REPORT

Pilot area actions implementation

ACTION B4

Life MONZA

Methodologies fOr Noise low emission Zones introduction And management

LIFE15 ENV/IT/000586

LIFE MONZA
Methodologies fOr Noise low emission Zones introduction And management

Technical Report

Milestone	Report on participatory activities (techniques, statistics, results)
Action/Sub-action	B4 – Pilot area actions implementation
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1. Introduction and objectives

LIFE MONZA project, co-founded by the European Commission in the context of Life2015 program, is realized in Libertà district in Monza, which is a densely populated area in the north-est part of the City. The district is crossed by Viale Libertà, where about 30.000 vehicles pass through every day.
Based on the results of the Strategic Acoustic Mapping performed in 2012, in the band of 30 m from Viale Libertà, almost the 100% of receivers are exposed to noise levels bigger than 65 dB(A) in the daytime and 55 dB(A) in the nighttime, so that this area is defined as critical in the Action Plan, drawn up according to the Directive 2002/49/CE.
The project has foreseen "top-down" measures consisting of infrastructural works and traffic management in Viale Libertà, and "bottom-up" measures that focused on active involvement of citizens in the promotion and management of customs aimed to reduce noise and improve air quality, and health in the living and working environment.
The B4 action "Pilot area actions implementation" focuses on the realization and monitoring of top-down interventions and the planning of activities with the users of the district (citizens, teachers and students, workers, neighbourhood associations).
"Bottom-up" actions have included training meetings in schools, the stipulation of two school-work alternation agreements, an idea contest to make people aware of the issue of noise pollution, the activation and promotion of Pedibus service and the information about the infrastructural works in Viale Libertà via road signs.

Action B4 is divided into 4 sub-actions:

B4.1 Top-down interventions implementation (MONZA)
B4.2 Bottom-up interventions implementation and management: public meetings organization and monitoring of the public involvement (MONZA)
B4.3 Support on bottom-up actions implementation - app management (UNIFI)
B4.4 Support on bottom-up actions implementation - school meetings, training activities on noise and other pollutants effects (VIENROSE)

Sub-action B4.1

Top-down interventions implementation

LIFE15 ENV/IT/000586

LIFE MONZA
Methodologies fOr Noise low emission Zones introduction And management

Technical Report on TOP-DOWN actions planning in the pilot area

Milestone	Report on participatory activities (techniques, statistics, results)
Action/Sub-action	B4.1 "Top-down interventions implementation"
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1. Introduction

The quality of life in densely populated urban areas is increasingly dependent on the acoustic impact of human activities. Sources of noise emissions - mainly vehicular traffic - are normally shielded or specially designed in order to limit the perceived sound pressure level of the so-called sensitive receptors. These interventions are often carried out in an uncoordinated way, singularly and without a multidisciplinary approach able to measure their effects avoiding overlapping, which does not allow to distinguish unequivocally which intervention is responsible for a reduction of the sound emission level measured at a point, before and after the intervention. This paragraph aims to illustrate the top-down interventions that have been carried out within the Life Monza project, highlighting the innovative aspects and the context that have characterized the design and implementation of the neighborhood. The pilot area of the project is the Libertà District, located in the north-east area of the Municipality of Monza, a densely populated area where Viale Libertà can be identified as the main road. Viale Libertà is used as the east-west crossing axis of the city and is identified as a critical area in the noise action plan prepared in compliance with Directive 2002/49/EC. The Life Monza project aims to identify both top-down and bottom-up interventions in the Libertà district, in order to reduce average noise levels. The combined actions are able to produce measurable effects. Therefore, this methodology, which can be replicated in other contexts, has been identified in order to verify the effectiveness of actions with the specific objective of reducing noise impact.

2. Top-down interventions

The top-down interventions are described. They are carried out in the context of the Libertà district, precisely in the road section of Viale Libertà between Via Bosisio and Via Sant'Anastasia.
The interventions concerned the paving of low-noise asphalt, the creation of a restricted traffic zone - forbidden to heavy vehicles - and the construction of two unaligned pedestrian crossings.
The asphalt paving operation involved the rebuilding of the binder layers and the wear and tear of the road package. The restricted traffic zone was made up of road signs forbidding vehicles over 3.5 tonnes on the stretch of Viale Libertà which involved the intervention. At the same time, two pedestrian crossings were improved and unaligned in the middle of the road, in order to reduce the crossing distance for weak users, and consequently the speed and noise emission of passing vehicles. The above-mentioned interventions are aimed at reducing noise emissions from vehicle traffic, together with the other actions planned within the Life Monza project.

3. Asphalting interventions in viale Libertà

This chapter illustrates the asphalting work carried out in Viale Libertà by paving a wear mat made of low-noise soundproofing material, certified for the purpose. Sample analyses were carried out on the material laid during the work in order to certify its compliance with current UNI regulations.
Works began at 9:00 p.m. on 17th September 2018 and were completed at 8:00 a.m. on 22nd September 2018. They were done during the night, closing to vehicular traffic (except for residents and buses) and reopening to traffic every day from 6:30 a.m. The works were carried out on two opposing fronts, starting simultaneously from the two extremes (west and east) of the intervention area for a stretch of about 1 km and have considered several small sections (Fig.1 Plan of the intervention area).

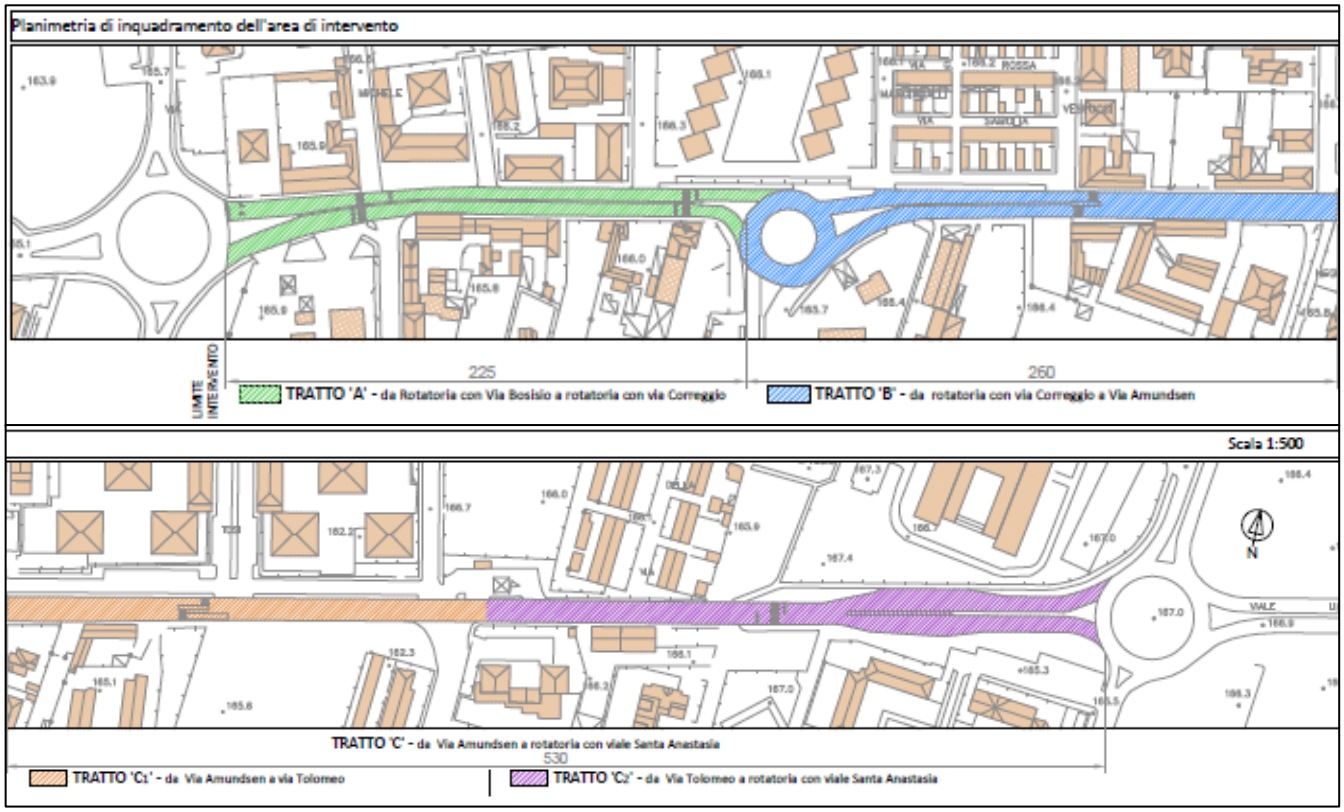


Figure 1 - Plan of the intervention area

The work consisted of setting up the construction site signs, then milling the existing road pavement, aligning manhole covers and grates, laying the 5 cm Binder connection layer and the 4 cm wear mat (Figure 2). Finally, the horizontal road markings were paved.

