


## Article

# Assessing the Soundscape Characteristics of Historical Urban Environments: An Analysis of the Historical Erbil Citadel and Its Environments

Asmaa Ahmed Mustafa Jaff <sup>1,2,\*</sup>, Çilen Erçin <sup>1</sup>  and Zeynep Onur <sup>3</sup><sup>1</sup> Department of Architecture, Faculty of Architecture, Near East University, 99138 Nicosia, Cyprus; cilen.ercin@neu.edu.tr<sup>2</sup> Department of Architectural Engineering, Cihan University, Erbil 44001, Iraq<sup>3</sup> Department of Architecture, Faculty of Architecture and Fine Arts, Final International University, 99320 Kyrenia, Cyprus; zeynep.onur@final.edu.tr

\* Correspondence: 20184675@std.neu.edu.tr

**Abstract:** This research addresses the neglect of sensory features, specifically the soundscape, in studies focused on preserving historic areas. The aim was to contribute to soundscape research by examining the effect of sound on the perception of urban historical places and the impact of the “renewal and transformation” process on audio-visual experiences. This study focused on the historical Erbil Citadel as a case study area, known for its extensive cultural history. Sound sources in the region were identified, recorded, and analyzed using software to calculate the Sound Pressure Level (SPL). The sound sources assessed as a result of the analysis were examined using Schafer’s sound characteristics. In this study, data was collected through a soundwalk study in the historical Erbil Citadel, and its surroundings were identified. The characteristics of the sounds were determined from the sound recordings, enabling the distinction of sounds contributing to the city’s identity. A route was established in its current state, and it was identified which regional precautions should be taken to preserve the sound identity of the city.



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**Keywords:** soundscape; acoustic; historical place; Erbil Citadel; sound identity; urban identity

## 1. Introduction

Today, there has been an increase in urban renewal and transformation projects aimed at protecting historical areas in recent years. Managing the urban environment, especially the uncontrolled urban development and the need to renew the historical urban fabric from the wrong policies regarding use, also reveals new problems. These historical areas, which were the first settlement centers of the city, changed over time, and the economic activities in the social, cultural, and historical regions differed because the middle and affluent classes began to leave these areas. As a result, local authorities have launched urban renewal and transformation initiatives to invigorate economic and cultural vibrancy in historical city centers. A significant number of these initiatives prioritize the restoration of the historical visual ambiance and gentrification, primarily achieved through functional alterations [1]. Nevertheless, it should not be forgotten that transformation and renewal works are visual and related to the human senses. In cities, perceptions and emotions emerge when users step in. According to Lynch, who conducted pioneering research on people’s perception of the city, each sense involved in perceiving the city plays a role [2]. Investigating the impact of place attachment on various categories of historical sites is unquestionably a worthwhile undertaking to enrich their cultural attributes and foster sustainable development. Place attachment denotes the emotional and psychological connection that individuals or communities establish with a particular location or environment. This concept becomes especially significant in the context of historical sites, as these areas often hold deep historical and cultural significance [3].

Certainly, place attachment in studies about this investigation of the connection between individuals and their spatial surroundings typically represents the deep and meaningful connections established by individuals or communities with specific places. Zhao, Yujie, et al. highlight that effective management of the acoustic environment is crucial for enhancing overall livability. By thoughtfully integrating and utilizing sounds in our surroundings, we can significantly improve the quality of life for residents, fostering positive and harmonious living experiences [4]. These connections arise as people develop an understanding of, and attribute value to, those places. Place attachment is a multi-dimensional concept that encompasses various emotional, cognitive, and behavioral aspects [5]. Sensory perceptions encompass all the senses, not just sight, and it is important to consider the complete sensory experience when studying place attachment or designing and planning spatial environments [6]. Sound, in particular, plays a significant role in how people perceive and connect with a place. Fundamentally, a well-maintained acoustic environment in a historical space is essential for preserving the authenticity and cultural importance of the area. The significance of soundscapes in shaping the historical ambiance and enhancing the perception of culture and landscape has been increasingly acknowledged and appreciated [1–7]. Leus and Herssens highlight the significance of conserving the entire sensory and natural experience of historical landscapes during renovation and conservation efforts. This approach ensures that the rich heritage of a place is fully appreciated and that future generations can continue to connect with the historical landscape on a profound level [8].

Everyday life constitutes an integral element of intangible living culture, and despite its pivotal role in the expression of cultural identity, intangible cultural heritage (ICH) has been underappreciated on an international scale until relatively recently. As per the UNESCO Convention for the Protection of Intangible Cultural Heritage (2003), cultural sounds are acknowledged as integral elements of intangible cultural heritage. Due to this rationale, visual perceptions should not be in the foreground in perceiving the city but should be perceived as a whole with sensory perceptions. These sensory elements (including smell, sound, etc.) are listed on UNESCO's "Intangible Cultural Heritage" roster. Therefore, it is necessary to document and protect these senses. People perceive places through their senses, creating the original image. When sensory information is shaped by cultural, social, and personal factors, it makes the character of any environment and leaves a trace in memory. The acoustic environment constitutes a crucial element within the physical context of heritage buildings, and acoustic heritage represents a significant facet of intangible cultural heritage. By the essential prerequisites for preserving heritage structures, assessing and enhancing the acoustic environment in variously configured and functioned heritage buildings should be expedited. Concurrently, safeguarding the auditory ambiance of historical districts holds paramount importance in elevating public appreciation of cultural heritage and heightening awareness about heritage building preservation. Moreover, as the restoration of acoustic heritage and rectification of acoustic characteristics in heritage buildings unfold, research, development, and experimentation with novel sustainable materials emerge as pivotal tasks [9]. Soundscape evaluations are crucial for understanding and guiding planning and design practices, helping formulate precise goals and strategies for preserving, restoring, and optimizing acoustic environments in scenic areas and World Heritage Sites [10].

Cities are changing rapidly, and they are developing in parallel with this change, while their population is increasing. With the development of cities, improving urban environments and responding to city demands have become one of the most critical challenges. Defining the soundscape, revealing the city's character, and the different sound that reveals this character's features need to be determined. Usually, approaches to sound in urban environments predominantly center on "noise control". In addition, visual, olfactory, and tactile features in defining the identities of historical sites must be present in the auditory characteristics. From this point of view, the sound factor must be considered in the planning and design of historical cities; it must also be taken into consideration in the preservation process [11]. However, since the soundscape is ignored in the design and

planning process in the renewal and preservation works carried out in historical areas today, the identity feature of the cities is disappearing. In line with the definition of the acoustic attributes of spatial character, beyond measuring sound levels, it is imperative to classify the recorded sounds and their relationship with the environment and spatial characteristics. Additionally, the temporal dynamics of the space should not be disregarded [12]. Although Schafer underscores the significance of human experience in the study of soundscapes, he also adopts a constructive perspective regarding the acoustic environment. He asserts that enhancing soundscapes necessitates discerning between the sounds we wish to protect or promote and the sounds we aim to eliminate, along with providing reasons for these choices [13]. The concept of soundscape focuses on sounds that have disappeared or are on the verge of disappearing. The process involves working with and creating compositions using natural sounds. This approach has gained broad recognition, encompassing activities such as recording and documenting [14]. Based on this point of view, symbolic sounds from the components that make up the soundscape are seen and the situations where the sound factor is specific to the city should be protected. To create a sustainable sound environment, the sounds existing in the urban identity must be preserved and transferred to the future. Cities have pivotal roles in preserving and perpetuating the historical-cultural heritage, safeguarding these values, and advancing in harmony with contemporary living conditions to ensure their healthy development. Historical cityscapes can be likened to a vibrant theater stage, brimming with memories passed down through generations, akin to a living archive. Throughout history, the manifestation of evolving values within urban spaces has facilitated the cohesion of urban communities, strengthening the shared bonds that underpin cities and enhancing their legibility and perceptibility [15].

The soundscape, in turn, has been evolving continuously due to the evolving characteristics of everyday urban life and traditions. Cities change over time and historical areas in the city are also included in this change [16]. Historical areas and surroundings change the environment, bringing change to the sound identity and environment formed in these areas to the agenda. Particularly with the transformation of historical urban areas, the intersection of various functions, and the positioning of historical city centers amidst these functions have given rise to the emergence of diverse soundscapes [17]. There is a particular need to incorporate soundscape research into urban design and planning which can contribute to enhancing the overall character of a historical area. The proposition put forth by Masullo [18], in favor of rehabilitating and establishing serene areas within historical urban areas, resonates with the broader acknowledgment that the preservation and improvement of such spaces can greatly enhance the sense of place, community identity, and general well-being. This strategy underscores the significance of crafting peaceful and meditative spaces within historical urban settings [18]. To enhance the soundscape, it is crucial to address not only the unwanted elements of sound but also to protect or revive the pleasing sounds that might be concealed or drowned out by the unwanted ones. If our living environments are to cater to the triple bottom line, we must take into account the complete range of sounds we encounter, to preserve or reinstate desirable soundscapes [19].

