



QUADMAP PROJECT



Quiet Areas Definition and Management in Action Plans

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www.quadmap.eu

Partners in this project, supported by EUROCITIES Working Group Noise are:

Coordinating beneficiary: University of Florence, Department of Mechanics and Industrial Technologies (Italy). Associated beneficiaries: DCMR Environmental Protection Agency (The Netherlands); Ayuntamiento de Bilbao, Area de Obras y Servicios (Spain); TECNALIA (Spain); VIE EN.RO.SE. Ingegneria S.r.l. (Italy); Comune di Firenze (Italy); BRUITPARIF (France).

Current practices about selection, assessment and management of Quiet Areas in EU Countries, though regulated by the EU Directive 2002/49/EC on Environmental Noise (commonly abbreviated END), appear to be extremely fragmented and inhomogeneous. During the past years each country has adopted a set of strategies strictly related to their specific contexts; as a consequence strategy transfer among EU Countries is now a hard task.

After a first phase of data collection about the State of the Art, the main objective of the QUADMAP project, co-financed by the European Commission on the LIFE+ Program, is to develop a harmonized methodology for selection, assessment (combining quantitative and qualitative parameters) and management (noise mitigation, increasing of usability of areas and users satisfaction) of Urban Quiet Areas, the aim being to overcome the current impasse. The proposed methods are chosen according to the State of the Art concerning EU strategies for selection and analysis of QUAs and also according to the results of stakeholders' questionnaires.

The aim is not to provide a strict sequence of operations, but a logical, effective procedure, to be implemented also thanks to schematic tools, despite of peculiarities characterizing each Member State.

The methodology is composed of the following phases: candidate QUAs selection, candidate QUAs analysis by using both quantitative and qualitative approaches, definition of strategic and operative actions devoted to the management of QUAs.

The project should also help to understand the definition of a Urban Quiet Area, the meaning and the added value for the city and its citizens in terms of health, social safety and lowering stress levels in men.

Mentioned procedures are meant to be tested and optimized according to the results obtained in pilot areas. In general, the proposed methodology is based on four elements:

- noise maps of the environmental noise levels (noise emitted by means of transport, road traffic, rail traffic, airports and sites of industrial activity) in the municipality/agglomeration, obtained by applying the methodology defined by the END;

- expert analysis (performed by staff belonging to municipality/agglomeration), based on the knowledge of the area or on the analysis of official documents;
- questionnaires submitted to end-users (citizens) about their perception of the selected areas;
- sound measurements in the selected areas.

Regarding the application of the methodology to pilot cases, it is actually ongoing in the cities of Florence, Bilbao, Rotterdam.

Below some first results of activities already carried out in Florence. In Firenze six pilot cases have been selected and analyzed, all the pilot areas in the city of Firenze are school gardens. This kind of QUAs is characterized by a specific category of end-users (students, teachers, school staff and sometimes parents) and by a defined time to stay in the area, connected to time in which children attend school. Pilot cases analyzed in Firenze can be distinguished in nursery schools (scenarios 04, 05 and 06), primary schools (scenarios 01, 03) and secondary schools (scenario 02).

The preliminary analysis of each QUA has requested, in accordance with the QUADMAP methodology, two levels of investigation:

- A preliminary study on the basis of the documents and information provided by the Administration;
- A "in situ" analysis by inspections during the period of use of the garden.

The preliminary studies, carried out together with the agglomeration staff, have made it possible to divide the area into sub-homogeneous areas, defined HUA (Homogeneous Units of Analysis) in which to make a further acoustic and non-acoustic detailed analysis. In particular, the HUAs delimitation, is based on three main themes:

1. landscape: every HUA must be characterized by the same visual elements;
2. use: every HUA must have a specific use prevalent. This issue is connected with the area equipment (for example in a park there are areas for sport, recreation areas, relaxation areas..);
3. distance and presence of acoustic sources: each HUA must have the same visual and acoustic impact of noise sources (road source, the source station, industrial activity, etc.)..Figure 1 shows the delimitation of sub areas (HUAs) in Firenze pilot cases.

Figure 1- HUAs of Firenze pilot cases.



