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Life MONZA
Methodologies for Noise low emission Zones introduction And management

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Methodologies for Noise Low Emission Zones introduction and management

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INTRA LIFE PT 2017

NETWORKING AND BEST PRACTICE DISSEMINATION AMONG PUBLIC ENTITIES

LISBON, 23/24 OCTOBER 2017

THE LIFE PROGRAM

ISPRA - Italian National Institute for the Environmental Protection and Research is a public body under the Ministry of Environment that provides environmental controls and supports policies oriented to the dissemination of environmental data and best practices.

LIFE projects are characterized by replicability and transferability, technological innovation and strong emphasis to dissemination activities.

Actions are aimed at developing and test best practices and solutions, including demonstration of innovative technologies.

THE LIFE PROGRAM

LIFE projects include activities and approaches which aim to facilitate the replication of the project results beyond the project, including in other sectors, regions or countries

LIFE projects results are actually suitable for being replicated and disseminated in support of EU policy and legislation.

Therefore, LIFE program requirements match the ISPRA mission regarding to the improvement of the environmental awareness and knowledge.

THE LIFE PROGRAM

Main strenghts of LIFE compared to other EU funding programs:

- Flexibility in partnership (even national partners only)
- Small projects, easier to manage for public bodies
- Focused on environmental issues
- Opportunity to improve the environmental quality of territories
- It forces to get pragmatic and oriented to efficient and effective results
- It encourages to design and develop innovative solutions
- It allowes to use project results beyond the project life time
- The documentation that concerns the project for the administrative and financial aspects (common provision, financial guidelines, etc.) is clear and exhaustive in comparison with other less detailed and clear programs.

THE LIFE PROGRAM

Weaknesses of the LIFE Program:

- Risk of lack of interest after project end, if consisting in procedures/guidelines
- Issues related to administrative aspects
- The excessive demand for justified payment documents, complete with proof of the payment, often results in considerable delays in charging costs, which requires further justification in the reports to be submitted
- the calculation of the daily rate, which in the FS project is calculated on the productive hours per year and not on the contractual hours, in contravention of the cost certified by the Entity and by altering the amount of staff costs sometimes excess but sometimes also in default, without considering the difference between the daily rate considered in the budget and the one that will be charged. All of this in some cases involves daily price mismatches that must be further justified
- LIFE's administrative management is therefore not very slim in consideration of the bureaucracy of public bodies, unlike the HORIZON 2020s that move almost exclusively on an online platform.

SCOPE

The introduction of **Low Emission Zones**, urban areas subject to road traffic restrictions in order to **ensure compliance with the air pollutants limit values,** set by the European Directive on ambient air quality (2008/50/EC), is a common and well-established action in the administrative government of the cities and the impacts on air quality improvement are widely analyzed, whereas the **effects and benefits concerning the noise have not been addressed in a comprehensive manner.**

The definition, the criteria for analysis and the management methods of a **Noise Low Emission Zone** are not yet clearly expressed and shared.

LIFE MONZA project (Methodologies fOr Noise low emission Zones introduction And management - LIFE15 ENV/ IT/000586) addresses these issues.

The key points on which the project is based are:

1)it's easier to change a town than a nation
2) Change can start at the civic level

First OBJECTIVE

1°

The main objective of the project is to **introduce an easy-repeatable method**, and related guidelines, for the **identification and the management of the Noise Low Emission Zone**, an urban area subject to traffic restrictions, whose **impacts and benefits regarding noise issues** will be analyzed and tested in the pilot area of the city of Monza, located in North Italy

Further OBJECTIVES

2. The second objective regards specific ***top-down measures***, adopted by the municipality and able to turn up the area in a permanent Noise LEZ, concerning infrastructural interventions

3. The third objective is to **reduce the average noise levels** in the pilot area of Libertà district, with positive complementary effects also on the **air quality** and benefits on **well-being conditions** of inhabitants

4. The fourth objective is to involve the population in an active management system (***bottom-up measures***) of lifestyle choices

Dialogue between citizens and public bodies

top-down measures adopted by the municipality and able to turn up the area in a permanent Noise LEZ, concerning:

- **traffic management** (limitation of the vehicles speed and prohibition access to trucks);
- **road paving substitution;**
- **introduction of two pedestrian crossings**

bottom-up measures: people will be involved in an active management system of a more sustainable lifestyle choices, related to the reduction of noise and the improvement of air quality and well-being conditions, in their living and working environment. In order to encourage the local community involvement and to strengthen the dialogue between citizens and public bodies, many activities will be carried out, as:

- **meetings** in primary and high schools, in order to raise awareness about noise effects;
- **ideas contests** for Noise LEZ picture and logo;
- **questionnaires** on quality of life and noise and air quality perceptions;
- use of the **mobile App**, developed throughout the course of the project, devoted to manage voluntary and sustainable actions carried out by citizens.

Contribution of the project to policy implications at different levels

European Level

In order to contribute to the implementation of the European directives, avoiding duplications and overlaps, potential synergies existing between the issues related to noise pollution and air quality will be investigated during the project.

The methodology will contribute to the implementation of the EU Directive 2002/49/EC, related to the assessment and management of environmental noise (Environmental Noise Directive - END), which introduces noise action plans, designed to manage noise issues and effect, including noise reduction if necessary.

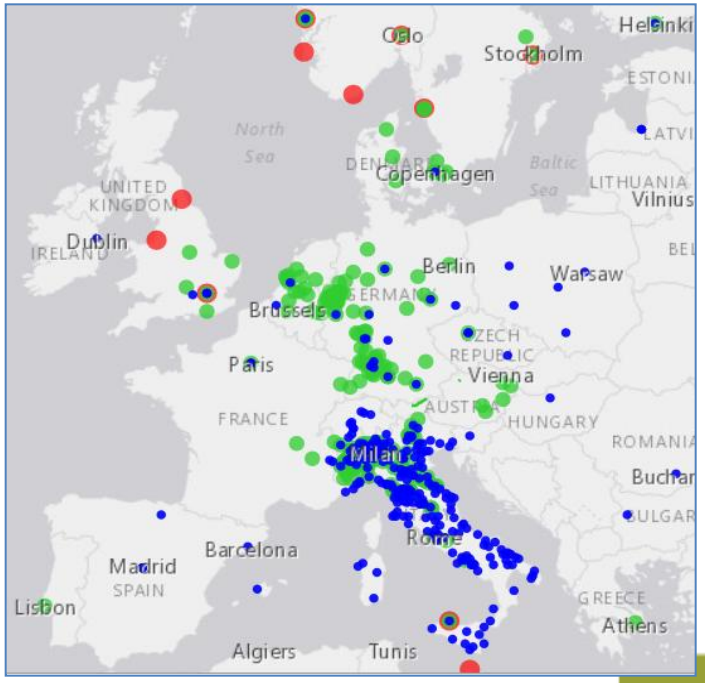
Contribution of the project to policy implications at different levels

European Level

LEZs have been implemented in more than 200 cities in Europe and they are the most common measures adopted in EU, considering traffic planning.
EU Directive 2008/50/EC on ambient air quality and cleaner air for Europe considers the establishment of LEZ a measure to be adopted in air quality action plans.

The EU 2002/49/EC Environmental Noise Directive (END) does not provide a definition of LEZ in relation to noise and it is not considered as an action to take into account in noise action plans drafting.

There is the need of synergies and LIFE MONZA project, aiming at providing management criteria of LEZ, related to noise, will contribute to the implementation of noise action plans set out in Annex V of the END Directive



Source: http://urbanaccessregulations.eu/

Contribution of the project to policy implications at different levels

National Level

Harmonization and simplification process among transposition decrees of EU Directives concerning noise and air pollution; definition of a proposal of a common method for NLEZ, as a proposal to be adopted by a national decree.

Local Level

Availability of a common procedure for Noise LEZ able to make the cities more sustainable; more knowledge about impacts and benefits due to NLEZ introduction; implementation of EU Directives at local level; enforcement of the dialogue between public institutions and citizens.

