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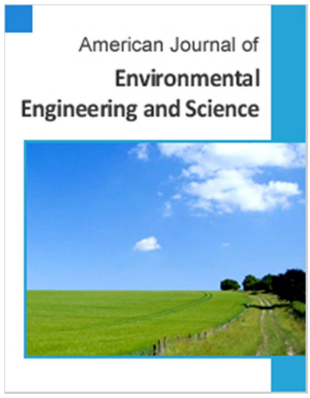

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Discussion on Soundscape Elements in Urban Residential Area

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Abstract

Urban acoustic environment is getting worse with economic development and urbanization in China. Therefore, more and more attentions are paid to urban soundscape. Urban residential areas are important living space for urban residents, its acoustic environment plays an important role in preserving and promoting the health of residents who are often exposed to noise pollution. This study emphasized soundscape elements in urban residential area and residents' subjective perception to different soundscape elements. From the survey and the measurements of the acoustic environment that were carried out in eight residential areas in two cities, the conclusion was drawed that the dwellers prefer the natural sounds to the artificial sounds in the urban residential areas. In addition, dwellers' taste to all kinds of sounds is affected by their age, gender, occupation etc.

1. Introduction

With the advancement of the urbanization and the increasing of the urban population density in China, the urban green space and the water body are continuously suffering from human occupation; the exploitable lands for residential area are becoming less and less, not to mention to choose a location with good acoustic environment to develop into residential district. And the landscape design of the residential quarter has long time been focused on visual landscape design, rarely noticed the auditory landscape design [1], and with China's social and economical development, the factors that can cause adverse effects of the sound environment are increasing, therefore, the complaint from the urban residents about the sound environment is growing.

The modern city people become exhausted or even upset-minded after one day's fast rhythm work in noisy working environment, so they are eager to have a relaxing living environment in order to relax their mind and tired body, putting aside things from work, feeling the breath of the nature and life and enjoy the pleasure of life.

In order to create a healthy and comfortable sound environment of the residential district for the dwellers, at present, the main method to create acoustic environment in the residential district is controlling noise. But it can not meet the demands of the dweller to the sound environment. The sounds that the residents want to hear should be provided on the basis of noise control, that is to concentrate on the build of the soundscape in the residential area [2].

2. Overview of the Soundscape of the Residential Area

During the late 60's and early 70's, the Canada composer, scientist R. Murray Schafer came up with the "Soundscape" theory [3]. Not only did this theory open up a new research field, but also urged human to have a reconsideration about the traditional behaviour of "listening". The soundscape is a kind of auditory landscape relative to visual landscape, it refers to the landscape captured by ears [4]. Soundscape is a kind of intersect subject involved several field such as physical acoustics, environmental science, architectural, psychology and ecology etc. It mainly focuses on the relationship between the sounds, nature and society [5, 6]. Soundscape is a kind of people-centred acoustic environment, which concentrates on more people mental feeling and the social, cultural, aesthetic meanings of the sound constrast with the acoustic environment in the noise control subject [7, 8].

Urban residential area is the base of human's survival, development and evolution. Environmental psychology studies have shown that the ecological environment as the objective environment outside human has an extremely close relationship between human's spirit environment and cultural environment, and it has an impact on human's behaviour, the former influences people's mood and mentally ecological pressure and so on; the latter has an impact on people's behavioural model. People spend two-thirds of their lifetime on residential area form the cradle to the grave. Therefore, the environmental quality of the residential area will have a great impact on people's development. In real environment, there are lots of meaningful sounds or the sounds that people are willing to hear besides noise. Acoustic environment should be an environment that contains all kinds of sound source (not only noise) that has a physical and psychological influence on the dwellers. When we consider the environmental problems of the residential area and put the dwellers in the first place, it will embody the idea of the soundscape.

