A grounded theory approach to the subjective understanding of urban soundscape in Sheffield

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Abstract: The aim of this study is to gain a greater insight into the factors that affect individuals' preferences and understanding of urban soundscapes. Based on a grounded theory approach, with 53 participants in Sheffield, five categories have been revealed for the subjective understanding of soundscape: soundscape definition, soundscape memory, soundscape sentiment, soundscape expectation, and soundscape aesthetics. More specifically, to some extent, the value people place on sounds does not lie in the sound itself or its physical properties but in the positive or negative behaviors associated with sounds. Some long-term soundscape memory was preserved because the sounds correlated to something profound in people's mind to some degree. Most people like to use two evaluation criteria, namely favorite sound and annoying sound, to reflect their soundscape sentiment, but emotion is also an important part of psychological stratification, which includes joyful, angry, sad, despair, and afraid. People hope that soundscape will change as time goes by, towards the soundscape of natural and comfortable sounds mixed with entertainment, as well as simple sounds containing peaceful and joyful information; notably, people look

forward to more electronic, comfortable, and technical sounds in the future. Soundscape aesthetics in the future reflect a presupposition for future-oriented aesthetic judgment.

Keywords: Urban, Soundscape, Grounded theory, Category, Aesthetics

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1. Introduction

One of the foremost scholars who studied the phenomenon of sound was the 18th-century philosopher George Berkeley. His *Three Dialogues Between Hylas and Philonous,* published in 1713, was largely a response to the work of another leading empiricist, John Locke. Berkeley's book contained the following dialogue about sound:

"Philonous: Then as to sounds, what must we think of them: are they accidents really inherent in external bodies, nor not?

Hylas: That they inhere not in the sonorous bodies, is plain from hence; because a bell struck in the exhausted receiver of an air-pump, sends forth no sound. The air,

therefore, must be thought the subject of sound. It is this very motion in the external air that produces in the mind the sensation of sound. For striking on the drum of the ear, it causes a vibration, which by the auditory nerves being communicated to the brain, the soul is thereupon affected with the sensation called 'sound'."

Subsequently, soundscape as a phenomenon became a noteworthy research topic. The term "soundscape," according to Schafer, refers to "the study of the effects of the acoustic environment on the physical responses or behavioral characteristics of creatures living within it" (Schafer, 1977). The soundscape of the world is changing. Modern man is beginning to inhabit a world with an acoustic environment radically different from any he has known before. These new sounds, which differ in quality and intensity from those of the past, have alerted many researchers to the dangers of an indiscriminate and imperialistic spread of more and larger sounds into every corner of human life (Schafer, 1977). Truax indicated that despite the profound social and technological changes over the past two decades, the issues raised in acoustic communication remain substantially the same as before: how to reinvigorate the listener's interaction with the environment through listening; how to design soundscapes on a functional, human scale; and how to distinguish the net gain offered by technology from its hype and oppressive aspects (Truax, 2001). Some of these questions have been explored in the context of the well-being of communities (Jeon, Lee, You, et al., 2010; Kang, 2000; Kang,2005; Watts,Miah, & Pheasant, 2013; Xie & Kang, 2009; Yu & Kang, 2010).

An interesting project related to the subject matter is "One Hundred Finnish Soundscapes", a three-year research program organized and executed by the Finnish Society for Acoustic Ecology. Its primary aim is to increase the Finnish people's awareness of the meaning of soundscapes. Indeed, the notion of soundscape transcends a purely negative definition of environmental noise (Kim and Kim, 2007;Lam and Ma, 2012; Yano and Ma, 2004), and is regarded more as the sonic component of quality of life, with positive and negative features (Schulte-Fortkamp & Dubois, 2006).

Human society developed numerous descriptions of urban phenomena, and well-being, good environment, and quality of urban life are key issues. The economic growth in the United Kingdom (UK) highlights the significance of social sustainability. However, cities face certain problems such as the driving forces behind a crisis of public space in industrial and pre-industrial societies (Jacobs, 1961). The de-materialization of the public sphere is driven by the media (Castells, 2000). Changes in soundscapes affect the overall functions and dynamics of the ecosystem and of people, and changes in sound-image compatibility conditions are significant in producing different aesthetic and affective reactions (Yu and Kang, 2008; Yu and Kang, 2009).

Listening is one of the psychological functions through which people perceive the world. Evaluating the effects of sounds on people is primarily a subjective issue rather than one merely based on objective parameters (Kang, 2002; Kang, 2007;

Yang and Kang, 2005; Zhang and Kang, 2009). To explore people's perceptions of soundscape, the grounded theory (GT) approach would be an appropriate method. For example, the comprehension between the acoustical stimulus and opinions of inhabitants has been investigated qualitatively by means of the grounded theory approach (Fiebig and Schulte-Fortkamp, 2004). GT is widely used in the social sciences and the natural sciences such as clinical medicine and psychology (Glaser, 1978; Glaser, 1998; Glaser and Strauss, 1967; Strauss and Corbin, 1998a; Strauss and Corbin, 1998b). It is useful for generating the inductive theory from systematically collected data regarding soundscape psychological stratification.

This study aims to identify the factors related to the psychological needs of the urban soundscape to create a comfortable acoustic environment, and to identify the existing urban crisis and explore the developmental trend of soundscapes. In particular, GT is adopted to analyze the soundscape in Sheffield, a typical UK city, and data are collected from in-depth interviews with 53 local residents for two months.

2. Methodology

2.1. Participants and interviews

The City of Sheffield has a population of 534,500 (2008 estimate) and is one of the eight largest cities that make up the English Core Cities Group. The city has grown from its largely industrial roots to encompass a wider economic base. During the 19th century, Sheffield gained an international reputation for steel production. Numerous

innovations were developed locally, including crucible and stainless steel, fueling an almost tenfold increase in the city's population during the Industrial Revolution (Lambert, 2013).

The idea behind data sampling in grounded theory is to select participants who will best contribute to the understanding of the problem and the research question. In this study, three types of approaches were considered to find representative interviewees: (1) *street interview*: a number of open spaces and urban main roads in the city center were randomly selected, and 32 interviews were conducted correspondingly in places suitable for in-depth interviews such as coffee shops and gardens; (2) *home-environment interview*: 11 Sheffield-born senior citizens aged 60–70 were interviewed at their homes and asked about soundscape history; and (3) *office-environment interview*: 10 interviews were conducted in the university library offices to gather the views of working persons. The interviews were carried out from August 13 to September 29, 2010, and the length of each interview ranged from 30 to 120 min, with an average of 60 min.

While the grounded theory approach would not require an exact sample composition representative of the actual population, there is a good balance of sample distributions. In terms of gender, in this study the male/female ratio was 25:28, which was close to the Sheffield ratio in general, according to the 2011 Census, the Sheffield male and female population were 272,700 and 280,000 respectively (Sheffield City Council, 2011a, 2011b). The age of the interviewees ranged from 9 to 79,

representing suitable physiological ages for people to complete the interviews. In this study, 11 interviewees were of black or minority ethnic backgrounds, which was 20% of the total interviewees, close to the statistical value in Sheffield of 19.2% (Sheffield City Council, 2011a, 2011b). The interviewees were sampled at different locations including homes, libraries, offices, coffee shops and gardens, and people of different occupations were covered. The age and gender distribution of the interviewees are shown in Fig.1.

