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Spatial and Sonic Evaluation of Urban Ambiances

By Solène Marry

Introduction

In order to propose a study of sonic ambiances, it appears essential to consider sound through its temporal character. Jean-François Augoyard (1991) argued that sound should be understood primarily as temporality. But the existence of a sound is revealed only if it is heard, perceived. It is this sonic perception and especially its specificities in urban public spaces that will be investigated in this article.

Sound is the subject of a mechanism of perceptual selection. Abraham Moles paid particular attention to the concept of “intention” (1972), that is, wanting (or not) to listen to a sound. Speaking about environmental sounds amounts to a tautology, and emphasizes how behind sound research is, in current ideology. Few research laboratories, such as the *Centre de recherche sur l'espace sonore et l'environnement urbain* (CRESSON), take a multidisciplinary interest in ordinary sound ambiances and everyday sounds. Our study is based on a survey conducted to learn about ordinary sounds of public space and their perception, and its objective is to contribute to better define urban ambiances. The concept of sound is ambivalent: Olivier Balajé (in Barraqué et al. 2004) reminds us that sound presence can be unpleasant but so can its absence; this contextual ambivalence of sound perception is the subject of the study presented here.

It is necessary to define some of the basic concepts before continuing: town planners associate the notion of *public space* to a collective and public urban area (for example a *public square*), whereas *space* is more unspecific and linked to spatial considerations; a *place* defines an area, a localisation. The *perception* of a public space goes through, among other things, all the *senses* (what we generally refer to as sensations).

The following assumptions have been made for this research. First, the parameters associated with sound perception in public spaces are numerous and heterogeneous. Second, sound perception is affected by spatial practices and all spatial, temporal, sensorial, individual parameters. Finally, spatial planning in urban public environments is fundamental not only for acoustic but also for synesthesical perception.

The scientific literature makes it possible to determine some classes of parameter influencing the perception of environmental sounds. These parameter classes are: temporal, spatial, sensitive and individual ones.

The evolution of the concept of ambiance

An ambiance is first of all determined by its immediate perception in a public space. The ambiance of a place is characterized by light, sound, material, traffic, volume, presence, etc.

These sensitive components are recognized by all specialists; nevertheless the notion of ambiance cannot be contained by a single, formal definition. Pascal Amphoux describes an ambiance as the material and moral atmosphere that surrounds a place (Amphoux,

Thibaud, Chelkoff 2004). The concept of ambiance is in fact a method used to produce an in situ investigation of daily situations taking place in urban environments. It simultaneously takes into account physical elements, practices, perceptions and representations. The term *ambiance* first appeared in 1885 with Villiers de l'Île d'Adam (Augoyard 2005), and comes from the Latin *ambire*, which means going all around, surrounding. This qualification of the environment is both physical and cultural. From a scientific standpoint, the term “*ambiance*” has no positive or negative connotation.

The concept of *ambiance* is currently being investigated by researchers at CRESSON. They remind us that: first, the notion of architectural and urban ambiances necessitates a sensitive relationship to the world. Second, it requires a multidisciplinary approach. Third, it is to be found in the experience of users in both commonplace and extraordinary spaces. The study of ambiances must take into account not only physical signals, notions of spatio-temporality, and perceptions, but it must also consider individual and collective representations as well as social interactions (such as conflicts). Urban ambiances create the identity of public spaces and allow us to characterize and appropriate them. Therefore, any intervention in a public space has to take into account all *ambiance* elements and potential appropriations by users, in a way not to confine a space to a single use, but rather to allow the evolution of practices and manners. Synesthesical perception in urban public spaces

Sonic *ambiance* is intrinsically connected to space; in particular public space, is characterized by an *ambiance*, which varies over time. Urban ambiances are perceived by the senses even if these senses are generally organized hierarchically, (for example, seeing is more important than listening). Sound is often being comprehended as a residual element of an urban planning or architectural intervention. Indeed, an ambient identity is not made of a single *ambiance* but rather of all possible perceptual ambiances (sonic, olfactive, etc.).

