

Characteristics of urban soundscapes worthy of preservation

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Abstract

Sound environment is an essential component of overall environment and reflects the characteristics of a city. Unfortunately, some precious soundscapes are gradually disappearing with the rapid development of cities. Therefore, preserving urban soundscapes is as important as noise control in order to create a good urban environment. In this study, a questionnaire survey was first carried out in Tianjin to investigate the urban soundscapes that should be preserved. Totally 2504 respondents, including residents and tourists participated in the survey, and 158 urban soundscapes were chosen by them as being worthy of preservation. Twelve of these soundscapes were selected as representatives for a group soundscape walk to explore the characteristics of soundscapes worthy of preservation. The result shows that relaxation, vibrancy, representativeness, strength, and richness were prominent characteristics of the soundscapes deemed worthy of preservation. Meanwhile, the preservation level were positively correlated with their relaxation and representativeness characteristics.

Keywords: Soundscape; Soundscape preservation; Characteristics, City

1. INTRODUCTION

Improving the sound environment is an essential way to improve overall urban environmental quality, and to reflect the characteristics of a city (1). However, with rapid urbanization, the urban sound environment is gradually degrading (2, 3). Most research and policies focus on noise propagation and reduction in urban areas, however, the measures do not necessarily lead to better acoustic comfort in urban areas (4, 5). Noise complaints in China accounted for almost 50% of the total number of environmental complaints in 2017, compared with 39.2% in 2013. Soundscapes, as positive environmental resources, have proved to be effective in enhancing the impression of a city(6). Therefore, besides noise control, preserving original, positive soundscapes should also be considered as a useful method of improving the sound environment in cities.

To identify the soundscapes worthy of preservation, previous projects and investigations have been performed in various types of spaces, including national parks and other naturally protected areas (7-9), historical city centres (10, 11), and the whole country (12). Overall, previous soundscape preservation studies have provided a quite detailed summary of the soundscapes worthy of preservation either from the point of view of the entire country or in specific blocks in urban areas. It seems necessary that additional studies need to be conducted from the perspective of soundscape preservation at the city level to create more active and vigorous cities.

Moreover, these previous researches involving soundscape preservation commonly focused on field investigations and measurements (10), and in order to understand the soundscapes worthy of preservation more deeply, the characteristics need to be analysed. There have been numerous studies investigating the characteristics of soundscapes in different urban areas (13-15). However, studies of the characteristics from the viewpoint of soundscapes worthy of preservation are still lacking. Additionally, these characteristics directly influence the preservation levels of the soundscapes worthy of preservation, however, how these characteristics affect the level of preservation still needs

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clarification.

Therefore, the study aims to explore: (1) soundscapes worthy of preservation and their distribution at the city scale, (2) the perceived characteristics and preservation levels of those soundscapes worthy of preservation, and (3) the relationship between the characteristics and preservation levels.

2. METHODOLOGY

2.1 Social Survey

The study was conducted in Tianjin, which is located in the North of China (between 38°34' and 40°15' N and 116°43' to 118°4' E). A great diversity of soundscapes have been formed in Tianjin owing to its profound culture character and beautiful scenery (Marinelli, 2010). Meanwhile, as one of the four municipalities in China, Tianjin also faces many environmental problems. The destruction of a large number of soundscapes is in conflict with the development of the city. Thus, the findings of this study can provide references for other cities.

The first step of this study was to determine what kind of urban soundscape should be preserved. Both online and face-to-face investigations were conducted throughout a period of six months, i.e. from June to December 2016, requiring respondents to recommend soundscapes that should be preserved in the city based on their own experiences. The respondents in this survey were selected randomly, including both locals and tourists. A total of 2504 valid questionnaires were collected and the demographic information of the respondents was listed in Table 1.