01_DE FILIPPO = 2 HUAs



02_MANZONI = 2 HUAs



03_PUCCELLO = 2 HUAs



04_DIONISI = 1 HUAs



05_VAMBA = 2 HUAs



06_PIO FEDI = 1 HUAs

More than 500 questionnaires have been submitted to end-users considered for the schools: students, teachers, school staff and parents.

Figure 2 – Some moments of the interviews in different garden schools



Short and long term measurements have been carried out according to the respective tools described below. In particular, for each QUA the following data are collected:

- one week measurement in one position by using a measurement station, combined to 30 minutes measurement in each HUA (long term measurements). Time History, 1 second based, of overall equivalent continuous A-weighted sound pressure level ($L_{Aeq,1s}$) has been carried out.
- at least a measurement position has been considered in each HUA with the microphone height at 1,5 m above the ground (short term measurements). The short term measurements have been carried out when the HUA is typically used, in parallel to both the long term measurement and the end-users interviews. The measurement position has been closed to the interview

location, but far enough (at least 3 m distance) not to be influenced by the on-going interview. The time period of short measurements has in general a 15 minutes duration, it has been taken in parallel to the end-users interviews. Time History, 1 second based, of overall equivalent continuous A-weighted sound pressure level (LAeq,1s) has been carried out;

- At least a binaural wave file, 44.1 kHz frequency sampling based, has been recorded in each HUA during each end-users interview.

From the results of the phases of the project above described (questionnaires, sound measurements and detailed acoustic study), and from expert non-acoustic analysis carried out by Comune di Firenze, the objectives for designing of interventions are defined for each of the six pilot cases.

The acoustic effectiveness of these interventions was assessed using acoustic simulations by iterative process, after discussing about the feasibility of interventions with authority (Tuscan Region and City of Florence).

To define the interventions project have been used the results of long term measurements and the results of the detailed acoustic study as a support to the acoustic modeling in the pilot cases.

In addition, techniques developed for the subdivision into sub-areas and the results of the questionnaires to the end-users have been used as a guide for the evaluation of the interventions definition and design.

From the calibrated model the acoustic environment simulation of each QUA has been made in the ante-operam scenario and the acoustic problems of each HUA and facades of buildings have been considered.

After assessing the feasibility of the interventions with the local authorities, the acoustic effectiveness has been verified by the acoustic model. In particular, the design of the interventions has followed an iterative process that includes:

1. inclusion in the acoustic model of the designed solutions (first design hypothesis)
2. post-operam acoustic environment analysis and acoustic improvement evaluation;
3. any changes to the intervention project and repeat steps 1 and 2 until the definition of the optimal solution referred to the parameters of cost and effectiveness.

if the designed intervention has not solved the problems on the facade of the building, the sound insulation of facade has been measured.

The evaluation has provided the verification of the date of installation of the windows and a visual analysis of their maintenance.

If the characteristics of the windows are poor, sound insulation of facade measurements have been made in accordance with standard UNI EN ISO 140-5.

Projects were presented to the different departments for the release of their approval. At the moment there are the following formal approvals: ASL, ARPAT and Landscape Commission.

First considerations about obtained results and procedure usability

Regarding obtained results, it must be underlined the great cooperation received in the phase of in situ analysis by the school managers, by students, teachers as well as by parents.

In a really short time it has been possible to collect a significant amount of data.

Regarding the usability of proposed procedure, some problems arisen, due to the young age of most of interviewed people. Especially with students of primary schools, it has been quite difficult to explain some of the questions asked, with particular reference to those concerning the sense of "perception". Pupils have not developed sense of perception yet. So the direct usability of these questions is uncertain.

Moreover, the questionnaire should have been revised depending on the type of quiet area analyzed. Some questions (regarding the reason to attend the area, the day in which the area is attended...) are not applicable in the case of a school garden, attended for all interviewed people for same reasons and in the same periods.

Anyway we think that consideration and suggestion arisen in the phase of data collection and questionnaires submission are very useful and almost indispensable for further phase of Quiet Urban Areas management and for intervention design.

More materials can be found and downloaded from QUADMAP project official website www.quadmap.eu

Further updating will be reported in next issues of Nuntius.