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TOWARDS A COMFORTABLE OUTDOOR SOUND ENVIRONMENT

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ABSTRACT

Sound environment has an influence on behavior in public places. The studies carried out showed that the "zones 30" visually contribute to a change in the environment of residents. We assume that in the privileged area (zone 30), the quality of life and also evaluation of sound environment for the inhabitants are highly improved. Some interviews have been made to prepare a questionnaire (400 individuals) made up of three subjects entailing the framework of life, sound environment of two parisian districts and the perception of the "zones 30". Some acoustical measurements were conducted likewise. The outcomes point out that sound perception and framework of life are linked by calm, neatness and security. Moreover the place of dwelling has (zone 30 / others streets) an influence on sounds perceived. Sound comfort has been defined mainly in terms of quietness, birdsong and absence of noise.

1 - INTRODUCTION

Sound perception is highly subjective and cannot result simply from processing of the acoustic signal. It is influenced by our needs as well as social and cultural affinities. It takes various forms and results from individual and collective experiments. Moreover, sounds have an influence on behavior in public places. The "zone 30" is a homogeneous area of circulation where speed is limited to 30 km/h (20 miles/h) and whose entries and exits are announced by road signs. The targets of urban planning are reducing traffic and accidents, the change of motorist's behavior and the general improvement of local life without obstructing traffic. The studies carried out showed a reduction of accidents and their gravity, as well as a decrease in speed. Moreover, they allowed for a more appropriate utilisation of the public places by the pedestrians. However, only few studies took into account the impact of these developments (pedestrian crossing raised, narrow part of the street used by motorist...) on sound environment. Thus, the study proposed to explore the sound perception of the residents during their daily travel in two parisian districts following new developments.

We compared thereafter the perception of the "zone 30" to the perception of streets without changes in roadway systems. The "zones 30" contribute to a change in the environment of residents. We assume that in the privileged area (zone 30), the quality of life and also evaluation of sound environment for the inhabitants are highly improved. Thus, sound comfort can be described in this context.

The main targets are:

1. to show that sound perception is a major element in the evaluation of the framework of life
2. to study the impact of a specific area (zones 30) on sound perception in space and time.
3. To evaluate the sound sensibility of the inhabitants in residential areas

2 - METHODOLOGY

- Some interviews has been made to index the major elements of the framework of life, the sources of sounds perceived in the district and the definitions of sound comfort.
We prepared thereafter a questionnaire (400 individuals) made up of three folds entailing the framework of life, sound environment of the district and the perception of the "zones 30".

- Some acoustical measurements were conducted likewise. The indicators used were the equivalent level and a specific indicator taking into account the separable sound elements (arithmetical average of the increasing at least 5 dB). The target was to connect these acoustic measurements to the answers of the individuals concerning the evaluation of the sound perceived.

3 - RESULTS

3.1 - The framework of life

The satisfaction from the framework of life was evaluated using 11 proposals (scales of agreement in 4 points, gathered afterwards in *agree* and *disagree*) including sound perception of the district. We underlined that some dimensionals of the framework of life were dependent between them. Indeed, a significant bond appears between the manner of evaluating the calm in the district and the cleanliness ($\chi^2 = 12.87$, ddl=1, $p < .001$) and between the calm and the security ($\chi^2 = 14.71$, ddl=1, $p < .001$) Thus, the evaluation of the framework of life linked to the perception of the sound environment in the two sites. These results are confirmed with the question of the impact of the *zone 30*. Indeed, the answers concerning the improvement of the sound environment, the cleanliness and the safety are also dependent on each other.

3.2 - The soundscape

During the interviews, 12 sounds were listed by the inhabitants in their district. These sounds were gathered afterwards in three groups according to their origin:

- human sounds: games of children, the trade activity, the sound of recreational settings, conversations and laughter of pedestrians, the dispute.
- mechanical sounds: normal traffic, Horns / sirens, deliver trucks, street construction work, city maintenance vehicles;
- sounds link to the nature: birdsong.

At first, we noted a particular sound identity in each of the two districts in space and time. Though the sounds of traffic were dominated the soundscape for more than 86% of the two samples.

There were some differences of perception according to the place of dwelling (*zones 30* / others streets). We observed in the two districts a significant difference in the manner of perceiving the flows of circulation in *zones 30* compared to the other streets. The inhabitants of the zone 30 perceived less the sound of the traffic (76%) than those who lived in the other streets (96%). ($\chi^2 = 16.61$, ddl=1, $p < .001$.)

In the same way, mechanical sounds were also less present in the *zone 30* of the second district ($\chi^2 = 6.06$, ddl=2, $p < .05$). In the first district, the inhabitants heard more human sounds ($\chi^2 = 13.92$, ddl=2, $p < .001$) and more pleasant sounds ($\chi^2 = 5.929$, ddl=1, $p < .05$) in the zone 30 than in the streets without development. So, the perception of the inhabitants is different according to the place of dwelling and the nature of sound perceived.

This type of installation seems to improve sound surrounding for 40% of the people in the first district and 46% of the interviewed in the second area.

3.3 - Sound comfort subjective

During the interviews, various proposals attempted to define sound comfort were used by the inhabitants. In the questionnaire, they have to choose three proposals that describe the best sound comfort for them. In the two districts, sound comfort is characterized especially by calm or quietness and by hearing the songs of birds. Then, the absence of noise, the relaxation, the possibility of communicating and the bustle cover a third of the answers.

After having defined sound comfort, we asked the interviewed if this was present in the district in the terms defined previously. The results show the prevalence of sound comfort in terms of bustle, communication and by hearing birds.

Moreover, we noted a significant connection between the global representation of the second district and some proposals to describe sound comfort presence in this area (calm, the songs of the birds, the absence of noise, the possibility to communicate and the relaxation) namely that the interviewed who has a positive mental image of framework of life tends to find more sound comfort in their district than those which have a negative mental image.

3.4 - Sound sensitivity

The sound sensitivity was also evaluated (scale of 6 points gathered in two parts: *not very sensitive* and *very sensitive*). We noticed that only a third of the residents of the first district estimate not very

sensitive to sound environment. In the second district 53 % of the residents are very sensitive to sound environment and 47 % not very significant.

A significant bond was established between the sensitivity and the importance attached to outdoor sound environment ($\chi^2 = 17.47$, $ddl=1$, $p < .001$). Indeed, the more sensitive individual is, the more they tend to attach importance to sound environment in their district. In addition, the attitudes are also related to the sensitivity of the interviewed. The sensitive individuals tend to move along very quickly whereas the less sensitive persons linger to listen sounds or do not pay attention ($\chi^2 = 11.86$, $ddl=2$, $p < .001$). Thus, the perception of sound environment is very subjective: the sensitivity and the importance attached to sound environment will determine the attitudes according to the sounds.

There seems to be an independence between the sound perception (pleasant / unpleasant; strong / weak) and indicators of measurement selected. Thus, within the framework of this study, the indicators tested (Laeq. . .) do not seem to account for the subjective evaluation of the sounds perceived by the two tested samples.

4 - CONCLUSION

This study has showed the impact of two *zones 30* on the framework of life and on the perception and evaluation of sound environment. The outcome point out that sound environment, neatness and security are valued in the same way. Moreover, we note a differentiation in sound perception in relation to the place of residence (inside/outside *zone 30*) in the two tested districts. Sound sensitivity and the importance attached to sound environment may determine the attitudes in the district.

The sound comfort described by the quietness and the birdsong seem mainly necessary to create an improved outdoor sound environment.

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