3. Investigation of Soundscape Elements in the Residential Area

In order to study the soundscapes elements in the residential areas and it's impact on the residents, the research group has used a widely ranged questionnaire and field measurements. The investigation was mainly divided into two stages. In the first stage, purpose of the survey is to screen out sound elements that already exist or may exist in the urban residential area, so we chose students and residents in the vicinity as the object of investigation. Respondents were asked to write some sounds that they can hear in the home or residential areas. The research group came up with the questionnaire for the second stage based on the analysis of the received questionnaires and the field survey in the residential areas. The audible sounds listed on the questionnaires, according to the characteristics of the sound source, are divided into animal sounds, plants sounds, sounds of the natural phenomenon, and sounds of the transportation with nine categories and forty one kinds of sounds in total. In addition, the interviewee was required to supplement sound elements that he was willing to heard in the residential area to prevent the sound elements listed in questionnaire were uncomprehensive. In order to investigate dwellers favourable degree of different kinds of the sound elements, interviewee was asked to rate all kinds of sounds, with 3 points for the sounds they like in particular, 2 points for the sounds they like, 1 point for the sounds their generally prefer, zero for the sounds they don't care, -1 for the sound they generally dislike, -2 for the sounds they dislike, -3 for the sounds they feel awful. In the second stage of the survey, According to the climate and scale, the two cities of shenyang and dalian can serve as the representative of the city in liaoning province, so survey was conducted by the research team to investigate soundscape elements in 8 residential areas in Shenyang and Dalian with the method of face to face questionnaire survey. The eight residential areas are respectively Jingfu courtyard, Olympic park courtyard, Spring water D1 district, Golden sunshine garden in Dalian and Chongshan residential area for public servants, Sunny city fourth period, East mansion of Prize worker, Boxiang real estate in Shenyang. The survey contents included representative sounds level and their spectrum, and the taste of residents to the various sounds with different age, gender, occupation. The soundscape elements in the urban residential area and the subjective evaluation to acoustic environments from residents were grasped by the survey and measurements, so references were provided to architects, urban planners, landscape designers while they design the acoustic environments of the residential areas.

4. Analysis of Soundscape Elements in the Residential Area

During second stage of survey, 800 questionnaires were dispersed and collected 718 effective answer papers, and the recovery rate was 90 percent. The statistics of collecting questionnaires were gathered by excel software, the soundscape elements of the urban residential areas and dwellers subjective evaluation to all kinds of sounds elements were grasped by the statistics and analysis of the survey result.

4.1. Analysis of the Sounds Existing in the City Residential Area

From statistics of the item "what kinds of sounds can you hear in your residential area?" in the survey, the proportion of all kinds of the sounds is shown in figure 1.

Figure 1 shows the overall statistic result of the eight residential areas, because of the different location, environment and construction time of the residential area, the sounds heard are quite differently in the eight area, like the

sounds heard in spring D1 district. As was shown in Figure 2, animal sound was also occupied in a large proportion. From the survey of this district, we can figure out that the animal sounds in this area are mainly from dogs and domesticated birds, because there are rarely sounds of natural animals such as wild birds, cicadas, and other inserts. The sound of car's engine, car's alarm, and car's horn occupy a large proportion of the sounds that can be heard in the residential areas, and other kinds of sounds mainly are firecrackers, construction sound, sounds of children and old man's activities. It demonstrates that this residential area is built many years ago and located in the city centre. Because it's far away from nature and suffering from noise masking, little nature sound can be heard in this area.

