and design. Southworth (1969) raised the question of “sound identity” for cities, which according to him, should be considered and designed in relation to the “visible” city. The sounds associated with cities can form an identity response in our minds. This situation shows that sound identity can also come to the fore when a city distinguishes itself from its counterparts [16]. The fact that sounds have an identity quality has brought with it the necessity of protecting them. However, the European Environmental Noise Directive (END) [17] requires European Union Member States to protect only 'quiet/calm areas'. This has brought an important qualitative perspective on the management of the acoustic environment [18]. Unfortunately, the Environmental Noise Directive didn't provide a definition for 'quiet areas', resulting in the need for a new implementation guide [19].

Looking at the directive and regulation, it is seen that the necessary conditions for a quiet/calm area are created depending on the quantity. However, in the scientific literature, it is known that there are different studies investigating non-acoustic parameters such as human perception and environmental conditions, apart from the quantitative aspect of quiet/calm areas [20-22]. In these studies, it has been observed that the desired conditions in the acoustic environment are not limited to quiet/calm areas

specified in legal regulations. Sound is an important way of communicating with people and places. Sound surrounds us. Even during sleep, our ears cannot be closed to sound stimuli and are always exposed to sound. For this reason, the only expectation from the city is not to make every urban area quiet/calm, but to interpret the functional equivalents of the areas in the city over the soundscape and to evaluate these areas to create a high-quality acoustic spaces without disturbing the listeners, and to utilize these spaces accordingly. Acoustic quality spaces have restorative effects in cities. The literature shows that psychological restorative work in natural settings has attracted a great deal of research interest in recent years, but such studies mainly focus on the visual dimension. However, due to the global trend towards urbanization, there is a need to extend these studies to urban environments, integrating the sound dimension into the landscape and exploring the benefits for positive health states [23]. However, the composition of a soundscape array in an urban open space containing several simultaneous sound sources is complex. This complexity complicates any study in that field and forces academics to simplify their goals. Considering the difficulties, constraints, limitations, and multivariate environments in the works, it is necessary to create acoustic quality space conditions that reflect the characteristics of cities, where listeners are not disturbed by the environment they are in, and they can realize their personal activities and goals.

Purpose of Review

This research was conducted with the aim of conveying the general framework of the concept of acoustic quality spaces. The research includes a literature review on environmental noise, quiet/calm areas, and the soundscape approach. Theoretical information about the concept of acoustic quality spaces is provided by examining the relationships between these concepts in previous studies. In order to eliminate the conceptual confusion between acoustic quality spaces and quiet/calm areas, and for researchers working on acoustic quality spaces, it is necessary to understand the similarities and differences between these concepts.

2. LITERATURE REVIEW

2.1 Quiet/calm areas in the management of environmental noise

Noise, as a physical stimulus in urban spaces, refers to any unwanted sound. However, according to the definition in the literature, it is a random variation of a sound wave in pressure over time. Randomness implies that the next pressure change in noise cannot be predicted based on the

previous one [24]. Noise is an environmental pollution issue and has been recognized as a significant problem in cities since the 1970s [25]. The fight against variable-structured noise involves efforts to bring the noise to acceptable threshold values [9]. When looking for solutions to noise-related problems, steps taken for noise reduction such as noise mapping, monitoring, and zoning focus only on the physical management of the quantitative structure of noise, rather than its psychological and physiological consequences. However, studies indicate that measuring and managing the only the A-weighted equivalent sound pressure level (LAeq) is not sufficient to ensure acoustic quality [9-10]. All noise sources require appropriate measurement, assessment, and management. To assess the effects of urban noise on people, an approach that addresses the general urban comfort issue is necessary [9]. People's perception of noise is not absolute, and the relationship between noise and people depends on the meaning of the sounds emitted by noise sources and evaluated by those who are exposed to them. Therefore, evaluating noise depends on the informational content of the sound and the context in which it is perceived [26]. Consequently, in order to describe the acoustic quality of an urban space and evaluate the subjective effects of noise, both negative and positive effects of sounds must be taken into account [9].