Besides, it is necessary to take into account the relationships between the senses. For this reason we shall consider the sonic *ambiance* in its sensitive, *cenaesthetic* (association of all the sensory impressions) and *synaesthetic* (interaction between two or several senses) relationship. A *synaesthetic* approach is a condition for any research focussed on one single sense. Perception is the fruit of all senses, “a single sense misses us and the received reality is modified” (translation mine) (Ledentu 2006, 67). For Alfred Tomatis, human listening is determined by all sensory functions (Tomatis 1974). How can we then account for the superiority of a sense over another? What can produce this sensory gap? It would seem that culturally, the greater solicitation of a sense is the cause of its superiority, and that this superiority is not innate but the fruit of a societal experience. Paradoxically, the ascendancy of sight in Western societies should highlight the importance of considering the other senses in perception studies.

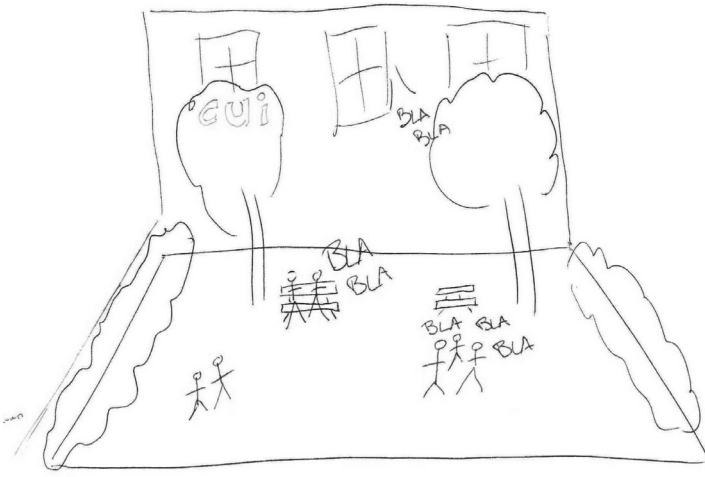


Figure 1: Sonic mind map of the ideal sonic ambiance of a square, interviewee n° 22

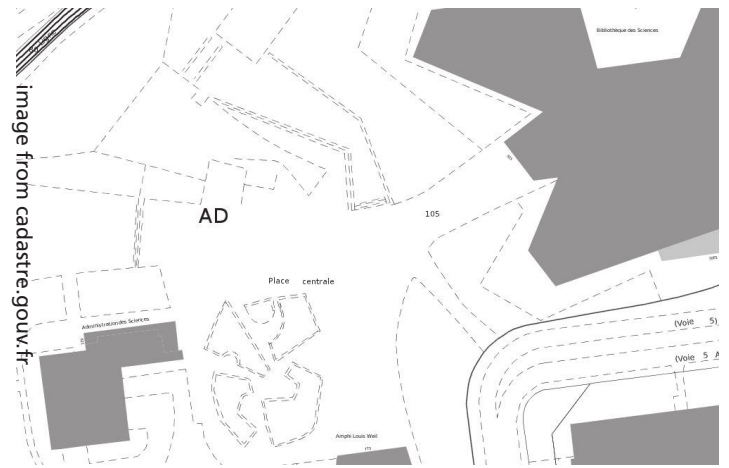


Figure 2: Place Centrale, campus, Saint-Martin-d'Hères

When visual attention is sought, hearing acuteness decreases, and vice versa; for this reason *visual* urban furniture can actually be effective in treating sound problems. It has been shown that when a demand for both visual and sonic attention is produced, visual attention reduces the perceptive consciousness of sounds (Yang, Kang 2005). Vision has a direct impact on sonic perception and on the evaluation of sound ambiances; several researches have attempted to demonstrate that the sensory interrelation evens out the impact of the direct view of a sound source on the sonic perception of that source (it was shown that when a demand of visual attention and a demand of sound attention are coupled, the visual attention reduces the perceptive consciousness of sounds, and vice versa) (Amphoux 1996), (Raimbault & Dubois 2005), (Yang & Kang 2005), (Faburel & Gourlot 2009), (Cox 2008), (Frize 2002), (Viollon, Lavandier & Drake 2002), (Vroomen & De Gelder 2000).