As mentioned earlier, attachment to historical sites is possibly utilized as a measure of cognitive perception. The assessment of the acoustic environment constitutes a crucial component of cultural heritage. However, there is limited systematic research on the relationship between soundscapes and historical areas. This study specifically underscores the physical attributes of sound as complementary elements to the sensory and spatial qualities of the location. It focuses on the sounds that change over time in the main street in the historical citadel and its surroundings in Erbil. This research article assesses the influence of soundmarks in the historical area on the city's identity, specifically focusing on the sound sources present in the area. Information about the records kept, the character of the historical place, and the effect of temporal change on these areas was emphasized so that it could be a source. As a study area, the historical citadel and its surroundings, situated within the center of the city of Erbil which has an essential place in Iraq with its historical fabric, are important trade and tourism areas of the city and were chosen because

it is one of the centers of communication and interaction. Therefore, this paper helps to assess daily urban life and cultural practices through an auditory lens and consider urban sounds as integral elements of intangible cultural heritage (ICH). In doing so, it provides an interdisciplinary examination and suggests cross-disciplinary solutions to tackle challenges associated with preserving the sound identity of Erbil's cultural soundscape. This study aims to contribute to the preservation of sounds in the historical area and future studies by investigating the effect of sound sources on the perception of urban historical places with the map created by finding sound marks that affect the urban identity in the area. The sound characteristics may change or remain unchanged depending on the changes in the use of the historical Erbil citadel and its surroundings. This study attempted to determine the harmony of the current soundscape with the character of the area and its effects.

#### *Research Questions/Hypothesis*

This research has established and explored the impact of the soundscape in historical areas on the identity of the city and the study poses the following research questions:

- How does the soundscape of the main street in the Erbil Citadel and its surroundings contribute to the preservation of sound heritage in the region?
- What are the dominant sound sources and characteristics in the main street in the Erbil Citadel and its surroundings?
- How do the sounds of the main street in the Erbil Citadel and its surroundings impact the city's identity?
- What are the key challenges and opportunities in managing and preserving the acoustic heritage of the main street in the historical Erbil Citadel and its surroundings?
- How can the sound characteristics of an urban historical area be compared with those of other urban historical sites, and what practices have been implemented for the preservation of acoustic heritage in these areas?

These research questions can serve as a starting point for further exploration of sound's impact characteristics in urban historical areas, specifically focusing on the main street in the Erbil Citadel and its surroundings.

## **2. Literature Review**

### *2.1. The Soundscape in the Historical Cities*

Rehan mentioned "Soundscape falls under the field of acoustic ecology, encompassing the complete auditory environment. This includes natural sounds, such as those produced by animals, trees, water, and weather, as well as sounds resulting from human activities, including musical compositions, sound design, and other human-generated sounds. It also encompasses mechanized sounds generated through the use of industrial technology" [20]. In the past decades, awareness of the temporality and heritage value of urban soundscapes has increased, and more and more efforts are being made to record and catalog urban soundscapes for research and future generations. The soundscape of historical cities possesses distinctive features and varies from one city to another worldwide. Across the annals of history, cities have been delineated by auditory attributes that shape the soundscape, aiding individuals in recognizing the unique character of each city [21]. Each community's soundscape will be unique, and at least as part of what makes an urban soundscape different will make it special and different. For instance, by comparing the urban soundscapes of Marrakech, Istanbul, and Paris, we can discern the distinct acoustic character of each city. It becomes evident that each city possesses its unique acoustic identity, which is shaped by the components of its urban environment and the various activities within. This concept leads to what can be termed the "sound branding" of a city [20].

These soundscapes add to the quality of these spaces and eventually define cities and communities. For example, the sound of azan in Islamic cities and the sound of church bells in European countries significantly impact users or citizens. The cities were also distinguished by the natural sounds. Songs, the call to prayer (azan), and the sounds of folk



or traditional music are also emblematic characteristics of the historic city. These symbolic sounds are important for the continuity of the urban identity. Every sound in historical cities gives us clues about that city and allows us to determine the cultural and social characteristics of that city [21]. Gary Siebein [22] defined the soundscape of worship as “centered around the presence of a cosmos, God, or a higher power deserving of worship, with whom people seek to communicate in various ways”. One of the primary means of communication in a mosque is through spoken words, which may involve chanting, Quran reciting, or preaching. When discussing the soundscape of worship, it is important to note that each worshipper has an assigned or designated place within the worship space [22]. Numerous studies in the literature are concerned with assessing the soundscape within the historical city, particularly in the context of “cultural soundscapes” falling under the purview of intangible cultural heritage. Soundscapes within historical areas are mainly crafted by a combination of natural and human-generated sound sources, with numerous of them bearing substantial “cultural, historical, and spiritual” importance. Ordinarily, the connection between individuals and these cultural soundscapes is formed through specific auditory cues [23]. The main goal of the urban soundscape concept is to integrate the historical, cultural, and sociological aspects of the acoustic environment’s historical identity [20]. The sub-objectives of the historical soundscape concept include:

- Providing the listener with a sense of location and environment.
- Identifying and preserving tranquil spaces.
- “To enhance health, comfort, communication, pleasure, thrill, joy, balance, liveliness, authenticity, serenity, security, and well-being” [24].
- “Enhancing serenity in open spaces within historic city areas” [25].
- Playing an important role in tourism brings significant economic advantages,
- Establishing an appealing environment for economic investment.

A soundscape in the historical site can signify the connections among diverse groups of people and instill in them a feeling of affiliation with specific locations. Every community and every place has its sound environment and its unique sound signature. Comprehending the urban soundscape in the historic district and monitoring its evolution over time should be adopted as a standard practice in urban planning.

## 2.2. Sound Identity of Urban Historical Areas as Components of Intangible Cultural Heritage (ICH)

Kato mentioned that the sounds of a city can encapsulate the social, spiritual, historical, and cultural memories linked to a specific place and community [26]. Soundscapes are sound values of significant importance for urban identity. It plays a crucial role in shaping both traditional and modern everyday culture. Sounds indeed function as hearing representations of our daily intangible culture, representing elements like our musical selections, religious observances, and ultimately, our identity. The World Soundscape Project investigated sounds categorized into keynote sounds, signals, and soundmarks [13]. Schafer’s conceptualization of the sound environment highlights the interplay between sound, space, and time. It is from this concept that the idea of acoustic design originates [27]. For this reason, Schafer argues that “Once a soundmark has been acknowledged, it deserves preservation, as sound marks play a role in creating a distinctive acoustic existence for the community” [13]. Soundmarks serve as auditory embodiments of cultural identity, underscoring the importance of their preservation and sustainability. UNESCO’s definition underscores that sound encapsulates representative values encompassing knowledge, skills, expressions, and more. These elements are continuously regenerated by communities as they carry their profound sense of cultural identity through the auditory experiences and expressions within their environments. The soundscape of a place is not merely a backdrop but a dynamic repository of cultural heritage, reflecting the ongoing practices and traditions of the community acknowledges that sounds, whether in the form of rituals, music, language, or everyday sounds, are essential elements in preserving and conveying cultural identity.

To establish an archive of sounds, the initial step involves a thoughtful selection process to identify which urban sounds should be regarded as elements of Intangible Cultural Heritage (ICH) [28]. Sonic culture encapsulates the quintessential acoustic traits that define society and contribute to its social memory. This selection process entails a comprehensive examination of the cultural and historical significance of various urban sounds, considering their role in shaping the identity and collective memory of a community or society.