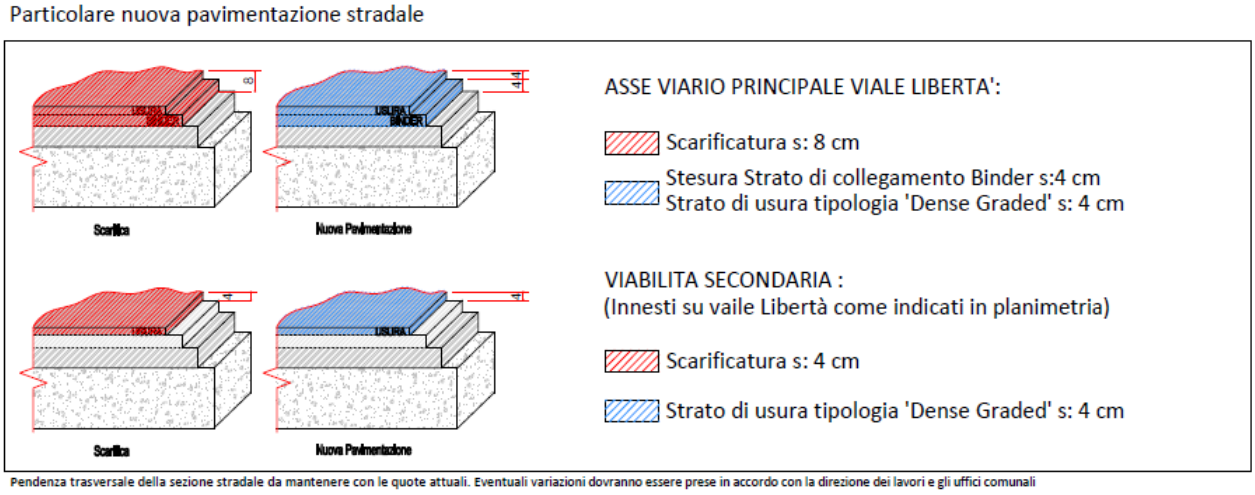


Figure 2 – Detail of the new soundproofing road pavement

For the laying of the low noise mat, interventions have been different, compared to traditional methods: the compacting of the low noise mat had to be carried out only after cooling of the laid material, thus making it necessary to lay the binder in the next section while waiting for the mat to reach the appropriate temperature for compacting it.

The laid binder is of the traditional type, whereas the wear mat is made of low-noise material. In particular, the asphalt used in the intervention is of the "dense-graded" type with optimized texture. It is a non-porous asphalt, which guarantees a noise reduction of 3-4 dB(A) in smooth traffic conditions and an efficiency period of at least 5 years.
The work was carried out by 30 people using 2 milling machines, 2 compactors, 2 pavers and 8 trucks for the transport of waste material every night. The surface area affected by the work measures 14,050 m²; every night work was carried out on approximately 3,000 m² of paving, which was milled and then asphalted (Figure 3).

Figure 3 - Steps for the works' realization

The amount of the intervention was about € 400.000 (according to the economic framework). With regard to the costs, the low noise mat costs 1 €/m² more than the cost of the traditional mat, with an incidence of about 12%. The incidence on the total cost of the intervention is less than 5%. The durability of the wear mat can only be assessed at the end of its useful life, depending on the characteristic parameters of use, taking into account the quantity and type of vehicular traffic (heavy and non-heavy vehicles) that has affected it.
The replicability of this solution can be verified according to the results that the experimentation will provide in terms of noise emission reduction. In addition, the simultaneous limitation to heavy traffic and the adoption of complementary measures (e.g. pedibuses and information actions, which in turn lead to a reduction in vehicle traffic) generates an overlap of effects that will have to be carefully assessed. In this way, it will be possible to give the correct contribution to each intervention in the final result.

4. Design and implementation of a limited traffic zone (LTZ)

A restricted traffic zone has been created in Viale della Libertà to prevent access to heavy vehicles. By Resolution of the City Council n.223/2018, access to heavy goods vehicles with a full load of more than 3.5 tons was restricted and the restriction began on 21st January 2019.
From the point of view of road hierarchy, Viale Libertà is a road that connects the axis of the SP60 Concorezzo-Monza with the road network formed by the Cantore-Boccaccio-Regina Margherita-Battisti and Viale Brianza. Nevertheless, the section involved in the project, between via Bosisio and via Santa Anastasia, has only one lane in each direction of travel of variable width between 3.75 and 4.50 m, with a 2 m wide resting strip on the side of the road (absent in some sections because of the reduced overall width that does not allow it to be inserted). The road section, as clearly visible in Figure 4, is part of the road network that plays a medium-range distribution role in the urban area represented

by the Municipality of Monza and its surroundings. The section that has been limited to the transit of heavy vehicles is highlighted in the figure in blue. The limitation to heavy traffic (vehicles over 3.5 t) involves the alternative route highlighted in red in the following figure.

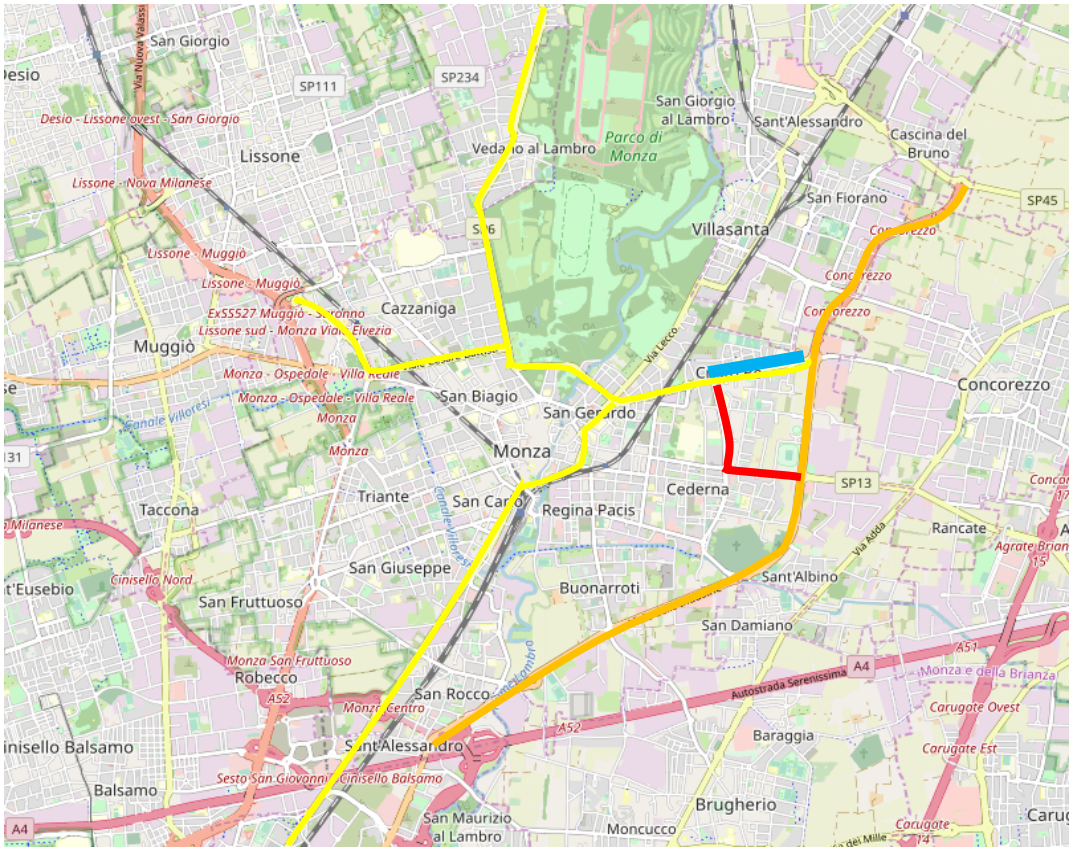


Figure 4 – Restriction to heavy vehicle traffic: the limited traffic route (in blue) and an alternative route (in red).

The limitation aims to reduce traffic noise produced by heavy vehicles depending on their flow rate, as well as exhaust emissions, which are proportional to the flow rate of the vehicles, are significantly reduced.

The signage that has been affixed on the roads is illustrated in Figure 5. The vertical sign illustrates the exceptions relating to urban and suburban buses that, although exceeding the weight limitation imposed, can pass through the intervention area. In addition, a supplementary panel has been provided with the description and logos of the project printed in colour, with class II film.

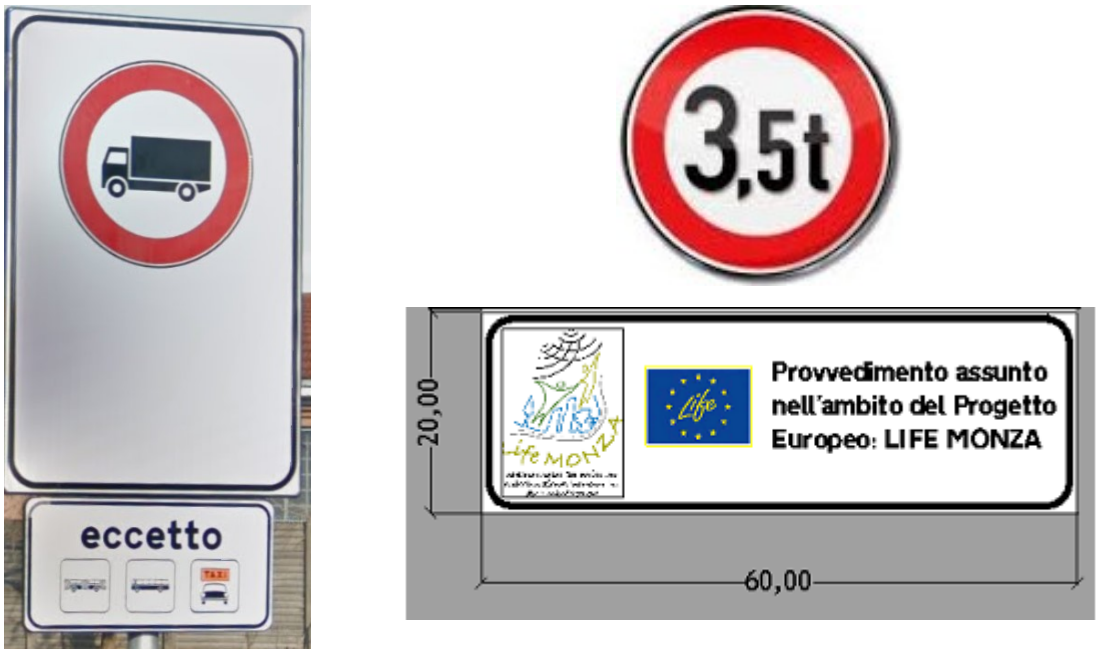


Figure 5 – Signs prohibiting the transit of heavy vehicles over 3.5 t and the additional panel 20 x 60 cm

5. Implementation of unaligned pedestrian crossings

Along Viale Libertà there are two pedestrian crossings, which had no form of protection for pedestrians in the middle of the carriageway, before the intervention.