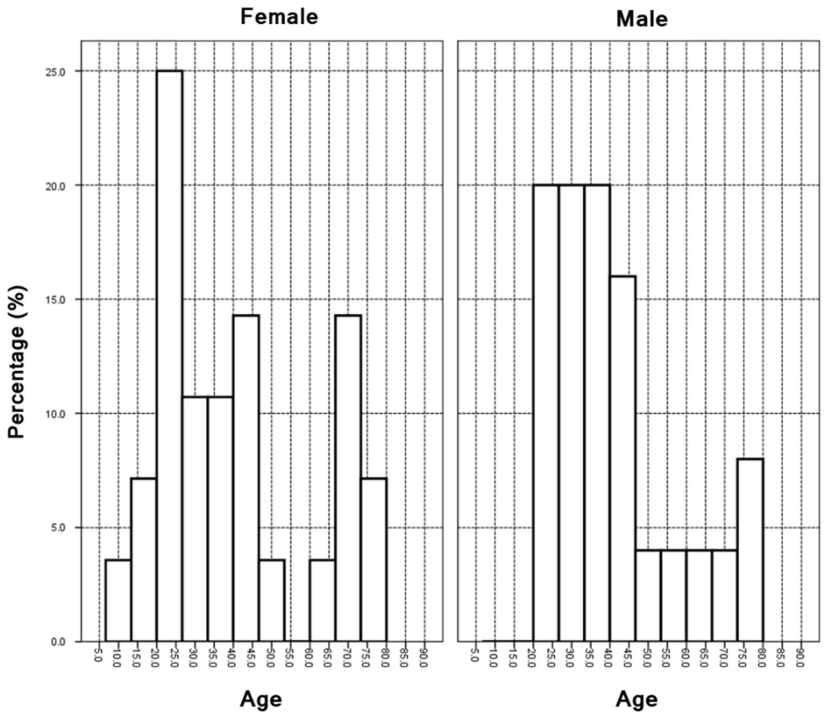

Fig. 1. Age and sex distribution of the respondents.

The questionnaire is composed of the following four parts: (1) Basic information on the respondents, such as age, gender, educational level, and the time of interview; (2) The quantitative evaluation of the acoustic perception factor for the overall sonic environment in Sheffield; (3) People's view of general soundscape feeling, such as:

Would you tell us what sound is according to your understanding? Can you describe it? Do you have any feeling of fretting, palpitation, dizziness, or other physiological responses when you hear some sounds? (4) People's view of soundscape history. For example, If you lived in Sheffield during 1939-1945, do you remember the sounds of the war during your childhood (1939–1945)? How do you feel about these sounds? If you lived in Sheffield during this period 1950-1970, what sounds did you hear during the development of the steel industry? Do you think these sounds interfered with your life? Which sounds from your childhood do you associate with historical events or major changes in the environment? Only part 4 had preconditions with respect to ages because people's views of soundscape history were dependent on their ages.

2.2. Data analysis

A multi-step analysis technique based on the approaches of Glaser (Glaser, 1992) was employed and is shown in Fig. 2. The steps were as follows:

(1) *Open coding*: emphasising key terms in the text about the subjective understanding of soundscape and coding the text;

(2) *Restating key phrases:* reading pertinent portions of the text to identify repeated words and main phrases, including those related to technical soundscape and artificial soundscape;

(3) *Reducing phrases:* codes were accumulated and reduced;

(4)*Identifying concepts:* asking questions, making comparisons and linkages with theoretical sampling, and raising terms to concepts. For example, what is the logic

between them? Which is the most significant of these soundscape phrases? Finally, these concepts were compared and further questions were asked based on the initial results achieved (Conrad, 1978);

(5) *Generating categories:* similar concepts were grouped together to develop categories such as soundscape memory based on some similar concepts from the responses of elderly people. Other categories were formed by other grouped concepts;

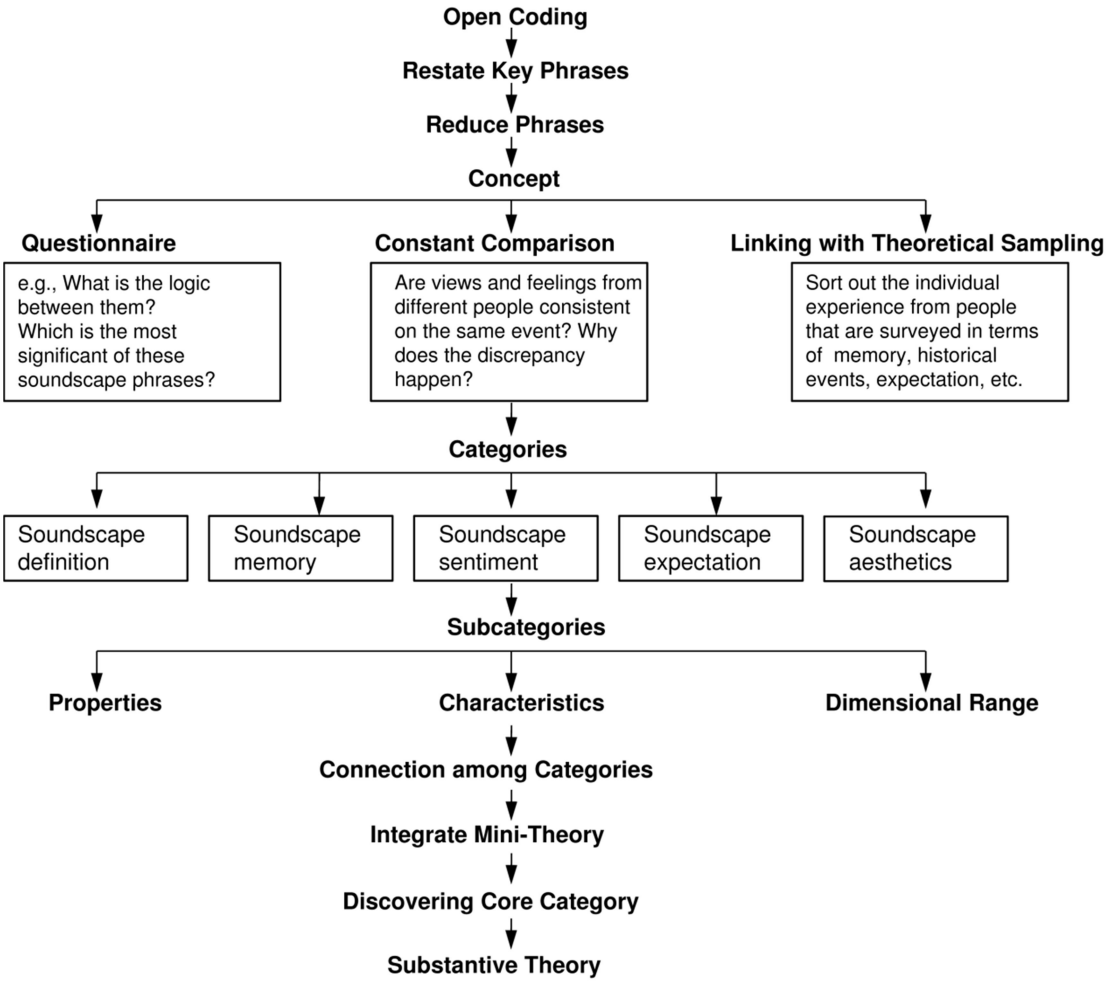

Fig. 2. Multi-step approach based on grounded theory.