THE MONZA PROJECT





A. Preparatory actions

- ✓ **A1** Operational context for Noise Low Emission Zones (LEZ) detection and management

B. Implementation actions

- ✓ **B1** TOP-DOWN actions planning in the pilot area
- ✓ **B2** BOTTOM-UP actions planning in the pilot area and public and stakeholders information and participation
- ✓ **B3** Prototype of monitoring system for Noise LEZ design - data analysis techniques definition
- ✓ **B4** Pilot area actions implementation
- ✓ **B5** Monitoring and data collection for impact assessment
- ✓ **B6** Noise LEZ Guidelines

C. Monitoring of the impact of the project actions

- ✓ **C1** Monitoring of the impact of the project actions. The monitoring activities in the pilot area will be carried out up to three years after the project end

D. Public awareness and dissemination of results

- ✓ **D1** Information and awareness raising activities regarding the project to the general public and stakeholders
- ✓ **D2** Technical dissemination activities to stakeholders could usefully benefit from project's experience

E. Project management

- ✓ **E1** Coordination, Monitoring and Project Management
- ✓ **E2** After-LIFE Plan

Project location and beneficiaries

PROJECT LOCATION: ITALY - MONZA, Lombardia

The project started on 1st September 2016 and the completion date is scheduled for 06.30.2020

PROJECT Beneficiaries

Coordinating Beneficiary: ISPRA

Italian National Institute for Environmental Protection and Research

Associated Beneficiaries: MONZA Municipality

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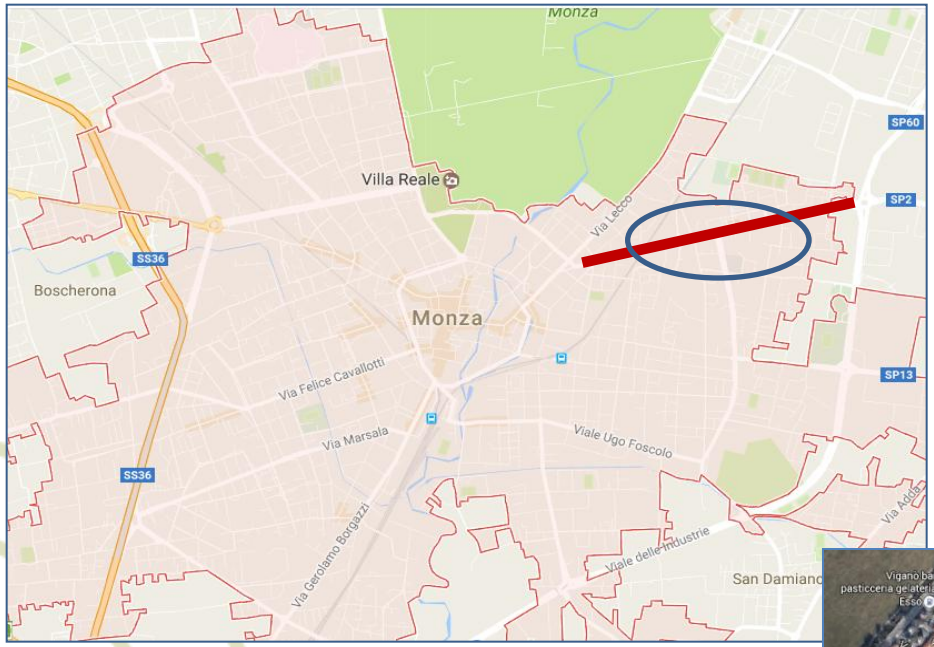
Courtesy Monza Municipality http://www.comune.monza.it/it/#0