Methodological Protocol

The objective of this research was to determine what the various sound perceptive parameters found in the experience of public spaces are. Our methodology was based in a qualitative survey combined with acoustical measurements taken in three public squares in order to correlate perceptive and physical data. A preliminary test allowed us to design a questionnaire and to choose the three sites of the case study. The survey was conducted over six months from September 2009 to March 2010. This qualitative survey was divided into two parts: the first part was carried out on site over two seasons; the second part consisted of complementary individual interviews.

The first part of the methodology consisted of 174 on site questionnaires (each participant answered the questionnaire six times, that is, twice at each location), 513 pictures (interviewees were asked to take three photographs at each site during both seasons to 'represent the global ambiance of the square') and 18 on site focus groups (participants discussed their feeling and appraisal during their visit of the squares).

This first, more collective part of the methodological protocol, was followed by 29 individual in-depth interviews, with the same participants. These individual interviews included:

1. In-depth interviews about their memory of the three squares (ambiance, comfort, environmental sounds) and their urban practices (daily means of transportation, behaviour in public spaces etc.)
2. A discussion about the pictures they took during their visit of the squares.
3. Drawing of five mental maps (participants were asked to draw the sonic environment of the three squares, followed by that of the ideal

and the worst sonic ambiance to be heard in a public square); Figure 1 shows one of the sonic mind maps of the ideal sonic ambiance of a square.

4. Ranking of a number of urban designs according to the perceived quality of their sound environment. We showed the interviewees drawings representing seven urban morphologies (isolated individual house, urban small individual housing, urban medium collective housing, private housing estate "pavillions", big buildings, Haussmannian housing and collective housing areas) and asked them to rank these morphologies from the most pleasant sonic environment to the most unpleasant one.

The field study of our research was made up of three urban public squares. A square is a particular type of space; it constitutes the conceptual basis of the public space, (as demonstrated by its Greek root *agora*). A square possesses a clear spatial delimitation and creates strong mental representations. We wondered if spatial morphology and urban typology influenced sound perception. In order to verify this hypothesis, we chose three different types of squares (different size, form, opening – see figures 2, 3, 4). Their position in the urban area (centered or not) were also a criterion, as well as features of the neighbourhood, vegetation or presence of water sources.

Twenty-nine interviewees were selected using a number of variables: age, gender, place of residence and means of transportation. Remuneration was attributed to all interviewees at the end of the three survey meetings to motivate them to finish, as it was important in our protocol that the same interviewees completed the process.

Three groups were constituted: the first group was composed of people who lived in houses, the second of people who lived in old collective housings and the third of people who lived in recent collective housings (this selection was deemed necessary to verify if the type of residence of participants influences sonic perception and values). These groups were asked to rate (thanks to a number of variables in the questionnaire) these urban squares during two seasons. In this part of the survey, performed *in situ*, interviewees were asked to:

1. Answer a questionnaire addressing the evaluation of visual and sonic ambiances, sound levels, types of sounds heard, etc.
2. Take three photographs which describe the *ambiance*. Come together to discuss their perception of the place in a focus group.

Acoustic measurements were performed during the same season as the surveys, and on the same day of the week, in order to make significant comparisons. The objective was to compare acoustic sound pressure levels and types of environmental sounds to their

