



# How the meaning a person gives to tranquility could affect the appraisal of the urban park soundscape

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## ABSTRACT

It has previously been established that different people attach a different meaning to the concept of “tranquil public space”. A majority of persons associate tranquility with social interaction, but others associate tranquility with hearing sounds from nature or even with pure silence. Having these different beliefs and views in mind, hypotheses could be formulated on their effect on the perception and appraisal of soundscapes in urban parks. Firstly, persons associating tranquility with sounds from nature may focus more on hearing these sounds while visiting a park, and might notice them more often as a consequence. Secondly, the meaning given to tranquility also influences one’s frame of reference and expectations. Thus, persons associating silence or sounds from nature to tranquility might state more easily that they hear less natural sounds and more mechanical sounds when visiting a park. These hypotheses were tested on survey and measurement data from 8 parks in Antwerp and on computational models of auditory perception. Results show that attention focusing is dominated by the change in frame of reference or expectation. In addition, a weak relationship was found between the park where persons were encountered and their view on the concept of tranquility.

Keywords: Soundscape, tranquil areas, urban park I-INCE Classification of Subjects Number(s): 56.3

## 1. INTRODUCTION

The importance of the soundscape of an urban public space has been demonstrated over the past years (COST TD0804). The term soundscape has been used by different communities of practice (e.g. acousticians, composers, architects, ecologists, psychologists), giving rise to several definitions. A standardized definition may not be required, and is still in discussion, but it is now understood that the soundscape is evoked by the physical sound environment henceforth called the sonic or acoustic environment, but it is not equal to it and therefore cannot be measured using classical sound measurement equipment alone. It is also clear that the soundscape is formed within a context. This context is shaped by all sensory stimulations – of which auditory and visual observations are the most important – and by the knowledge people have accumulated about the space, its use, its purpose, its cultural meaning, their own and others motivations and purposes to be there, the associated activities, etc. (1)

The soundscape of urban parks is a small subset of all imaginable soundscapes and the context is reasonably well described. Urban parks are often regarded as calm and tranquil areas within the liveliness of the city. In the underlying study we focus on how the meaning a person gives to tranquility – in the context of urban parks – could influence its appraisal of the park soundscape.

From a theoretical point of view several hypotheses can be formulated. It is known that natural sounds are in general appreciated in a park soundscape (2) while mechanical sounds are not acceptable and human sounds are acceptable to some degree. It has also been shown (3) that a large group of people associate “zone calme” (tranquil area) to social interactions while the viewpoint of others is more oriented towards (natural) sounds or absolute quietness. A first hypothesis could be that those people associating tranquility to natural sounds pay more attention to the sounds of nature (6) and thus on average hear more of these sounds while wandering through a park and thus appreciate the soundscape more. People that follow the viewpoint that tranquility requires silence on the contrary will interpret every sound as a disturbance of tranquility. Finally, people associating tranquility to social interactions may hear more human voices and children as these are the sounds they are listening

for.

A second hypothesis relies on appraisal being the result of matching expectations (7). Persons whose understanding of tranquility involves natural sounds and silence could be assumed to have expectations concerning a tranquil park that do not include the sound of humans. Therefore the presence of such sounds (or mechanical sounds) would make them rate the quality of the sound environment in this park less appealing. Their perceived intensity of hearing unwanted sound may be higher due to the different frame of reference they may use when it comes to quantifying this intensity.

Although the importance of personal factors such as the meaning given to tranquility has been mentioned in literature, the underlying study is to our knowledge amongst the very few to quantitatively and directly link this personal factor to perception of the sonic environment in parks.

## 2. METHODOLOGY

### 2.1 Study area

The data used in this study were gathered during 22 days in August and September 2013 in eight different parks in the city of Antwerp (Figure 1). Antwerp has a population of about 500,000 and a harbor handling about 200,000,000 tons of freight a year. This makes the burden of traffic a hot issue. The main ring road (R1) lies inside the city and relatively close to some of the investigated parks. Antwerp has also a small international airport, however its impact on the noise climate in the studied parks is rather limited.