(6) *Identifying subcategories:* the properties and characteristics of subcategories along a dimensional range were identified such as multi-dimensional soundscape expectation characteristics;

(7) *Linking categories:* linkages were made among categories;

(8) *Integrating mini-theory:* mini-theories were integrated to enhance the strength of the framework in this theory;

(9) *Discovering core categories,* such as the soundscape definition, which has an extensive relationship with the other categories; and

Sorting Memos	Labeling	Conceptualizing Data	Categorizing Data	Categories	Subcategorised
("Can you describe your understanding of future sounds?") "The future of sounds will be peaceful with less traffic noise..." "Music needs to always to be changing, city sounds and music, like movies need changes..." "Future of sounds will be quiet..." "It will be worse since more constructions are underway..." "Future sound is mix of entertainment. Future sound is music in a live environment ..." "I hope there will be more sounds of happy people speaking out without fear, working happily in good environment..." "More comfortable, like a remote countryside some sounds will disappear like of industry while some might appear of new technologies." ... (Do you have any feeling of fretting, palpitation, dizziness, and other physiological responses when you hear some sounds?) ...	a1 The future of sounds would be peaceful. a2 Sounds of traffic would be reduced by electric car. a3 Future sounds would be sounds of nature. a4 Music needs to always be changing, city sounds and music, like movies must changes. a5 Future of sounds would be quiet. a6 It would be worse as building work continuance. a7 Future sounds are a mixture of entertainments. a8 Future sound is music in a live environment. a9 Future sounds would be quieter. Hopefully less traffic. ...	aa1 The future of sounds will be peaceful with less traffic noise. (a1, a5, a9 and a16) aa2 Sounds of traffic will be reduced by electric car. (a2) aa3 Future sounds are some sounds of nature (natural river, bird songs, waterfalls, bells and silence). (a3, a17 and a18) aa4 Music needs to always be changing, city sounds and music, like movies must changes. (a4) aa5 Worse as building work continuance. (a6) aa6 Mix of entertainment. (a7) aa7 Music live in environment. (a8, a17, a21) aa8 In 50s'-70s' mostly mono-culture /mono-lingual (Sheffield accent). (a10) ...	A1 The future of sounds will be peaceful with less traffic. Future sounds are some sounds of nature (natural river, bird songs, waterfalls, bells, silence). (aa1 and aa3) A2 Sounds of traffic will be reduced by electric car.(aa2) A3 Music needs to always be changing, city sounds and music, like movies must changes.(aa4) A4 Worse as building work continuance. (aa5) A5 Future sounds is mix of entertainment. (aa6) A6 Future sound is music in a live environment. (aa7) A7 Now, multi-ethnic/ multi-culture/ multi-lingual is probably increasing. (aa8 and aa9) A8 In the future, fewer people will speak with a Sheffield accent. (aa10) A9 Young people are influenced by TV, computers. Artificial voices could sound like robots. (aa11) ...	AA1 Soundscape Definition AA2 Soundscape Memory AA3 Soundscape Sentiment AA4 Soundscape Expectation AA5 Soundscape Aesthetics	AA1 Soundscape definition (1) The soundscape is behaviour. (2) The soundscape is a representation of vision. (3) The soundscape is a representation of tactility. (4) The soundscape is a representation of scene from the past. AA2 Soundscape memory (1) Positive memory (2) Special memory (3) Negative memory AA3 Soundscape sentiment (1) Preference a: Favourite sound b: Annoying sound (2) Emotion a: Joyful sound b: Angry sound c: Sad sound d: Despair sound e: Afraid sound AA4 Soundscape expectation (1) Changing soundscape as time goes by. (2) Simple sound containing a lot of peaceful and Joyful information (3) Natural and comfortable sounds mixed with entertainment (4) The multi-ethnic, multi-cultural and multi-lingual soundscape (5) More electronic sounds and comfortable technical soundscape AA5 Soundscape aesthetics (1) Past soundscape (2) Present soundscape (3) Future soundscape
Initial Data Collection	218 items	199 items	166 items	5 items	Generating the substantive theory

Table 1. Coding process for open coding, axial coding,

and selective coding based on GT.

(10) *Generating the substantive theory:* concerning the subjective understanding of urban soundscape (Glaser, 2002).

In accordance with the above steps, the data were broken down into discrete ideas, events, and acts. Each phenomenon was related to the public attitude towards the soundscape. The open-coding process enabled the development of themes that were grounded in the data itself (Strauss & Corbin, 1998a). Table 1 shows the process of open, axial, and selective coding based on GT, where the process involved sorting memos, labelling data, conceptualizing data, categorizing data and subcategorizing data. Open coding is the process of breaking down, examining, comparing, and conceptualizing data. As examples, some labeled sentences about the future of sounds in the sorting memos are shown in Table 1. After the process of conceptualization, four items (a1, a5, a9, and a16) can be sorted out into one (aa1), which is about the future soundscape. The total labeled number was 218. After conceptualizing, the number decreased to 199. To a certain extent, the concepts became clearer through open coding. Axial coding occurred concurrently with open coding. In the data analysis step, the data were broken down into concepts and categories and then reassembled by axial coding. In the process of coding, a concept was defined whenever a certain phenomenon was mentioned by two or more respondents. It can be seen that 199 initial concepts were unstructured. The next step was to gather these concepts into categories based on their similarities or differences. For example, in the process of conceptualizing data, the concepts aa1 and aa3 were

gathered into category A1. Therefore, 166 categorized items were generated (Table1). When coding axially, the main point was to determine how categories link and crosscut. For example, the relationship among A1, A3, A5, and A6 were similar, so they were also allocated to one category labeled soundscape expectation (AA4). Once fairly developed categories emerged, selective coding was started. Central to the procedure of selective coding was the selection of a core category and major categories related to it and to one another.

3. Results

Through the above procedure, five main categories were generated, as shown in Table 1. Soundscape definition (AA1) was the core category, and the major categories were soundscape memory (AA2), soundscape sentiment (AA3), and soundscape expectation (AA4). The relationship among them was characterized as moving forward from the past to the future. Some answers about the subconscious mind form the soundscape aesthetics (AA5). Details of the linkages among categories are presented in the latter part of this section. Ultimately, the properties and characteristics of the subcategories along a dimensional range were identified.

3. 1 Soundscape definition

(1) The soundscape is a behavior that produces a chain of effects on peoples' lives in either a positive or a negative sense. For example, steam trains made a

rumbling sound that represented the time of the Industrial Revolution. The investigation showed that these sounds made people feel excited. Thus, the sound of the steam train had a positive social sense during that time. However, during World War II, people's feelings of certain sounds were different. As shown in the recordings, a person who lived in Sheffield from 1939 to 1945 said, "I remember the sounds of air raids, sirens, and bonfires. They were scary and exciting" (A143–A144).

