

# Impact of Soundscapes on the Attractiveness of Vernacular Traditional Settlements: Insights from Baghdad, Iraq

**Tiba Basil Dahham & Susan Abed Hassan**

Architectural Department,

Al-Nahrian University, College of engineering

Baghdad, Iraq

[teababasil@gmail.com](mailto:teababasil@gmail.com)

[dr.susanabedhassan@eng.nahrainuniv.edu.iq](mailto:dr.susanabedhassan@eng.nahrainuniv.edu.iq)

## Abstract

Over the past decades, numerous studies have presented several research related to soundscapes of settlements. However, the impact of the soundscape on the attractiveness of vernacular traditional cities has not been adequately addressed. The traditional open spaces in Baghdad are distinguished by their geometrical formation of buildings with a unique architectural character, specific building heights, and the use of local building materials, in addition to the unique social events that define each of them.

This research hypothesizes that there is a possibility of measuring the attractiveness of a soundscape of open spaces of settlements by adopting an indicator. This can be called the Urban Attractiveness Soundscape Index (UASI). It is defined in this research as the proportion between the perceived positive sounds and the perceived negative sounds.

In order to test this indicator and its usefulness, the data were collected from sound environment measurements and a questionnaire-based survey in three traditional open spaces in Baghdad, including soundscape (SSQP) and urban attractiveness scales. The findings revealed that the diversity of perceived positive sounds increased urban attractiveness. The overall soundscape assessment was significantly negatively correlated with urban attractiveness. These findings demonstrate the key role of positively perceived sounds (eventful, calm, and vibrant) in an open space, encouraging the idea of a UASI as a crucial indicator to assess the overall quality of traditional open spaces. The proposed index allows the assessment and categorization of urban soundscapes in traditional open spaces.

**Keywords:** soundscape index, urban attractiveness, traditional open spaces, positive soundscape, negative soundscape.

## Introduction

Soundscape is one of the aspects that can characterize the uniqueness of traditional open spaces. The sound sources of a traditional open spaces are associated to daily, weekly, monthly, or even annual activities. They are recognized as an important factor in developing

the cultural identity of a place through perceiving daily economic and social activities as sound sources that contribute to the final product of a soundscape. There is a theoretical framework for soundscapes in ISO-12913 (BSI (The British Standards Institution), 2014). According to this, the acoustic environment of urban open spaces is significantly influenced by sound sources. Natural sounds, human sounds, mechanical sounds, and other sounds are the most common types (Yu and Kang, 2010). All of the sound sources release various levels of sound due to the variety of sound source types, producing an ambient sound that affects how a soundscape is perceived.

This research on soundscape perception is concerned mostly with the perceived affective quality of soundscapes. It aims to examine the effects of both positive and negative soundscapes on urban attractiveness. In addition, it examines how the UASI index predicts the quality of traditional urban open spaces

## Literature Review

Several studies have been conducted on how people perceive human sounds in cities, and they have revealed that these sounds have either neutral (Nilsson and Berglund, 2006; Yang and Kang, 2005) or positive effects (Szeremeta and Zannin, 2009). In natural environments, the lack of human-related sound increased the perceived tranquility and pleasantness of the soundscape (Axelsson *et al.*, 2010a; Kaplan, 1995; Ulrich *et al.*, 1991). Human sounds have positive effects in some situations. The sound of children enjoying and playing, for instance, will cause an increase in the pleasantness and eventfulness of the sonic environments. (Van Kamp *et al.*, 2016). A study in Baghdad's traditional city showed that the interaction of people and sounds enhances a place's sense of identity in the metropolis. The city's sounds represent social interaction, daily life activity, and unique traits. This study examined the effects of urban soundscape and looked at its elements and attributes. The findings showed that the traditional cities' soundscapes featured indicators that improved people's awareness of soundscapes (Hassan and Taha, 2021).

However, human sounds can also have adverse effects. As an illustration, people's negative emotions can be increased by the sound of children crying (Bernat, 2014). Jo and Jeon has shown that human sounds reduced the perceived peacefulness or calmness of a park while increasing the sense that it is pleasant and vibrant (Young Hong & Yong Jeon, 2020). On the other hand, music may enhance the quality of the sonic environment (Truax, 2016).