Table 1 Demographic information of the respondents

		Frequency
Gender	Male	51%
	Female	49%
Age groups	<20	7%
	20–29	59%
	30–39	17%
	40–49	8%
	50–59	4%
	>60	4%
Education level	Primary school	2%
	Secondary school	19%
	University	59%
	Graduated	20%
Occupation	Architect	6%
	Student	32%
	Working person	57%
	Pensioner	5%

2.2 Group Soundscape Walk

A group soundscape walk was conducted to explore the characteristics and preservation levels of the soundscapes worthy of preservation. Twenty-three students aged 20 to 25 participated in this study. They were graduate students majoring in Architecture and they could understand the purpose of this study well. Figure 1 showed the twelve evaluation locations of this group soundscape walk, which were recommended more than 20 times in the questionnaire survey. They are located in five

districts: Water Park, Italian Style Street, Five Old Street, Ancient Cultural Street and the Civic Square. Water Park, the largest park in Tianjin, is an essential place for citizens to relax, which has leisure and comforting characteristics. Italian Style Street is the only street in Asia with an Italian style. There are more than 200 European buildings in this area, which have been preserved for more than 100 years. The Five Old Street is a famous attraction, with profound cultural and historical character. The horse carriage is still one of the transportation means in this area. The sound environment is relatively quiet in Five Old Street, as motor vehicles are limited in this district. Ancient Cultural Street is a historical block with Chinese characteristics. This block still conserves the traditional Chinese urban structure and organizational layout. Civic Square has a pleasant environment, and many children play in the square every day.

