Measuring the Soundscape Quality in Urban Spaces

Subjects: Architecture And Design

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The goals of a good soundscape are to create a sense of place, provide comfort to the users, and encourage intractability in a public space. At the same time, many public areas in cities are having problems due to the weakness in creating the opportunity for people to attend.

Keywords: soundscape ; sonic environment ; public open space ; historic urban area

1. Introduction

The ever-increasing pace of urban life and rapid developments in urban population growth trends, along with poor urban planning and management, have led to the rise in formidable challenges to the public health of the urban public, especially in developing countries [1][2][3][4]. Still, changes on a global scale are more rapid and alarming, with significant impacts on human health during the past century [5]. This process continues in the present century so it is predicted that by 2050 almost 68% of the world's population will live in cities [6]. With continued growth and redevelopment within cities, urban planners are now responsible for designing cities that enhance the quality of the sonic environment [7][8][9].

The sonic environment, including acoustic ecology and diversity, has been neglected in urban design and planning [10][11][12]. The qualitative aspects of sound are considered critical factors for healthy cities [13][14]. Many reports have stated that due to rapid urbanization and industrialization, noise pollution has been gradually growing and adversely affects mental and physiological health [15][16][17]. Traffic and transport noise pollution in particular is a big environmental problem in cities that is not limited to a city; it is considered a larger problem affecting city lifestyle in modern environments [18][19][20].

High noise levels are harmful to people's activities which need concentration. The International Organization for Standardization (ISO) defines noise as any acoustic phenomenon which is perceived as annoying and disturbing. The World Health Organization (WHO) has a standard of 70, 50, and 35 decibels (dB) for residential areas and hospital rooms in the daytime [21]. Meanwhile, the range of 60 to 91 dB has been recorded in the studied area in District 12 of Tehran, 15 Khordad Street. The growth in population, the increase in motor vehicles, production workshops, and commercial land uses are among the factors that cause unpleasant sounds and noise pollution in this area.

2. Sonic Environment and Urban Soundscape

Soundscapes are defined as "any acoustic field of study" including the acoustic elements of the actual environments or more abstract environments such as musical compositions [22]-p7. Several studies assessed environmental noise as a potential health concern that detracts from human well-being and other values [23][24]. Some organizations such as the World Health Organization [13] and European Environment Agency [25] have warned about the effects of noise, such as hearing loss and metabolic effects. Other studies identified evidence of links between the quality of the sonic environment and sleep disturbance, heart disease, and biological mechanisms related to cardiovascular, mental illness, hypertension, and health in vulnerable groups [14][26]. There is some strong evidence that human health and well-being are impaired when exposed to degraded soundscapes [21][27]. It is important to note that most studies have been on the effects of noise, but not focused on people's attendance in a POS and raising issues of rights to access a healthy acoustic environment.

A sonic environment is based on a mixture of diverse sounds such as anthrophony, biophony, and geophony [28]. Anthrophony or human-generated sounds include motorized transportation, such as sounds from industrial and domestic machines, air travel and road noise due to friction, the sounding of bells, sirens, alarms, and human voices. Sometimes, these sounds are subjectively deemed noise by a listener [29]. Biophony includes the sounds produced by non-human living organisms such as insects, amphibians, frogs, birds, and other animals [30][31][32] and geophony is related to weather changes and climatic conditions such as waves, earthquakes, lightning, rain, and wind [33]. The phonic identity is

considered a significant part of urban areas [11] that depends on the characteristics of the sonic environment furnishing, material, space, and shape. Therefore, sounds are an essential part of cities to create a sense of place [34][35].

3. Social Interaction and People Attendance in POS

In urban studies, the presence of people, walking, and the livability of a POS bring life to the streets, so lively streets contribute to the growth in public life and a safer urban environment [36]. There are three distinct groups of human activities in public spaces including social, optional, and necessary, and two types of activity (socially interactive and solitary) that are important to the quality of the city [37]. The successful urban space may promote many social activities, and favorite options could increase opportunities to participate in communal activity, so people spend more time in the space [38]. As these experiences are repeated, POSs become vessels to carry positive communal meanings.

Neighborhood attendance promotes walking and is considered a key concept for sustainable urban development, regardless of the inhabitants' demographic variables such as age group and gender [39][40].