Due to the high impact, the acoustic quality in visually attractive areas are better than in visually deficient areas. Axelsson and his colleagues (Axelsson *et al.*, 2010a) have developed and verified the circumplex model (Fig. 1) to examine the sites. It consists of eight different attributes of scale (pleasant, calm, eventful, vibrant, unpleasant, uneventful, unpleasant, monotonous, and chaotic), that demonstrate the overall impressions of a site. Two vertical axes compose the circumplex model: pleasantness and eventfulness. The first two (orthogonal) components organize the soundscape qualities in a circular or 'circumplex' pattern. An attractive soundscape (which represents the positive soundscape) would be both pleasant and eventful in this two-dimensional model. At the same time, a calm soundscape would be both uneventful and pleasant. A chaotic soundscape (indicating the negative soundscape) could be unpleasant and eventful, while a monotonous soundscape would be unpleasant and uneventful. In the two-dimensional space of soundscape perception, a simple pattern has been found between the various sound categories. Extracted soundscapes that were covered by industrial sounds have been unpleasant while those covered by the natural sounds have been found to be pleasant. Indeed, those covered by human sounds have been found to be eventful.

Significantly, such relationships have been maintained even after taking into consideration the overall loudness of the soundscape (Zwicker and Fastl, 1999). This indicates that soundscape informational characteristics, or the types of sounds (technology, natural, and human), significantly influence how a soundscape is perceived. According to Hall *et al.*, individual preferences, history and other cultural and social aspects are also connected to the perceived affective quality of a soundscape (Hall *et al.*, 2013).

Soundscapes typically contain a large variety of sounds that take place equally or sequentially in time. Those sounds may be positive like, natural sounds, or adverse like, busy road traffic sounds. In this context, this study considers chaotic soundscapes as negative soundscapes and pleasant soundscapes as positive soundscapes. Recent studies have begun to focus on the mixture ratio of different sound sources. The green soundscape index (GSI), which is the ratio of the perceived extent of natural sound to the perceived extent of traffic noise, was developed by Kogan et al. (2018) after they conducted an experimental investigation into this issue. Through the Swedish Soundscape-Quality Protocol (SSQP) and GSI, they examined the correlation between the overall soundscape assessment (OSA) and the qualitative soundscape quality. The results demonstrate that a higher GSI corresponds to an overall soundscape assessment (OSA) (Kogan *et al.*, 2018). In a study of the effects of a human sound-based index on the soundscapes of urban open spaces, the main emphasis of the research was the proportion of natural sounds, human sounds, and traffic sounds in the acoustic environment. Designers are recommended to alter the RSI (red soundscape index) to control the SPL (Yang *et al.*, 2022).

Urban open spaces consist of two main components. First, there are the physical components (walls, floors, ceilings, plants, blue and green spaces, and furniture). Second, there are human activities (Şatir and Korkmaz, 2005). Previous studies on soundscapes perceptions have revealed that people's motivations for activities vary according to their geographic locations, which might further influence how they perceive sound there (Bild et al., 2016; Herranz-Pascual et al., 2010; Steffens et al., 2017; Carmona, 2015; Woolley, 2003).

Gehl has divided outdoor activities into three categories:

1. Necessary activities.
2. Optional activities.
3. Social activities.

These activities have an impact on the users' perceptions of places because when individuals decided to linger in places rather than rush through them, the areas appear relatively liveable (Woolley, 2003). The activity-related contexts take into account both individual attributes as well as activity level attributes, such as activity time, location, type, and companion. The locations of daily activities, including the home, workplace, and other places are taken into account while assessing activity locations (Ellegård, 1999; Kwan, 1999). Furthermore, activities are essential components of a site due to having something to do, and gives users a reason to visit. Bild et al. (Bild *et al.*, 2018) discovered that lone users in urban parks are more susceptible to being affected by loud noises than their socially active counterparts. Boumezoued, Bada, and Bougdah (Boumezoued *et al.*, 2020) presume that engaging all five senses in an urban area has a positive impact on users. Church and Marston (2003) claim that when given a choice, service users don't necessarily select the closest accessible activity. The attractiveness of the activity area, distance, size, and means of transportation available will all influence the decision.

Urban attractiveness, according to planning and tourism studies is a location's capacity to satisfy users' requirements and goals as well as the elements that affect their decision-making (Ariya *et al.*, 2017; Vengesai *et al.*, 2009). These aspects of space quality, which should be generically planned to accommodate all users include amenities, services, and facilities. This represents what Litman (2007) called "the opportunities in a place", which constitute a driving force in the attractiveness of places.

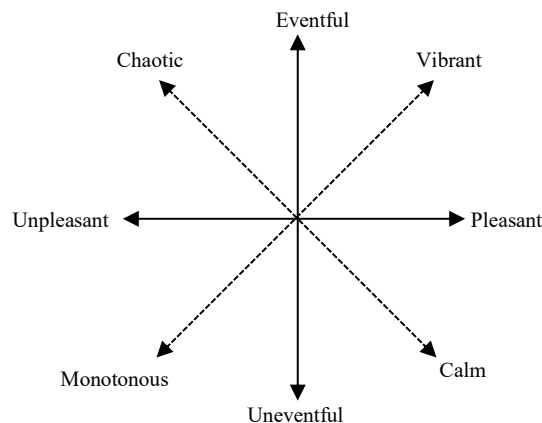
Gehl has argued in his explanation of the influence of physical environment elements on the attractiveness of open spaces that elements such as size, shape, the physical locations of elements, as well as their detailed design, are critical in establishing the quality of public spaces, and consequently the types of human activities that can take place in them (Carmona, 2015).