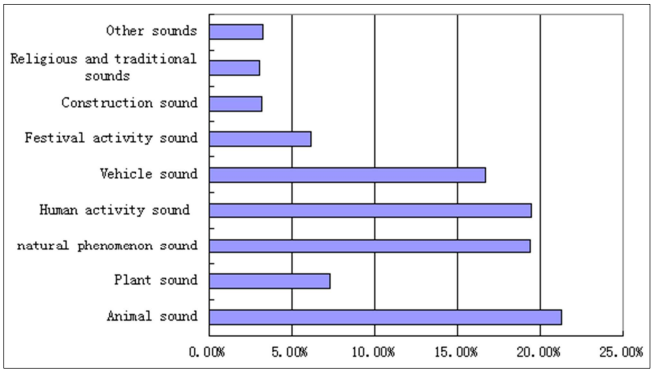

Fig. 1. *The total statistics of sound classification in residential area.*

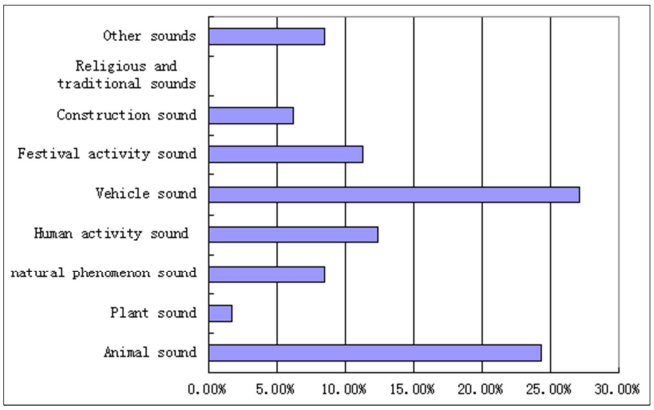

Fig. 2. *The statistics of sound classification in spring d1 residential area.*

4.2. Analysis of the Sounds That the Dwellers Prefer

1) Analysis of the Sounds That the Dwellers Like

According to the questionnaire result of soundscape in the urban residential areas, top ten kinds of sounds that dwellers prefer were presented, as shown in figure 3.

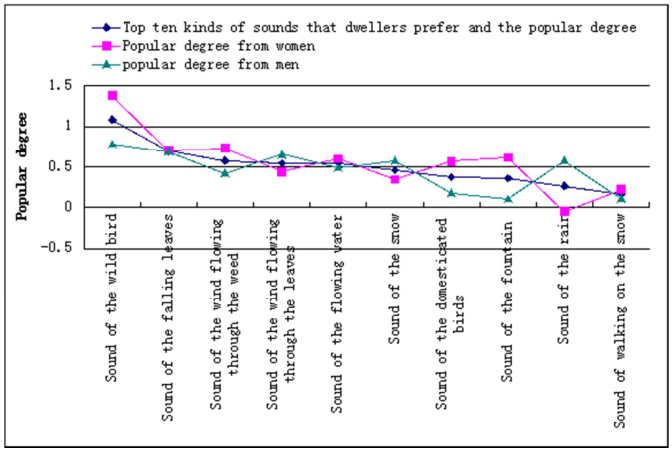

Fig. 3. *Favorite ten kinds of sounds and the popular degree.*

There are three curves in the figure, the middle one is the overall results of the subjective evaluation to the sounds that can be heard in the residential area from the dwellers. The other two curves individually represent the evaluation from the male residents and female residents to the top ten sounds that they like. As is shown that residents of different gender have almost same favorable degree to all kinds of the sounds preferred by them in figure 3, that is most of the sounds in the top ten are nature sounds, but the evaluation to some kind of sounds differs from male and female. For example, female residents prefer the sounds which have more life flavour such as the sound of the fountain and the birds (both wild birds and domesticated bird) more than the male residents, because these kinds of sounds can bring them more security sense and more living atmosphere. On the other hand, the male residents prefer the sound of the rain and snow which make people feel quiet more, because the quiet environment makes them feel relaxed, however, the female residents will feel insecure when they are in a very quiet environment [9].

2) Analysis of the Sounds That the Dwellers Dislike

Ten kinds of sounds that the dwellers dislike were presented based on the questionnaire results of soundscape in the urban residential areas, as shown in figure 4. There are three curves in the figure, the middle one is the overall results of the subjective evaluation to the sounds that can be heard in the residential area from the dwellers, and the other two curves respectively represents the evaluation from the male residents and female residents to the top ten sounds that they hate.