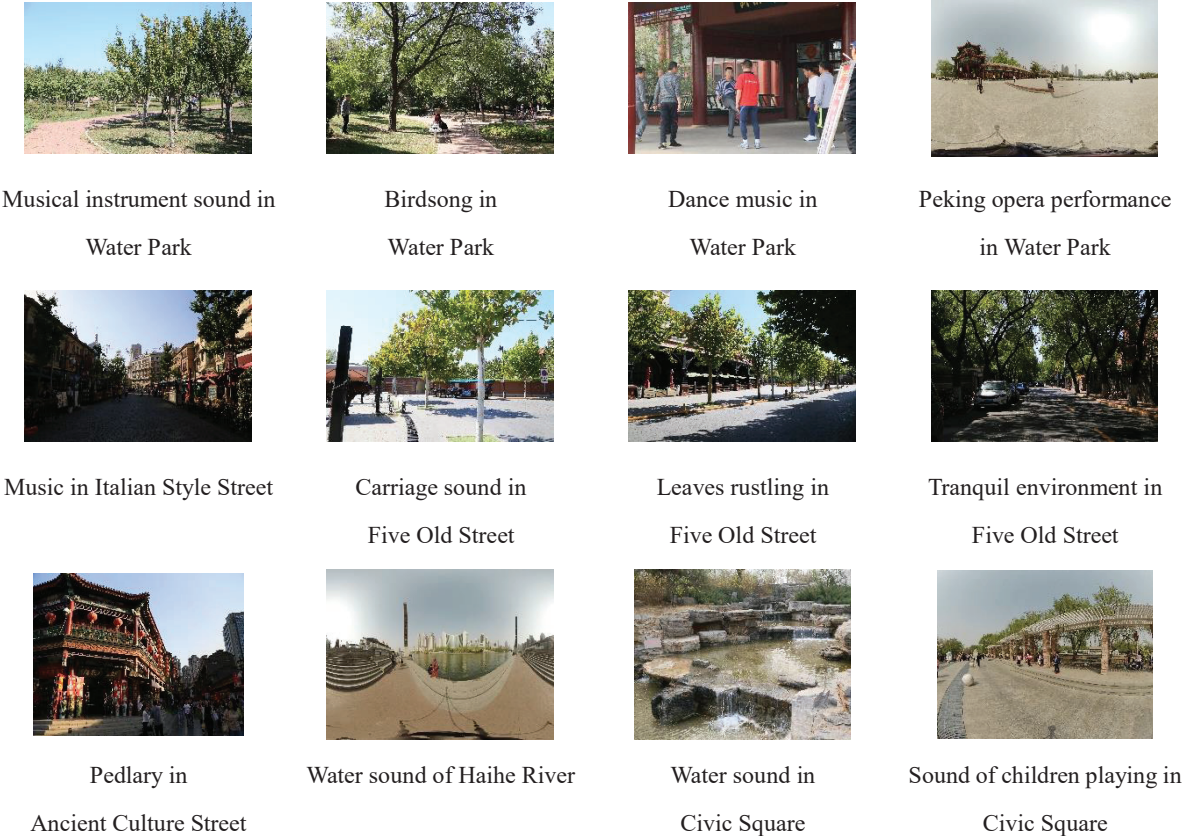


Figure 1 – Evaluation locations of the group soundscape walk

During the soundscape walk, the participants were asked to stay at each evaluation location for 30 minutes to experience the sound environment and complete the assessment questionnaire. There are two questions in the questionnaire. The first question was used to evaluate the characteristics of the soundscapes using the semantic differential method. Seventeen semantic indicators were used in the questionnaire, which were summarized from previous research studies (16) and our previous focus group, including: gentle – harsh, fast – slow, simple – varied, natural – artificial, strong – weak, far – close, pleasant – unpleasant, relaxed – intensive, harmonious – disharmonious, light – heavy, quiet – noisy, comfort – discomfort, impure – pure, like – dislike, vibrancy – dull, directional – universal, and representative – unrepresentative. The second question explored the preservation level of each soundscape. Participants used the ten-point rating scale to determine the level of preservation based on their own understanding.

3. RESULTS

3.1 Soundscapes Worthy of Preservation

A total of 158 soundscapes were considered to be worthy of preservation according to the recommendations from respondents. Among those soundscapes, twenty-seven were recommended more than 20 times (approximately 1% of total respondents), as shown in Figure 2.