As a result, the urban environment's quality is essential to achieving its attractiveness. It is obvious from the previous studies, that urban attractiveness is a characteristic of open spaces, flexible, and high-quality areas. It is related to human perception and behavior. According to research on urban planning, attractive public open spaces are essential for

promoting a sense of safety and enjoyable experiences in public life, where a common experience is shared by strangers (Childs, 2006; Cooper Marcus and Francis, 1998; Whyte, 1980). According to Anderson *et al.*, (2017), promoting psychological health and social life in contemporary communities could contribute to promoting high-quality urban spaces. Parallel to this, Pacheco (2017) outlined how the health of public places affects public appeal in her article, "Ten principles for connecting people and streets." that the vibrancy of public places is a key factor in urban attractions.

Based on these concepts, the main assumption of this study is that the assessment of perceived sound that are dominant primarily determines the soundscape quality of traditional open spaces. Positive sounds, as an example of natural sounds and negative sounds, like traffic noise, have been examined in soundscape research quite frequently.

The mixture ratio of various sound sources has become the subject of recent research. The entity of soundscape contains multiple variables such as the Extra-Acoustic Environment, the Acoustic Environment and the experienced environment (Kogan *et al.*, 2017). The last variable represents the physical environment. Since urban attractiveness is considered as the opportunity in the open spaces (physical environment) and an indicator of its quality, the urban attractiveness soundscape index is defined here as the ratio of the perceived extent of positive sounds (PPS) to the perceived extent of negative sounds (PNeS).



**Fig. 1:** The two-dimensional space of soundscape perception (Axelsson's circumplex model).

Source: author

## Research Methodology

This study employs the urban attractiveness through soundscape index to measure the quality of the soundscape in three traditional urban open spaces in Baghdad by evaluating these spaces and advises adjusting or improving the soundscape, in addition to connecting to the cultural and historical features of the regions through the recovery of sound memory for the space.

The urban attractiveness through soundscape index (UASI)

The Urban Attractiveness Soundscape Index (UASI) is defined as the ratio of the perceived extent of positive sounds (PPS) to the perceived extent of negative sounds (PNeS). Considering that in urban open spaces, human activities and sounds frequently play a dominant, leading, and dynamic role.

To ascertain the UASI, a questionnaire survey was conducted. Through it, specific questions such as "How often do you presently hear the following types of sounds? Were asked. The respondents were offered one option for each type of response. Answers were provided for each question about human sounds, traffic noise, and other sound sources. The second question inquired, "for each of the eight scales below, to what extent do you agree or disagree that the present surrounding sound environment is". It offered the respondents one option for each response on the scale, which runs from strongly agree to strongly disagree.

The type of sources that each respondent was asked to hear and evaluate were: traffic sounds (cars, motorcycles, buses), other noises (construction, industry, machinery, engines),

human sounds (talks, steps, music, children's playfulness), and natural sounds (animals, wind, water). They were based on the Swedish Soundscape-Quality Protocol (SSQP) (Axelsson *et al.*, 2009)(Axelsson *et al.*, 2010b).

Answers for PPS and PNeS were averaged at each measurement to obtain a mean perceived extent of positive sounds (PPS) and a mean perceived extent of negative sounds (PNeS ). Then the UASI was calculated as follows:

$$UASI = \frac{PPS}{PNeS}$$

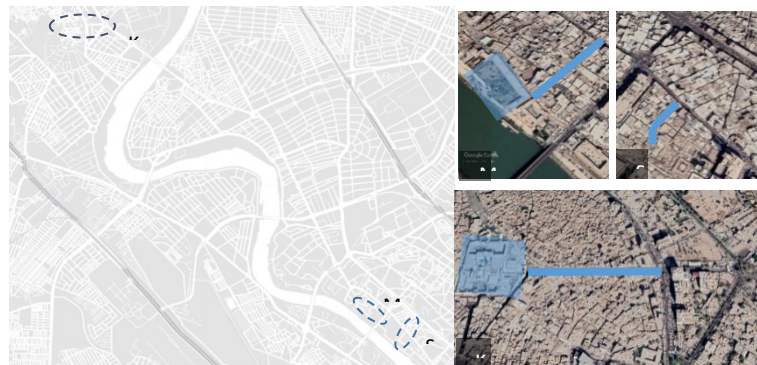
### Survey Sites

In this study, survey sites included three traditional urban spaces, in Baghdad. According to the dominant sound sources at the survey sites, two categories were created: 1. Human sounds and 2. other sounds. Fig. 2 shows information about the following open spaces: (1) Al-Al-Safafir Market Market, (2) Al-Mutanabbi Street and al qishla square, (3) Al-Murad Street.