The width of the carriageway, the characteristics of road traffic and the presence of points of interest on both sides of the road suggested to carry out measures to improve the perceived safety of weak users using these crossings. The described intervention concerns the pedestrian crossings located in Viale Libertà at number 114 and at the civic centre.

The design of two unaligned pedestrian crossings was carried out by creating a "safety area" in the middle of the carriageway, with the dual purpose of reducing the distance travelled by pedestrians when crossing and helping to reduce the average speed of the vehicles involved in the crossings thanks to the narrower width of the lanes, since the creation of these areas actually creates a restriction. The speed limit has been set at 50 km/h as foreseen in the project. As a matter of fact, there is a linear correlation between the average speed of a vehicle current and the perceived width of the lane by the user: the narrower the width, the lower the average speed tends to decrease. The intervention costs € 34,550.08 and was carried out in 40 consecutive days. The work was completed on 3rd October 2017.

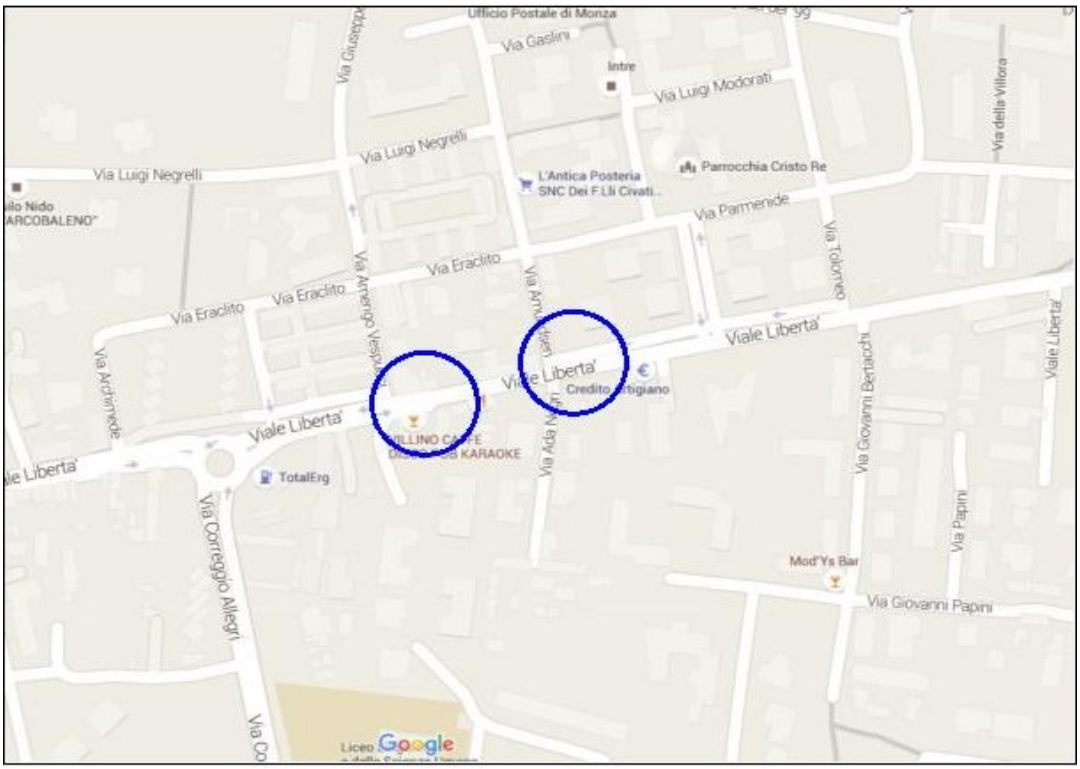
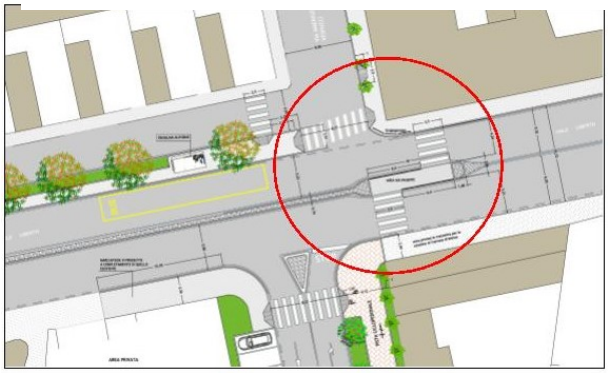


Figure 6 – Location of pedestrian crossings (before the intervention) at number 114 and at the civic center.

Figure 1 – State of the art

Figure 8 – Project status



The intervention aimed to secure two pedestrian crossings that presented critical issues related to the perceived safety of weak users in Viale Libertà. The action had as a further secondary objective to reduce the speed of vehicles in transit and consequently their acoustic impact on the surrounding environment, considering that noise emissions are proportional to the speed of travel.

6. Conclusions and future outlook

The top-down interventions carried out within the Life Monza project concerned infrastructural and regulatory aspects, related to the road, capable of producing a significant impact on the noise emission levels in the reference area (Libertà district, city of Monza). These interventions, together with other actions planned within the project, can be used and replicated in other contexts in order to allow the noise mitigation at the noise source of vehicular traffic. The contribution of each single noise mitigation intervention to noise abatement is the subject of possible future research. It could be carried out separating the overlapping effects with the aim to determine the effectiveness of each intervention compared to the others.

Sub-action B4.2
Bottom-up interventions implementation and management: public meetings organization and monitoring of the public involvement

LIFE15 ENV/IT/000586

LIFE MONZA

Methodologies fOr Noise low emission Zones introduction And management

Technical Report on Pilot area actions implementation

Milestone	Report on participatory activities (techniques, statistics, results)
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1. Introduction

The LIFE MONZA Project started in 2016 and will end in June 2020. It will have impacts and benefits regarding noise pollution in the pilot area of the Municipality of Monza.
The project has foreseen two main types of actions: the top-down ones have concerned the design and realization of interventions on Viale Libertà, whereas the bottom-up ones have aimed at involving citizens for the whole duration of the project, in order to promote and stimulate more sustainable habits and lifestyles.
Therefore, the objective of the project was to act both on environmental aspects, to reduce average noise levels in the pilot area - with correlated positive effects also with air quality - and on citizens' well-being and perception of the quality of life.
Several initiatives have been dedicated to the information and involvement of residents and users of the pilot area, in order to be able to share with people more sustainable life choices related to noise and air pollution and to well-being conditions in living environments. The bottom-up measures have dealt with these latter aspects.
Activities have been carried out, such as lessons organised in the schools of Libertà district, a competition of ideas for students for the definition of the Noise LEZ logo, the start-up of the Pedibus service, the filling in of questionnaires by citizens and the design and spread of an App to provide various services and monitor the behaviour of end-users.
Following the implementation of the top-down interventions, the project aimed to make citizens participate in the bottom-up actions. As explained in the following chapters, the main actions have seen the active involvement of people in the project.

2. Bottom-up interventions for the involvement of students

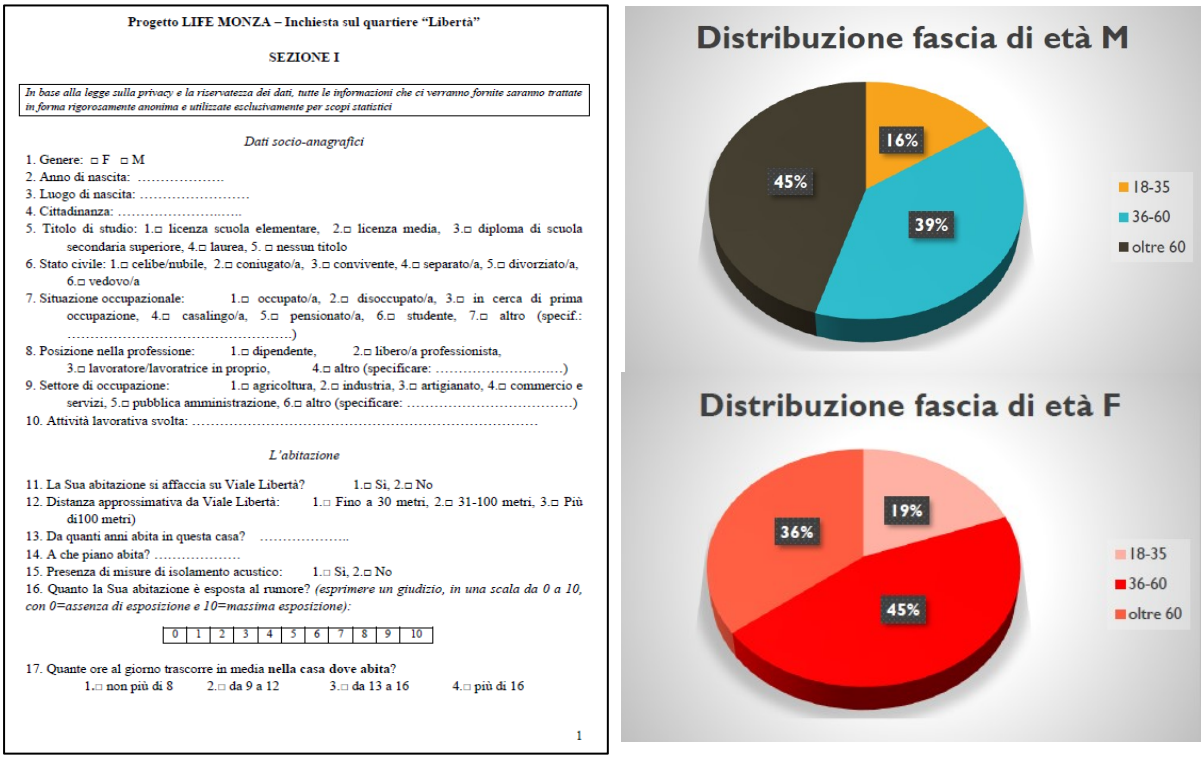
Among the main bottom-up interventions carried out during the project, the following activities have involved students:

- "Noise Awareness Day", the International Noise Awareness Day was organized at the “Gianni Rodari” Primary School (in Libertà district) in May 2019. It was promoted by INAD Italia group of AIA, in collaboration with Vie en.ro.se. Ingegneria. During this edition, a prize competition was also organized for the *classi terze* (corresponding to students aged 8-9) which joined the initiative.
- Training meetings have been organized with about 500 students of the “Achille Mapelli” Institute on topics related to physics of sound, noise disturbance and acoustic comfort.
- The stipulation of a work-school alternation activity with the students of three classes of the “Mapelli” Institute, to provide them with basic theoretical notions on acoustics and involve them in a project for the acoustic comfort upgrading of a classroom of their school.
- The realization of an ideas competition for the creation of a logo and a slogan for the promotion of the Noise LEZ of the Libertà district.
- The activation of the "Pedibus Libertà" service for the school years 2018/2019/2020.

3. Bottom-up interventions for the involvement of citizens

During the LIFE MONZA Project, a fundamental aspect was to promote the involvement of citizens in activities aimed at encouraging good habits for noise reduction, improvement of air quality and health in living and working environments.
The involvement of people also wants to promote a better understanding of how noise affects the quality of life, to underline the objectives of the project and the interventions implemented in the Libertà district in the city of Monza.
Activities have been organized for involving citizens of the Libertà district in order to establish a direct link between public institutions and citizens. The initiatives are reported below:

- A questionnaire has been elaborated and administrated, thanks to the students of the "Carlo Porta" High School for the collection and analysis, in the ante and post-operam phase of the project. The survey concerns the quality of life, the perception of noise and air quality. For the ante-operam phase, a sample of citizens aged 18-80 and living in the pilot area was selected. Three variables have been considered: gender, age and distance from Viale Libertà.



Progetto LIFE MONZA – Inchiesta sul quartiere "Libertà"

SEZIONE I

In base alla legge sulla privacy e la riservatezza dei dati, tutte le informazioni che ci verranno fornite saranno trattate in forma rigorosamente anonima e utilizzate esclusivamente per scopi statistici

Dati socio-anagrafici

1. Genere: □ F □ M
2. Anno di nascita: ……
3. Luogo di nascita: ……
4. Cittadinanza: ……
5. Titolo di studio: 1.□ licenza scuola elementare, 2.□ licenza media, 3.□ diploma di scuola secondaria superiore, 4.□ laurea, 5. □ nessun titolo
6. Stato civile: 1.□ celibe/nubile, 2.□ coniugato/a, 3.□ convivente, 4.□ separato/a, 5.□ divorziato/a, 6.□ vedovo/a
7. Situazione occupazionale: 1.□ occupato/a, 2.□ disoccupato/a, 3.□ in cerca di prima occupazione, 4.□ casalingo/a, 5.□ pensionato/a, 6.□ studente, 7.□ altro (specif.: ……)
8. Posizione nella professione: 1.□ dipendente, 2.□ libero/a professionista, 3.□ lavoratore/lavoratrice in proprio, 4.□ altro (specificare: ……)
9. Settore di occupazione: 1.□ agricoltura, 2.□ industria, 3.□ artigianato, 4.□ commercio e servizi, 5.□ pubblica amministrazione, 6.□ altro (specificare: ……)
10. Attività lavorativa svolta: ……

L'abitazione

11. La Sua abitazione si affaccia su Viale Libertà? 1.□ Si, 2.□ No
12. Distanza approssimativa da Viale Libertà: 1.□ Fino a 30 metri, 2.□ 31-100 metri, 3.□ Più di100 metri)
13. Da quanti anni abita in questa casa? ……
14. A che piano abita? ……
15. Presenza di misure di isolamento acustico: 1.□ Si, 2.□ No
16. Quanto la Sua abitazione è esposta al rumore? *(esprimere un giudizio, in una scala da 0 a 10, con 0=assenza di esposizione e 10=massima esposizione):*

0	1	2	3	4	5	6	7	8	9	10

17. Quante ore al giorno trascorre in media nella casa dove abita?
1.□ non più di 8 2.□ da 9 a 12 3.□ da 13 a 16 4.□ più di 16

1

Figure 1 – Questionnaire and responses received by age group.

- For the Pedibus, meetings were held at schools and civic centres in the evening, so that people can participate. The Viale Libertà Council was also involved.
- The dissemination of the Life Monza Project was carried out in a specific section of the institutional website of the Municipality of Monza. The section contains the objectives and actions which took place during the whole life of the project.
- Periodical promotion of the project on social media - Facebook - (see Figure 2).

Figure 2 – Post on the Facebook page of the Municipality of Monza for the Pedibus service.

- Creation of the free LIFE MONZA App to provide up-to-date information concerning the project, to allow the management of the Pedibus service by parents and volunteers and to stimulate sustainable lifestyles through the awarding of “Green Points". Figure 3 shows the App screenshots.

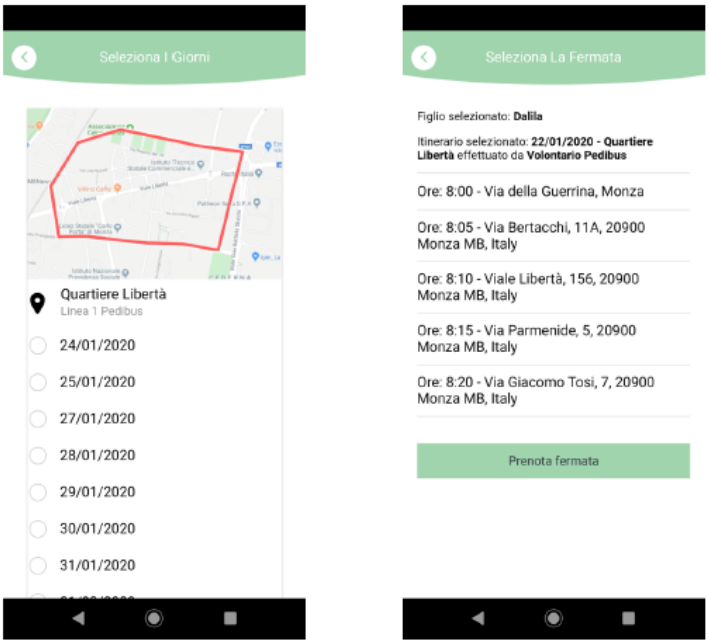


Figure 3 – Life Monza App

4. Objectives achieved by the monitoring of "Bottom-up" actions

This chapter describes the main objectives achieved by the implementation of bottom-up actions and the organization of public meetings for monitoring results.
One of the bottom-up actions included the ideas competition. The objective of this latter is the definition of the logo and the slogan to represent the key elements for identifying the neighbourhood in terms of noise pollution and for encouraging the several activities to increase environmental quality.

Questionnaire

The sample survey aims to analyse the effects of the actions envisaged by the project through the detection and evaluation of opinions, perceptions and behaviours of the population. These aspects are studied considering a series of elements related to the liveability of the neighbourhood and the conditions of environmental and social well-being. As shown in figure 4, the number of responses was high and proportional to citizens' participation.

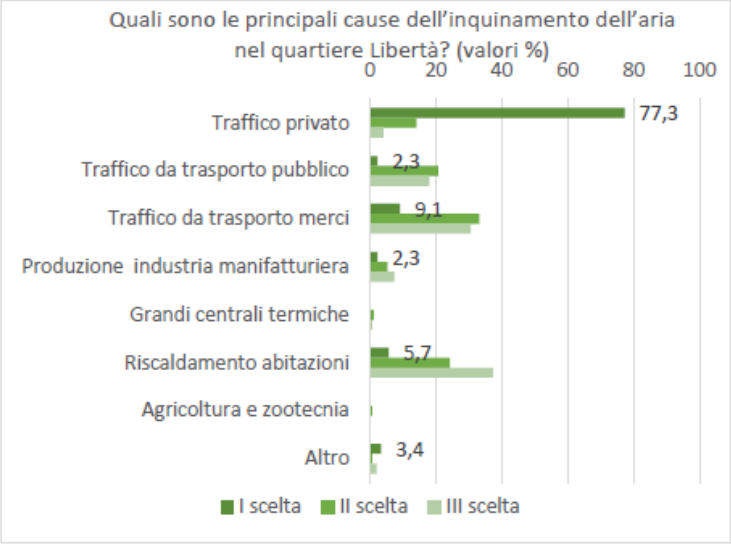


Figure 4 – Sample survey in the Libertà district

Most respondents report that the above-mentioned "Traffico privato" (which involves vehicles of private citizens in the neighbourhood) is the main cause of noise and air pollution.
Moreover, for most of the subjects, the low-noise emission re-paving led to a significant reduction in traffic noise. This intervention was the most appreciated.