There are two attitudes towards the sound of the tram in Sheffield, as shown in the recordings (A18–A20), in which one respondent said, "The tram is noisy. I feel bored because it causes the floor vibrations". However, some elderly interviewees said, "The super tram is good because it can take me to different parts of Sheffield" (A38–A39). They like the sounds of the tram, and the fact that the low tram fare is beneficial to retirees. The sound was associated with returning home quickly. The usefulness and positive function of the tram gave the respondents an optimistic attitude towards its sound. Similarly, the sounds of rubbish collection were acceptable because the activity can make the environment clean. According to some of the respondents (A42–A43), "The sound of rubbish collection is okay because it can keep the environment clean weekly."

To a certain extent, understanding the sounds does not depend on the sound itself and its physical property, but on the associated behaviors, which could be positive or negative.

(2) The soundscape is also a process of imaging, as demonstrated in the recording A22: "I like the soundscape; it is comfortable and it creates the same image as in the remote villages." It involves a feeling of substitution between the hearing and visual senses. Most common is the audio-visual association (Bauer, 2013). It is thought that the vision relies enormously on spatial analysis, but the sense of hearing relies on the analysis of time (Blackmore, 2004).

(3) The soundscape is tactile. Soundscape is related not only to the sense of hearing but also to the sense of touch. From the perspective of physics, sound is one type of vibration. However, from apperception, sound is produced by special environments, as shown in the recordings (A47–A50), "Cold is a voice, because of mountains surrounded by the monsoon climate. Cold leads to fear and I feel fear." Because the sounds were produced by the monsoon climate in the hills, they were related to the physical environment. Based on the respondent's view, coldness can also be regarded as a type of sound; thus, the understanding of sound goes beyond the auditory ability of the ear. Sound is related to the sense of touch in that the latter can awaken peoples' feelings towards the former.

(4) In a sense, soundscape is the process of reproducing scenes from the past, as shown in the recordings (A127–A128). According to an interviewee who grew up in Sheffield from 1950 to 1970, "Comparing my childhood with the present, happy sounds have been lost. Some good sounds such as laughter, songs, birds, and nature

are missing. Comparing my childhood with the present, there is less quiet, more noise, population, and mobile phones. Children do not seem to play outside as much."

The subjective understanding of sound becomes more diversified and complicated each day. The definition of soundscape covers more fields than people can comprehend. Further findings demonstrate that the visual context can modulate the effective connectivity of the auditory cortex with the cortical and sub-cortical regions beyond the sensory cortex. Therefore, from a neuro-scientific perspective, this suggests that subjective experience is more closely linked to the connectivity state of the auditory cortex than to its basic sensory inputs (Hunter, Eickhoff, Pheasant, et al., 2010).

3.2 Soundscape memory

This study has also illustrated that sound memory is a long-term memory that stays deeply hidden in people's minds. Three types of memory have been found, namely:

(1) Positive memory: When a sound is related to sentimental feelings, people wish the sounds to increase, not vanish. The reason is that people desire to retain the feeling of recalling happy days in the past, as shown in the recordings (A163–A166). When asked about his attitude towards the tram in Sheffield, a middle-aged respondent who was born in China said, "I had to go home by tram frequently during my childhood. With the family relationship, I have a deep emotional connection to the

tram. It is different from the effect of the trolley bus. I hope that retaining but reducing the sound of the tram by technology can be achieved, but I do not want the sound to vanish." The interviewee recalled the happy times of his childhood, and the sound of the tram caused him to remember warm relationships.

(2) Special memory: Sheffield was regarded as the Steel City in the past. As shown in the recordings (A129, A135 and A146), "We lived in a suburb at the west end of the city. The sound of drop hammers did not affect my life. However, the noises from the 'little master' during work hours (pre-1960) caused me to remember pressure at all times."

The results of the survey were inconsistent with our suppositions. Before the investigation, we assumed that the noise from the iron and steel plants would have a strong noise influence on people's lives. However, the survey results revealed that the sounds from steel and iron forging did not have a strong negative effect. Rather, it was the noise from the factory management that had a negative association in people's memory. Because the respondents were laborers, their relationship with authority figures was a more crucial factor and had a direct influence on their lives. Therefore, the sound memory retained in people's minds is that which had the most profound impact on their lives.

(3) Negative memory: During the Second World War, 589 people were killed in Sheffield by German bombing and nearly 3,000 houses were destroyed (Lambert, 2013). During the war from 1939 to 1945, a male interviewee now aged 71 was blind

and was not able to see until recent years. In the recordings (A133, A134, A144, A148 and A149), he said: “I was 6 to 11 years old whilst the war lasted... I can remember the sound of airplanes sometimes. The sound caused very little anxiety. I can remember the sounds of war bombs and machine guns. I do remember the sounds but they have no physiological effect on me. However, I was worried about the safety of my home and parents…” One can find that during the war, some people felt restless and panic-stricken. Thus, the soundscape of war has a profound effect on people’s memory.

3.3 Soundscape sentiment

Soundscape sentiment is the description of present soundscape feeling. Most people use two evaluation criteria when inquiring about soundscape view: favorite or annoying sound. Fig. 3 shows the surveyed sound preferences. People mostly prefer the sounds of nature such as the sounds of birds and leaves, followed by the sounds of music and bells. Conversely, people mostly dislike the sounds of traffic and other artificial sounds. However, the discussion is broader than these usual criteria. The interviewees were allowed to talk about anything related to soundscape sentiment. The items are divided into two subcategories:

(1) Preference

a. Favorite sound

b. Annoying sound

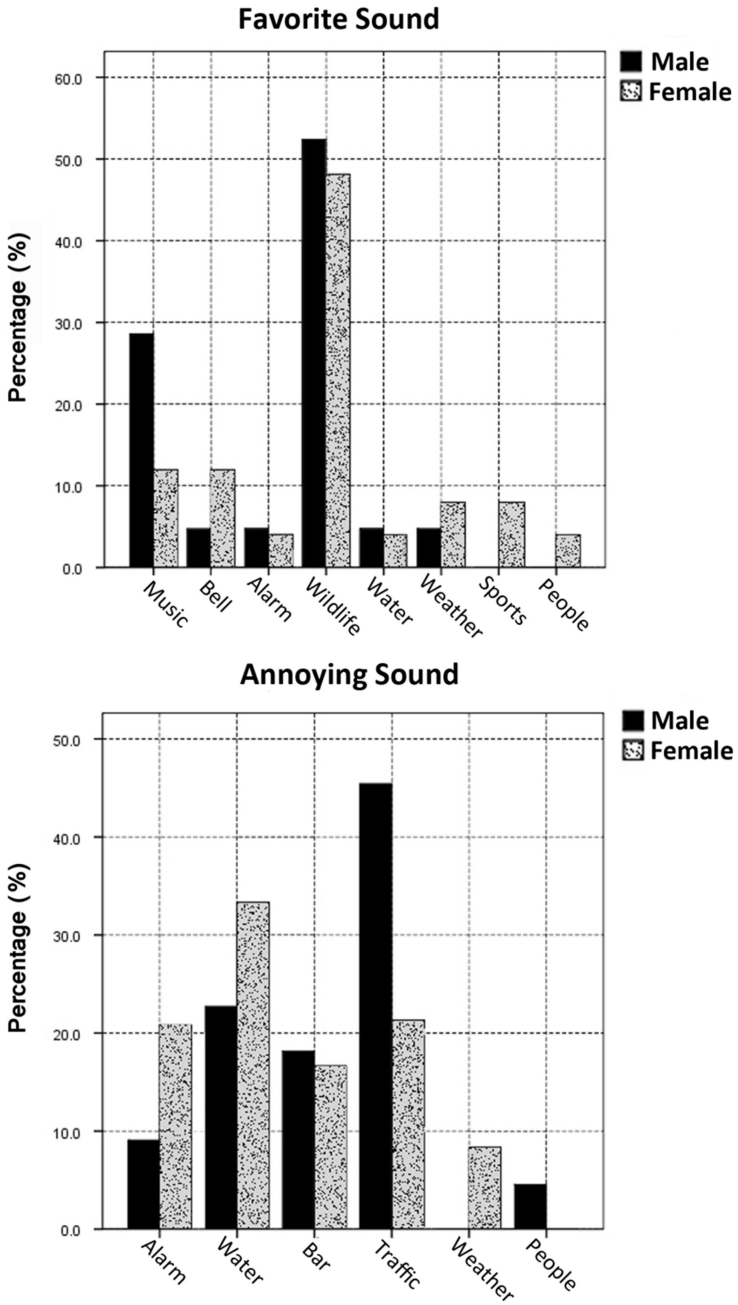

Fig. 3. Preferences of various sounds.

(2) Emotion

Some sounds related to emotion are identified below. These data are based on the following recordings: A21, A25, A26 , A27, A44, A45, A46 and A52.

a. Joyful sounds (bird songs, waterfalls, bells, market, wildlife, music, songs in church, church bells, ringing, people relaxing)

b. Angry sounds (drunken people, dogs barking, dance music, car alarm)

c. Sad sounds (wind between high buildings, the funeral of Diana, angry people, crying, noise in West Street on weekends, drunken people, sick people in the streets, pubs, traffic, ambulance)

d. Despair sounds (crying children, alarm, shopping, fire alarm, train noise, bad music, alcoholic students, missing the last bus)

e. Afraid sounds (noisy people outside the bar, dogs barking, ambulance police car, drunken people, fretting motor on weekends, night winds in the mountains, crazy car, sirens)

While joyful sounds would be a positive emotional resource, angry, sad, and fearful sounds are negative emotions. According to clinical research, emotions change the body. For example, persistent fear in the absence of actual threat may lead to chronic, maladaptive expression of autonomic activity, such as sustained elevated heart rate and reduced parasympathetic heart rate control (Brosschot Gerin,&Thayer, 2006; Friedman, 2007; Knepp and Friedman, 2008). Emotion is a functional provision, even if not all of its occurrences are (Frijda, 1994).

3.4 Soundscape expectation

A main focus of this research is people's view about future soundscape, which is related to soundscape sustainability. For example, a question was asked: "Can you describe your understanding of future sounds?" A number of key ideas about future soundscape are provided below.

(1) Soundscape changes as time goes by. "Music needs to always be changing, city sounds and music, like movies must change" (A3 and A123). This phenomenon shows that people's expectations of urban sound environment are changing.

(2) Simple sounds containing peaceful and joyful information. "I hope there will be more quiet background music, and I hope there will be less noisy traffic, but quiet and simple sounds, containing a lot of information, quiet, peaceful, joyful" (A15–A16).

(3) Natural and comfortable sounds mixed with entertainment. "The future of sounds will be peaceful with less traffic. Future sounds are some sounds of nature (natural river, bird songs, waterfalls, bells, silence). Sounds of traffic will be reduced by electric car" (A1–A2). "I hope there will be more peace, some natural sounds, natural river, birds and silence" (A12–A13). "I hope there will be more sounds of happy people speaking out without fear, working happily in good environment. And it will be comfortable, like a remote countryside" (A11 and A22). "Future sound is a mix of entertainment. Future sound is music in a live environment" (A5–A6). These responses show that people requirements are not only complicated but also delicate.

(4) The multi-ethnic, multi-cultural, and multi-lingual soundscape. Some respondents indicated that only one language culture (Sheffield accent) existed in Sheffield from 1950–1970. However, a multi-language culture has now appeared as a new trend. People predicted that soundscape will gradually multiply as cities become more complicated. “Now, multi-ethnic/ multi-culture/ multi-lingual is probably increasing. In the future, fewer people will speak with a Sheffield accent” (A7–A8). This phenomenon shows that the urban sound environment is becoming more varied. The concept of soundscape tends to be more complex and diversified as society becomes more multi-ethnic.

(5) More electronic sounds and comfortable technical soundscape. “I hope there will be more electronic and less natural. And I hope there will be more comfortable music from technology and computers” (A14 and A17). “Young people are influenced by TV, computers. Artificial voices could sound like robots”(A9) . Electronic man-made sounds will possibly become increasingly common.

3.5 Soundscape aesthetics

Compared to the above categories, soundscape aesthetics is a deeper form of soundscape understanding. According to Schafer, Bauhaus brought aesthetics to machinery and mass production (Schafer, 1977). Thus, the invention of a subject that will qualify as acoustic design is required to enable musicians, acousticians, psychologists, sociologists, and other professionals to study soundscape and make intelligent recommendations for its improvements. Much of the creativity of an artist

is symbolically expressed through the unconscious. Music is formed by the creativity of the artist. The vibration of the sound waves in music reflected through musical instruments stimulates the intense sense of hearing and feeling of a person, which further enhances the mood and emotion experienced on a sympathetic chord (Seashore, 1967). Moreover, musical works are appreciated by their melody, rhythm, speed, dynamics, timbre, intonation, and so on (Batt-Rawden, 2010). The basic purpose of music creation is to imagine, just as a painter uses imagination to paint. Soundscape aesthetics are also displayed through the sound image (Kwon and Siebein, 2007). The evaluation of soundscapes was explored extensively, focusing on the description of soundscape, (Schulte-Fortkamp, 2007; Zhang & Kang, 2007).