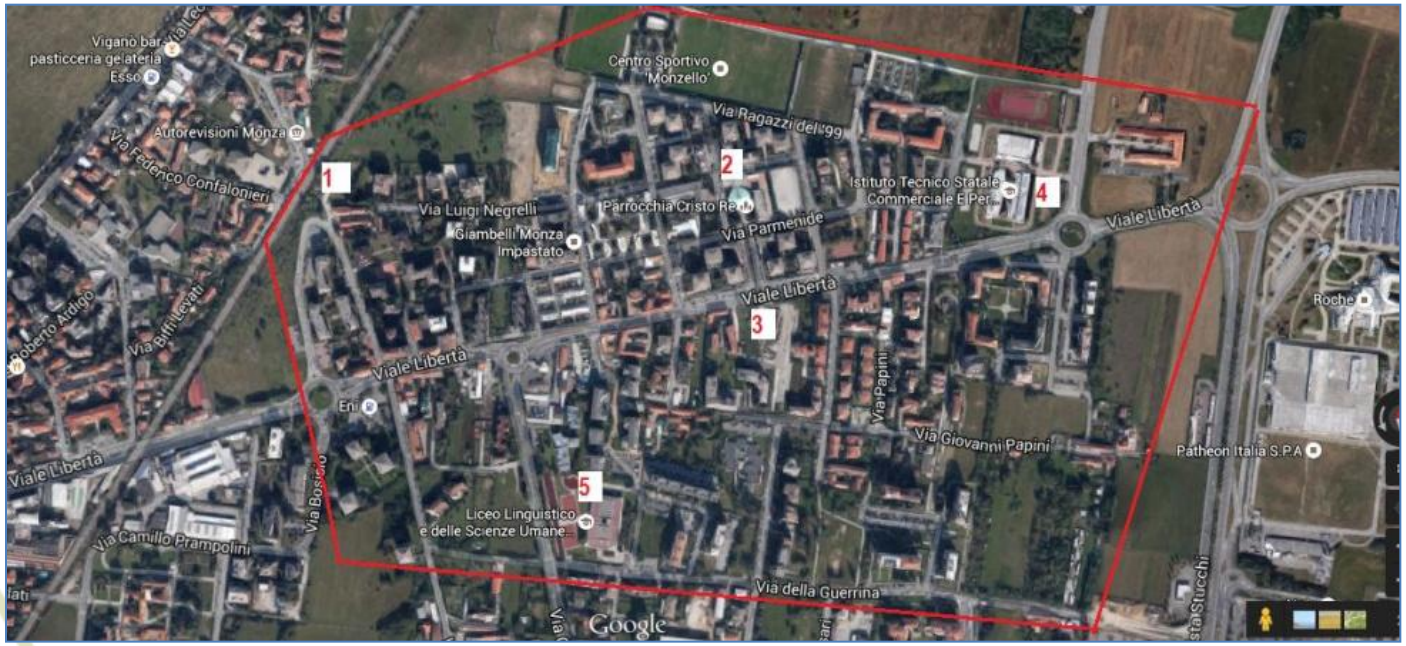
Pilot area in Monza Municipality



Pilota area – Monza Municipality – Libertà District

Courtesy Monza Municipality

Pilot area in Monza Municipality



Significant average levels of noise pollution affect a large number of citizens so that Libertà district is identified as a hotspot in the Action Plan of the city of Monza.

Noise strategic map of the city of Monza, dated 2012, highlights that in a range of 30 m from the Viale Libertà almost the 100% of the receivers is exposed to levels higher than 65 dB(A) during the day and 55 dB(A) during the night.

Monitoring activities and methods tested in pilot area

Objective: reduction of **the average noise levels** in the pilot area of Libertà district, with positive complementary effects also on the **air quality** and benefits on **well-being conditions** of inhabitants.

Priority will be given to actions for noise reduction, but attention will be also focused on the improvement of the air quality and citizens' quality of life.

Noise Monitoring	• Traditional equipment • Smart low-cost sensors
Air Quality Monitoring	• EU Directive requirements • Passive sampling
Quality of life	• Questionnaire

Monitoring methods and activities tested in pilot area

Air Quality Monitoring

- EU Directive requirements
- Passive sampling

Air Quality monitoring within the pilot area is ongoing, according to requirements provided by Directive 2008/50/EC on ambient air quality and cleaner air for Europe

Also, the low cost and easy operation of the diffusive sampling technique is used for a large scale air pollution surveys with a high spatial resolution.

In order to compare the spatial variability of air pollution before and after the noise LEZ implementation, NO2 and benzene land use regression models in a defined urban area of Monza, including the noise LEZ, will be developed.

The objectives of monitoring will be to assess whether the implementation of the noise low emission zone contributes, as an ancillary effect, to reduce air pollution levels in the pilot area.

