Elements of temporal design approach in soundscape based planning of urban quiet areas

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ABSTRACT

A methodology based on integration of urban plans and participation of stakeholders has been applied by the authors in the development of EU LIFE+ HUSH (Harmonization.....) project and in the Strategic Action Plan provided for the Florence City agglomeration. In two case studies noise sources and perception of noise have been considered and relative actions planned according to a Participatory Design approach. The idea moves from the multi-sensorial conception of landscape and its perception and define a process that attempts to actively involve all the real or potential stakeholders. The Temporal Design approach, considering time and space entities as matter of realizing human scaled and people-friendly environments dominated by new rules aiming to design harmonious and comfortable places, has been considered as source of inspiration for the soundscape based actions definition. The combination of ideas given by casual web, burden of disease and temporal design theories has resulted in a significant added value to the system of design methods used in Florence city Strategic Action Plan and Noise Reduction Plan development.

1. INTRODUCTION

Somewhere, the main goal of design is comfort. Global comfort can be defined as a particular condition of well-being in a space (indoor or open space), according to the sensorial perceptions determined by several factors as temperature, humidity, acoustics and brightness. This condition of wellness, however, depends on the relations between the subjective variables and objective variables (environmental variables). So, global comfort is directly connected to psychological and physical aspects \[1\]. Designers have the responsibility to create highly comfortable spaces following users’ expectations. This paper describes two examples of urban design based on the integration of urban plans in the city of Florence and the participation of stakeholders in the development of EU LIFE+ HUSH project. In these two case studies, elements of temporal design approach have been implemented in soundscape based planning according to a Participatory Design approach. The idea moves from the multi-sensorial conception of landscape and its perception and defines a process that attempts to actively involve all the real or potential stakeholders.
2. METHODOLOGY

In the specific context of acoustic comfort, the Temporal Design aims to create an environment on a human scale, dominated by the laws of harmony, using a mathematical model based on processing signals received by both the left and the right ear through operations of auto-correlation and cross-correlation. [2] On the other hand, the soundscape approach also allows designers to consider human perception as a contribution. [3,4,5] These two theories can be well integrated in the requalification of a indoor or confined outdoor place such as urban quiet areas. The common feature between the Temporal Design and the Soundscape Approach is precisely the concept of "wellness" contextualized within the different phases of architectural design and urban planning. The optimization of the environmental quality in a living space can be considered as the full compliance of the environmental system to the users’ health requirements (temperature, humidity, visual, noise, respiratory-olfactory). During the process of designing of the recovery and requalification interventions, in the two considered areas, urban spaces have been conceived not as a set of independent and passive elements but as real entities interacting actively with users. A unique policy for quality of life in terms of overall comfort of a space is lacking. The reason is probably that not all city plans and relative projects involve a simultaneous evaluation of multiple aspects of comfort, even if they are closely related and interdependent. The author’s designing procedure first considers the subjective parameters and then assesses the degree of comfort perceived by users and the overall environmental acceptability. Within the project HUSH the requalification of two sites (a school courtyard and a suburban area, identified as acoustic hotspot) has followed a peculiar planning and designing approach. It considers the effects of the evaluation of global comfort, being based on soundscape analysis and on the philosophy of temporal design.

The methodology for the HUSH project has been developed on the basis of following steps:
- preliminary investigation phase (site description, analysis of the urban characteristics, materials, orientation, vegetation, predominant colours, sound sources, etc…);
- measurement phase (physical measurements of temperature, humidity, brightness sound pressure level, binaural measurements etc…);
- multilayer mapping phase;
- psychological and social analysis (interviews and questionnaires to users about all the aspects of the comfort according to the principles of Participatory Design);
- design phase based on the results developed in previous phases;
- the confirmation of the results (through users interviews and questionnaires).