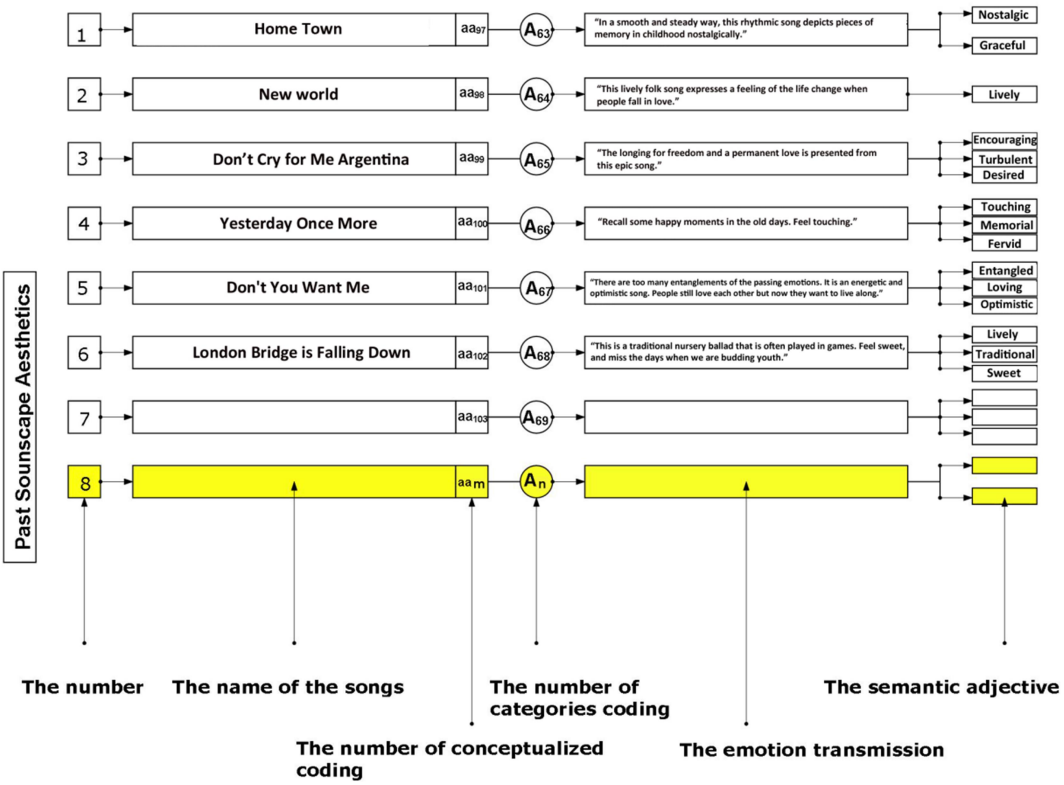

Fig. 4. Diagram of soundscape aesthetic analysis.

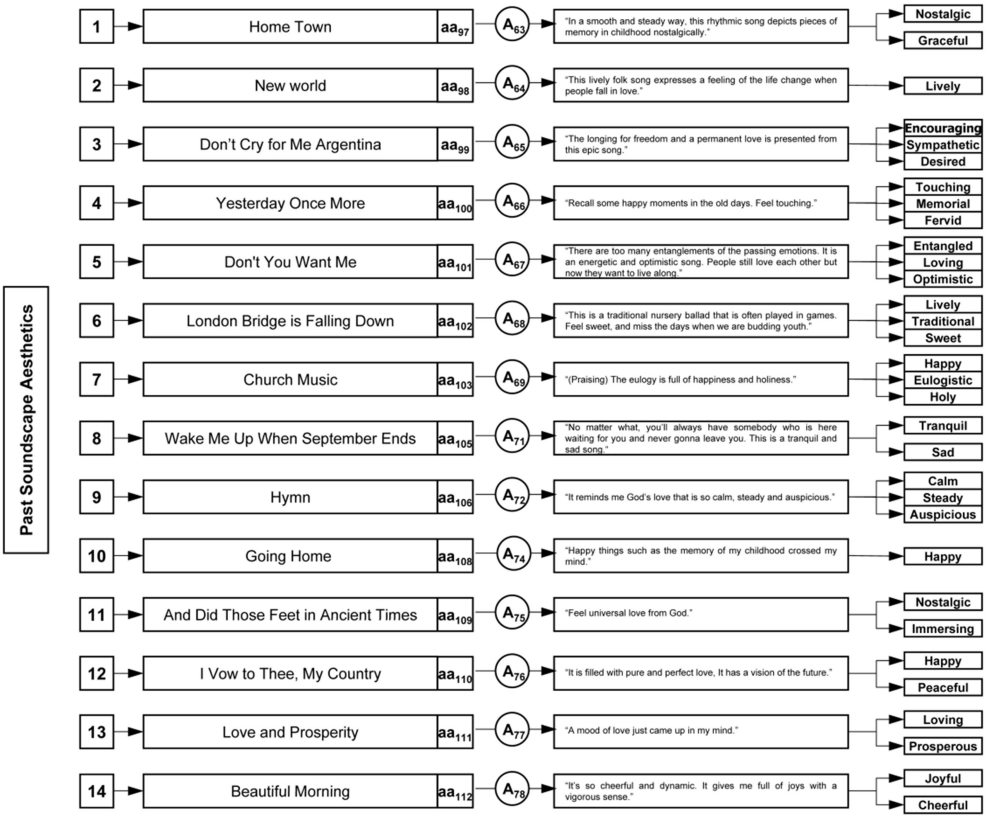

Fig. 5. Diagram of the aesthetic analysis of past soundscape.

A question about soundscape image was designed in this study: "If the soundscape of Sheffield could be represented in songs, which songs do you think might best depict the past, present, and future of the soundscape in Sheffield?" The results based on the answers to these questions are shown in Fig. 4. Emotional transmission is reflected by the words. The semantic adjectives are generated further below.

(1) Past soundscape. Fig. 5 graphically represents the responses from the question that asked respondents to choose songs that represent their aesthetic understanding of past soundscape. The adjectives that express their impression of the melody were extracted. These adjectives reflect their ideas regarding soundscape: nostalgic, graceful, lively, encouraging, sympathetic, desired, touching, memorial,

fervid, entangled, loving, optimistic, lively, traditional, sweet, happy, eulogistic, holy, tranquil, sad, calm, steady, auspicious, happy, nostalgic, immersing , happy, peaceful, loving, prosperous, joyful, and cheerful.