### *2.3. Preserving Sound Identity in Historical Areas*

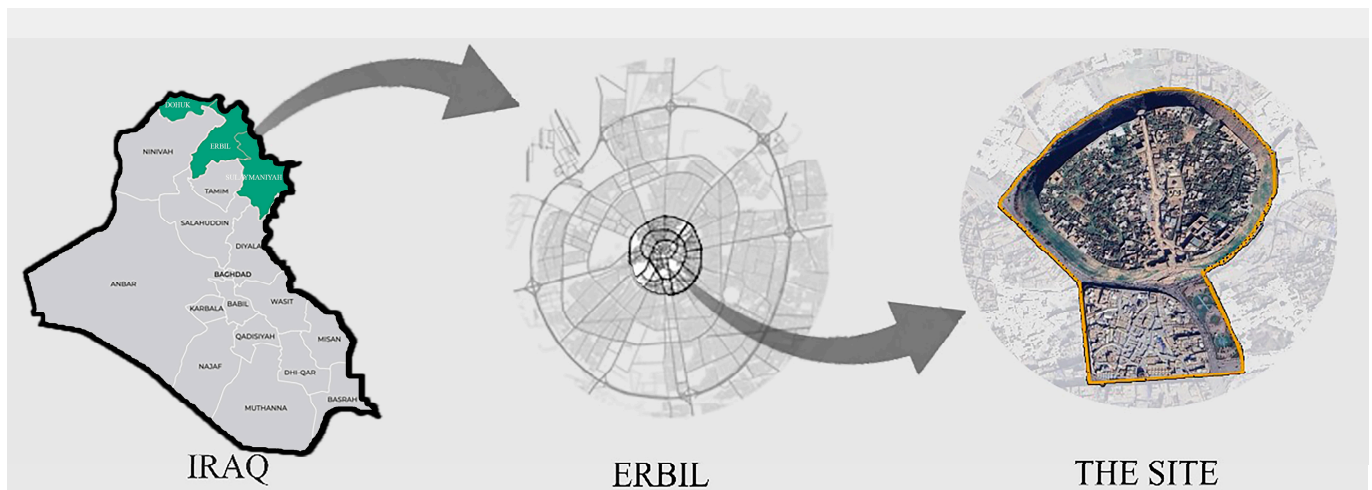
Sound is a dynamic and ephemeral phenomenon that is inherently limited in time due to its physical properties. As sound is not a permanent object, it requires reproduction each time it occurs, which inherently makes it perpetually unique [13]. Intangible Cultural Heritage (ICH) is not a static entity; it undergoes continuous transformations over time. These changes occur as ICH adapts to new versions of cultural elements, incorporates innovations driven by technological advancements, responds to the forces of globalization and immigration, and is influenced by political shifts. Additionally, changing life standards and conditions can significantly impact the evolution of ICH. Intangible Cultural Heritage (ICH) is a dynamic and evolving aspect of culture that reflects the adaptability and resilience of communities. It responds to a wide range of factors, including technological innovations, global interactions, political dynamics, and changing socioeconomic conditions. Recognizing these transformations is essential for effectively safeguarding and promoting ICH in a rapidly changing world. As a result of the swiftly evolving cultural contexts and lived experiences, sonic heritage is also undergoing rapid transformation. In essence, sonic heritage is not static; it is an ever-evolving reflection of the dynamic interplay between culture, technology, environment, and human experience. Recognizing and adapting to these changes is essential for preserving and promoting the rich tapestry of sonic heritage in an evolving world.

Sounds are living entities that evolve in parallel with the changing conditions of life, serving as dynamic mirrors that reflect the ongoing development of a society's culture. Sound identity is passed down from one generation to the next and continually recreated, adapting to contemporary life conditions. This adaptive process ensures that sound identity remains relevant and enduring as long as it continues to be practiced within society. Thus, making Intangible Cultural Heritage (ICH) relevant to society can be challenging, especially when tangible elements are involved. However, it is important to note that this challenge does not make it impossible. Through a combination of preservation, reinterpretation, community involvement, and education, it is possible to make these elements relevant to contemporary society while respecting their cultural heritage sounds.

Certainly, the attributes of tangible and intangible cultures are separate, and consequently, their preservation methods must also diverge. Tangible culture represents the end-products or results of cultural expressions, making it relatively stable, while intangible culture pertains to the processes and dynamic aspects of a culture [29,30]. Tangible and intangible cultures complement each other by providing insights into one another. The sounds of the city are shaped by the cultural context of those practicing the tradition, and their auditory characteristics are influenced by both tangible and intangible cultural elements. As a result, all sonic attributes in urban sounds hold significant importance in comprehensively grasping their evolution over time. Therefore, it is imperative to methodically accumulate sonic cultural attributes at specific time intervals. This allows for the observation of acoustic manifestations of change and ensures the preservation of the original forms of cultural sounds. Given that sounds have a fleeting nature and can quickly vanish, it becomes imperative to initiate sound collection efforts promptly and efficiently. This urgency is crucial to capture and preserve the richness of cultural auditory experiences before they are lost forever.

### 3. Methodology

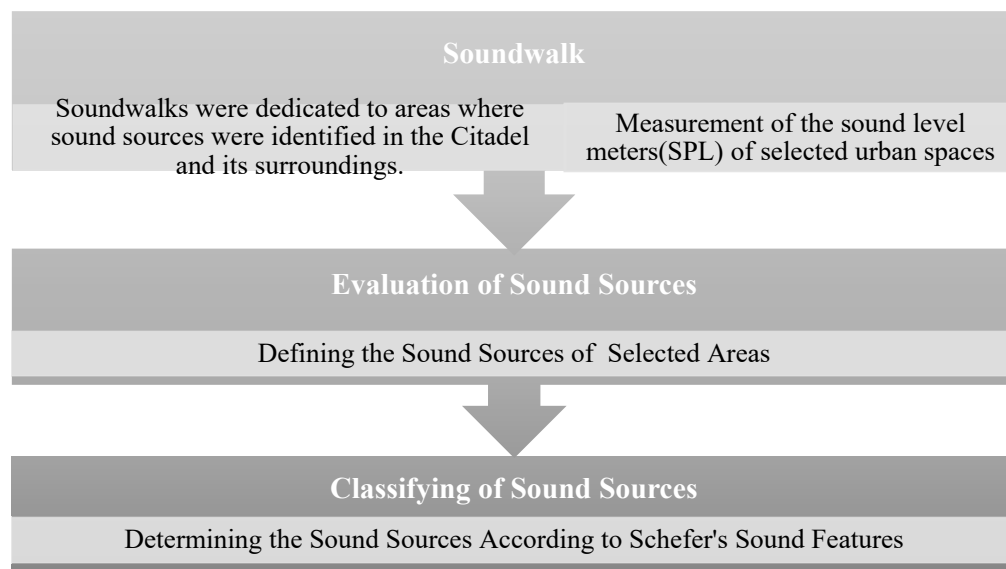
This research focused primarily on quantitative data analysis, especially in the creation of sound mapping of the old town of Erbil. We based our approach on ‘soundscape analysis of historical contexts’ and ‘preservation of sounds that influence urban identity’. The research area was situated in the historical urban fabric of Erbil, encompassing both the Erbil Citadel and the existing city center (Figure 1). The study area had the position of a commercial center and was also the busiest area of the city. The reason for this is that it can be listed as being in the city’s center and at the same time being in an important position in terms of tourism, with the trade and historical Qaysari bazaar located here. The city center is also a historical site; UNESCO inscribed the Citadel on the World Heritage List on 21 June 2014. The restoration and renovation work carried out greatly affected the city socially, culturally, and economically. Presently, the Erbil Citadel and its surroundings are predominantly characterized by recreational, tourism, and commercial undertakings, and there has been a notable surge in the number of visitors.



**Figure 1.** Study area with sounds affecting the identity of the historical city in Erbil (edited by the author, 2023).

The method frequently used in soundscape studies is the observations made in the study area walking along the route determined by the sound level measurements and determination of soundscape types to define components-related hearings [31,32]. Sound-walking allows for the examination of different soundscapes during the walk and focuses on how spaces change as they are experienced. During a soundwalk, recording sounds transitioning through sound environments, and the events that unfold are frequently categorized as part of this journey for the users in the places [33]. A common urban sound model, derived from the sound of walking in the historical city of Erbil, helps determine which sounds should be protected in the region. This model encompasses all three characteristics of a soundscape as defined by Schafer: keynotes, signals, and soundmarks. Although physically distinct, all of the resulting sounds can be regarded as soundmarks, given their significant role in shaping urban memory and urban identity. With this method, we attempted to determine the spatial sound levels and explore the relationship between sound sources and the unique characteristics of the historical location. In this research, we employed an applied approach to investigate the events that took place within the historical Erbil Citadel and its surroundings and measure the impact of these sounds on the site’s historical ambiance. The research methodology depended on discovering and analyzing soundscape indicators for the historical Erbil city. The chosen study area was the old city of Erbil. To test the main research hypothesis, the main street in the Erbil Citadel and its surrounding area is one of the traditional urban fabrics. In this study, the walking route was determined to reflect the area’s character in the best way, including daily activities and

sound sources. The objective of this study was to assess the soundscape in historical urban areas and the conservation of sounds that play a role in defining urban identity. The field study comprised three main components: measurements conducted through soundwalks, identification of sound sources encountered during measurements, and the classification of sound sources originating from the study area. See Figure 2.