Al-Al-Safafir Market, or Al-Saffarin is a market named after copper metal, as this market is famous for making dishes, household utensils, teapots, cups, spoons, picture frames, and copper lanterns and engraving on them. The Al-Safafir Market is located in Baghdad, and it is a group of shops scattered in the narrow alleys located in the Bab Al-Agha area, close to Al-Shorja on Al-Rashid Street, opposite the Marjan Mosque building, which is part of the traditional urban fabric of the Baghdad city. Copper crafts and tools are sold in it. However, out of the 200 shops and craftsmen, only a few shops and craftsmen remained in the market, with production capacities.

Al-Mutanabbi Street is located in the center of the Iraqi capital, Baghdad, near the Al-Midan area and Al-Rashid Street. Al-Mutanabbi Street is considered the cultural market for the people of Baghdad, where the trade in books of all kinds and fields flourishes, and it is usually active on Fridays. In addition to some old Baghdadi buildings, including the civil courts in the past, which is now called the Qishla building and it is considered as a Cultural Center, the courtyard of the Cultural Center is distinguished by the gathering of artists and intellectuals every Friday. The street is currently a market selling old and modern books and magazines.

Al-Kadhimiya is one of the ancient regions of Baghdad on the side of Karkh. It was named after the presence of the shrine of Imam Musa Al-Kadhim. It is located North of the capital, Baghdad, 5 km on the western side of it, and on the western bank of the Tigris River, next to Al-Karkh. The courtyard of Bab Al-Murad is in the eastern part of the shrine. Al-Murad Street is located to the eastern side of the Al-Kazemi shrine, and it is a lively and crowded commercial street, in which one of the three gates of the Al-Kazemi shrine is the Al-Murad Gate.



**Fig. 2:** Satellite images of the survey sites, k represents Al-Kadhimiya(Al-Murad Street), M represents Al-Mutanabbi Street, and S represents Al-Al-Safafir Market Market

Source: author

### Questionnaire Survey

In this study, three typical urban open spaces in Baghdad, Iraq, were investigated. The subjective evaluations were obtained through questionnaire surveys. The visitors were



randomly selected to participate in surveys to know more about how they perceived different sound sources and how they perceived the acoustic environment. A total of 60 valid questionnaires were collected. The questionnaire was designed based on the principles of ISO/TS 12913–2:2018 (ISO, 2018). See table 1.

**Table 1:** The summary of the questionnaire survey  
Source: Author

Parts	Questions	Response Type	Scales
Part1:A. sound source identification	To what extent do you presently hear the four following types of sounds ?	<ul style="list-style-type: none"> <li>• Traffic noise</li> <li>• Other noise</li> <li>• Natural sounds</li> <li>• Human sounds</li> </ul>	Not at all ( 1 ) A little ( 2 ) Moderately ( 3 ) A lot ( 4 ) Dominates completely ( 5 )
Part 1:B. perceived affected quality	For each of the 8 scales below , to what extent do you agree or disagree that the present surrounding sound environment is	<ul style="list-style-type: none"> <li>•Pleasant</li> <li>•Chaotic</li> <li>•Vibrant</li> <li>•uneventful</li> <li>•Annoying .</li> <li>•Eventful</li> <li>•Monotonous</li> <li>•calm</li> </ul>	Strongly agree ( 1 ) Agree ( 2 ) Neither agree, nor disagree ( 3 ) Disagree ( 4 ) Strongly disagree ( 5 )
Part 1: C.Overall soundscape assessment	How loud is it here ? How unpleasant is here ? How appropriate is the sound to the surrounding ? How often would you like to visit this place again ?		Not at all ( 1 ) Slightly ( 2 ) Moderately ( 3 ) Very ( 4 ) Extremely ( 5 )

The Swedish Soundscape-Quality Protocol SSQP is a widely used tool to describe soundscapes. The sound pressure level (SPL) was measured consistently with the questionnaire survey.