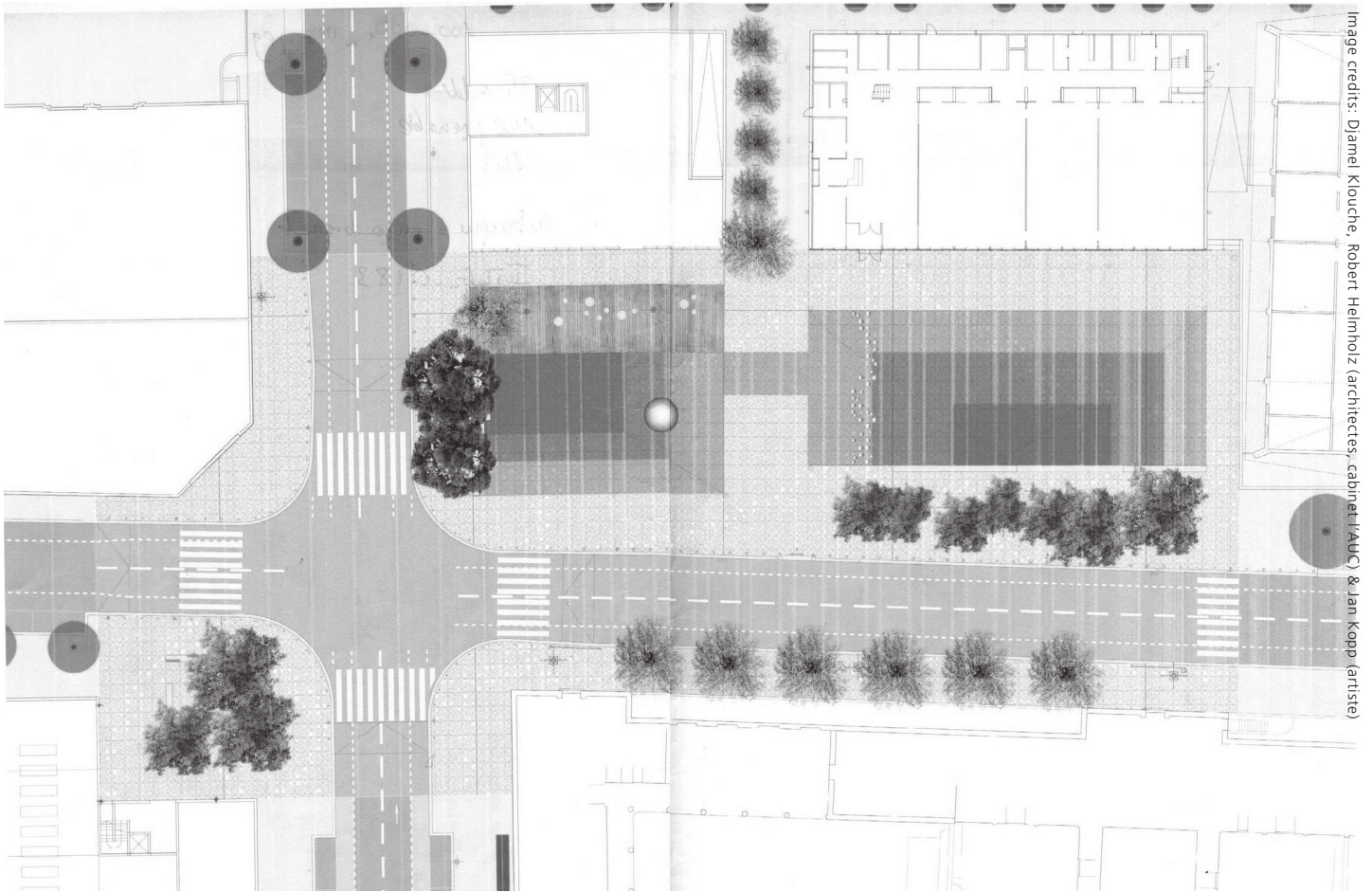


Image credits: Diemel Klouche, Robert Helmholtz (architectes), cabinet I'AVC & Jan Kopp (artiste)

Figure 3 : Place Mistral-Eaux-Claires, urban regeneration zone, Grenoble

perception. For this reason equivalent acoustic level measurements were done in each square, at fixed points and while travelling around the square, while listening to the various sonic events. Measurements were not done at the same time as the qualitative survey in order not to interfere with interviewees' answers.