**Figure 2.** The chart describes the data collection and analysis of the study.

### 3.1. Soundwalk

The historical citadel and its surroundings, representing Erbil's oldest settlement area have been included in the field sound recordings. The selection of soundwalk sources was made with careful consideration of their profound historical importance, their capacity to exemplify the soundscape of the area, and their central positioning within the city. These regions included the main streets in the Erbil Citadel, Bata Street, Qalat Street, Shar Park, Qaysari Bazaar, and Shex Choli Street. This study area encompassed representatives of nearly all sound identities in the historical city (see Figure 3).



**Figure 3.** The study area is located on the borders of the historical city of Erbil (edited by the author, 2023).



In addition to assessing sounds based on their location, it is also crucial to plan field recordings temporally, considering the specific timeline like morning, afternoon, and evening. These can be regarded as sound events characterized by distinct frequencies that help to shape the harmony of the sonic environment in the city. Specific traditions unfold daily, transpiring either once a day or with even greater frequency, encompassing practices like tea consumption, the call to prayer, or the cries of street vendors. As a result, the authors organized field recordings for each site, considering the urban sound sources that evolve.

In this study conducted in March 2023, a hands-on approach was employed to assess the impact of sounds on individuals within the main street of the Citadel of Erbil and its surrounding areas. Initial sound exploration in the study area occurred before research resources were examined and streets/areas were identified. Sound recordings were carried out in historical areas with significant sound sources, and the obtained results were subsequently compared with quantitative data collected during the implementation phase analysis.

Soundscape works as the sound desired to be heard at a certain point or the specified route along a specified route is made promptly to include sound resources [34]. The soundwalks conducted in the historical areas unveiled diverse audible resources. In modernized areas, only sounds like human voices and traffic noise were discernible. The sound sources in the study area exhibited a rich diversity in terms of what was discovered.

The findings from soundwalks emphasize that in perceiving urban spaces, sound is an inseparable component of daily life and carries substantial significance in our existence. Drawing from the insights gained through the recordings, the everyday activities in historical Erbil City can be classified into seven distinct categories: food and drink, street occupations, festivals, religious practices, transportation, entertainment, and urban life. These classifications were determined by applying Schafer's categorization system, which entails organizing sounds according to their functions, meanings, and sources.






Throughout the soundwalk recording, six specific points were selected (as shown in Table 1) to recognize distinct acoustic environments, visual attributes, and prevailing sound origins contributing to the city's identity. This study included areas characterized by high sound frequencies that were identified during soundwalks. Following the methodology outlined in the preceding section, sound recordings were made at each designated point to capture sound sources in the old city. Data measurements were conducted using a sound level meter via the soundwalk approach during this time frame. The result from the records was sound pressure levels (SPL), measured using PULSE Reflex (x64) version 20.0.0.455, which was calculated for areas with sound sources using the software. It can be seen that the quantitative analysis data regarding the areas where the sound sources are located, and the sound sources recorded during the soundwalk are parallel to each other. See Table 1.

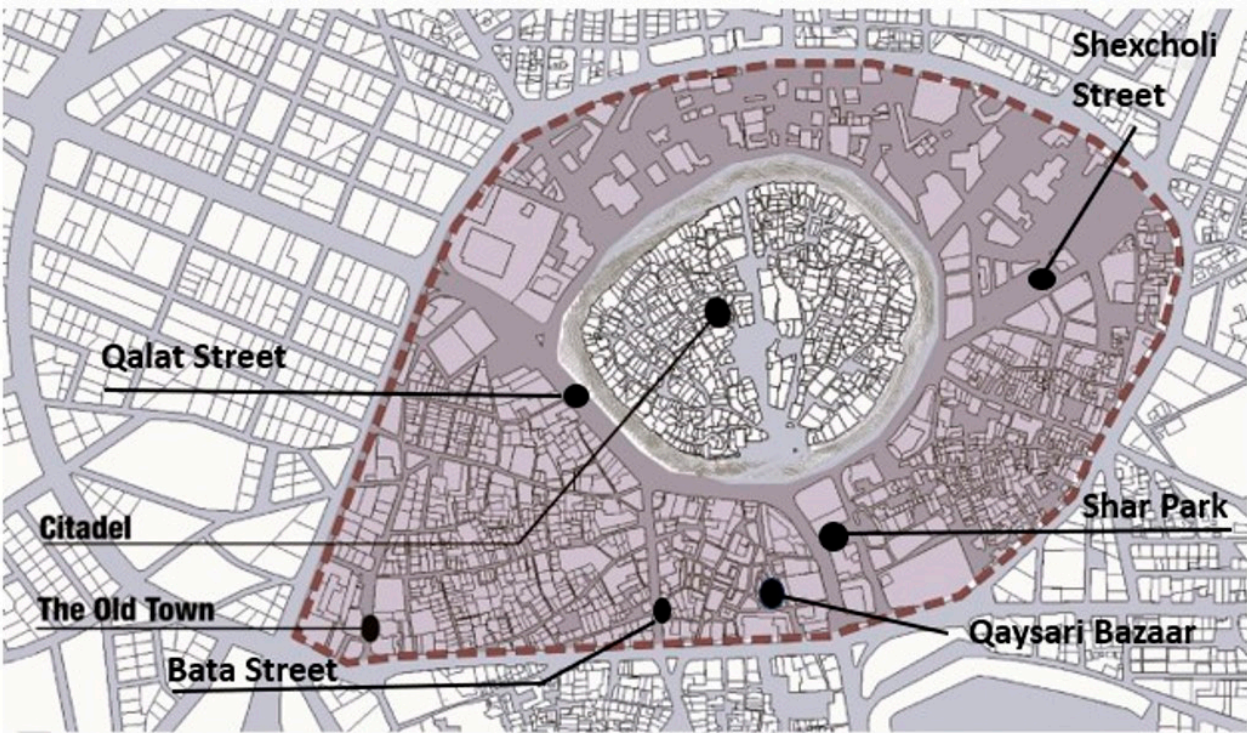
### 3.2. Evaluation of Sound Sources

Listening walks for audio recordings during which the sound sources are intense and the sounds desired to be heard in their areas were selected. A suitable walking route was created in the areas where these sound sources are located. The sounds of vehicles and human activity were commonly audible, particularly at the intersections of Qalat Street and Shex Choli. During our walks, we passed by numerous mosques, with the call to prayer (azan) emanating five times a day, serving as the most prominent and symbolic sound source in the region. Notably, our soundwalk on the main street in the Erbil Citadel revealed a quieter atmosphere compared to its surroundings, primarily due to the citadel being closed to vehicle traffic. The area was characterized by frequent sounds of both humans and birds. Soundwalks in the Erbil Citadel uncovered traditional music, melodious voices, and sounds emerging from historical museum houses. Visitors to this area immediately experience a pleasant shift to a different environment, and their presence is observed to enhance the atmosphere, as illustrated in Figure 4.



**Table 1.** Quantitative analysis data about areas with sound sources (Author, 2023).

Location	Sound Level dB in the Morning	Sound Level dB at Noon	Sound Level dB in the Evening	Visualization of Sound Waves
Shar Park and Qalat Street	70	62	75	
The main street in the Erbil Citadel	55	48	44	
Qaysari Bazaar	58	64	50	
Bata Street	68.7	60	54	
Shex Choli Street	66.4	56	62	



**Figure 4.** Designated locations for conducting Soundwalks within the study area (edited by the author, 2023).

Figure 4, where the vehicle, hops and tea vendors, people's voices, call to prayer, traffic, street vendors, children's voices, and local music sounds can be heard over approximately 1850 m, shows the walking route. To conduct an impartial evaluation of the surveyed areas, measurements were performed within the interior sections of the examined spaces. The sound walks, performed with the help of an M-Audio Micro Track II portable professional recorder occurred over a week in March 2023. Measurements were taken for each of the points defined on weekends and weekdays. As a result of listening walks in the historical Erbil area, conducted to identify sound sources, the streets, and areas in the old town have been recognized.

The general analysis of the five points in the historical area, including their location, area, primary functions, and main sound sources are in Table 2. Before commencing the study, extensive soundwalks were conducted in and around the historical Erbil Citadel and its vicinity. These soundwalks revealed various sound effects of urban identity in the streets and alleys of the historic citadel district. Heavy traffic noise dominates the area due to changes in the historical area and modernization over time. Furthermore, the area's transformation into a central commercial hub over time has led to heavy traffic and human voices becoming the predominant features in the region. Traffic sounds and construction noise, identified as prominent mechanical sounds in the historical area, exhibited adverse relationships with the overall soundscape. These sources are universally recognized as detrimental elements in the auditory environment, emphasizing the necessity for enhanced control measures specifically tailored for historical areas [35]. Nonetheless, upon ascending to the historical citadel, it becomes readily apparent that tranquility pervades the vicinity. This arises from the citadel's commanding position over the surrounding area, its elevated location, and the absence of vehicular traffic. It can be observed that the sounds influencing the urban identity are primarily concentrated in the vicinity of the citadel rather than within the citadel itself. This is because the sound intensity is sustainable in these regions. See Table 2.