Next, the relationship between the UASI and the qualitative soundscape quality was explored. In the second part of the questionnaire, the respondents were asked about their qualitative soundscape quality in the local acoustic environment. Visitors' behavioral intentions are often described by their willingness and ability to travel to the same place. This study used Lam, and Hsu's interpretation of travel intention, which said, "in general, I intend / hope / may visit here again to experience the soundscape here" (Lam and Hsu, 2006). In addition, the stay condition (proportion of people remaining in the open space) includes:

1. Passers (people who pass through the open space)
2. Stoppers (people who stay and do activities).

Furthermore, the activity types comprise of 1. stopping, 2.stopping by, 3. walking, 4. meeting someone, 5. attending an event.

## Data Processing

At the survey sites, a Spearman correlation analysis was done on the relationship between urban attractiveness and the UASI. The UASI can categorize the urban environment, according to the findings of the correlations between the UASI and the OSA. The four qualitative soundscape quality aspects of various urban environment types and the OSA were examined. Different metropolitan contexts perceived the qualitative soundscape quality. The overall soundscape quality was discussed.

## Results and the Discussion

The data analysis of the questionnaires was carried out through a descriptive statistical analysis of the sound source identification of the sites; in addition, SPSS software was used to calculate the relationship between the overall perceived affective quality (OPQ) and urban attractiveness. The positive and negative soundscape's role in enhancing urban attractiveness was explained. Moreover, the relationship between the UASI and overall soundscape assessment (OSA) was explored.

### Sound source identification

Table 2 presents the results from the participant questionnaire response analysis of sound source identification of the three sites. In a traditional open space with great people inflow, human sounds from the visitors are the most frequently perceived sound sources. The overall response to the sound source identification indicates that the human sound was strongly dominant at the Al-Mutanabbi Street and that includes vendor shooting, talking and footsteps, as well as children playing and other sounds such as pulling carts. You can also hear some music sounds and motorcycles noise. While in al Kadhmya (Almurad street), in which human sounds (talking, footsteps, street vendor, calling for prayer, and children playing) are dominant and some other noise like pulling carts exist. Meanwhile, other sounds (construction, industry, loading of goods, engines, copper banging, and pulling carts) are dominant at the Al-Safafir Market, in addition to human sounds (talks and foot steps). Furthermore, sounds of Nature are limited at all sites.

This indicates that the sound source identification assessment was positive. It is important to notice that, sound sources assessment depends on its location. For instance, previous study by Jeon and Hong has shown that human sounds in urban parks have a significant influence on the eventfulness of soundscapes (Jeon and Hong, 2015). Young Hong and Yong Jeon have also showed that human sounds increased the pleasantness and eventfulness in commercial streets (Young Hong and Yong Jeon, 2020). Thus, the sound sources assessment is related to its context.

In our three sites, the sound sources vary from religious sounds as alathan (call to prayer) in Al Kadhmyia, economic as in the metal workshops in Al Sifafir. Finally, social context as kids playing, people's crowd voices, and calls of vendors exist in Al Mutanabi. Playing music goes with the cultural context. Adding new sound sources will enhance the spirit of the place and give a positive impact on the urban attractiveness of the space. Thus, the new sound sources are either new or supporting the existing trend of activities. Sounds that reflect the history and culture of the area, such as, in this context, sounds from folk activities and handcraft production. In order to keep the soundscape pleasant in traditional open spaces, the perception of human sound should be well controlled. Major mechanical sounds like traffic and building in conventional open spaces revealed a substantial negative correlation with the pleasantness of the soundscape.

**Table 2:** sound source identification in the three sites

**Source:** Author

Descriptive Statistics	Al Sifafier			Al Mutanabbi Street		Al Kadhmya	
	N	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Traffic noise (eg, cars, buses, trains, airplanes )	20	1.70	0.979	1.35	0.587	1.90	0.788
Other noise ( eg. irens, construction, industry, loading of goods )	20	3.75	0.910	1.85	1.182	2.25	0.716
Sounds from human beings (eg , conversation, laughter, children at play , footsteps )	20	3.75	0.786	4.00	0.795	3.75	1.164
Natural sounds (eg . singing birds, flowing water , wind in vegetation )	20	1.15	0.366	2.05	0.945	1.50	0.688
Valid N (listwise)	20						

### Positive and negative soundscape

The positive soundscape was calculated as the mean perceived extent of the pleasant, vibrant, eventful, and calm perceived affective quality. Meanwhile, the negative soundscape was calculated as the mean perceived extent of the chaotic, uneventful, annoying, and monotonous perceived affective quality.

The positive and negative soundscape assessment was examined (see Table 3). The three sites present measurements on both positive and negative perceptual models. In Al Sifafier, Al Mutanabbi Street, and Al Kadhmya sites, there was a significant positive correlation between the urban attractiveness indicators and the positive soundscape. Concerning negative soundscape, there was a significant negative correlation between the negative soundscape and the urban attractiveness at the Al-Mutanabbi Street site. Hence, the positive soundscape assessment in all sites was due to the attributes eventful, vibrant and pleasant perceived affected quality.