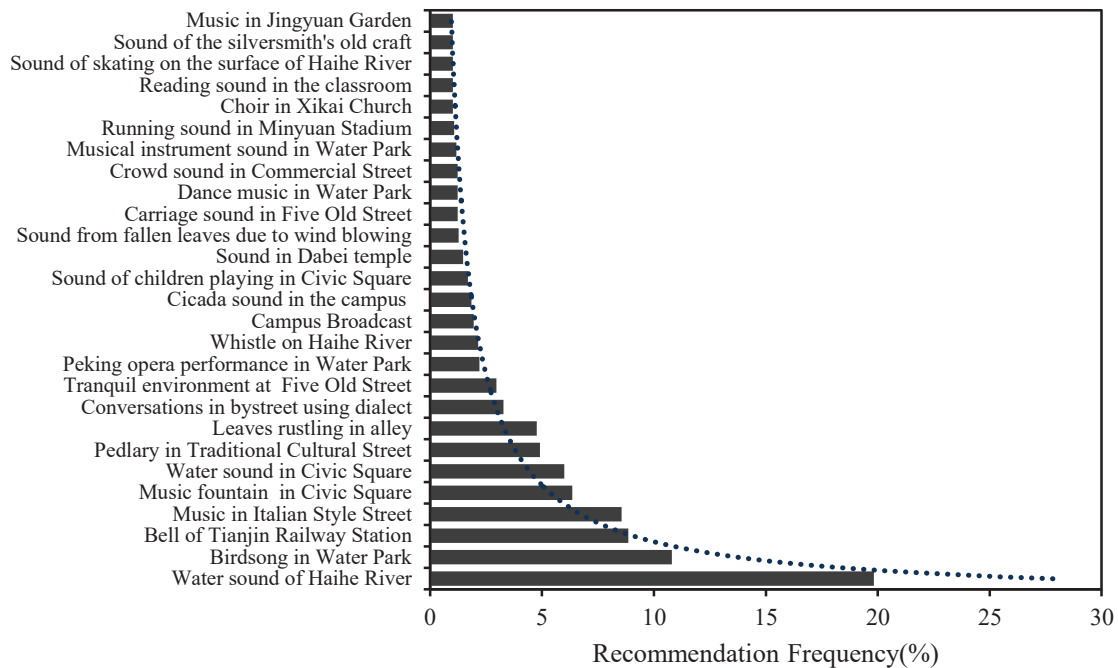


Figure 2 – Soundscapes worthy of preservation

These recommended soundscapes are in urban parks or recreation areas, historical districts, and commercial areas, with the respective proportions of 66.37%, 19.47%, and 14.16%. Urban parks were the most important areas for soundscapes worthy of preservation. Because as important areas for restoring the physical and mental health of citizens, urban parks often contain comfortable soundscapes. Furthermore, the top three sound sources of these soundscapes were social/communal sounds (talking, bells, laughter, and sounds from human activities), animal sounds (birdsongs and other sounds from non-domesticated animals) and water sounds, with the respective proportions of 34.1%, 17.7%, and 15.2%. It was found that the soundscapes worthy of preservation often affected larger areas and larger populations. For example, the water sound of Haihe River was the most frequently mentioned as a soundscape worthy of preservation. Haihe River, as the mother river of Tianjin, traverses the city from the North to the South, affecting a lot of people. The birdsong in Water Park was also recommended frequently. Water Park is the largest park in Tianjin, with a large flow of people. The music in Italian Style Street was also an important soundscape worthy of preservation. As one of the most attractive scenic spots in Tianjin, Italian Style Street attracts many tourists. As for the periodicity of these soundscapes, most of them were stable except some natural soundscapes that changed with the seasons.

3.2 Characteristics of Urban Soundscapes Worthy of Preservation

Factor analysis was conducted using the 276 (23participants × 12 locations) responses obtained through the soundscape walking. As a result, five factors were identified to describe the characteristics of the soundscapes worthy of preservation, as shown in Table 2.

Factor 1 (32%) called relaxation, including gentle-harsh, harmonious-disharmonious, comfort-discomfort, like-dislike, fast-slow, relaxed-intensive, quiet-noisy, impure-pure. Factor 2 (15%) was generally associated with vibrancy, including pleasant-unpleasant, light-heavy. Factor 3 (8%) was best explained as representativeness, including natural-artificial and representative-unrepresentative. Factor 4 (7%) was principally related to strength, including far-close and strong-weak. Factor 5 (6%) was mostly associated with richness, including simple-varied and directional-universal.

These five factors explained total of 69% of the variance, however, in many previous studies, only 2-4 factors were needed to explain basically equal or even more total variance(16, 17). This indicated that the characteristics of the soundscapes worthy of preservation in cities were more complicated. Meanwhile, the weight of the relaxation characteristic was higher than that of other factors, which indicating that the relaxation is the most important characteristic of the soundscapes worthy of preservation. This result reflected people’s urgent need for a highly relaxing sound environment in

modern cities.

Table 2 Results of factor analyses (where KMO=0.844, N: 276)

Semantic indicators	1 (32%)	2 (15%)	3 (8%)	4 (7%)	5 (6%)
Gentle–Harsh	0.614	0.208	0.206	0.341	-0.293
Fast–Slow	-0.637	0.422	0.125	-0.328	0.067
Relaxed–Intensive	-0.550	-0.440	-0.117	-0.177	0.208
Harmonious–Disharmonious	0.557	0.520	-0.014	0.216	-0.112
Quiet–Noisy	-0.71	-0.115	-0.299	-0.196	-0.054
Comfort–Discomfort	0.675	0.488	0.078	-0.059	0.102
Impure–Pure	-0.634	-0.274	-0.332	0.062	-0.278
Like–Dislike	0.637	0.552	0.059	0.070	-0.077
Pleasant–Unpleasant	0.131	0.728	-0.017	0.098	-0.067
Light–Heavy	0.236	0.691	0.155	0.131	-0.226
Vibrancy–Dull	0.052	-0.795	0.270	0.133	0.132
Natural–Artificial	0.234	0.086	0.719	-0.196	0.242
Representative–Unrepresentative	0.154	0.152	-0.761	-0.113	-0.155
Strong–Weak	-0.391	0.120	-0.264	-0.633	0.071
Far–Close	-0.226	0.103	0.080	0.885	0.068
Simple–Varied	0.065	-0.165	0.394	-0.144	0.692
Directional–Universal	0.020	-0.012	-0.203	0.170	0.850

3.3 The Relationship between Characteristics and Preservation Level of Soundscapes Worthy of Preservation

Figure 3 showed the relationship between the preservation level and the characteristics of the soundscapes worthy of preservation. It could be seen that the level of preservation increases with the improvement of relaxation, representativeness, strength and richness, while decreases with the increase of vibrancy evaluation. In Table 2, the correlation coefficients between the preservation level and the evaluation of the characteristics are shown.