The increasing population and density in cities have led to a growing noise problem. Long working hours and stressful urban life have increased the need for rest, relaxation, and mental rejuvenation among city dwellers. From this perspective, quiet/calm areas within the city have been identified as spaces where urban residents can meet these needs. Consequently, psychologists and health professionals have shown interest in these areas, leading to scientific studies. The main legal basis for environmental noise management in EU countries is the European Environmental Noise Directive (2002/49/EC), which aims to "establish a common approach to reducing and preventing environmental noise effects in areas exposed to environmental noise." The directive defines several actions that need to be implemented gradually to support this objective. One of these actions is the development of action plans for residential areas, which aim to "protect quiet/calm areas against an increase in noise." The concept of quiet/calm areas in the directive is defined in two different contexts: A quiet area in an agglomeration and a quiet area in open country.

- "A quiet/calm area in an agglomeration" refers to an area designated by the competent authority, where individuals are not exposed to noise exceeding the limit values set for noise sources or a certain noise indicator value determined by the competent authority.

- "A quiet/calm area in open country" refers to an area designated by the competent authority, where individuals are not exposed to any noise disturbance caused by transportation, industry, or recreational activities [17]

Even if a space has quantitative conditions specified in directives and regulations, and is quiet, the presence of an unwanted sound in that environment prevents it from being evaluated as an acoustic quality space. In short, not every quiet/calm area is an acoustic quality space. Additionally, what is desired in an acoustic environment is not just quiet/calm areas, as specified within the legal framework. The quantitative approaches driven by the directives and regulations, as well as the different parameter searches in studies conducted in the scientific world, hinder the establishment of methodological clarity in creating acoustic quality spaces and prioritizing users' perception in the process of noise control. Therefore, considering the changing focus, user expectations, and user perception, it is not a correct approach to create regulations and current practices based solely on sound pressure levels when it comes to noise control.

2.2 Acoustic quality spaces in soundscape approach

The soundscape approach involves contextualizing the perception of the acoustic environment, irrespective of positive or negative judgments, while considering the interrelationships between individuals, activities, and spaces [5]. As a result, soundscape research goes beyond simply identifying noise, taking a human-centered perspective that reconsiders the conditions and purposes of production, detection and evaluation, thereby advancing noise control [27-29]. The integration of the body with surrounding sounds, resulting from physical, physiological, sociological, and psychological interactions among multiple sound sources, the environment, and the receiver, gives rise to the concept of "soundscape." This concept encompasses the coexistence of perceived sounds, formed by the combination of soundscape and sound [5, 30-33]. ISO 12913-1 provides a compilation of definitions from the literature and establishes a conceptual framework for soundscape. According to this standard, soundscape is defined as the "acoustic environment perceived, experienced, or understood by a person or persons" [34]. Extensive research has been conducted on the negative effects of environmental sounds on individuals, and these effects have been well-documented [35]. However, the positive effects of soundscape, such as improving one's mood, providing information about activities, fostering a sense of community, triggering memories, and facilitating relaxation [36-37], have received less attention. There is

increasing evidence indicating limitations in capturing various aspects of human experiences through physical measurements related to environmental sounds and soundscape. Consequently, the focus has shifted from noise control and annoyance towards soundscape and acoustic quality [38].

Precise definitions of spaces with high acoustic quality have not been established in the literature. Furthermore, while many low-quality acoustic spaces are noisy or very noisy, it is known that high-quality acoustic spaces, although not all of them, are not necessarily quiet or devoid of sound. These areas may include the sound of waves on the beach, wind in the trees, the church bell in a town square, bird chirping, the sounds of animals on a farm, and even the sounds of children playing. People enjoy these sounds in appropriate contexts and value them. The components of human experiences are crucial for life quality. High-quality acoustic spaces encompass natural spaces, non-urban/rural areas, and urban spaces. Sounds exist in natural and urban environments, either in their natural or artificial form, and absolute silence is not possible. In natural environments, the aim of ensuring or maintaining quality is not to create a silent environment but to prevent wildlife from being disturbed by human-induced sounds. Non-urban/rural spaces overlap with natural environments, but the fundamental distinction is that they don't include wildlife conservation or wildlife elements. Considering these areas as having acoustic quality and preserving their acoustic qualities is aimed at meeting people's preferences. In urban spaces (such as parks, gardens, squares, etc.), it can be observed that people work, spend their daily lives, and engage in passive recreation. One of the reasons why these places are attractive is that people can actively participate in these areas. The objectives of managing the quality of the outdoor acoustic environment can be reduced to two specific goals: wildlife conservation and people's preferences. These objectives require significantly different approaches [39].