The negative soundscape assessment in the Al Mutanabi Street was because of the chaotic and monotonous attributes perceived affected quality for some of the respondents. There are many human-related activities in these three regions, some of which are children playing, reciting poetry and rhetoric at Al Mutanabi and Al Qishla sites. In addition, some activities arose from the metal workshops at Al Sifafier site. The other was calling for prayer or reading al Quran as at Al Kadhmya site.

It is interesting that all these events were the reason and the motivation to attract people to these spaces and their preference to stay in them for a longer period. Furthermore, an important aspect of the purpose of urban open spaces is furniture. Its purpose is to complete the urban identity with visual and semantic harmony. Moreover, it is a major component of urban open spaces. The multi-events that occurred in Al Qishal (Al Mutanabi ) and their location was not distributed well, as some activities overlapped with each other, and some were far from the sitting area; hence the attributes of the soundscape were chaotic and monotonous for some of the respondents. This indicates the impact of the positive and negative soundscape assessments on the urban attractiveness of urban open spaces and their relationship since urban attractiveness tends to increase with the increase of positive soundscapes.

**Table 3:** The correlation between positive \negative soundscape and urban attractiveness

Source: Author



sites	Al Sifafier		Al Mutanabi		Al Kadhmia	
n	20		20		20	
	positive	negative	positive	negative	positive	negative
Correlation Coefficient	.648**	0.024	.527*	.695**	0.532*	-0.167
Sig. (2-tailed)	0.002	0.921	0.017	0.001	0.016	0.482

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed). N is the number of participants.

### Overall soundscape assessment (OSA)

In relation to the experienced environment, the overall soundscape assessment (OSA) correlation was significantly negative with the urban attractiveness indicators and UASI in the three sites, as shown in the Table 4 & table 5

The OSA decreases with the increase of human sound identification as in the previous studies (Kogan *et al.*, 2018; Yang *et al.*, 2022). The higher the proportion of human sounds, the lower was the OSA of the sound environment by the participant. Therefore, in order to improve the overall quality of the urban sound environment, the perception of natural sounds must be increased as far as possible. Since the OSA increased with increasing natural sound (Yang *et al.*, 2022). Therefore, highly perceived loudness of human sounds, such as background speech, children playing and singing, even via broadcasting, may all contribute to an unpleasant soundscape. Along with other visitors' levels of tolerance, the choice for handcrafting sounds can also add to a pleasant soundscape. The perception of multiple sound sources may help to reduce monotonous soundscape perceptions.

Children who are frequently seen playing could add to a variety of soundscapes. Preference for traditional sounds may also contribute to different soundscapes, and comparable effects may be present in live music. Adjusting the physical elements of the open spaces such as, adding plants and green spaces may contribute in increasing both the urban open space quality (attractiveness) and the overall soundscape assessment.

**Table 4:** The correlation between urban attractiveness indicator and OSA

Source: Author

sites	Al Sifafier	Al Mutanabi	Al Kadhmia
n	20	20	20
Correlation Coefficient	-.576**	-.614**	-.566**
Sig. (2-tailed)	.008	.004	.009

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed). N is the number of participants.

**Table 5:** The correlation between OSA and UASI

Source: Author

sites	Al Sifafier	Al Mutanabi	Al Kadhmia
n	20	20	20
Correlation Coefficient	-.594**	-.556*	-.553*
Sig. (2-tailed)	0.006	0.011	0.011

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed). N is the number of participants.

## Conclusion

The traditional open spaces are essential. And sound is a very important component of the identity of a place. Although many studies have confirmed the impact of positive and

negative soundscapes, and perceived affective quality of the urban open spaces, only few studies exist. This study aimed to present an index that helps to assess the urban attractiveness from a sound point of view, and this could serve as one of the foundations for urban design. The result emphasizes on the role of sound sources and human activities in the overall environmental assessment. Furthermore, this study emphasizes on the influence of the physical component of the open spaces, such as the furniture, the green spaces on the perceived soundscape, and the attractiveness of these spaces. The (UASI) is an indicator that measures the quality of the soundscape in urban spaces by evaluating these spaces and suggests modifying or improving the soundscape so that this space is attractive to people. This could improve life in cities and enhance the social and psychological aspects in addition to linking to the cultural and historical aspects of the regions through the retrieval of sound memory of a space.

## Acknowledgments

The authors would like to thank Zinah Al-bayyar for her time and advice throughout this work.