Pedibus

The implementation of the Pedibus service implicated the organization of several meetings with the schools and the "Consulta di Viale Libertà" (a group, formed by committed citizens, which collaborates with the Public Administration). The meetings have been an opportunity for the promotion and subsequent start-up of the action and for relaunching relations among groups of volunteers.

In addition, the informal groups of volunteers in the neighbourhood, such as the “Gruppo del Controllo del Vicinato” and the “Gruppi di Cammino”, have immediately accepted their involvement in the Pedibus. The latter has been considered as an action capable of supporting the idea of sustainable school mobility and have a strong impact on the social relationships between children of different ages (children enrolled in the Pedibus are divided according to addresses and not to ages), parents, grandparents and volunteers (who do not necessarily have children and/or grandchildren enrolled in school).

APP

The app aims to disseminate information, drawn up by the Municipality of Monza under the supervision of the UNIFI partner, among citizens, who live outside the district as well. Moreover, thanks to the App, it will be possible to disseminate the acoustic data coming from the 10 low-cost sensors installed in the neighbourhood, even after the end of the project.

Regarding the publication of the noise pollution data, it is also foreseen the periodic calculation of an index, which is recorded on a server.

The app wants to be a practical tool for the management of the Pedibus and the organization of the participants: children and volunteers. The advantage is that children and young people can take their first steps towards autonomy, get to know their neighbourhood, socialize with others and concretely promote sustainable mobility on the home-school journey.

Sub-action B4.3

Support on bottom-up actions implementation - app management

LIFE15 ENV/IT/000586

LIFE MONZA
Methodologies fOr Noise low emission Zones introduction And management

Technical Report

Milestone	Report on participatory activities (techniques, statistics, results)
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Table of content

1. Introduction and objectives

Activities foreseen in the frame of Sub Action B4.3 “Support on bottom-up actions implementation (App management)” are strictly related to those scheduled in Sub Action B4.2 “Bottom-up interventions implementation and management: public meetings organization and monitoring of the public involvement”.

In action B4.2, in order to implement bottom-up interventions, a first meeting to present the project is planned in April 2017, in the premises of the neighborhood council, where experts will explain aims and objectives of the project (sub-action B2.1.1), asking citizens for suggestions and ideas to reduce noise in the district. During this meeting an ideas contest (about possible good practices to reduce noise in the area) will be launched. Two other meetings are planned during the sub-action B4.2, the first one will be organized in April 2018 to award the winners of the ideas contest and explain how the App works; the second one will be organized in April 2019 to keep citizens informed about the progress and the results of the Project.
In order to ensure the widest participation, meetings will be scheduled after 8:00 PM, to give the workers the opportunity to attend. Moreover, wide dissemination to the meetings will be given through all information channel available: City official website, SMS, social networks like Facebook and Twitter but also through posters in the streets.

According to action B4.3, the citizens’ engagement is fundamental for a successful exploitation of the entire platform. UNIFI will participate to the meeting organized by the Municipality in April 2018 (sub-action B4.2) to make citizens aware about how the App work and how the use of the App can help in reducing noise pollution.

Moreover, UNIFI will attend to other two meetings in high schools to involve the students in the use of the App.

In these meetings, the participants will be informed of their own potentiality in supporting the inversion of such current trend. During the meetings, citizens will be provided with a specific guideline that reminds to the project website and with flyers showing how easily through a mobile app they can help stopping the pollution.

The website will collect all the processed data and provide an open access to them.
The website will show accessible statistical reports together with georeferenced maps with several layered views. Each map layer will self-explain the past, current and trend situation of the citizen actions.
Furthermore, residents can access to their own profile and monitor all their “good action” over time, while checking the relative “score” to gain a reward.

2. App management

Although the specifications of the App were defined in July 2018 (Action B2), the external assignment for its implementation has been delayed by the Municipality of Monza. As a consequence, the beginning of Sub-Action B4.3 has been also delayed.
Delays are mainly related to the difficulties in activating the "pedibus" service (Actions B2 and B5) on which an important part of the App services is based.

In order to give further support to the Municipality, in December 2018 contacts were resumed and a next meeting was scheduled on 9th January 2019 at the municipality of Monza where the timing of activation of the "pedibus" and implementation of the App have been discussed. These activities can be included among those foreseen by Action B.4.

During the meeting held on 9th of January at the Municipality of Monza, the progress of the procedure for the start-up of the "pedibus" service and the assignment of the service for the App realization was also discussed with the Municipality. The Municipality has announced the decision to wait for the effective start of the "pedibus" service, one of the most important services managed by the App, to proceed with its implementation. At the same time, the Municipality communicated that there have been difficulties in starting the "pedibus" service, which seem to be in the process of being resolved. The service was re-scheduled to start in February 2019. At that time, it seemed appropriate to proceed with the implementation of the App based on the pedibus as one of the main services. During the meeting, however, it was reiterated the need to proceed as soon as possible with the task of implementing the App given the expected implementation and testing times of the order of 3-4 months.
There were no specific contacts with the Municipality and therefore no particular updates on this point until the next project meeting scheduled in Rome on 22nd March 2019 in presence of all partners at the headquarters of the coordinator.
During the meeting of 22nd March, the Municipality of Monza communicated that the "pedibus" service was going to start. In the meeting the Municipality described the methods and the time of effective activation, however contained within a few weeks.

Regarding the App, the Municipality of Monza communicated that the purchase procedure for the realization of the App was not yet activated because on one hand the municipality was waiting for the activation of the pedibus service and on the other it feared that the citizens do not fully understand the usefulness of the App in relation to its actual cost.
Project partners discussed the issue and still urged the implementation of the App in line with the original proposal.

Further updates were discussed during the meeting with the project monitor on 14th May 2019. The pedibus service had started and its potentiality and interest were also confirmed by other districts of Monza. Regarding the App, the monitor expressed doubts about the late activation. The monitor also urged a quick implementation of the App so that it could be operational at the beginning of the new school year in September 2019, in order to have a minimum time to test it. At the same time the monitor suggested the inclusion of additional services of general interest for citizens.

In the month of September 2019, contacts were refreshed with the Municipality of Monza that communicated the assignment of the contract for the realization of the App. The completion of the beta version was scheduled for November, followed by an intensive verification test. The Municipality has communicated a delay in the implementation of the beta version, scheduled for December.

On 17 December 2019 a technical meeting was held with the Municipality and in the presence of the developers to verify the functioning of the beta version of the App pending its activation and testing in January 2020. Consequently, a period of testing and verification of the App has been assumed at least until March 2020.

In figure 1, it is shown how the App looks like.

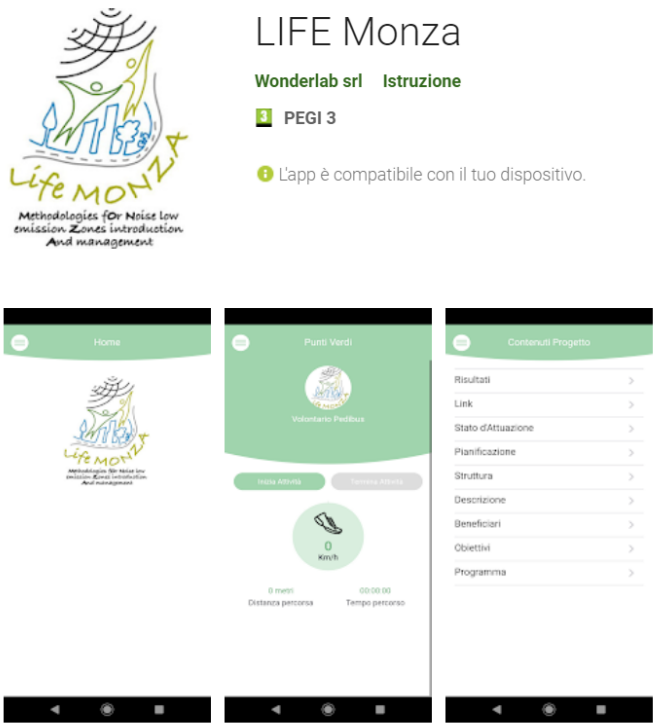


Figure 1. LIFE MONZA App preview.

3. The HARMONICA index

It was evaluated and discussed the possibility to insert and display an acoustic indicator derived from the data downloaded from the smart acoustic sensors. The developers of the App will think about the predisposition of this service too.

Specifically, indications for the implementation of the HARMONICA index have been provided by UNIFI to the App developers.

Within the LIFE HARMONICA project, the HARMONICA index was developed and proposed to facilitate the understanding of the public and decision-makers on noise and its impacts.
The quantification of noise perception is on an hourly basis and on a linear scale from 0 to 10, so the higher the index score, the worse the quality of the sound environment.

Figure 2 shows an example of hourly variation of the index over 24 hours of the day.