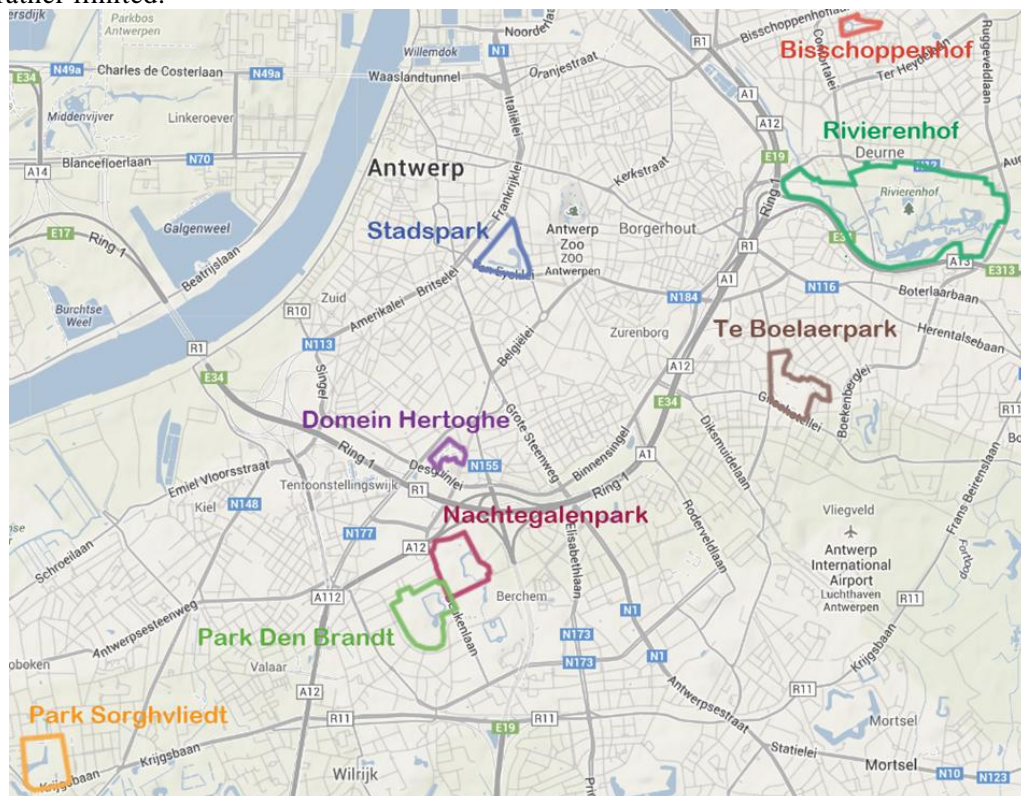


Figure 1 – Location of the eight parks in the city of Antwerp considered in this study.

### 2.2 Questionnaire study

A questionnaire study was conducted with approximately 80 participants per park recruited amongst visitors that were encountered close to a central spot in each park. The questionnaire included questions on

- The use of the park: why, when, how often
- Soundscape quality: 4 item Stockholm scale (2)
- Overall park quality: general quality, annoyance, ...
- Noticed sounds: nature, human, mechanical
- Sounds matching the park environment
- The visitor's home situation

- Attitudes and beliefs: 13 statements on tranquility; additional beliefs

The question on noticing sounds reads “to what degree did you hear the following sounds during your current visit to this park” and was followed by three groups of sounds “human sounds (talking people, playing children, ...)”, “natural sounds (wind in the leaves, birds, water, ...)”, “mechanical sounds (traffic, airplanes, machines, small electronic, ...)”.

The question “How do you rate the following aspects of the park during your visit today?” with categories landscape, environmental sound, air quality, smell, light will also be used in the analysis in this paper.