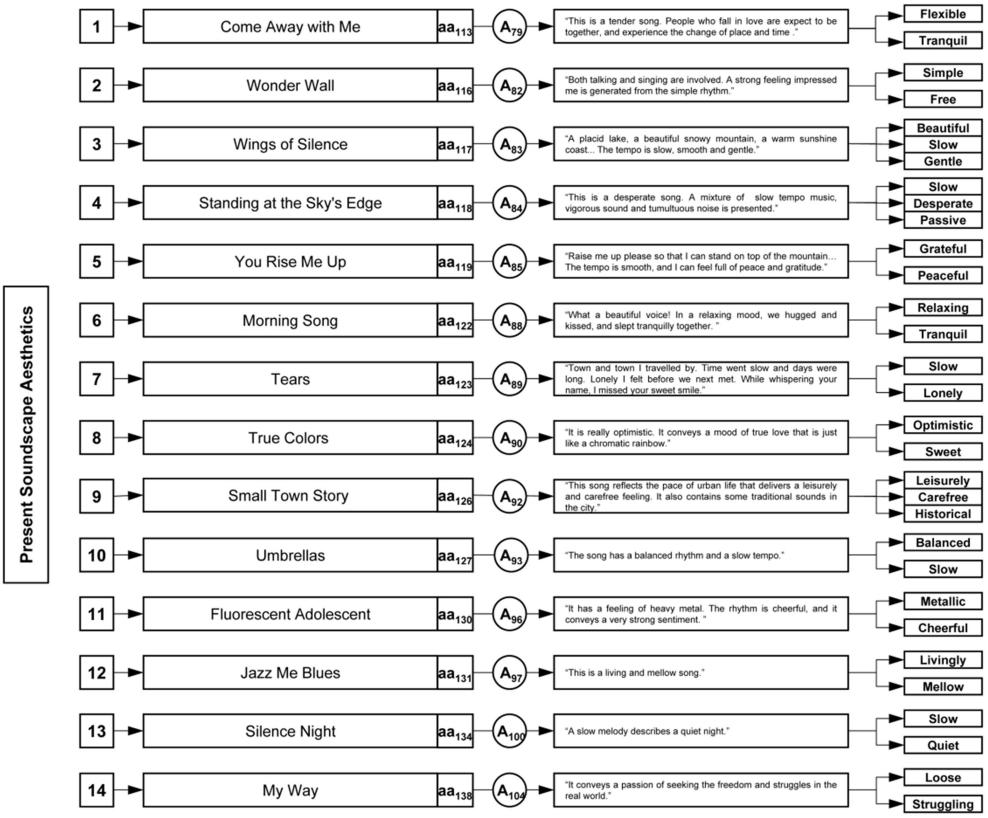

Fig. 6. Diagram of the aesthetic analysis of present soundscape.

(2) Present soundscape. Fig. 6 graphically represents responses from the question that asked respondents to choose songs that represent their aesthetic understanding of present soundscape. The extracted adjectives express their impression of the melody and reflect their ideas regarding their aesthetic understanding of the present soundscape: flexible, tranquil, simple, free, beautiful, slow, gentle, slow, desperate, passive, grateful, peaceful, relaxing, tranquil, slow, lonely, optimistic, sweet, leisurely,

carefree, historical, balanced, slow, metallic, cheerful, livingly, mellow, slow, quiet, loose, and struggling.

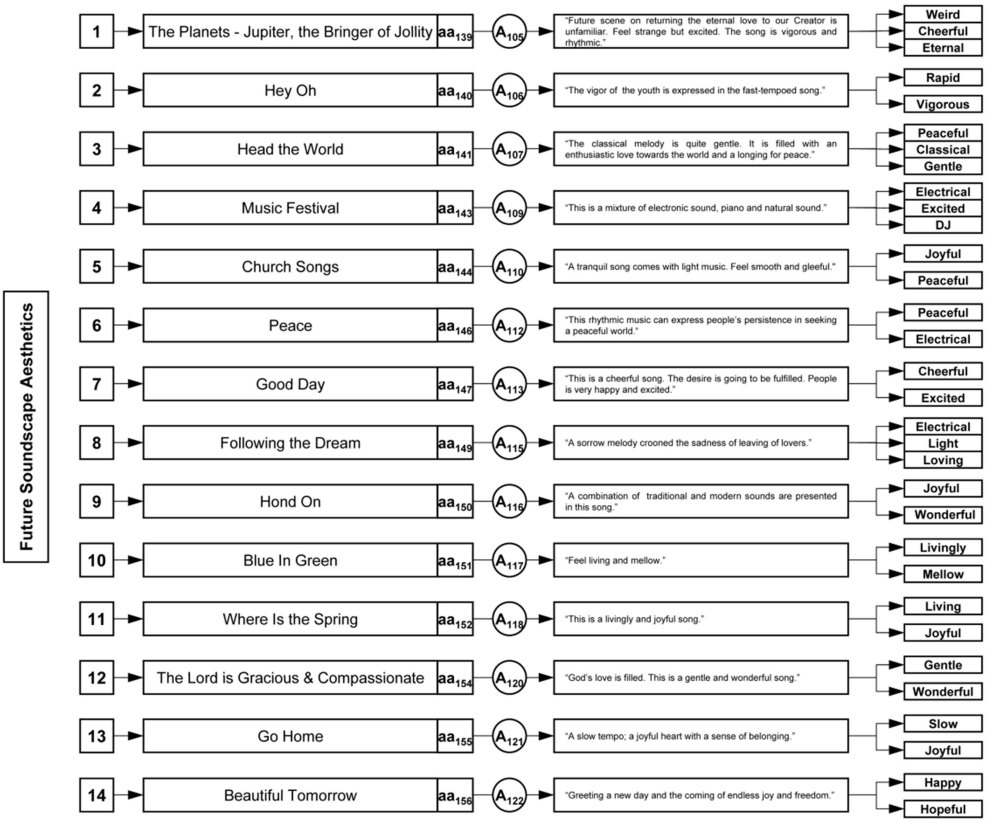

Fig. 7. Diagram of the aesthetic analysis of future soundscape.

(3) Future soundscape. Fig. 7 shows the results of the respondents' understanding of future soundscape. The extracted adjectives describe their ideas of the future soundscape: weird, cheerful, eternal, rapid, vigorous, peaceful, classical, gentle, electrical, excited, DJ, joyful, peaceful, peaceful, electrical, cheerful, excited, electrical, light, loving, joyful, wonderful, livingly, mellow, living, joyful, gentle, wonderful, slow, joyful, happy, and hopeful.

Fig. 7 shows that words such as electrical, exciting, DJ, joyful and peaceful are similar to the soundscape expectations as discussed in Section 3.4. In addition, some

words such as classical, mellow, and light enrich the description of the future soundscape. Aesthetic emotions as cognitive responses have a functional role to provide emergent motivation (Bickhard, 2000; Brehm, Miron,&Miller, 2009). This reflects a presupposition for a future-oriented aesthetic judgment, which confirms the subjectivity of the aesthetic preference based on motivation (Xenakis, Arnellos, &Darzentas, 2012).

3.6 Links among the categories

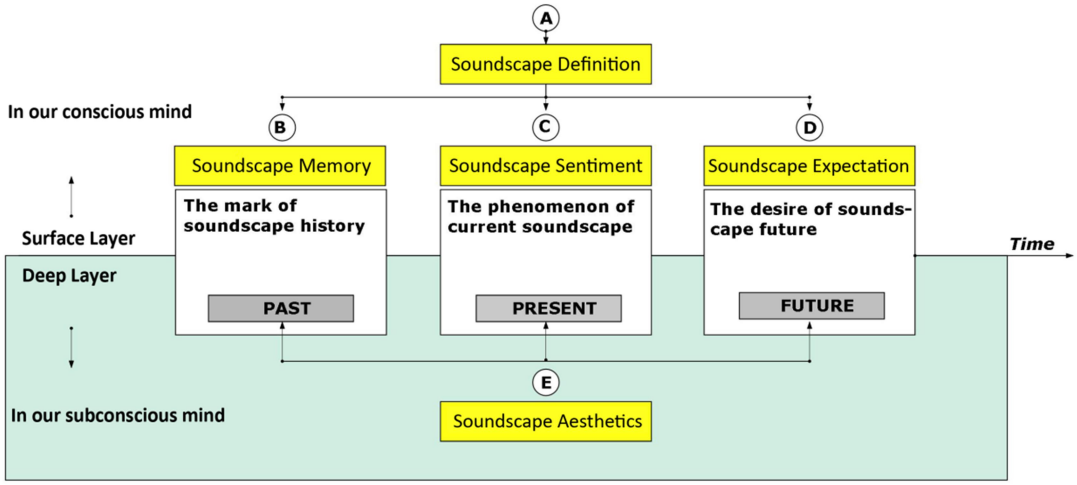

Fig. 8. Links between the soundscape categories.