A growing body of literature has been found on the association study of particular variables with attendance in urban spaces. Some research illustrates the positive effects of green spaces and the naturalness of the built environment on the satisfaction of stakeholders in urban spaces. In the natural areas of cities, plazas, markets, parks, and waterfronts, people from different cultural groups can come together in a supportive context of mutual enjoyment [41][42]. Other researchers have stated that these criteria are related to urban space attendance and POS pleasantness along with built environments, social conditions, and individual reactions: calmness and convenience, social presence, spending leisure time, the number of people present in a POS for desirable activity, interactions and social relations, and social convergence or divergence are among the activities that encourage attendance and create identity [43][44][45].

4. People Attendance Based on the Sonic Environment

Landscape effects including functional and aesthetic aspects have been revealed to be in close relationship with the soundscape experience [46]. The integration of aesthetic and sociological aspects of the sonic environment is a main aim of the urban soundscape concept [11]. There is also a lack of studies examining the behavioral responses to soundscapes in a specific environment, such as urban commercial zones (Bazar). The sonic environment affects the pleasantness of a public space even when the participants in the experiment focused on visual designs and were kept unaware of the sound [47]. The other key objectives of the urban soundscape concept are those such as familiarity with what is heard, level of social interaction, and frequency of use of the public space [37]. The physical characteristics of the auditory landscape can vary strongly from aspects of behavioral patterns and perception, and it needs frequent testing to substantiate the relationship between specific soundscape features [48].

The main objective includes providing the listener with a sense of place that plays an important inspiration role and needs paying attention to the component of the sonic environment such as attractive and repulsive sounds, sound path orientation, dominant ambient sound, rich, and saturated feelings based on the sonic environment. Controlling noise and decreasing the feeling of confusion in the space are the other objectives [49][50][51][52]. Additionally, how humans perceive environmental quality based on soundscapes raises important resource considerations [29].

Sonic environments have a relationship with the attendance level [28]. Calleri et al. [53] found that the soundscape affects the perceived social presence. Noise effects that represent intrusions into the desired recreation experiences of people have a negative impact on the degree to which user enjoyment is achieved.

Figure 1 shows the indicators and variables affecting the quality of the sonic environment. Considering the above, this study mainly focuses on studying a practical unanswered problem such as understanding the association between the soundscape and people attendance in a POS. Therefore, the soundscape approach, which considers environmental sound as a resource, can be most effective when applied in the urban planning and design process.

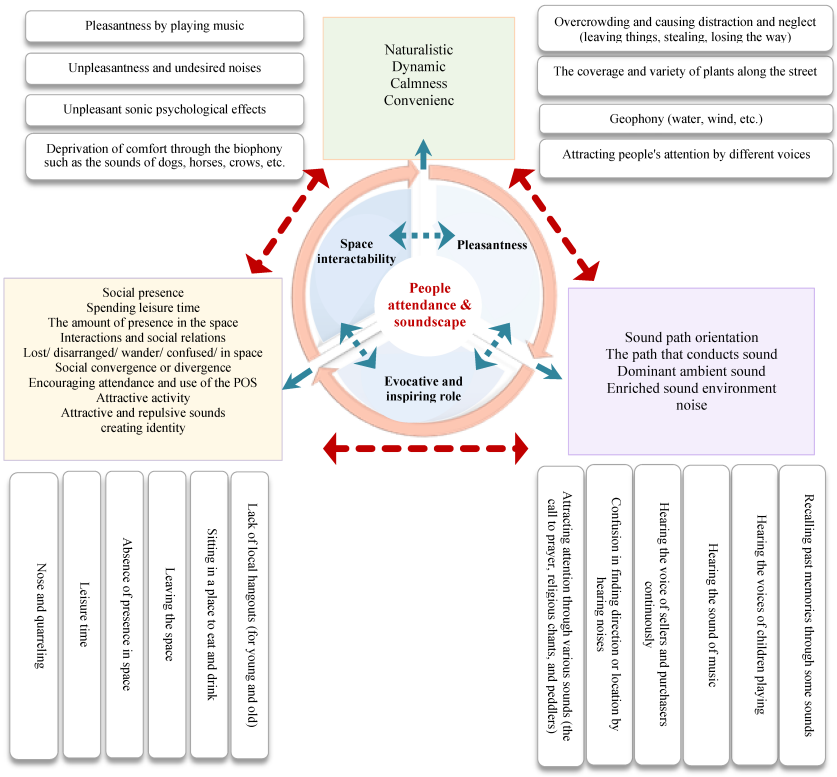

Figure 1. Effective indicators in people attendance in urban POS based on the qualities of the sonic environment.

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