Of particular interest for this paper are the 13 statements on tranquility. They have been selected from the 47 questions used in the study by Delaitre et al (3). The questions that were discriminating most between the different viewpoints discovered in (3) were selected in order not to overload the questionnaire. In contrast to the cited work, the answers were collected on an 11-point scale ranging from “completely agree” (+5) to “not agree at all” (-5).

### 2.3 Sound recording

At the same time the questionnaires were administered, continuous sound measurements were performed in the park. In addition to the more common fixed measurement location where sound pressure level and B-format recordings were acquired, also a more innovative technique was used. During the campaign, two or three investigators were walking throughout the park carrying a backpack equipped with sound level meter and GPS. Much care was taken not to produce unwanted sounds while walking that eventually could disturb the measurements.

Data were subsequently aggregated to 15-minute indicators as well as to 1-minute running average indicators calculated every 10 seconds. The latter were mainly used for mapping and will not be discussed in this paper. Inspired by (4), acoustic and perceptual indicators were combined to an overall quality rating for each park. The acoustic indicators include  $L_{50}$ , spectral center of gravity ( $CoG$ ), music likeness ( $ML$ ), and number of events ( $NcN$ ). The perceptual indicators used were the overall rating of quietness and the noticing of non-matching sounds.

## 3. RESULTS

In this paper, we focus in particular on the influence of the viewpoints or beliefs related to tranquility and how it affects soundscape perception. To analyze the results of the 13 questions that express belief on tranquility, the three main viewpoints obtained by Delaitre et al. (6) are used: social relationships, sounds and nature, and silence. The prototypical response obtained from the Q-methodology on the 47 questions used in this study is firstly truncated to the 13 most differentiating questions that were translated for the Antwerp park study. For each respondent the degree of similarity between their response on the 13 questions and this prototypical response is calculated using the overlap-integral of the answer profile as a measure.

When classifying the visitors of the surveyed park according to the class that their answers are most similar to, it is found that 74% of the park visitors interviewed adhere to the viewpoint: a tranquil park is a place for social relationships, while only 18% associate a tranquil park to silence, and the remaining group associates tranquility to special sounds and nature. However, it should be noted that the context of the current study is urban parks, whereas in the work by Delaitre et al., places in a more abstract sense were considered. Consequently, this reasoning might explain the lack of association of tranquility to sounds and nature.

A weak relationship was observed between the sounds that park visitors reported to have heard during their visit to the park and the membership degree of different viewpoints on tranquility (Figure 2). Hearing human sounds does not differentiate between groups, although there is a tendency for people that report hearing much to very much natural sounds not to belong to the groups that associate tranquility with hearing sounds and nature or silence. The trend is even more pronounced when it comes to hearing mechanical sounds: a monotonous increase is observed between belonging to the group of people that associate tranquility with sounds and nature or silence and hearing mechanical sounds. It should however be observed that although the relationship is clear, the magnitude of the effect is limited to about 15%. In line with these observations, and previous studies that showed that mechanical sounds are in general not much appreciated, Figure 2 also shows a monotonous decreasing trend in membership of the groups that associate tranquility with sounds and nature or silence and the quality judgment of the environmental sound.