Qualitative on site survey results

The results presented here show a number of words that were used by all 29 interviewees to describe the general ambiance of Place Centrale (Figure 5), Place Mistral-Eaux-Claires (Figure 6) and Place des Tilleuls (Figure 7). Expressions used by participants to describe the squares have been brought together through the use of Sphinx Lexica (a content analysis software), thus creating themes such as "quiet" or "vegetation". The # mark indicates a thematic grouping; for example, "#quiet" may include terms such as "quiet", "quieten" and "quiet down".

As part of the on-site questionnaire, participants were asked to qualify the global ambiance of the area. In all cases, the overall ambiance is commonly associated with its sonic ambiance; for instance, at Place Centrale and Place des Tilleuls (Figure 5 and Figure 7) the word "#quiet" is employed 26 times, while for Place Mistral the lemma "#noise" is produced eight times. We can then assume that sonic ambiance is essential to the evaluation of global ambiance in urban public spaces.

Another observation concerns temporality; while the word "#quiet" is used during both seasons (26 occurrences) to describe the general ambiance of the squares, interviewees used more sound-related words ("#noise" and "#calm") in the second on-site questionnaire. We can venture the hypothesis that during the second round, participants had a better knowledge of the three squares, and it is for this reason that their attention was more focused on sounds.

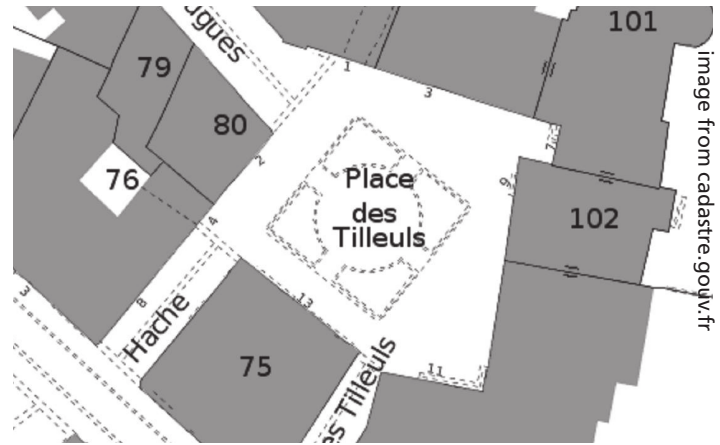


image from cadastre.gouv.fr

Figure 4 : Place des Tilleuls, historical urban center, Grenoble

For instance, in Place Mistral-Eaux-Claires (Figure 6), the word "#noise" is used by two interviewees in September to describe the ambiance, while twelve of them used it in December. Space knowledge seems to interfere with global perception and particularly in sonic perception. For this reason we chose interviewees who did not previously know the squares. We wondered if their sonic space judgment would change between the two experiments.

Crossing the judgment variables of the sonic ambiance and the visual space demonstrates a very significant relation. When the visual space is considered open, the sonic ambiance is generally perceived in a positive way, as we can see in Figure 8.

Conclusions

Our study, which is based on a qualitative survey, attempts to understand everyday sound perception in urban public spaces. Parameters influencing sound perception have been investigated. The elaboration of a complex methodological protocol allowed us to match qualitative and quantitative data (questionnaires, focus groups, pictures, acoustic measurements, interviews, sonic mind maps).

The subjective evaluation of the overall ambiance of a public space requires, as it appeared through this study, the acknowledgement of its sonic features. The results presented in this paper illustrate the importance of sonic perception in the evaluation of urban ambiances. Synaesthetic perception should be taken into account since variables concerning sonic and visual ambiance evaluation are significantly correlated. Results indicate that the presence of vegetation (in the three urban public spaces studied) influences the evaluation of the ambiance. The analysis of the sonic mind maps of 'ideal' squares using *NVivo* software also shows that natural sounds are most desired. Another result concerns the volume and morphology of the public space, which directly influences sonic perception. The subjective evaluation of the sound level of squares, when confronted with the acoustic indicators measured in situ, allows us to distinguish which acoustic factors influence the evaluation of the public spaces sound level, considering their extreme values. We have also investigated the relation between the type of residence inhabited by participants and its impact on the evaluation of the urban typologies that were presented.