The UNI EN ISO 7730 [6] identifies two indicators that express the relationships between the activity of the human body and the sensation of thermal comfort:
- The Predicted Mean Vote PMV: assess the wellbeing of an individual according to subjective preferences and environmental variables. It is a mathematical function that express in a numerical value on a scale from -3 (index of feeling too cold) to +3 (index sensation of too hot) the state of thermal comfort (0 is neutral);
- Predicted Percentage Dissatisfied PPD, which expresses the percentage of dissatisfied people in a space.

Being the two case studies located in open outdoor spaces, not particularly significant values of some environmental parameters have been found (temperature, humidity, and thermal resistance of clothing, lighting level for the assessment of visual comfort) therefore noise pollution caused by road traffic has been considered as main factor.

In analogy with the above mentioned relationships, the same scale of values in the post-implementation phase of the interventions regarding visual comfort, air quality and global
evaluation of the environments has been considered. The subjective method suggests using a questionnaire for the assessment of global wellness. This questionnaire allows investigating the reactions of people who use the space. The questions relating to each aspect of the environment will be reported as: intensity of perceived noise, acoustic comfort, acoustic preference, noise tolerability, visual perception, visual preference, visual tolerance, air quality tolerance, environmental impact.

3. CASE STUDY 1 : COURTYARD OF DON MINZONI SCHOOL

Don Minzoni is a Primary School located in proximity of a street. The main environmental problem of this area is noise generated by road traffic of the street, identified in the Florence Strategic Action Plan as an acoustic hotspot. The school has been chosen for an experience of participatory planning. A very special design team has been established, consisting of children from different classrooms, co-operating with their teachers as well as with other adults (parents, architects, engineers). The collection of subjective data has been directly used by designers, without reducing the level of originality and creativity of the children, taking care of selecting the most appropriate materials and solutions and taking into account the regulatory constraints for school buildings. The project for the garden of the school combines noise mitigation goals with the needs emerged in subjective survey. At the end, this project involved:

- the building of a non intrusive barrier, for reducing noise in a visually pleasant way, well integrated with the space and, above all, enjoyed by the children during playtime;
- the provision of games with educational purposes;
- a wooden mobile amphitheatre to give lesson in the garden.

The location of different functions is closely related to the noise climate sub-areas of the garden.

4. CASE STUDY 2: SUBURBAN AREA OF BROZZI-QUARACCHI

The area of Brozzi-Quaracchi includes the historical quarters of Brozzi and Quaracchi, in the north-west of Florence. The area is delimited by two major roads: Via Pratese and Via Pistoiese Road. This is an area with high density of population and presence of a community deeply rooted in its territory. Noise annoyance to the population, is mainly caused by the flow of vehicles crossing the area between the two main roads using local streets rather than the road system outside the quarter. In this urban area five green areas are present but, due to their condition, not properly used, or used without satisfaction, by citizens.

Proposed interventions for improving overall green areas conditions can be summarized in:

- viability variation and creation of a zone 30 Km/h to discourage traffic crossing area, to favor pedestrian path and/or bicycle lane to connect green areas;
- protection against noise by means of embankment and green barriers for the most critical green area;
- introduction in some green areas, of pleasant sounds, like music, composed soundscapes as a mix of natural sound and artificial sounds typical of the area, can make these areas more interesting and attractive creating a path among flowers and music. In this choice the principles of Temporal Design have been applied as far as possible.

![Figure 3. road system outside the quarter Brozzi-Quaracchi (zone 30) example of acoustic speakers for new soundscapes](image)

5. CONCLUSIONS

In this paper, the recent experience of the authors in two case studies has been reported. They are part of Florence city Strategic Action Plan and of EU funded project HUSH, based on Soundscape Analysis applied to participatory design of urban areas. The theory of Temporal Design has been considered as source of inspiration in the definition of the methodology and in the parameters used in the process of intervention design. The choice spaces exposed to high levels of traffic noise, was significant, given the measurable characteristics of objectivity and subjectivity resulting by the regular permanence in these areas of pupils, teachers, residents and users, true stakeholeders of the designed spaces.

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6. REFERENCES