Monitoring methods and activities tested in pilot area

Quality of life

- questionnaire

Regarding the monitoring of the quality of life, a two-step survey will be performed: before and after the institution of the noise LEZ zone (about 600 citizens and stakeholders involved).

The WHO QOL-Bref questionnaire, as it is the only tool that has a specific environmental section, validated in Italian language.

The WHO QOL-BREF instrument comprises 26 items, which measure the following broad domains: physical health, psychological health, social relationships, and environment.

Noise Monitoring in pilot area

Noise Monitoring

- Traditional equipment
- Smart low-cost sensors

Regarding the noise monitoring phases planned in pilot area, the activities will be carried out referring to the standard methods, using sound level meters of class I precision, and also by developing and using a smart low-cost monitoring system.

Noise Monitoring in pilot area

Regarding the smart low-cost noise monitoring system a prototype system for smart monitoring has been designed and implemented, in order to be used as a continuous monitoring unit.

In particular, the state of the art about smart noise monitoring systems has been defined by ISPRA, while smart monitoring system design and data analysis procedures have been performed by UNIFI.

UNIFI is developing the procedures for in situ calibration check and verification of the noise monitoring system performance.

After the end of LIFE MONZA project, the prototype will be given for free to Municipality of Monza that will take care of using it for monitoring activities in the three years after the project end.

Smart low-cost noise monitoring system – LIFE MONZA

Action A1 MONZA. Abacus on operational contexts related to legislation; smart noise low-cost monitoring networks; air quality monitoring systems; health indicators; interventions and expected effects on air quality, noise and health.
Operational contexts on smart low-cost noise monitoring systems.

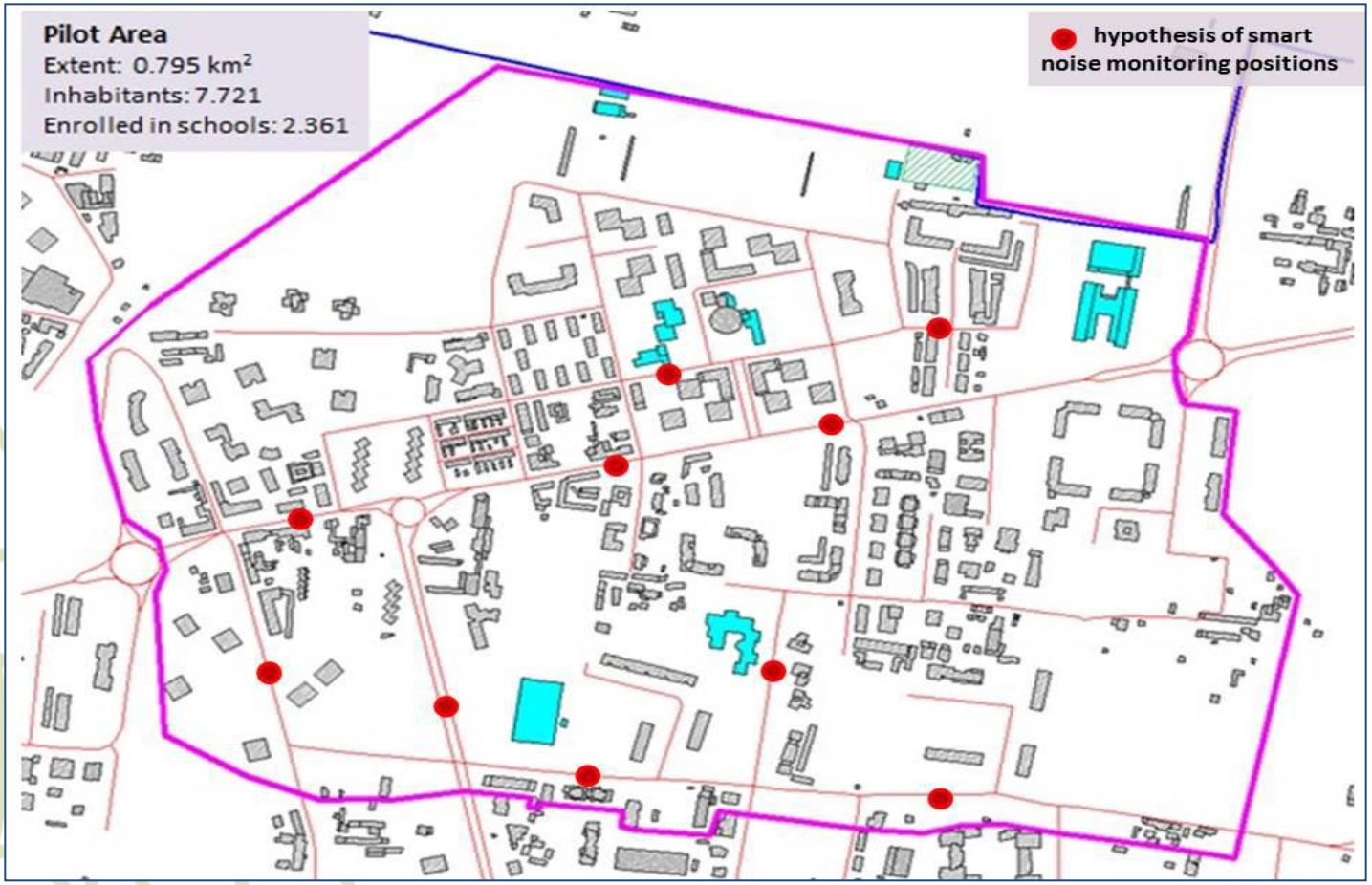
DREAMsys
Smart monitoring networks – Ghent University SENSEable Pisa