Table 2 Correlation between characteristics and the preservation level

	Relaxation	Vibrancy	Representativeness	Strength	Richness
Preservation Level	0.966**	-0.521	0.897**	0.488	0.430

There was a strong positive correlation between the preservation level and the relaxation and representativeness characteristics, while no statistically significant correlation was observed on the other three characteristics. It meant that the soundscapes with outstanding relaxation or representativeness usually get a high level of preservation. Thus, in urban areas, more attention should be paid to preserving the relaxing soundscapes, such as the birdsong in parks, the water sound and the tranquil environment. Meanwhile, priority should also be given to the soundscapes that have high representativeness such as the bells and pedlary in historical areas. As part of the intangible cultural heritage, these representative soundscapes can effectively avoid homogeneity of urban areas.

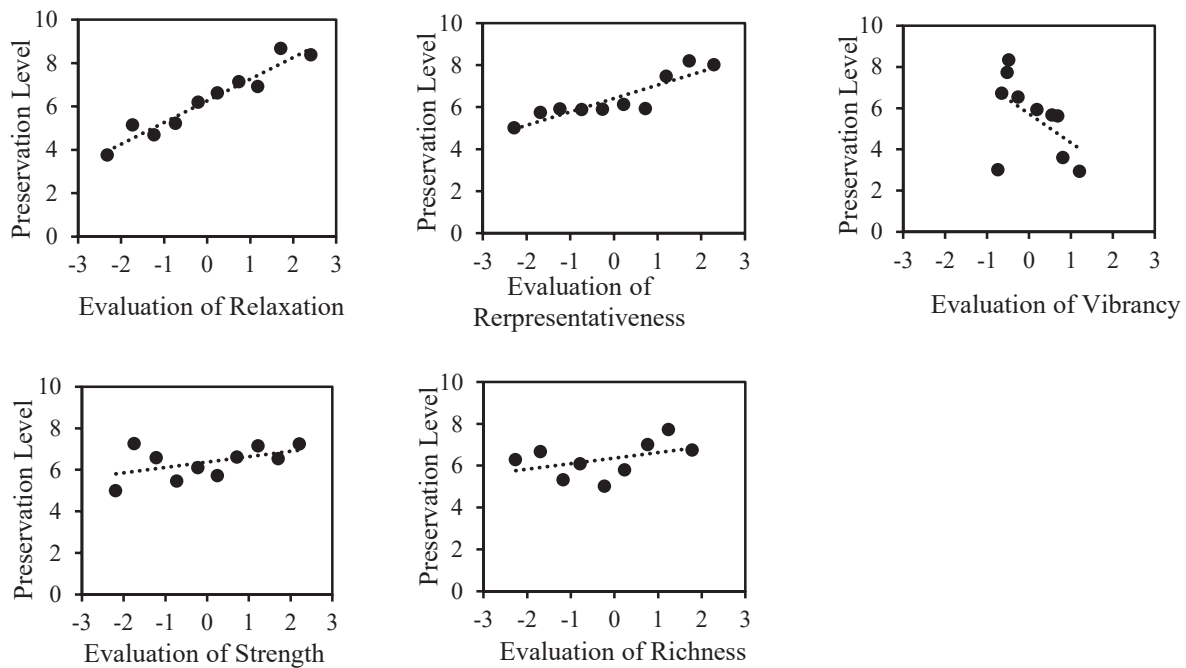


Figure 3 – The relationship between the preservation level and the characteristics of the soundscapes worthy of preservation

4. CONCLUSIONS

This study investigated the characteristics of urban soundscapes worthy of preservation. The main conclusions can be summarized as follows:

1. The urban soundscapes worthy of preservation recommended by the participants were situated in various locations. Among them, parks and historical districts were the most important urban contexts for these soundscapes. Furthermore, the top three sound sources of these recommended soundscapes were social/communal sounds (talking, bells, laughter, and sounds from human activities), animal sounds (birdsong, and other sounds from non-domesticated animals), and water sounds. It was also found that the soundscapes which could affect larger areas and crowds were more frequently recommended by the participants.
2. Five major factors were identified to evaluate the soundscapes worthy of preservation, including relaxation, vibrancy, representativeness, strength, and richness. These five factors covered 68% of the total variance, while half of the variance was explained by the relaxation factor.
3. Relaxation and representativeness were positively correlated with the preservation level of soundscapes worthy of preservation, which meant that residents would like to preserve soundscapes with a higher sense of relaxation and representativeness.

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