**Table 2.** Measurement of defined sources (Author, 2023).






	Measurement Points	Main Functions	Main Sound Resources	Site View
Site (Sound Walk areas in black)	1. Shar Park and Qalat Street	Recreation, Commercial, Tourism, Transportation	Traffic and Car horns, Human sounds, sirens, police whistles, street vendors, animal sounds, Nostalgic and Kurdish music, Street food, restaurants & leisure activities (kabab, nargile, tea, backgammon), Azan Sound, Water sounds	
	2. Main Street in the Erbil Citadel	Heritage Sites, tourism, recreation,	Human Sounds, music, and bird sound	

Table 2. Cont.

	Measurement Points	Main Functions	Main Sound Resources	Site View
Site (Sound Walk areas in black)	3. Qaysari Bazaar	Commercial, tourism,	Human Sounds, sounds from restaurants and shops, Construction noise, Nostalgic and Kurdish music	
	4. Bata Street	Commercial	Human sounds, street vendors, sounds from cafes and restaurants, traffic and car horns, police whistles, and Azan Sound	
	5. Shex Choli Street	Commercial	Traffic, car horns, police whistles, human sounds, sounds from shops, vendors, Azan Sound	

Erbil's historical old city stands out for several reasons, notably serving as the central trade hub and tourism activity of the city. The distinctive characteristics of sound sources, including the calls of street vendors, animated conversations in cafes, the vibrant ambience of bazaars and mosques, and traffic noise on the roads, collectively contribute to its unique acoustic ambience.

### 3.3. Classifying of Sound Sources

This study assessed the historical Erbil Citadel and its environment soundwalks, during which sound sources were recorded and selected. The outcomes of this research have led to the identification of the sounds that characterize the historical city of Erbil, which are shown in Table 3 below.

Table 3. Sounds that contribute to sound identity in the historical city of Erbil (Author, 2023).




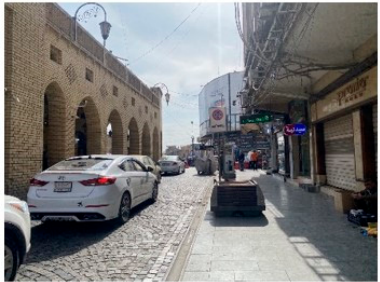

Location	Sound Characteristics in Erbil's Old Town as Defined by Schaefer	View of Sound Sources Affecting the Historical City of Erbil
Sharpark and Qalat Street	Keynote: Human sounds, animal sounds, Vehicle traffic, water sounds Signal: Car horns, sirens, police whistles, street vendors, Soundmark: Nostalgic and Kurdish music, Street food, restaurants & leisure activities (kabab, nargile, tea, backgammon), Azan Sound	 This area serves as a passageway to the historical site, characterized by traffic, tourists, and shops, including restaurants. The overall sound environment in this area is notably noisy.



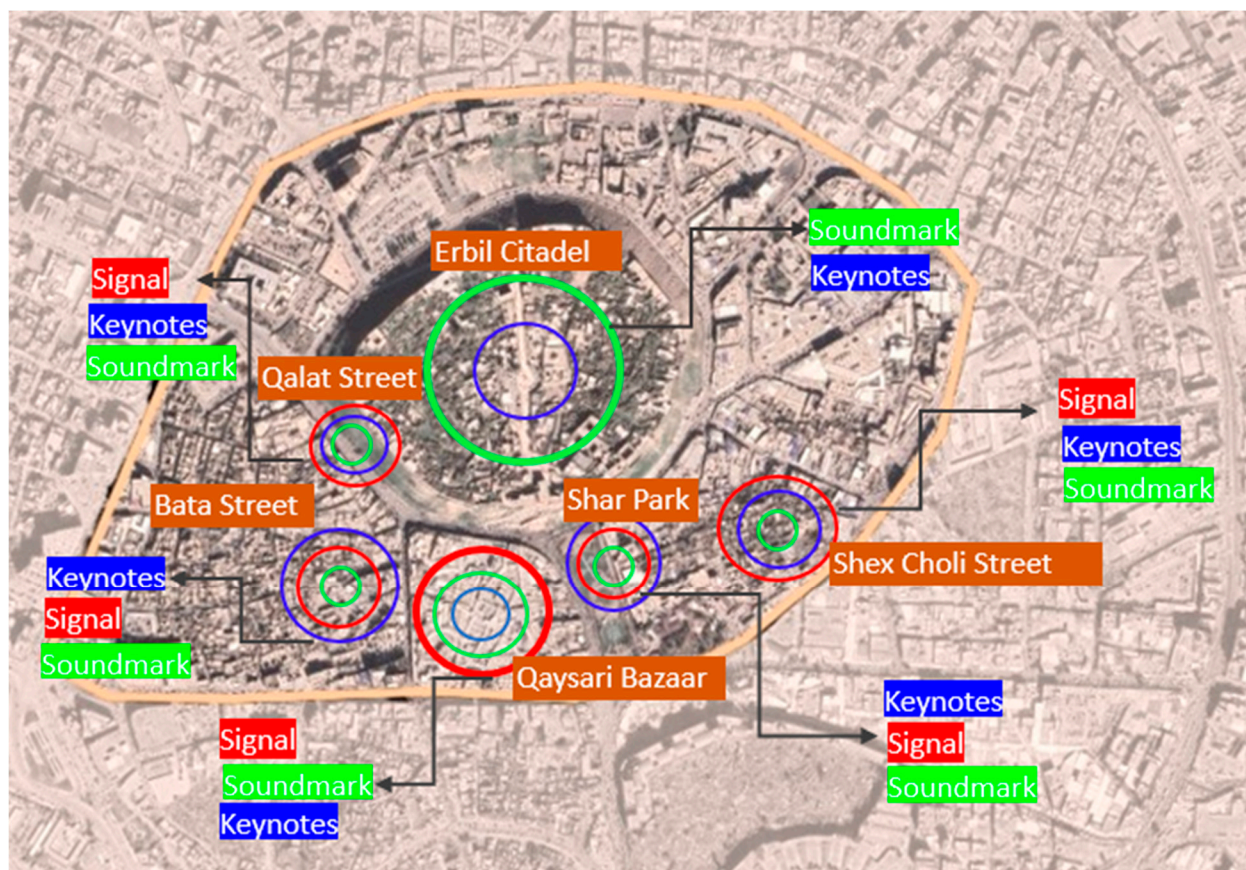
Table 3. Cont.

Location	Sound Characteristics in Erbil's Old Town as Defined by Schaefer	View of Sound Sources Affecting the Historical City of Erbil
The main street in the Erbil Citadel	Keynote: Human Sounds and Bird sounds Signal: None Soundmark: Nostalgic and Kurdish music, Kurdish dancing performance (in Newroz Eid)	 <p>This tranquil area, predominantly frequented by tourists, is characterized by natural sounds (bird sounds). The dominant sounds in the region are dialects, including Arabic and Turkmen languages.</p>
Qaysari Bazaar	Keynote: Human Sounds Signal: Sounds from shops, construction noise Soundmark: Nostalgic and Kurdish music, leisure activities (kabab, tea shop)	 <p>This area noisy with a lot of shops, tea shops, and restaurant vendors</p>
Bata Street	Keynote: Human Sounds, Vehicle traffic, Animals (cats, dogs, birds) Signal: Sounds from shops, Car Horn, Street vendors, sounds from cafes and restaurants, police whistle Soundmark: Azan sound, Nostalgic and Kurdish music	 <p>The area is a bustling area with shops, restaurants, and a high volume of pedestrians with street vendors.</p>
Shex Choli Street	Keynote: Human Sounds, Vehicle traffic, Animals (cats, dogs, birds) Signal: Sounds from shops, Car Horn, Street vendors, police whistles, sounds from cafes and restaurants Soundmark: Azan sound	 <p>This is a noisy road with many commercial shops.</p>

## 4. Results

### 4.1. Characteristics Features of the Sound Sources

The initial step in soundscape analysis was to identify notable characteristics of the soundscape, emphasizing sounds that are distinctive, abundant, or prominent. Consequently, by discerning the primary sounds in field studies, we effectively categorized the principal themes of a soundscape, making a clear distinction between what we refer to as signals and sound signs. Schaefer elaborated on the concept where the figure symbolizes the signal or soundmark, and the ground encompasses the ambient sounds around it, frequently incorporating keynote sounds. The field denotes the space where all these sounds come together, shaping the overall soundscape [13]. Keynote sounds primarily include ambient sounds associated with the geographic location, climate, and daily life of a community or region. These may include sounds like water flowing, wind rustling, market noise, etc. For instance, in the historical city of Erbil, traffic noise, bird sounds, and street vendors could be among the most fitting keynote sounds, given that they are consistently heard daily, at all hours, and in nearly every corner of the city. Signals are prominent sounds that require our deliberate attention, such as ringing and bells. Police or ambulance sirens and the call to prayers can be considered examples of signals in the Historical Erbil city. Soundmarks are sounds that only reveal the characteristics of that society. Soundmarks, a term originating from landmarks, are distinctive to a particular place or community, like the evocative Kurdish music resonating around the historic Erbil Citadel. Keynote sounds and signals can be encountered in various locations and generally lack distinctive identifying characteristics. On the contrary, soundmarks are of great significance to both a society and a particular location. See Figure 5.