LIFE DYNAMAP
Barcellona Noise Monitoring network Low-cost monitoring systems based on smartphone devices – Regional Environmental Agency of Piedmont Participatory monitoring projects

Smart low cost noise monitoring systems	
main characteristics arising from analyzed projects	
Short /long term noise measurement	long term noise measurement
Embedded pc monitoring system /Units with microcontroller and digital signal processor	Embedded pc monitoring system
Type of microphones	MEMS microphones ¼ - inch condenser low cost microphone
Time basis acquisition	Different values. In most frequent cases =1 sec;
Acoustic dynamic range	70 dB
Acoustic Measure range	Different ranges. 30 (40)-100 (110) dB(A)
Acoustic frequency range	20 Hz-20 kHz
Floor noise value	30-35 dB(A)
Tolerance	LAeq ±2 dB(A)
Acoustic indicators	In all cases studies: L_{Aeq}, L_{A10}, L_{A50}, L_{A90}; In some cases studies: $L_{A01;}$ L_{Ceq}, M_{60}, M_{70}, N_{cn}
Spectral data	1/3 octave
Calibration	Periodic calibration
additional characteristics	
weatherproof	Applied in all case studies
connectivity	Wifi/3G/4G
possibility of audio recording	Applied in some case studies
other properties	Extensible with temperature/humidity sensors, air pollution monitoring sensors, GPS logging etc; battery for energy storage.
Size of PCB assembly	10mm < x < 10 mm
Shape of PCB	Optimized to avoid diffraction effects
pilot area of implementation	
Urban/Suburban	Urban and sub-urban areas
Territorial scales	Different dimensions, from medium to large scale; (most frequent dimension in urban area: ≈1,00 km^2)
Number of stations	Different situations. For areas of medium spatial dimensions, in most cases, from 5 to 20 units

Smart low-cost noise monitoring system – LIFE MONZA

Smart low-cost noise monitoring systems, allowing an extensive and long-term noise monitoring, in medium sized territorial scale as urban area, seem to be able to ensure an appreciated quality output measurement data. 10 monitoring stations are expected to be installed in the pilot area of Libertà district.