Wildlife can be found at various scales and habitats, both on land and in water. Animals residing in these habitats rely on nature's acoustic signals for various essential functions such as communication, navigation, mating, feeding, predator detection, and food search. In this context, disturbance in high-quality acoustic areas refers to the unauthorized entry of "unnatural sounds" into the environment. These sounds include industrial noise, sounds generated by air transportation vehicles, amplified music, and road traffic noise, which are produced as a result of human activities. These sounds can mask the natural acoustic signals in the environment and potentially disrupt the performance of any of the essential functions, thus potentially disturbing

wildlife. In times when wildlife cannot escape from noise, this situation becomes a source of stress for populations in the wild [39]. Not only humans but also other organisms learn to live with noise. Because it becomes a necessity. However, noise is a source of discomfort that reduces the quality of life.

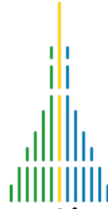
2.3 Quiet/calm areas and acoustic quality spaces

Contrary to what Schafer claims, the world doesn't produce increasingly monotonous sounds. On the contrary, soundscapes are more generous, more colorful, and three-dimensional than ever before [14]. When focusing on human preferences in acoustic environments, there has been increasing interest in high-quality acoustic spaces. While the question "Which noise bothers you?" is frequently asked in the literature, relatively limited research has been conducted on context-related questions, such as "Which sounds do you like?" or "Which sounds do you prefer?". In studies on sound preference, it is observed that people can prefer all kinds of water sounds (flowing streams, waves on the beach, fountains in urban areas, etc.), as well as mechanical sounds, nature sounds (birds, insects, wind, etc.), and human sounds (footsteps, speech, singing). In this case, the question arises: What are the conditions that support people's preferences and sound choices and make a space acoustic quality? [15]. A theoretical framework has been proposed in response to this question. In a study conducted by Brown in 2007, a 2x2 matrix was created, consisting of the level of experienced sounds and the situations of wanted or unwanted the perception of sounds. The answer to the question of "Who wants to hear in what conditions and in which places?" is entirely dependent on who is doing the listening and the environment in which the listening takes place.

Table 1. Acoustical conditions for areas of high acoustic quality by Brown [58]

	Sounds are unwanted	Sounds are wanted
Loud Sounds (high sound levels)	Noisy area	not a quiet area, but an area of high acoustic quality
Soft Sounds (low sound levels)	not an area of high acoustic quality	quiet area, and an area of high acoustic quality

According to the matrix conditions established by Brown in Table 1, it is evident that the determination of areas with high acoustic quality cannot solely rely on sound levels. Whether the sound is wanted or unwanted in contextually



appropriate conditions is also a piece of information related to acoustic quality. The conditions present in this matrix alone are not sufficient when considering the breadth of the context of the concept of acoustic quality spaces. This situation necessitates a discussion of the concept of quiet/calm areas and an evaluation of existing approaches to acoustic quality spaces.

In the European Environmental Noise Directive 2002/49/EC, the creation of action plans based on noise mapping results is accepted to prevent and reduce environmental noise and to protect environmental noise quality, especially in cases where exposure levels can have harmful effects on human health [17]. It is thought that the concept of environmental noise quality in the directive doesn't reflect the same content and opinions as the concepts of acoustic quality and acoustic quality spaces discussed in the scientific world. Noise, by all definitions, refers to unwanted sounds. This situation creates confusion in understanding the concepts and achieving the objectives. In this case, "noise quality" is understood as "the quality of unwanted sound," and it is believed that unwanted sounds can have good quality. Spaces where unwanted sounds exist aren't considered acoustic quality spaces. In the recommended quiet areas against environmental noise in the directive, there is a functional and spatial limitation since silence isn't sought and expected in every space. This situation creates a conceptual confusion between quiet areas and acoustic quality spaces. Within the scope of this study, research examining the concepts of quiet/calm areas, acoustic quality spaces, and soundscape quality have been reviewed to understand the difference between acoustic quality spaces and quiet/calm areas and to comprehend the conditions that make a space acoustic quality.