**Figure 5.** Analysis of soundscape characteristics of sound sources in the field (edited by the author, 2023).

The sound sources gathered through soundwalks were evaluated using Schaefer's sound characteristics, revealing their integral role in shaping the urban identity of the



Historical City of Erbil. The distinctive soundscape of Erbil Historical City illustrated its acoustic identity. Vehicle traffic and car horns emerged as the predominant sound types in the city, while human voices and music constituted other prevalent sound categories in the area. The sound characteristics derived from the sound sources in the regions are determined based on their features. The characteristic features of the sound sources in each region on the map varied from one region to another. Therefore, in the analyses conducted for each region, sounds were categorized by color (blue color shows the keynote, red color shows the signal, and green color shows the soundmark). They were marked in the field, ranging from the most identified sound characteristics to the lowest sound characteristics.

When you entered the axis between the Shar Park area and the Qaysari Bazaar area, it was immediately noticed that intense sounds began to come and you entered a different city environment. Local music and street vendors were the first to attract attention in the area. Local music sounds coming from the shops, especially the sounds made by the employees are remarkable for those who have just discovered the city. As you continued walking, there were sherbet shops around Kayseri bazaar, and coffee shops under the citadel were seen. Tea makers, who were drinking tea, used glass teacups that were hitting each other to attract customers by creating sounds. Because the region is the center of the city, human voices often intermingled with each other during the walks. It was determined that the most common speech sounds of the people in the region were among the natural sound sources. Due to the location of the historical area as a commercial center, the sound of traffic was among the sound sources that were heard intensely in the region. In this section, the characteristics of sound sources were evaluated according to regions, and their impact on urban identity is discussed.

#### 4.1.1. Shar Park and Qalat Street

Shar Park has been incorporated into the historical area through conservation efforts. With the work done, the area contains the featured recreational area. Keynote sounds were the most dominant sound features in the region. The presence of a water fountain in the area aided in masking the signal sounds. It was also demonstrated that human voices were prevalent in these areas, attributed to the high influx of tourists to the region. However, the diverse languages spoken by both tourists and residents led them to perceive these voices as distinctive soundmarks. The sounds emanating from the shopping areas and street vendors around the region act as signals for those experiencing the city. Since there are streets around the area, heavy traffic sounds were disturbing in this area and acted as a signal sound. In a general assessment, it was unveiled that there were sound sources in the area, but the distinctive soundmark sounds that contribute to the city's identity were diminished due to the prevalence of other sound features.

In Qalat Street, the call to prayer, traditional nostalgic Kurdish music, and activities such as playing tavla (backgammon) and smoking nargile (hookah) were observed. Tavla, also known as backgammon, holds a cherished place in Kurdish culture as a widely enjoyed board game often played in the vibrant ambiance of street cafés. This engaging two-player game is frequently accompanied by the soothing rituals of sipping tea and sharing a hookah, creating a deeply immersive and social experience for participants. Hence, the leisure moments of city residents and visitors often resonated with the clatter of dice and the shuffle of checkers, as these traditional gaming tools served as conduits for their recreational pursuits. The streets of the old city were profoundly enriched by the presence of these sounds, as they frequently punctuated the city's vibrant outdoor atmosphere.

#### 4.1.2. Main Street in The Erbil Citadel

The closure of the area to traffic provided an advantage for the continued presence of sound signal sounds. Upon entering the environment, one immediately perceives the presence of natural sounds, such as bird calls. Newroz, the Kurdish New Year, stood out as the most celebrated holiday in Kurdistan. Each year, local residents and tourists gather at the castle in traditional Kurdish costumes, engaging in spirited dances accom-

panied by the rhythms of traditional Kurdish music. Listening to the voices in the castle signified the sustained Kurdish identity in the region. The sounds emerging during celebrations on specific dates, such as the commemoration of the Prophet's birth, Ramadan, and Newroz Festival, not only impact the city's identity but also contribute to the formation of sound signs.

#### 4.1.3. Qaysari Bazaar

As the area has maintained the same function from old times to the present day, sounds have been preserved in this region. In Qaysari Bazaar, the voices of sellers were the most prevalent. Another significant sound element was the sounds emanating from the historical tea shop in the bazaar. Tea, with sociological implications like hospitality, shared experiences, and conversations, holds a significant place in Kurdish identity. Many small commercial tea shops in the area serve this beverage to shopkeepers and visitors. This enduring tea tradition brings along its unique auditory attributes. For example, the tea preparation procedure encompasses various acoustic elements, including the sound of water coming to a boil, the pouring of tea into glasses, the clinking of spoons while stirring sugar into the tea, and the vocal calls of tea vendors, among other auditory features. The fact that the bazaar was covered contributed to establishing a connection with the past in the historical area, as the echoes of sounds and signals reverberated in the vicinity. This enables visitors to the old city to discover clues about the city's identity.

#### 4.1.4. Bata Street

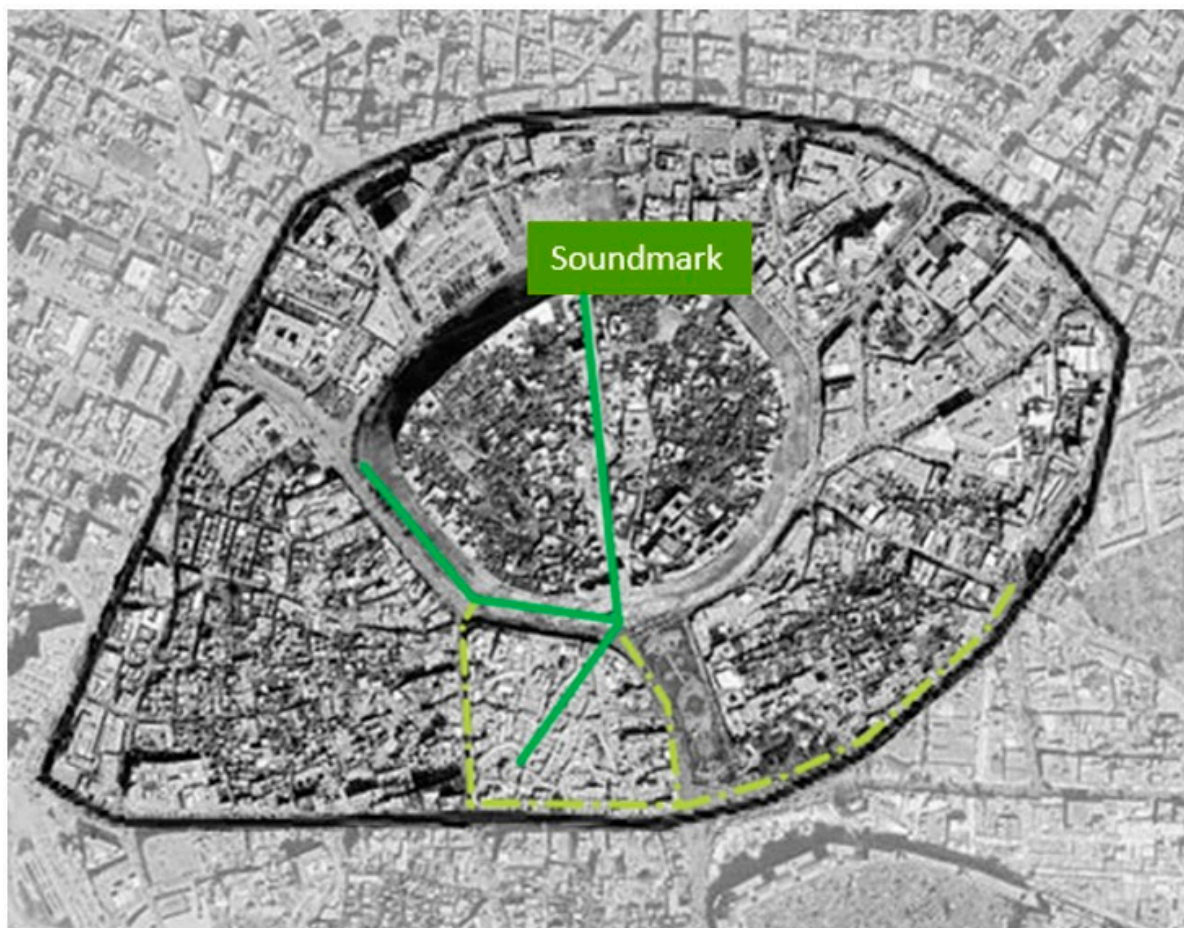
In this area, situated on the exit axis of the historical city, there was heavy vehicle traffic during the day, causing the absorption of signal sounds in the vicinity. The signal sounds emanating from restaurants were often drowned out by the noise from heavy traffic and human voices. Reducing the sounds that contribute to the loss of urban identity in the region and amplifying the sounds that serve as signals will be an analytical practice.