## References

- Anderson, J., Ruggeri, K., Steemers, K. and Huppert, F. (2017) “Lively social space, well-being activity, and urban design: findings from a low-cost community-led public space intervention”, *Environment and Behavior*, SAGE Publications Sage CA: Los Angeles, CA, Vol. 49 No. 6, pp. 685–716.
- Ariya, G., Wishitemi, B. and Sitati, N. (2017) “Tourism destination attractiveness as perceived by tourists visiting Lake Nakuru National Park, Kenya”, Semantics scholar.
- Axelsson, Ö., Nilsson, M.E. and Berglund, B. (2009) “A Swedish instrument for measuring soundscape quality”, *Euronoise 2009*, Institute of Acoustics.
- Axelsson, Ö., Nilsson, M.E. and Berglund, B. (2010a) “A principal components model of soundscape perception”, *The Journal of the Acoustical Society of America*, Acoustical Society of America, Vol. 128 No. 5, pp. 2836–2846.
- Axelsson, Ö., Nilsson, M.E. and Berglund, B. (2010b) “A principal components model of soundscape perception”, *The Journal of the Acoustical Society of America*, Vol. 128 No. 5, pp. 2836–2846, doi: 10.1121/1.3493436.
- Bernat, S. (2014) “Soundscapes and tourism—towards sustainable tourism”, *Problemy Ekorożwoju—Problems of Sustainable Development*, Vol. 9 No. 1, pp. 107–117.
- Bild, E., Coler, M., Pfeffer, K. and Bertolini, L. (2016) “Considering sound in planning and designing public spaces: A review of theory and applications and a proposed framework for integrating research and practice”, *Journal of Planning Literature*, SAGE Publications Sage CA: Los Angeles, CA, Vol. 31 No. 4, pp. 419–434.
- Bild, E., Pfeffer, K., Coler, M., Rubin, O. and Bertolini, L. (2018) “Public space users’ soundscape evaluations in relation to their activities. An Amsterdam-based study”, *Frontiers in Psychology*, Frontiers Media SA, Vol. 9, p. 1593.
- Boumezoued, S., Bada, Y. and Bougdah, H. (2020) “Pedestrian itinerary choice: between multi-sensory, affective and syntactic aspects of the street pattern in the historic quarter of Bejaia, Algeria”, *International Review for Spatial Planning and Sustainable Development*, International Community of Spatial Planning and Sustainable Development, Vol. 8 No. 4, pp. 91–108.
- BSI (The British Standards Institution). (2014) “BSI Standards Publication Acoustics — Soundscape Part 1 : Definition and conceptual framework”, *BSI Standards Publication*.
- Carmona, M. (2015) “Re-theorising contemporary public space: a new narrative and a new normative”, *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, Taylor & Francis, Vol. 8 No. 4, pp. 373–405.
- Childs, M.C. (2006) *Squares: A Public Place Design Guide for Urbanists*, UNM Press.
- Church, R. L. & Marston, J. R. (2003) “Measuring accessibility for people with a disability”, *Geographical Analysis*, Wiley Online Library, Vol. 35 No. 1, pp. 83–96.
- Cooper Marcus, C. and Francis, C. (1998) “People places: Design guidelines for urban open