Regarding quiet/calm areas; studies have focused on topics such as the quality and evaluation of quiet areas [40], rating silence and perception of quiet/calm areas [41-42], the positive effects of quiet spaces and the need for quiet/calm areas [43-44] and the restorative effects of quiet/calm areas [23, 45-47].

Regarding soundscape quality; studies have also been conducted on the quality and effects of soundscapes [48-52], the influence of sound quality on soundscape preference [53-55], sound preferences in soundscape [56], the relationship between acoustic quality spaces - quiet/calm areas and high acoustic quality spaces [57-58].

According to the theoretical information obtained from these studies, a table (Table 2) has been created to illustrate the similarities and differences between acoustic quality spaces and quiet/calm areas. The table also includes definitions, focus, materials, content, expectations, and recommendations associated with these concepts.

Table 2. Comparison of Quiet/Calm Areas and Acoustic Quality Space

		Quiet/calm areas	Acoustic Quality Spaces
Similarities	Definition	Its definition has not been clearly defined.	Its definition has not been clearly defined.
		Non-acoustic factors are also examined in scientific studies.	Non-acoustic factors are also examined in scientific studies.
		It is recommended against the environmental noise problem.	It is recommended against the environmental noise problem.
		It is included in the Environmental Noise Directive.	It isn't included in the Environmental Noise Directive.
Differences	Focus	The focus is on low sound pressure level and wanted sounds.	User expectations and suitability for the place are considered.
		Usually, the focus is on the dominant sound source	The type of sound source, duration of perception, acoustic and psychoacoustic properties are important.
		The expectation from an acoustic environment is not always silence.	The expectation from an acoustic environment is for the users not to be disturbed.
	Material and content	In research on quiet/calm areas, materials such as sound pressure level measurements and noise maps prepared based on these measurements are generally used.	In research on acoustic quality spaces, measurable and immeasurable materials such as user expectations and preferences, spatial characteristics, environmental and sensory features are generally used.
		There are quantitative limit values for the sound pressure level.	There are no quantitative limit values for the sound pressure level.
		Quiet/calm areas are more stable due to the content of the concept.	Quality is variable as a concept and acoustic quality space is also variable accordingly.
	Expectations and suggestions	There is a desire to get away from city life.	There is a desire to be in healthy acoustic environments in urban life.
		There is a limiting approach to the function of spaces that are only used for purposes such as relaxation and resting.	There is an inclusive approach in urban open spaces where there are appropriate applications for the function of each space.
		It has priorities such as well-being, relaxation, rehabilitation, and health	In addition to priorities such as well-being, relaxation, rehabilitation and health, it also considers situations such as appreciation and preference.
		The sound pressure level is expected to be below a limit values.	Sound pressure level can be high as long as there are wanted sounds in the soundscape

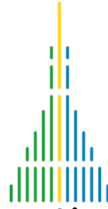
According to Table 2, both concepts are still being developed. The uncertainty between the concepts and their similar structures cause confusion in the meaning of both concepts. It should not be forgotten that the silence mentioned in quiet/calm area studies doesn't mean the complete absence of sound.

3. CONCLUSION

In the context of environmental noise control, which originates from the discomfort caused by environmental noise problems, various approaches are being generated, directed, and reconsidered with the aim of maximizing benefits and reducing discomfort for urban users. The soundscape approach, through its perceptual scope, demonstrates that sound can be considered as a resource, providing benefits beyond mere reduction. In this process, the concept of quiet/calm areas, initially suggested as a priority, actually indicates the need for acoustic high-quality spaces with the aim of preserving "good environmental noise quality" as directed by the European Environmental Noise Directive. Because in reality, every quiet/calm area is an acoustic quality space, but not every acoustic quality space is a quiet/calm area. It is important to remember that there are differences between these two concepts, although they are researched and developed with the same goals and intentions. Considering the sounds that exist in the world and will always exist, the notion that every space should become silent would lead to monotony. When thinking about cities, silence is not the first thing that comes to mind; rather, sound is an inseparable part of the environment in which we live. Furthermore, meeting the expectations of users, their enjoyment of spaces, and the reduction of noise are equally important as silence. Therefore, in order to examine the conditions of acoustic quality spaces and answer the question of what constitutes an acoustic quality space, new approaches should be sought while clearly defining the differences between these two concepts.

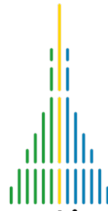
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