#### 4.1.5. Shex Choli Street

While local residents have adapted to the densely crowded conditions and vehicle noise in this area, this situation is quite distressing for tourists. Vehicle traffic, car horns, and human noises were identified as the most "annoying" sound categories. Erbil is predominantly inhabited by Muslims, and the region features numerous mosques that cater to the religious needs of the local community. The calls to prayer are announced by muezzins in the mosques, resonating five times daily. The call to prayer was audible from almost anywhere in the street, making it the soundmark and widespread religious sound element in the urban soundscape.

The variety of sound sources and the rich tapestry of soundscapes exemplified the vibrancy and liveliness of the districts in Erbil's historical areas. The sounds of Erbil's Historical areas help the city to continue its identity, history, and culture. When it comes to sound source preferences, the soundscape evaluation of historical areas benefits from the presence of various sound sources, which make the environment lively and diverse. In research conducted by Nursyamsiah et al. [36], it was established that place attachment served as an intermediary factor in the connection between contentment related to revitalization endeavors and the inclination to revisit. In historical areas, noteworthy correlations were observed between evaluations related to soundscape and place attachment. As a result of the analysis, it was evident that soundmark sounds existed in the region but tended to diminish due to the density of keynote and signal sounds. Preserving the soundmark will necessitate efforts to enhance the area. The escalating traffic congestion, exacerbated by its status as a commercial hub, contributed to more noise in the area, leading to a clear loss of background soundmarks and signal sounds. This phenomenon may impact the identity of the historical city over time. For this reason, a map of the soundmark sounds that influence the city's identity was created, and future studies will contribute to preserving and protecting the sounds in these regions. The route of soundmark sounds, which significantly

influences the city's identity, is delineated by the green lines on the road map below. The dark green lines indicate denser occurrences in the specified areas, while the light green lines are less audible in the designated regions. Light lines indicate that the signal and keynote sounds are louder. Thus, by minimizing signal sounds in these areas, we can attain an uninterrupted historical acoustic environment while walking in these zones See Figure 6.



**Figure 6.** Sound Identity Route of Old Erbil City Depending on Soundmarks (edited by the author, 2023).

## 5. Discussion

### 5.1. Acoustic Comfort

Given the central location of the historical district within the city, it serves as one of the city's significant commercial districts. The main street in the Erbil Citadel and its surroundings, located in this historical area, is utilized for tourism purposes, ensuring that the detected sound sources and levels in the area remain at an acceptable level. When the sound sources detected in the area were evaluated, human-induced sounds increased the volume level in the area, and it can be stated that natural sounds remained in the background of human-induced sounds due to the low sound level.

Sound recordings indicated higher noise levels in specific areas, particularly in Qalat Street and Shar Park area compared to Bata Street and Shex Choli Street. This difference is attributed to the historical area's vehicle entrances and exits being on these streets. During the soundwalk and recordings, it was observed that the noise level in the Historical Citadel was lower compared to other regions. The Citadel is closed to vehicle traffic, open to visitors at specific times, and stands higher than its surroundings, allowing it to absorb ambient sounds. In the Qaysari bazaar, sound intensity varied throughout the day, with increased human noise in the afternoon and evening hours. Despite not having a very low sound pressure level, the sound environment, where the call to prayer and traditional music can

be heard, encapsulates elements related to the city's identity. Upon examining the sound measurements, it was found that the sound levels throughout the area averaged below 75 dB. This indicates that the noise in the study area represents a sound environment that can be considered. From a temporal perspective, it was observed that sound levels were higher during weekdays in the area, primarily due to the commercial center's intensive use, especially on weekdays. The Erbil Citadel, situated in the historical area and attracting attention from tourists, is closed to vehicle traffic, resulting in low sound levels in its surroundings. While the World Health Organization (WHO) recommends sound levels below 70 dB as healthy, the field study revealed that some regions exceeded this threshold. This suggests that, over time, these elevated sound levels could potentially pose a risk to human health. Therefore, variations in auditory comfort are evident across different regions within the study area.

### 5.2. Sound Features in Old Cities

Erbil City has hosted many civilizations and cultures. The city is marked by substantial diversity in religion, ethnicity, language, culture, and traditions, all of which collectively contribute to the continual cultivation of an exceptionally lively acoustic environment. The development of the city has also affected the sound environment, which has changed over the years. According to Figures 1 and 2, keynote sounds do not necessarily demand conscious listening. They are more often overheard, yet they cannot be disregarded as they become ingrained listening habits almost involuntarily. Many of these sounds may bear archetypal significance, meaning they are so deeply ingrained in the communities that their absence could be perceived as a noticeable impoverishment. Furthermore, keynote sounds may even influence the behavior or lifestyle of a society [13]. When the sound characteristics of Erbil's old city, as defined by Schafer, were evaluated, the result was that the keynote sounds were heard intensely in the area. In the historical city of Erbil, the soundscape is a tapestry woven with various auditory elements that encapsulate the essence of daily life. Among these, traffic noise forms a constant backdrop, a symphony of honking horns, engine revs, and the shuffle of vehicles navigating the ancient streets. It is an ever-present layer of the city's fabric, echoing through the narrow alleys and bustling squares. The continuous presence of these sounds throughout the day and night might, in some cases, overshadow or dilute the distinct identity and cultural heritage of the historical city of Erbil. They could potentially obscure the essence of Erbil's vibrant life and rich cultural heritage, relegating them to the background. In Deng, Zhiyong, et al.'s study titled "A Case Study on Soundscape Analysis for the Historical and Ethnic Village of Dong Nationality in Zhaoxing County" [37], and Engel & Fiebig's research on "Detection and classification of soundmarks and special features in urban areas" in Aachen, Germany [38], similar patterns surfaced during the opening remarks. Predominant sounds encompassed natural elements: traffic, occupational noise, and car horns. These findings are consistent with the results obtained in the historical city of Erbil. However, in historical areas, efforts are needed to reduce these sounds and implement the necessary measures for us to perceive the old city fabric.

The intensity of signal sounds in the historical area of Erbil shows that the general noise levels are high. The presence of heavy vehicle traffic, car horns, sellers' shouts, and various signals in the area is perceived as disruptive noise. The dense amount of signal sounds allows for the formation of a complex atmosphere in the region, hindering the prominence of natural sounds and soundmarks that influence historical elements. Similarly, visitors and residents alike are losing the area's historical richness, resulting in a less immersive and distinct urban identity. While sound signals are necessary to preserve the identity of the city, they were prominently present in the study areas, causing other main sounds and soundmarks to recede into the background. However, whether they are traditional calls, historical echoes, or specific cultural signals, these significant sounds were not as widespread or pronounced as other ambient sounds in the environment, causing them to be somewhat overshadowed by the more general sounds in the surroundings. In



the historical city of Erbil, horns, sirens, street vendors, and construction sounds served as signal sounds in the region. However, signal sounds can vary between regions due to different cultural practices. For example, in the “Dong Nationality Village in Zhaoxing County”, local residents highlighted the historical significance of drum sounds from drum towers, serving various purposes such as religious ceremonies, social events, traditional music and dance performances, and fire alarms [37]. Meanwhile, church bells can be considered signal sounds in Aachen, Germany [38]. For this reason, these sounds can sometimes serve as soundmarks for those who have just experienced the city.