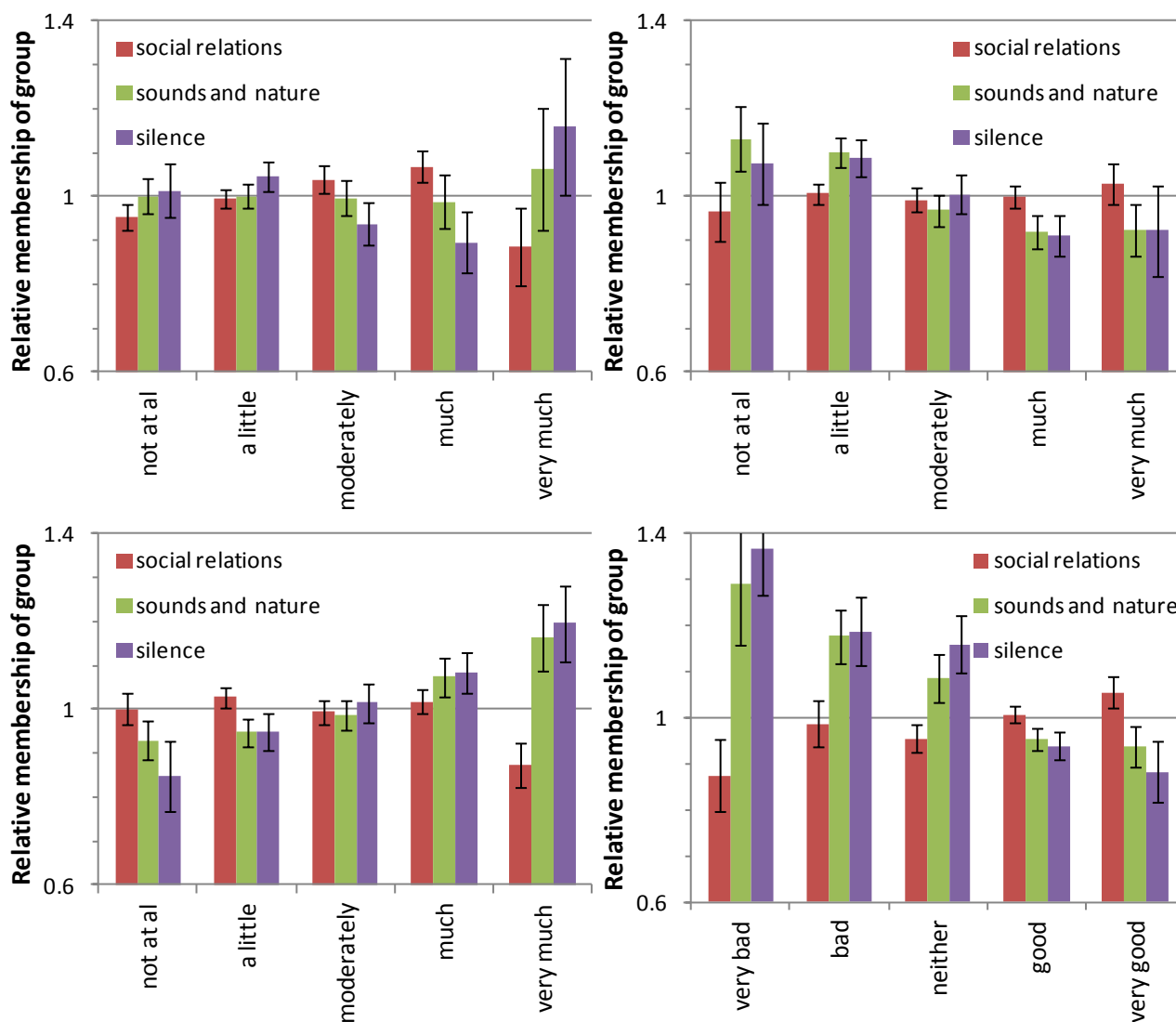


Figure 2 – Relative membership of the three different viewpoint of tranquility of respondents reporting different degrees of hearing human sound (upper left), natural sound (upper right), and mechanical sound (lower left); and overall environmental sound evaluation (lower right).

For further unraveling whether expectations could be a mediator between viewpoint and quality assessment, the adherence to different viewpoints on tranquility are analyzed as a function of the location where the persons were encountered (Table 1). A significantly higher fraction of the persons associating tranquility to social relations is found in Te Boelaerpark while a significantly lower fraction is found in Bisschoppenhof; persons associating tranquility to sounds and nature are statistically significantly more often found in Nachtegalenpark and Park Den Brandt; persons associating tranquility to silence are statistically more often found in Domein Hertoge and Park Den Brandt. The soundscape quality in the parks was also rated on the basis of a multi-criterion approach including sound levels and perceived quality (not reported here). The result is shown using a star-rating. There seems to be no clear relationship between the viewpoint of the persons encountered in the park and the quality rating.