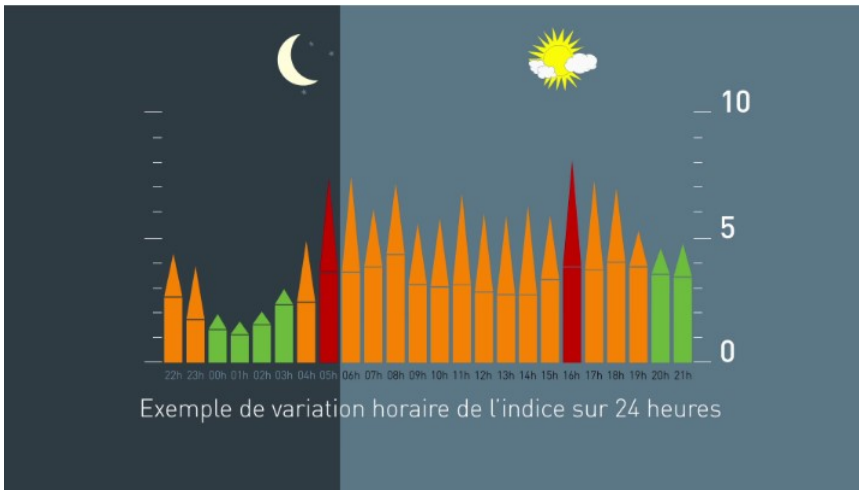


Figure 2. Graphic explanation of the Harmonica index (http://www.noiseineu.eu/).

Generally speaking, if the index takes values between 0 and 4 by day and between 0 and 3 by night the environment can be considered calm (green), if the index is between 4 and 8 by day and between 3 and 7 by night the environment can be considered noisy (yellow), while if the index takes values greater than 8 by day and greater than 7 by night the environment can be perceived as very noisy (red).
It is important to note that the values assumed by this index are not associated with the official limits of the Municipal Acoustic Classification Plan.
The Harmonic Index takes into account the main components that influence the perception of noise, i.e. background noise (BGN) and the average value of energy associated with sound events (EVT) exceeding BGN. The two terms BGN and EVT, appropriately weighted, appear in the index formulation, as shown in the equation (1):

$$HI = 0.2 \cdot \left(L_{A95_{eq}} - 30\right) + 0.25 \cdot (L_{A_{eq}} - L_{A95_{eq}}) \qquad (1)$$

where:

HI is the Harmonica index;

LA95eq is the value in [dB] integrated over 60 minutes of the series of 3600 LA95 values calculated from the instantaneous LAeq,1s values contained in a 10-minute time window progressively shifted every second;

LAeq is the hourly equivalent continuous level in [dB].

Sub-action B4.4
Support on bottom-up actions implementation: school meetings, training activities on noise and other pollutants effects

LIFE15 ENV/IT/000586

LIFE MONZA
Methodologies fOr Noise low emission Zones introduction And management

Technical Report on Pilot area actions implementation

Milestone	Report on participatory activities (techniques, statistics, results)
Action/Sub-action	B4.4 "Support on bottom-up actions implementation (school meetings, training activities on noise and other pollutants effects)"
Authors	Vie en.ro.se. Ingegneria: Raffaella Bellomini, Sergio Luzzi, Lucia Busa, Gianfrancesco Colucci
Status - date	Versione- 31/05/2019

Beneficiary:	Vie en.ro.se. Ingegneria
Contact person:	Raffaella Bellomini
E-mail:	raffaella.bellomini@vienrose.it
Project Website:	www.lifemonza.eu

1. Action B4.4 *"Support on bottom-up actions implementation (school meetings, training activities on noise and other pollutants effects)"*

This paragraph contains the description of the activities related to action B.4 "Pilot area actions implementation", with particular reference to sub-action B4.4 "Support on bottom-up actions implementation (school meetings, training activities on noise and other pollutants effects)" whose beneficiary is Vie en.ro.se. Ingegneria.

Table 1 –B4 sub-actions

Sub-action	Activity	Beneficiary
B4.1	Top-down interventions implementation	MONZA
B4.2	Bottom-up interventions implementation and management: public meetings organization and monitoring of the public involvement	MONZA
B4.3	Support on bottom-up actions implementation (App management)	UNIFI
B4.4	**Support on bottom-up actions implementation (school meetings, training activities on noise and other pollutants effects)**	**Vie en.ro.se. Ingegneria**

In the sub-action B4.4 several activities were carried out with the students of the "Achille Mapelli" Institute and the "Gianni Rodari" Primary School of Monza:

1. Training and information meetings about the Life Monza project and acoustics topics.
2. School-work alternation (the so-called "Alternanza scuola/lavoro") project in which the most interested students were involved.
3. Ideas contest for the creation of a Logo and a Slogan for the communication and to promote the Noise LEZ in the Libertà district in Monza involving the students of the "Mapelli" Institute during the school year 2017-2018.
4. Organization and management of the competition "The most annoying noise in my city" in three classes of the "Gianni Rodari" Primary School in the context of INAD 2019.

2. Training and information meetings in the Mapelli school

During the second semester of 2017-2018 school year, Vie en.ro.se. Ingegneria has carried out 5 meetings, each one lasting two hours, attended by more than 100 students and several teachers per meeting, for a total of **over 500 students involved** and 20 teachers from:

- Liceo Scientifico indirizzo «Scienze applicate»;
- Istituto Tecnico indirizzo «Costruzioni, Ambiente e Territorio»;
- Istituto tecnico indirizzo «Agraria, Agroalimentare, Agroindustria»;
- Istituto Tecnico indirizzo «Amministrazione, finanza e marketing»;
- Istituto Tecnico indirizzo «Turismo».

  Note: all the above-mentioned schools refer to the "Mapelli" Institute.

Each of the meetings is prepared according to the specific audience (age of students and type of school). During the meetings, the following topics were discussed: Life Monza Project, physics and sound perception, noise disturbance and acoustic comfort of outdoor and indoor environments.

Table 2 – Calendar of training/information meetings for the "Mapelli" Institute

Meeting date	Audience
20th February 2018	Class rappresentative
27th February 2018	LICEO-AGRARIO-CAT *primo anno* (corresponding to students aged 14-15)
6th March 2018	LICEO-AGRARIO-CAT *secondo anno* (corresponding to students aged 15-16)
13th March 2018	LICEO *terzo, quarto e quinto anno* (corresponding to students aged 16-19)
20th March 2018	CAT-AGRARIO-AFM-TURISTICO terzo, quarto e quinto anno (corresponding to students aged 16-19)

Figure 2 – Views of the auditorium where the meetings took place

The meetings have always been structured into two distinct parts.
In the first part, the contents of the Life Monza Project have been illustrated, with particular reference to actions that directly involve the population of the Libertà district in Monza.
The description of the infrastructural interventions of the Libertà district, as well as the promotion of bottom-up actions, have been explained in detail.
Additionally, the meeting was dedicated to the presentation of the ideas contest for the creation of the logo and the slogan for the communication and promotion of the LEZ in Libertà district. How to participate in the contest has been explained as well.

Figure 3 – Some slides about the Life Monza project shown to the students

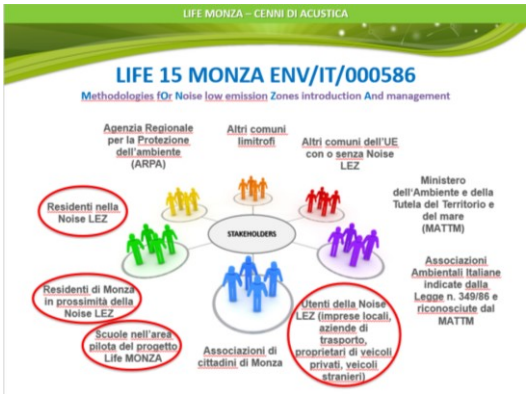
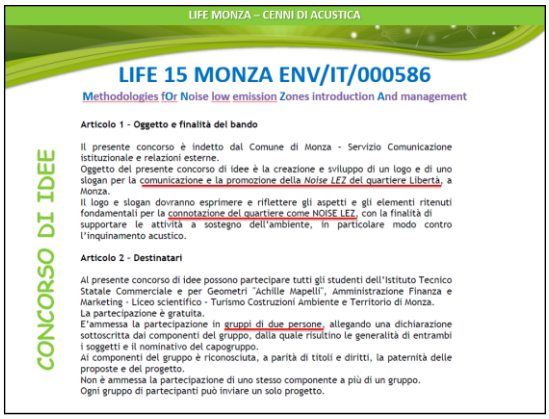
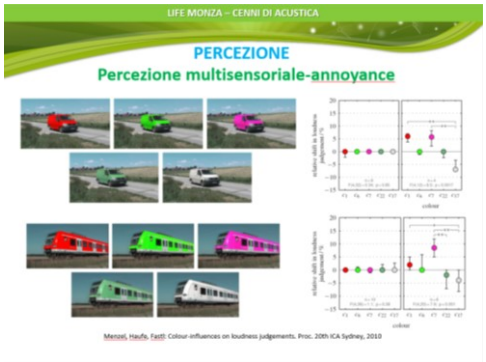


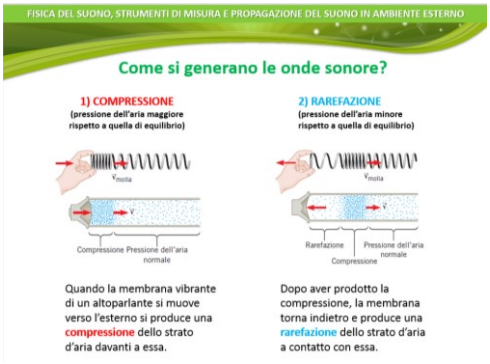
Figure 4 – Some slides about the ideas contest shown to the students



In the second part of the meetings, the following topics were discussed with different levels of depth: fundamentals of acoustics, sound perception, soundscapes and noise disturbance.
In the meetings with elder students, the physics of sound (wave nature of sounds, noise parameters, time and frequency analysis of sound, etc.) has been deepened, also with audio and video contents.
In the meetings with younger students, the sound perception, in relation to visual perception, and the use of sounds in leisure and work environments (e.g. shops, restaurants, offices, etc.) have been examined.
For all the classes, the topics related to noise annoyance, consequences for people of bad acoustics in indoor and outdoor environments, with particular reference to the acoustics of school buildings have been dealt with. These themes have raised great interest both among students and teachers, in fact, they have asked many questions about how to improve the quality of listening and, at the same time, reduce the vocal effort of the speakers who have to talk for long periods, such as teachers.