Soundscape research in psychology requires knowledge in the base of consciousness. Consciousness is composed of two parts: one is the state of awareness wherein humans think and perceive and the other is called the subconscious mind, which is state of being unconscious. The links among the above five categories are shown in Fig. 8, where soundscape definition is the core category. The definition of soundscape is a concept of the development of understanding, which can be broken down into three parts based on time: soundscape memory (the mark of soundscape

history), soundscape sentiment (the phenomenon of current soundscape), and soundscape expectation (the desire for future soundscape). These parts are internally related to soundscape aesthetics in three time periods, namely the past and memory, the present and sentiment, and the future and expectation. As shown in Figs. 5–7，the expressions in the soundscape aesthetics analysis of the three time periods evoked memories of soundscapes related to pastime, showed soundscape feelings at present, and indicated the expectation of soundscape in the future. Soundscape aesthetics are in the subconscious, whereas the other categories are in the conscious mind. With the five categories, a united consciousness of soundscape is formed by combining the surface layer in our conscious mind with the deep layer in our subconscious mind.

4. Discussion

Three key points need to be discussed, considering the three stages of the past and memory, the present and sentiment, and the future and expectation:

(1) Why do sounds from the past stay in our mind? How do we forget?

(2) What are the major problems that face the UK at present?

(3) What are the trends in future soundscape? Does it reflect the evolution of society?

Long-term soundscape memories such as sounds from World War II are preserved in the human mind. However, these memories are forgotten. The forgetting mechanism was initiated by Ebbinghaus in 1885, which still persists at present. Decay theory evolved from the seminal research of Ebbinghaus, wherein he proposed that

forgetting appears as a function of time, whereas learned material decays as time goes by (Müller and Pilzecker, 1900). However, arguments were raised on whether the materials and tasks that occupy time are involved in the forgetting process because of their interference with the to-be-retained material. The materials and tasks that intervene between presentation and recall may interfere with the to-be-remembered items. This phenomenon was named "retroactive interference" (RI) (Müller and Pilzecker, 1900). Dewar stated that RI plays a role in (everyday) forgetting. Similarity, which is most frequently associated with RI, is not a "requirement" for RI effects to emerge but mental effort which can cause considerable disruption to everyday memory (Dewar,Cowan,&Sala, 2007). Therefore, long-term soundscape memories such as sounds from World War II were preserved because they have a vital degree of correlation.

Sound is also an experience related to the climatic environment, the experience of individual life, and the experience of historical events. When a sound is associated with positive feelings, people wish that the sound could be increased rather than eliminated. This paper discovered a number of soundscape features in Sheffield and focused on the sounds that were considered important either because of their individuality, number, or domination. To some extent, the locals are the most direct and important audience. Thus, soundscape planning does not only mean noise reduction, local history preservation, culture presentation, or even modernization, but also meeting the unique requirements of the local people

(Deng,Wu,&Shi,2009;Schulte-Fortkamp, 2013). The responses from the interviewees in this study show that the protection and preservation of local soundscape should be considered. Soundscape is now facing challenges because of the diverse cultures in the sound fields (Kang, 1998). Therefore, remedies should be sought not only in the scientific, technical, socio-economical, and political spheres but also in the spheres of spiritual values and appreciation of nature, not only as source of materialistic satisfaction but also its intrinsic values. The word "spiritual" has various meanings for different people (O'Callaghan & Grocke, 2009). Some sounds about a city's history, such as the sounds from old urban railways and the local accents, can evoke warm memories about the city and reduce the crisis of disappearing local culture.

The general acoustic environment of a society can be regarded as an indicator of the social conditions that produced it. Moreover, the soundscape may say something about the trends and evolution of that society. The findings in this study provide evidence for the social needs of electronic sound, such as keywords about future soundscape shown in Fig. 7. Some interviewees revealed that they like music with comfortable electronic sound (A14 and A17). This reflects that the digitization of the living conditions influences people's cognition. The digital age has brought computerization and digitization to family and work. The invention of electro acoustical equipment for the transmission and storage of sound enabled any sound, no matter how tiny, to be recorded and transmitted around the world. Because the social system includes people with intense consciousness, according to "reciprocal

determinism," which states that a person's behaviors both influence and are influenced by personal factors and the social environments, humans can use foresight to make rapid unceasing adaptation and use feedback mechanisms to move the social system rapidly to meet their needs. The future soundscape will be directed by the demands of the people. This is similar to Wilson's concept of "consilience," where urban natural systems and human systems interact and alter one another, producing an energetic synthesis in the process (Steiner, 2011). People's preference for electronic soundscape probably reflects the development of the entire society.

5. Conclusions

This article explores peoples' psychological understanding of urban soundscape in Sheffield. The study identified five categories, which, in addition to the soundscape definition and aesthetics, also reflect the process of soundscape understanding, including soundscape memory, soundscape sentiment, and soundscape expectation: (1) Soundscape definition: the value people place on sounds does not lie in the sound itself or its physical properties but in the positive or negative behaviors associated with sounds. (2) Soundscape memory: Some long-term soundscape memory was preserved because they correlated to something profound in people's mind to some degree. (3) Soundscape sentiment: Further interviews reveal that emotion is also an important part of psychological stratification, which includes joyful, angry, sad, despair, and afraid. (4) Soundscape expectation: People hope that soundscape will

change as time goes by, towards the soundscape of natural and comfortable sounds mixed with entertainment as well as simple sounds containing peaceful and joyful information. Notably, people look forward to more electronic, comfortable, and technical sounds in the future. (5) Soundscape aesthetics: The study explored soundscape understanding in people's subconscious. Soundscape aesthetics in the future reflects a presupposition for future-oriented aesthetic judgment, which can provide qualitative direction for urban sound environment designers.

People's complexity determines the complexity of soundscape perception: the article suggests that people need to reduce the sound pressure level of the environment and that the urban soundscape is expressed by favorite and annoying sounds. Actually, people's sound experience is a more complex and diverse experience mode, and we should focus on urban landscape perception models and attributes. Because soundscape is not fully reflected by physical measurement and evaluation, it should be combined with positive and negative significance in soundscape evaluation. Urban planning of soundscape should contain more refined emotion attribute evaluation, and the investigation of soundscape, especially in areas of crowds that live under a special historical background, need to consider their particular soundscape life experience. Soundscape is closely related to the city history, culture, and time. It is a multidimensional awareness. The future investigation of soundscape shows that the soundscape design should not be in a fixed style; people hope to have fresh soundscape experiences as time goes by. To some extent, the

survey of soundscape futures can serve as a direct reference in urban soundscape design. Only by surveying individuals' preferences and understanding of urban soundscape will soundscape design become more down-to-earth and a design basis of the urban sound environment.

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