Every soundscape marked by distinctive tones often qualifies as a soundmark [13]. Soundmarks are reflective of the society in a region and vary across different societies. However, as cities undergo development, maintaining the persistence of soundmark sounds becomes a challenge. In historical Erbil City, the call to prayer (Azan), traditional Kurdish music, speeches in various dialects and languages, and events organized on specific days (such as the Newroz holiday, Prophet Muhammad’s birthday, etc.) can be classified as soundmarks in the region. In the Dong Nationality Village, traditional music and dance performances serve as prominent soundmarks [37]. A study in Aachen, Germany, reported a scarcity of soundmarks in the area, occasionally leading to confusion with other sound signals, such as church bells [38]. As Schafer suggested, sounds are perceived as keynotes by local residents and can evolve into distinctive soundmarks for tourists [13]. However, under the influence of development and modernization in the city, the density of main notes and sound signals increases, and the sound pressure levels of noise types also increase, and the sounds that have a place in the urban identity are losing their existence.

Observing studies on the soundscape in historical areas reveals a common trend in which the characteristics of sounds have typically evolved. Historical areas have tended to become noisier, and soundmarks integral to urban identity have often vanished. In the study titled “Perceived Soundscape of Urban Historical Places: Ankara Hamamönü Example,” it is observed that during conservation efforts, urban identity and historically significant sounds are often overlooked. The focus tends to be on visual aspects during renovation and conservation projects, neglecting the acoustic environments that hold historical importance. The study emphasized that these sounds play an active role in shaping the character, identity, and integrity of places worldwide [1]. In the study titled “The Historical Soundscape Analysis of Fatahillah Square, Jakarta”, in Indonesia, researchers explored the effects of historical changes in the area over time, examining how sound sources have evolved. The study emphasized that there should not be a passive situation where past sounds disappear, and contemporary sounds are minimized in historical areas. Instead, it suggests that while sounds may change over time, proper preservation and planning efforts can ensure that these changes are intentional and well-managed [39].

Some aspects of historical and cultural ambiance can be effectively conveyed, particularly through distinctive soundmarks that contribute to a unique acoustic identity. Therefore, the development of specific sound identity resources and the presentation of the area’s history and culture can facilitate the sustainability of historic areas. This approach can foster connections and cultivate a dynamic, vibrant, enjoyable, and harmonious acoustic environment. In historical districts, the range of sound origins and soundscapes portrayed the dynamism and vibrancy of the locations. Historical regions encapsulate the city’s heritage and culture during a particular era. Positive evaluations of the acoustic environment by visitors to historical tourist sites fostered the cultivation of a sense of connection to the place and also bolstered overall contentment [40].

The sonic milieu of Erbil’s old city is undeniably rich and diverse, encompassing a broad spectrum of sounds beyond those previously mentioned. These specific sound instances, thoughtfully cataloged in archives, not only provide a vivid portrayal of Erbil’s cultural soundscape but also offer valuable insights into the kind of sounds that can be regarded as iconic cultural markers for any urban setting. Consequently, the research findings and recommendations of this study are listed below:



- It cannot be evaluated without taking into account the soundscapes that make up the acoustic city identity of historical urban spaces.
- Many sound sources in our cultural identity, despite the high noise levels, must be protected.
- Preserving these soundmarks by making sound maps in historical areas and transferring them to future studies.
- Architects and urban planners need to take into account the perception of sound in the preservation and renewal of historical areas.

## 6. Conclusions

The predilection for sound identity sources played a role in bolstering place attachment in historical areas. Preserving certain soundmarks in historical areas can enhance place attachment, especially when these sounds are associated with the historical places' history, background, and culture. These sounds contribute to the overall sensory experience, deepen the emotional connection to the place, and play a vital role in preserving the area's cultural and historical significance. The renewal and transformation process in historical places is seen as successful in terms of revitalizing economic and social activities. However, the sounds that have an impact on the urban identity are generally forgotten and the original state of these regions' changes. Civilizations, cultures, and societies shape acoustic urban identity. Historical areas with protection status within urban areas lose their physical and sensory properties partially or entirely. In particular, these losses of the environments, lifestyles, and, thus, cultures that people are very accustomed to in life, entail their disappearance. People live their daily lives in the environment they live in and need sensory references to facilitate. While the sound of a clock bell, heard in daily life, gives information about time, the sound of azan reminds the time of worship. The removal of certain sound sources that individuals rely on in their daily lives can lead to a sense of disorientation in their surroundings. For this reason, a sound that should be one of the pieces of information, that should be obtained from historical places in urban resources, is of enormous significance for the sequel of the place sense of the user's concern.

"Assessing the Soundscape Characteristics" stands as the inaugural research endeavor with the primary objective of systematically gathering and documenting significant elements of the urban identity of Erbil. The recorded sounds were determined by the sound analysis by sound walkings and an established sound archive serves as the cornerstone for the sustained progression of soundscape preservation within a historical city. Recreating the ambiance of the past within historical areas can be realized through the meticulous preservation of existing soundmarks and the faithful reconstruction of past soundscapes. In this way, it contributes significantly to the safeguarding of cities' distinctive identities, ensuring their transmission to succeeding generations. This research takes a unique angle on cultural heritage by focusing on the sonic dimension, emphasizing the importance of sounds as intrinsic components of daily life, and thereby, fundamental to the articulation of urban identity. In rapidly evolving historical cities, the voices that shape urban identity are at risk of being imperiled. This article aimed to protect forgotten sounds in historical areas and to remove unwanted sounds from the region. Vehicle and siren sounds in the Erbil historical area negatively affect the region and precautions must be taken to remove them from the area. However, the loud Kurdish music heard in the region does not disturb the surroundings and is a soundmark that should be protected for the identity of the city. Thus, there is an immediate and preserving need to swiftly conserve soundscapes within the historical city.

One of the most important components that support the soundscape is the sounds that affect the identity of the place. The definition of identity in urban space is important in terms of determining the specifications that make up that identity, and one of these specifications is the sources of sound in the place. Preserving spatial identity, especially in historical areas and as a part of the compatibility of the sources of the sound with the field identity, needs to be emphasized in the subject because the sources of sound in the

historical place sometimes bring out a characteristic compatible with the place's character. Sometimes there are sound sources that do not match the space; sometimes the sounds in the space are in question. While it shows continuity over time, it sometimes changes depending on the change in living conditions shown. Elements that do not coincide with the identity of historical areas' prominence cause the historical features of these areas to remain in the background. For this reason, in this study, especially within the conservation of historical sites, the inventory, and taking into consideration the sensory elements in analysis studies, it was considered essential data. The aim was to emphasize the identification and preservation of these sound sources.

Sounds serve as profound conduits, evoking a deep sense of connection to one's heritage, origins, and treasured memories. This renovation and preservation project has constituted a new Historical Erbil district with areas that look identical but have distinctive functions. This study examined the Historical Erbil Citadel and its surroundings in terms of use. It revealed significant changes over time, with alterations in sound sources that overlapped with the intended use of the environment. The change in the type of use in most of the area, the sound environment, and therefore the area, has caused a change in urban identity. It was expressed negatively in terms of a sound source and level in the historical area, and the only sound that can be heard is the sound of vehicles, which is caused by traffic and is continuous in the background. Natural sounds such as water and animal sounds in the area remained in the background due to the intensity of human voices. Therefore, natural sound resources need to be increased. Within the historical area, it would be appropriate to close the area to traffic or open it to traffic at certain times. For these natural sounds to be felt throughout the historical area, it is necessary to use the sound of other sources and design studies to reduce the sound levels around it that need to be improved. Soundmarks, which will come to the fore by reducing the signal sounds in the area, will help the historical structure of the region to come to the fore again. Thus, with the sound identity route obtained in the study, the areas where soundmarks were concentrated were determined and the sound sources that affect the city identity in these areas will be protected and these sounds will be brought to the fore in future studies. This will allow the continuation of an uninterrupted city identity in the conservation works to be carried out in the region. For this reason, in urban designs, the soundscape sensation of users is of enormous significance in the historical area.

The outcomes of this study showed that the sound character of the historical Erbil region depended on the usage type of the area; the user was shown that it is influenced by noise (such as traffic noise, shop, and vendor sounds) due to the intensity and background usage. In this context, determining the kind of use according to the characteristics of each place, controlling, and determining the sound features, increasing and revealing these soundmark sounds, and necessary planning and design studies should be carried out to reduce signal sounds. Increasing the soundmark sounds of natural origin in such areas will achieve an acoustic environment suitable for the historical city's identity. Therefore, it is important to confirm the specific connections between soundscape assessments and historical place attachment in these contexts as well. The historical place can also investigate alternative approaches to enhance place identity attachment, including aspects related to social dynamics and effective management practices.

This study concluded that a careful understanding of the soundscape is essential in guiding design decisions. When regarded as an initial step for the city of Erbil, this study model is expected to serve as a guiding framework for future endeavors in documenting the sound identity of cities. It is anticipated that this model will provide direction for forthcoming efforts to characterize the auditory essence of urban areas. Hence, it is considered to be an important step in standardizing the selection of study fields and the documentation of acoustic identity with quantitative data.

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