Whether or not the sound environment matches the expectations of the park visitor depends on many different factors:

- The intrinsic quality of the sound environment in the park averaged over visitors and time;
- Deviation in the sound environment compared to the usual situation, that the visitor might know;
- The expectations related to what the visitor would like to encounter in a park, which could be related to the meaning given to tranquility by this person.

To investigate matching expectations the percentage of the persons agreeing or completely agreeing with the statement “The sounds in this park are the sounds that one expects to hear in a park ” (translated from Dutch) is calculated and shown in Table 1. Even for the parks with lowest quality rating, about 70% of the visitors state that the sounds match their expectations. In the parks with the most highly rated soundscape quality, this percentage increases above 80%. Of particular interest is the difference between Park Den Brandt and Park Sorghvliedt. The soundscape in both parks is rated of highest quality, but in Park Den Brandt more people are found that associate tranquility to sounds and nature or silence. At the same time the percentage of the persons interviewed stating that the sound environment matches their expectations is lower.

Table 1 – Membership of the classes of viewpoint on tranquility, normalized so as to indicate where persons adhering to these viewpoints are found more often than average, colors indicate statistical significance; multi-criterion evaluation of soundscape quality is indicated using a star system; also percentage of the visitors stating that the sounds they heard match a park environment.

	Viewpoint			Soundscape quality	Matching expectations
	social relations	sounds and nature	silence		
Bisschoppenhof	0.93	0.91	0.97	**	88%
Domein Hertoghe	1.00	1.01	1.09	*	86%
Nachtegalenpark	1.01	1.06	0.93		71%
Park Den Brandt	0.99	1.08	1.07	**	81%
Park Sorghvliedt	1.01	0.94	0.95	**	98%
Rivierenhof	1.01	0.99	1.05		76%
Stadspark	0.98	0.97	0.94		75%
Te Boelaerpark	1.08	1.04	1.00		69%

#### 4. DISCUSSION AND CONCLUSION

Based on a total of 660 interviews conducted in 8 urban parks in Antwerp, it was demonstrated that the viewpoint on tranquility of park visitors has an effect on which sounds they hear, and on their general appreciation of the environmental sound in the park. In particular, amongst those that hear much to very much mechanical sounds, more persons are found that associate tranquility to sounds and nature or silence. Amongst those that hear natural sound much to very much, less persons that associate tranquility to sounds and nature or to silence are found. This clearly rejects the hypothesis that people looking for sounds and nature would pay more attention to the sound in the park and would thus notice these sounds more.

Within the group of persons that rates the quality of the sound environment bad to very bad, a significantly higher fraction relates tranquility to hearing sounds and nature or to silence. This could be explained by those people being more critical, having higher expectations concerning the sonic environment in an urban park. This observation seems to be confirmed by the analysis of the direct question whether the sounds heard in the park match the expectations. The quality of the soundscape in the park clearly has a strong influence on the percentage of the interviewed people that state that the sounds match their expectation. In addition however, finding more persons that associate tranquility to sounds and nature or silence, reduces the percentage of persons that state that the sounds match their expectations.

Finally, belonging to the cluster of persons with as a point of view that a tranquil space is a place for social interaction, an experience that is shared, a place with children and cafés, etc., does not influence which sounds are heard. This group of people is slightly more present amongst those that rate the sound environment as very good, yet these trends are not very pronounced.

In conclusion, from the data collected and the analysis performed, the most plausible influence of associating sounds and nature or silence to tranquility is that it makes people more critical concerning the sound environment in parks and gives them higher expectations concerning this sound environment. As a consequence, they observe unwanted mechanical sounds more frequently and desired sounds slightly less frequently, and rate the quality of the sound environment poorer. Those that associate tranquil spaces to social interaction seem to have very low expectations and do not observe sounds of any category, even not mechanical sounds, or at least do not label the noticing of these sounds as much or very much frequent.

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