Smart low-cost noise monitoring system – LIFE MONZA

The main technical specifications requested to the low costs sensors are:
- acoustic parameters: overall A-weighted continuous equivalent sound pressure level, LAeq and continuous equivalent sound pressure level, Leq, as 1/3 octave band spectrum data;
- timing for data recording: data will be registered 1 second based to permit the recognition of unusual events will be advisable in the post analysis phase;
- timing for data transmission: data will be sent every hour;
- data transmission network: will be assessed according to parameters like distance among sensors;
- power supply: solar panel (max expected size 60cm x 60cm, effective expected size 20cm x 30cm) and battery for energy storage;
- sensors location: on streetlight or on façade, height 4 m;
- 1⁄4 or 1⁄2 - inch low cost microphones;
- weather protection.

The main electroacoustic specification
- floor noise < 35 dB(A);
-...

Starting from the previous specs, the monitoring system architecture has been mainly based on monitoring units designed in the DYNAMAP project tailoring the data transmission, storage and post-analysis on the needs of the Life MONZA project.

Smart low-cost noise monitoring system – LIFE MONZA

Preliminary check of the performance maintenance (during the first two months)
The challenge of the low cost sensors consists of maintaining of performance during long term periods.
Two time-stability checks, one week based, are proposed during the first two working months.
1 – **a calibration check @ 1 kHz** (by using a sound pressure class I calibrator).
Requirement: the sound pressure level should stay within 0,5 dB from the calibration level;
2 – **a comparison between LAeq,60s obtained from low cost sensor and class I microphone** recording an environmental noise in the range 45/105 dBA. Requiements: the difference between "LAeq,60s" have to stay within 1,5 dB(A).

Under discussion: the procedure to perform the comparison, the best position and direction of class I microphone to perform a good comparison.

Smart low-cost noise monitoring system – LIFE MONZA

Long term check of the performance maintenance (during two years period)
The previous two time-stability checks are proposed, three months based, during the first two monitoring years.

Under discussion: the calibration check is really needed in this phase ?
If a sensors does not comply to the requirements, the sensors will have to be repaired or replaced with a new one.

Conclusions and future works about the Smart Noise Monitoring System developed in the MONZA project

- Optimization of stability check procedures
- Long term test implementation
- Analysis of long term test results

Air quality monitoring activities

A first ex-ante air quality monitoring campaign has been carried out in May. In addition, to spatially cover the study area 20-point were identified to locate passive air quality samplers.
A second campaign has been carried out in July and also the first campaign with passive samplers in the above selected points.
At the moment we are analyzing the data collected.

A following step is the preparation of the pollutant dispersion model in the atmosphere, for which is necessary to acquire the results of traffic monitoring and information on the structure of the building (height and volume of the buildings) now in progress.

Public involvement

The challenge is to define a territorial identity of the noise LEZ area, through initiatives able to design a part of the city and to share new lifestyle choices.

During the Noise Awareness day of April 2017, meetings have been organized in the primary and high schools located in Libertà district to raise awareness in students about noise and a sustainable home – school mobility system.

Ideas contest in the high schools, about a new logo for identifying noise LEZ and good practices to reduce noise in the area will be launched.

Ideas contest in primary schools about a picture for identifying noise LEZ, possible good practices to reduce noise in the area will also be opened.

Development of an application for mobile and pc to manage voluntary actions and to “measure” benefits and concrete changes in people lifestyle, to be transposed in a bonus for citizens.

RESULTS OF THE PROJECT

The LIFE MONZA project aims to define a **guideline** describing a procedure applicable in different contexts for the definition, the identification and the management of a Noise LEZ.

In the project will be implemented and tested intervention techniques **strongly involving the population**.

Within the project activities, implementation and testing of a **new low noise monitoring system will be carried out and tested in the pilot area** in the long period, also after the project's end.

For the monitoring of the environmental impact in the pilot area, **indicators will be set taking into account both the noise and air quality** as well as the **well-being conditions** of the population.

Monitoring methods and activities tested in pilot area

Website: www.lifemonza.eu

References

- ***LIFE MONZA – "FONOMOC MEETING" Paris, 24 March 2017***
- ***LIFE MONZA – "I progetti LIFE svolti in Italia sul tema dell'inquinamento acustico ambientale: risultati conseguiti, esperienze in corso e sviluppi futuri" Firenze, 11 luglio 2017***
- ***LIFE MONZA – "Working Group Noise Eurocities" Essen, 17/18 september 2017***

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Thank you for your kind attention

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