Sound perception should be considered as a significant aspect in urban public space appraisal and may alter city planning and urban furniture design. This evaluation could be used by urban planners to design urban public spaces as public squares.

References

- Amphoux, P. 1996. *Au seuil de l'audible*. Vol. 1. 2 vol. Cresson, February.
- Amphoux, P, J-P Thibaud, et G. Chelkoff. 2004. *Ambiances en débats*. Bernin: A la croisée.
- Augoyard, J-F. 1991. *La vue est-elle souveraine dans l'esthétique paysagère?* Dans *Le Débat*, pp. 51–59.
- Augoyard, J.-F. & H. Torgue. 2005. *Sonic Experience: A Guide to Everyday Sounds*. Transl. Andra McCartney & David Paquette. Montreal: McGill-Queen's University press.
- Barraqué, Bernard, Faburel, et Guillaume. 2004. Ambiances et espaces sonores. *Espaces et Sociétés*, no. 15. L'Harmattan.
- Cox, T-J. 2008. The effect of visual stimuli on the horribleness of awful sounds. *Applied Acoustics* 69, no. 8: pp. 691–703.
- Faburel, G, et N Gourlot. 2009. Référentiel national pour la définition et la création des zones calmes. A destination des collectivités locales. Ministère de l'Écologie, du Développement et de l'Aménagement Durables, Direction de la Prévention des Pollutions et des Risques - Mission Bruit, March 23.
- Frize, N. 2002. Des yeux qui n'entendent pas. *Le visiteur*, n°. 8 (March): pp. 88–104.

General ambiance - Centrale

reduced and
lemmatized
vocabulary

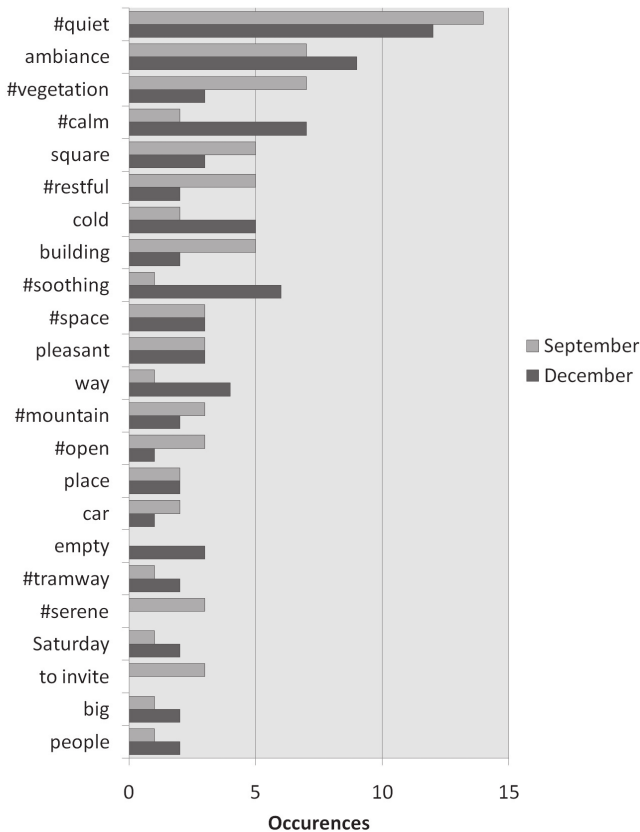


Figure 5: Occurrences of lemmatized vocabulary used by interviewees to answer the question "How would you describe the ambiance of this square?" for *Place Centrale* at two different seasons