Figure 5 – Some slides about the sound perception shown to the students

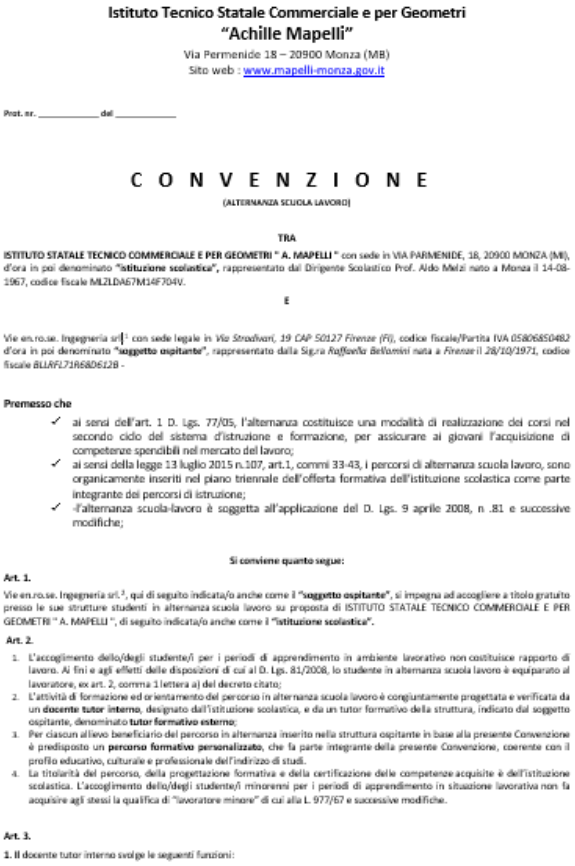




3. The stipulation of the "school-work alternation" convention

In January 2018, a meeting was held at the “Achille Mapelli” Institute to define the agreement with Vie en.ro.se Ingegneria on the project of school-work alternation.
In that occasion, a programme of meetings was drawn up to be held between February and March 2018, managed exclusively by Vie en.ro.se Ingegneria, with the aim of organising a training course on room acoustics as well as a series of training/information lessons on noise risks for bigger groups of students.

Figura 6 – “School/work alternation” convention between Vie en.ro.se. Ingegneria and “Achille Mapelli” Insitute



Istituto Tecnico Statale Commerciale e per Geometri
“Achille Mapelli”
Via Permenide 18 – 20900 Monza (MB)
Sito web : www.mapelli-monza.gov.it

Prot. nr. _____ del _____

C O N V E N Z I O N E
(ALTERNANZA SCUOLA LAVORO)

TRA

ISTITUTO STATALE TECNICO COMMERCIALE E PER GEOMETRI " A. MAPELLI " con sede in VIA PARMENIDE, 18, 20900 MONZA (MB), d'ora in poi denominato **"istituzione scolastica"**, rappresentato dal Dirigente Scolastico Prof. Aldo Melzi nato a Monza il 14-08-1967, codice fiscale MLZLDA67M14F704V.

E

Vie en.ro.se. Ingegneria srl[1] con sede legale in *Via Stradivari, 19 CAP 50127 Firenze (Fi)*, codice fiscale/Partita IVA 05806850482 d'ora in poi denominato **"soggetto ospitante"**, rappresentato dalla Sig.ra *Raffaella Bellomini* nata a *Firenze* il 28/10/1971, codice fiscale *BLLRFL71R68D612B* -

Premesso che

- ai sensi dell'art. 1 D. Lgs. 77/05, l'alternanza costituisce una modalità di realizzazione dei corsi nel secondo ciclo del sistema d'istruzione e formazione, per assicurare ai giovani l'acquisizione di competenze spendibili nel mercato del lavoro;
- ai sensi della legge 13 luglio 2015 n.107, art.1, commi 33-43, i percorsi di alternanza scuola lavoro, sono organicamente inseriti nel piano triennale dell'offerta formativa dell'istituzione scolastica come parte integrante dei percorsi di istruzione;
- -l'alternanza scuola-lavoro è soggetta all'applicazione del D. Lgs. 9 aprile 2008, n .81 e successive modifiche;

Si conviene quanto segue:

Art. 1.

Vie en.ro.se. Ingegneria srl,[2], qui di seguito indicata/o anche come il **"soggetto ospitante"**, si impegna ad accogliere a titolo gratuito presso le sue strutture studenti in alternanza scuola lavoro su proposta di ISTITUTO STATALE TECNICO COMMERCIALE E PER GEOMETRI " A. MAPELLI ", di seguito indicata/o anche come il **"istituzione scolastica"**.

Art. 2.

1. L'accoglimento dello/degli studente/i per i periodi di apprendimento in ambiente lavorativo non costituisce rapporto di lavoro. Ai fini e agli effetti delle disposizioni di cui al D. Lgs. 81/2008, lo studente in alternanza scuola lavoro è equiparato al lavoratore, ex art. 2, comma 1 lettera a) del decreto citato;
2. L'attività di formazione ed orientamento del percorso in alternanza scuola lavoro è congiuntamente progettata e verificata da un **docente tutor interno**, designato dall'istituzione scolastica, e da un tutor formativo della struttura, indicato dal soggetto ospitante, denominato **tutor formativo esterno**;
3. Per ciascun allievo beneficiario del percorso in alternanza inserito nella struttura ospitante in base alla presente Convenzione è predisposto un **percorso formativo personalizzato**, che fa parte integrante della presente Convenzione, coerente con il profilo educativo, culturale e professionale dell'indirizzo di studi.
4. La titolarità del percorso, della progettazione formativa e della certificazione delle competenze acquisite è dell'istituzione scolastica. L'accoglimento dello/degli studente/i minorenni per i periodi di apprendimento in situazione lavorativa non fa acquisire agli stessi la qualifica di "lavoratore minore" di cui alla L. 977/67 e successive modifiche.

Art. 3.

1. Il docente tutor interno svolge le seguenti funzioni:

3.1 School-work program

The school-work program involved 20 students from three different classes:
- Liceo Scientifico *terzo, quarto anno* (corresponding to students aged 16-18).
- "Costruzione, Ambiente e Territorio" terzo anno (corresponding to students aged 16-17).

Figure 7 – Activities carried out with the students

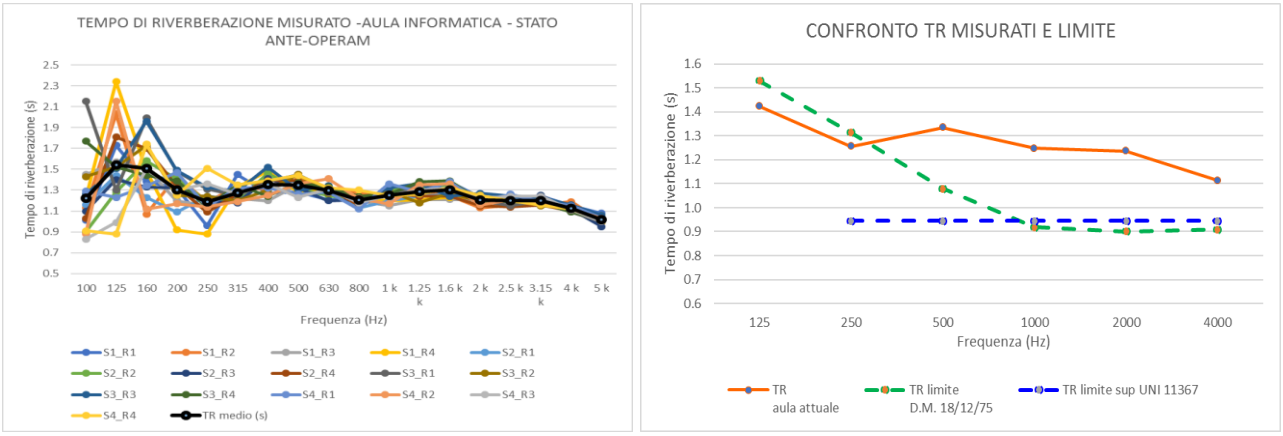
The first two meetings (20th and 27th February) were aimed to provide the basic theoretical knowledge related to:
- Room acoustics;
- Sound propagation inside the rooms;
- room acoustics parameters;
- reference legislation;
- materials and solutions for acoustic comfort optimization, according to the use of the room.

In addition to this, some case studies regarding acoustic correction interventions designed and realized in different types of rooms (school canteens, offices, restaurants, auditoriums, etc.) have been shown and analysed.