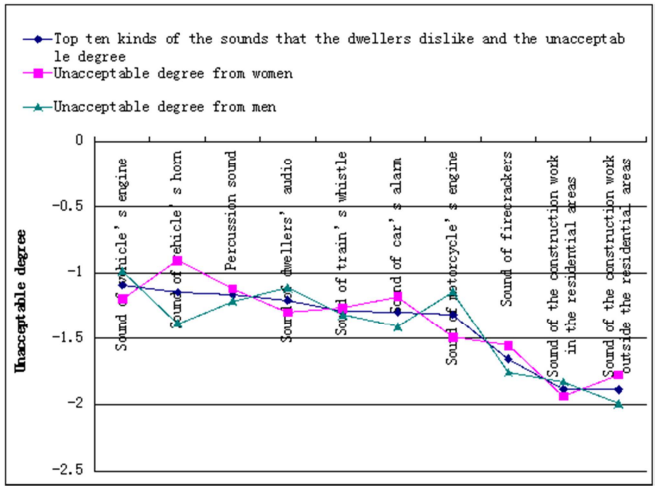

Fig. 4. *Unfavorite ten kinds of sounds and the unacceptable degree.*

From figure 4, residents of different gender have almost same kind of unacceptable degree to all kinds of the sounds they hate. Most of the ten kinds of the noise unaccepted by residents are artificial sounds, however the evaluation to the unacceptable sounds are certain different, for example, female residents dislike the sound of vehicle and motorcycles' engine more than male, because those kinds of sounds represent speed and power, the male residents think those kinds of life noise such as the sound of firecrackers and vehicle's alarm are more unacceptable.

4.3. Analysis of the Sound Environment That the Dwellers Expect

One of the questions in the questionnaire is the ideal environment of your residential area, which also provided four options: very quiet; quiet, occasionally and a little noisy; only can hear nature sounds; often hear nature sounds, occasionally hear people's activities sounds. The survey results of the eight residential areas in two cities are shown in figure 5.

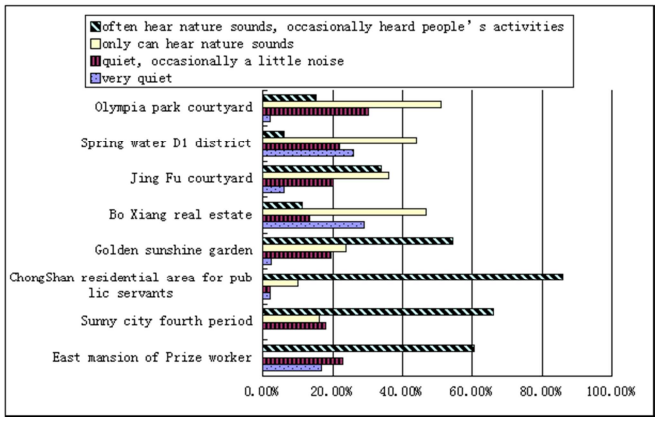

Fig. 5. *The survey results of residential sound environment that residents expect.*

Figure 5 shows that divergence appears when residents with different gender, residential environment, age, and occupation from different cities choose the ideal residential sound environment. But their common point on this issue is obvious, that is the expectation of all kinds of the nature sounds. No matter the residents in the city center or the residents in the countryside they all expect to hear all kinds of the nature sounds. On the contrary, the residents they hope to have a very quiet residential area share a very small proportion in the total residents investigated. This is mainly because the working environment of modern people is far away from nature and always filled with all kinds of artificial noise, and human being has been used to all kind of nature sounds during the long evolution process [10, 11].

5. Conclusions

This paper was mainly based on the investigation results of the soundscape in urban residential areas, discussing elements of soundscape in urban residential areas and the subjective evaluations to the sound elements from residents. The dwellers prefer the nature sounds to the artificial sounds in the urban residential areas. Among the nature sounds, the wild bird sounds are highly praised compared with the other sounds, and this is a very positive sound element. According to this factor, we should create and try to reserve the environments that are suitable for bird's activity when planning the soundscape of a residential area. The construction sounds outside the residential area has the lowest reputation among the dwellers. We should continue to focus on the noise control from outside environment when designing the soundscape of the residential area.

This study takes the scale of the residential area fully into consideration by choosing 8 different residential areas for soundscape investigation. Also the construction period of the residential area, and the location in the city were also given an important place when research team choose the eight residential areas. The factors such as gender and age and so on were considered when selecting the respondents, so research results and the analysis have general universality, and have a certain reference value to the design and evaluation of the soundscape in urban residential areas.

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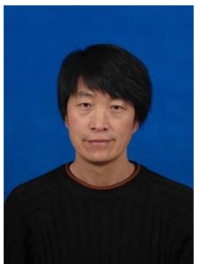
Biography



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