General ambiance - Mistral

reduced and
lemmatized
vocabulary

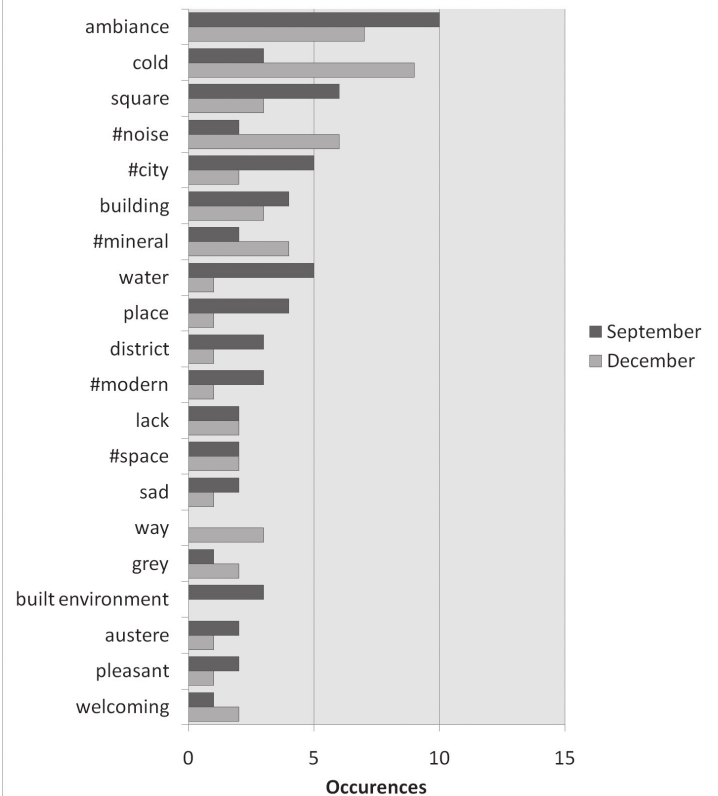


Figure 6: Occurrences of lemmatized vocabulary used by interviewees to answer the question "How would you describe the ambiance of this square?" for *Place Mistral-Eaux-Clares* at two different seasons

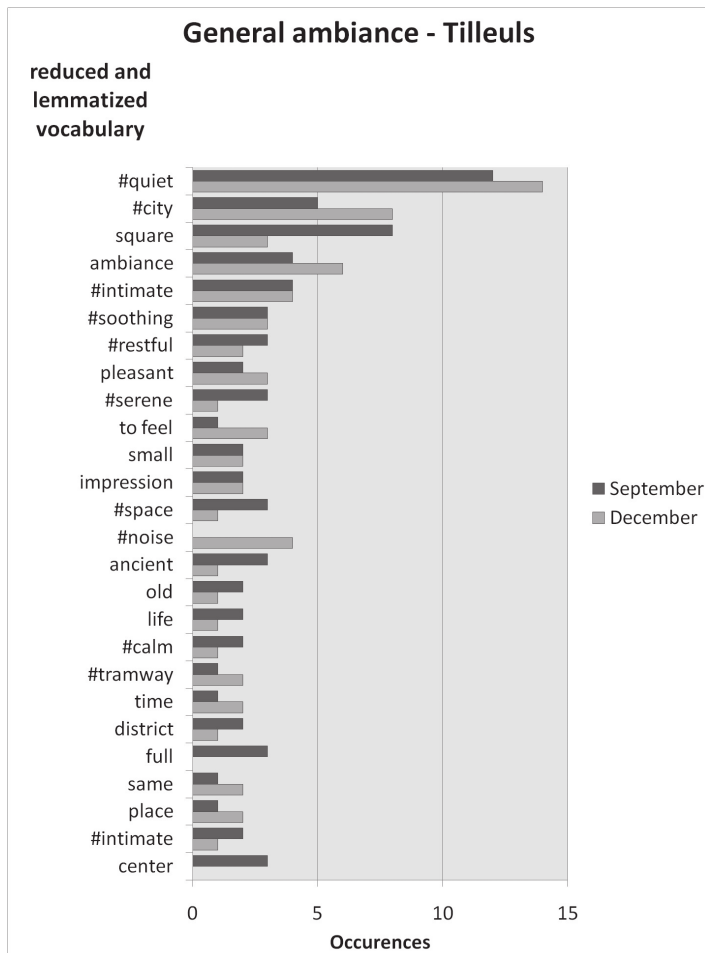


Figure 7: Occurrences of lemmatized vocabulary used by interviewees to answer the question "How would you describe the ambiance of this square?" for Place Mistral-Eaux-Clares at two seasons Place des Tilleuls at two different seasons