- space”, *New York, NY: John Wiley & Sons*.
- Ellegård, K. (1999) “A time-geographical approach to the study of everyday life of individuals—a challenge of complexity”, *GeoJournal*, JSTOR, Vol. 48 No. 3, pp. 167–175.
- Hall, D.A., Irwin, A., Edmondson-Jones, M., Phillips, S. & Poxon, J.E.W. (2013) “An exploratory evaluation of perceptual, psychoacoustic and acoustical properties of urban soundscapes”, *Applied Acoustics*, Elsevier, Vol. 74 No. 2, pp. 248–254.
- Hassan, S.A. & Taha, H.S. (2021) “The role of the urban soundscape in identification of Baghdad traditional city”, *IOP Conference Series: Materials Science and Engineering*, Vol. 1105 No. 1, p. 012113, doi: 10.1088/1757-899x/1105/1/012113.
- Herranz-Pascual, K., Aspuru, I. & García, I. (2010) “Proposed conceptual model of environmental experience as framework to study the soundscape”, *InterNoise, Lisbon*.
- Jeon, J.Y. and Hong, J.Y. (2015) “Classification of urban park soundscapes through perceptions of the acoustical environments”, *Landscape and Urban Planning*, Elsevier B.V., Vol. 141, pp. 100–111, doi: 10.1016/j.landurbplan.2015.05.005.
- Van Kamp, I., Klaeboe, R., Kruize, H., Brown, A.L. & Lercher, P. (2016) “Soundscapes, human restoration and quality of life”, *INTER-NOISE and NOISE-CON Congress and Conference Proceedings*, Vol. 253, Institute of Noise Control Engineering, pp. 1205–1215.
- Kaplan, S. (1995) “The restorative benefits of nature: Toward an integrative framework”, *Journal of Environmental Psychology*, Elsevier, Vol. 15 No. 3, pp. 169–182.
- Kogan, P., Arenas, J.P., Bermejo, F., Hinalaf, M. & Turra, B. (2018) “A Green Soundscape Index (GSI): The potential of assessing the perceived balance between natural sound and traffic noise”, *Science of the Total Environment*, Elsevier B.V., Vol. 642, pp. 463–472, doi: 10.1016/j.scitotenv.2018.06.023.
- Kogan, P., Turra, B., Arenas, J. P. & Hinalaf, M. (2017) “A comprehensive methodology for the multidimensional and synchronic data collecting in soundscape”, *Science of the Total Environment*, Elsevier B.V., Vol. 580, pp. 1068–1077, doi: 10.1016/j.scitotenv.2016.12.061.
- Kwan, M. (1999) “Gender and individual access to urban opportunities: a study using space–time measures”, *The Professional Geographer*, Wiley Online Library, Vol. 51 No. 2, pp. 210–227.
- Lam, T. & Hsu, C.H.C. (2006) “Predicting behavioral intention of choosing a travel destination”, *Tourism Management*, Elsevier, Vol. 27 No. 4, pp. 589–599.
- Nilsson, M.E. & Berglund, B. (2006) “Soundscape quality in suburban green areas and city parks”, *Acta Acustica United with Acustica*, S. Hirzel Verlag, Vol. 92 No. 6, pp. 903–911.
- Şatir, S. & Korkmaz, E. (2005), “Urban open spaces with examples & the classification of urban furniture”, *A|Z ITU Journal of the Faculty of Architecture*, Vol. 2 No. 1–2, pp. 130–141.
- Steffens, N.K., Haslam, S.A., Schuh, S.C., Jetten, J. & van Dick, R. (2017) “A meta-analytic review of social identification and health in organizational contexts”, *Personality and Social Psychology Review*, Sage Publications Sage CA: Los Angeles, CA, Vol. 21 No. 4, pp. 303–335.
- Szeremeta, B. & Zannin, P.H.T. (2009) “Analysis and evaluation of soundscapes in public parks through interviews and measurement of noise”, *Science of the Total Environment*, Elsevier, Vol. 407 No. 24, pp. 6143–6149.
- Truax, B. (2016) “Environmental sound and its relation to human emotion”, *Canadian Acoustics*, Vol. 44 No. 3.
- Ulrich, R.S., Simons, R.F., Losito, B.D., Fiorito, E., Miles, M.A. and Zelson, M. (1991) “Stress recovery during exposure to natural and urban environments”, *Journal of Environmental Psychology*, Elsevier, Vol. 11 No. 3, pp. 201–230.
- Vengesai, S., Mavondo, F.T. & Reisinger, Y. (2009) “Tourism destination attractiveness: Attractions, facilities, and people as predictors”, *Tourism Analysis*, Cognizant Communication Corporation, Vol. 14 No. 5, pp. 621–636.
- Whyte, W.H. (1980) “The social life of small urban spaces”, Conservation Foundation Washington, DC.
- Woolley, H. (2003) *Urban Open Spaces*, *Urban Open Spaces*, doi: 10.4324/9780203402146.

- Yang, D., Cao, X. & Meng, Q. (2022), “Effects of a human sound-based index on the soundscapes of urban open spaces”, *Science of the Total Environment*, Elsevier B.V., Vol. 802 No. 66, p. 149869, doi: 10.1016/j.scitotenv.2021.149869.
- Yang, W. & Kang, J. (2005) “Soundscape and sound preferences in urban squares: a case study in Sheffield”, *Journal of Urban Design*, Taylor & Francis, Vol. 10 No. 1, pp. 61–80.
- Young Hong, J. & Yong Jeon, J. (2020) “Comparing associations among sound sources, human behaviors, and soundscapes on central business and commercial streets in Seoul, Korea”, *Building and Environment*, Vol. 186 No. December, doi: 10.1016/j.buildenv.2020.107327.
- Yu, L. & Kang, J. (2010) “Factors influencing the sound preference in urban open spaces”, *Applied Acoustics*, Elsevier Ltd, Vol. 71 No. 7, pp. 622–633, doi: 10.1016/j.apacoust.2010.02.005.
- Zwicker, E. & Fastl, H. (1999) “Psychoacoustics Facts and Models Springer Heiderberg”, *Technische Universität München. München: Germany.*