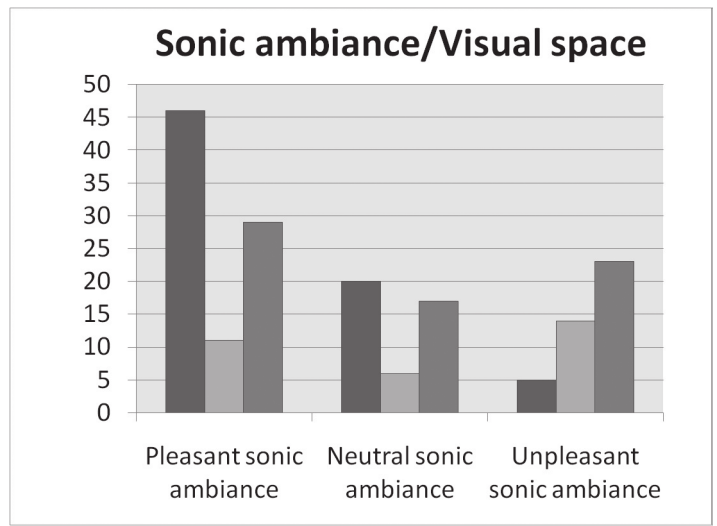


Figure 8: Cross table of the questions: "How does the sonic ambiance appears to you? (pleasant, unpleasant, neither of them)" and "How does the visual space appears to you? (opened, closed, neither of them)" in the questionnaires

Kang, J, et M Zhang. 2010. Semantic differential analysis of the soundscape in urban open public spaces. *Building and Environment*, no. 45: pp. 150–157.

Ledentu, S. 2006. *Ecoutez la ville! Pour une éducation à l'environnement sonore*. Montpellier: APIEU (Atelier permanent d'initiation à l'environnement urbain).

Moles, A. 1972. *Théorie de l'information et perception esthétique*. Paris: Denoël-Gonthier.

Raimbault, M, et D Dubois. 2005. Urban soundscapes: experiences and knowledge. *Cities* 22, no. 5: pp. 339–350.

Société française d'enquête par sondage. 2007. *Les français et leur habitat: perception de la densité et des formes d'habitat*. Paris: SOFRES.

Thibaud, J-P. 2002. L'horizon des ambiances urbaines. *Communications*, no. 73: pp. 185–201.

Tomatis, A.A. 1974. Vers l'écoute humaine. ESF. Vol. 1. *Collection Sciences de l'éducation*.

Viollon, S, C Lavandier, et C Drake. 2002. Influence of visual setting on sound ratings in an urban environment. *Applied Acoustics* 63, no. 5 (May): pp. 493–511.

Vroomen, J, et B De Gelder. 2000. Sound enhances visual perception: cross-modal effects of auditory organisation on vision. *Journal of Experimental Psychology* 26, no. 5: pp. 1583–1590.

Yang, W, et J Kang. 2005. Acoustic comfort evaluation in urban open public spaces. *Applied Acoustics* 66, no. 2 (February): pp. 211–229.

As an urban planner, SOLÈNE MARRY's research deals with sonic perception in urban public spaces. Her thesis is titled *Ordinary sonic public space. Sound perception parameters in urban public spaces. Contribution to sonic ambiance knowledge*.

She is working both with urban planners (in her Laboratory: Pacte Territoire UMR 51 94, Urban Planning Institute of Grenoble) and with acousticians in her office at CSTB (Centre Scientifique et Technique du Bâtiment), at the Environmental and urban acoustics department. Her research is focused on the understanding of how city-dwellers perceive their sonic environment. For this reason she has presented oral communications at urban planning congresses and acoustical congresses in order to link together urban and sonic aspects, and to develop multidisciplinary approaches.