During the third meeting (on 6th March), together with the students, reverberation time measurements were carried out in the computer lab, which was made available by the school as a case study. The students were divided into five groups and the classroom impulse response was measured in different positions and current conditions. In addition to acoustic measurements, the students carried out the metric survey of the computer lab, including the installations and furnishings present.

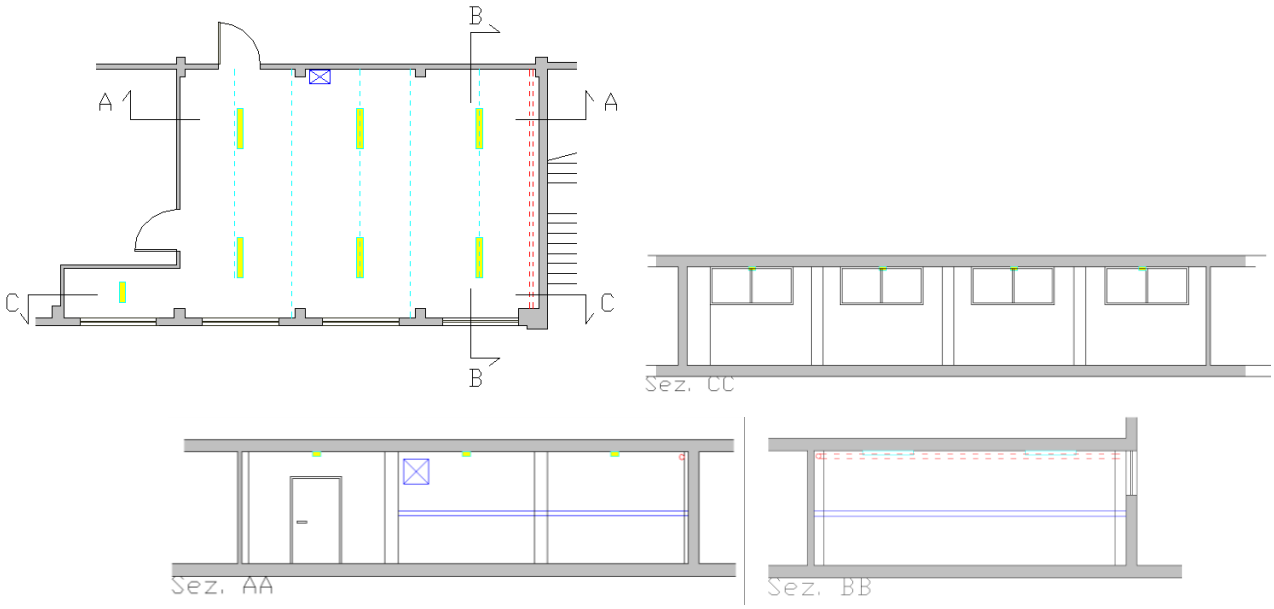
Then, together with the students, the acoustic measurements were downloaded from the sound level meter to the computer and they were shown how these data are processed to calculate the average reverberation time of the classroom to be compared with the current regulation limits.

Figure 8 – Reverberation time measurements results and comparison with regulation values



During the fourth meeting (13th March), students were divided into five workgroups, each group realized the DWG plan and sections of the case study in the current conditions, and calculated the model calibration with an Excel worksheet, by comparison between simulated and measured RT values.

Figure 9 – Case study plan and sections



During the last meeting on 20th March, the groups worked on the acoustic project of the computer lab, by producing plan and sections of acoustic interventions, implementing the project in the Excel worksheet in order to verify the acoustic benefit of the planned intervention and producing a technical report containing the results of all the activities carried out.

Figure 10 – Work group A

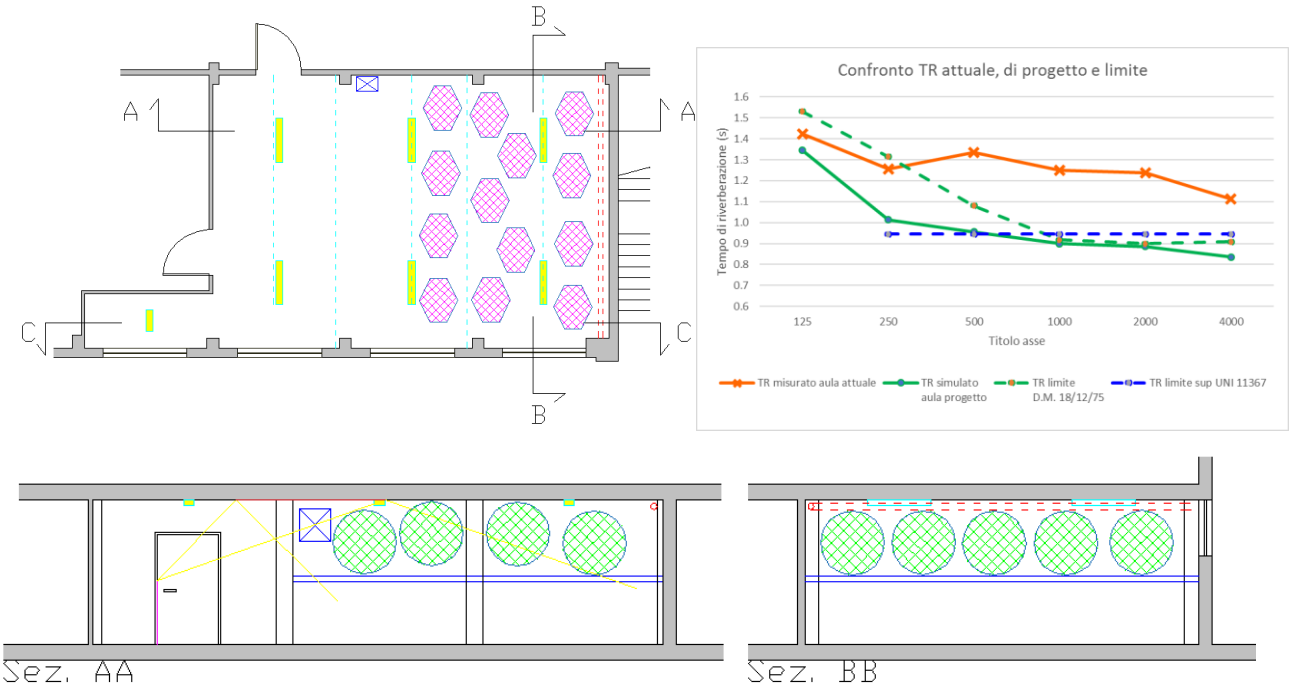


Figure 11 – Work group B

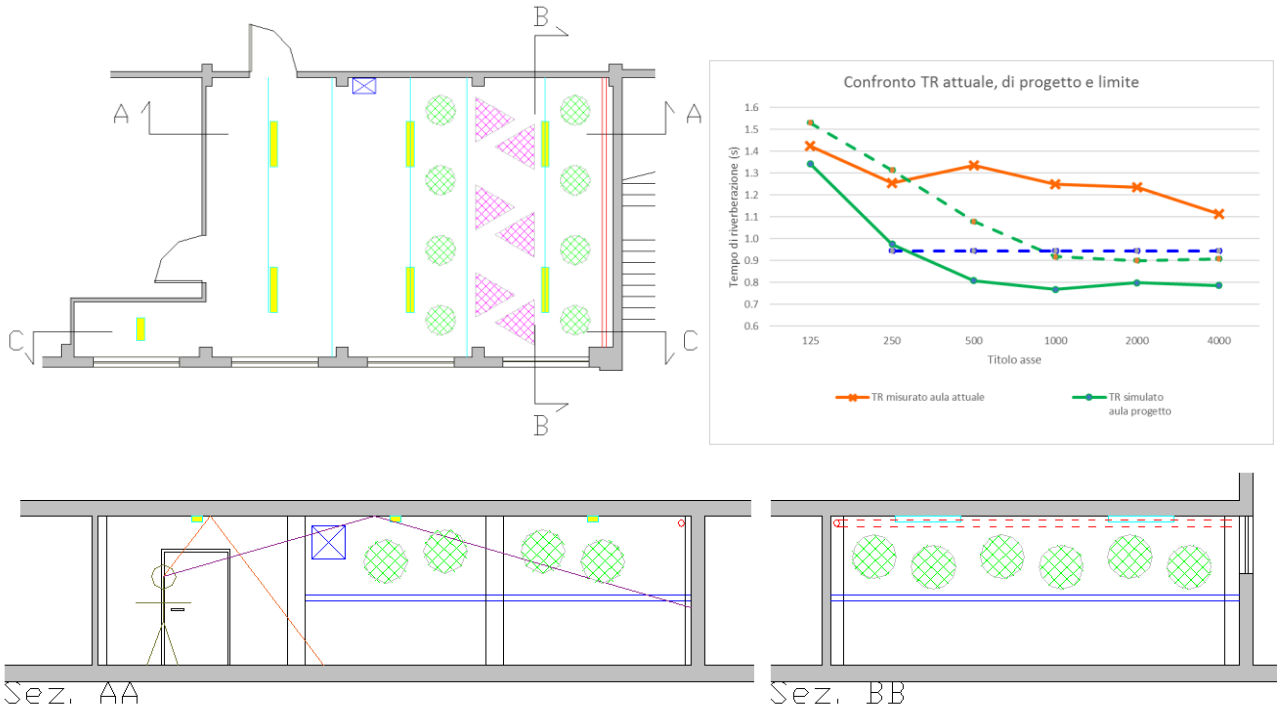


Figure 12 – Work group D

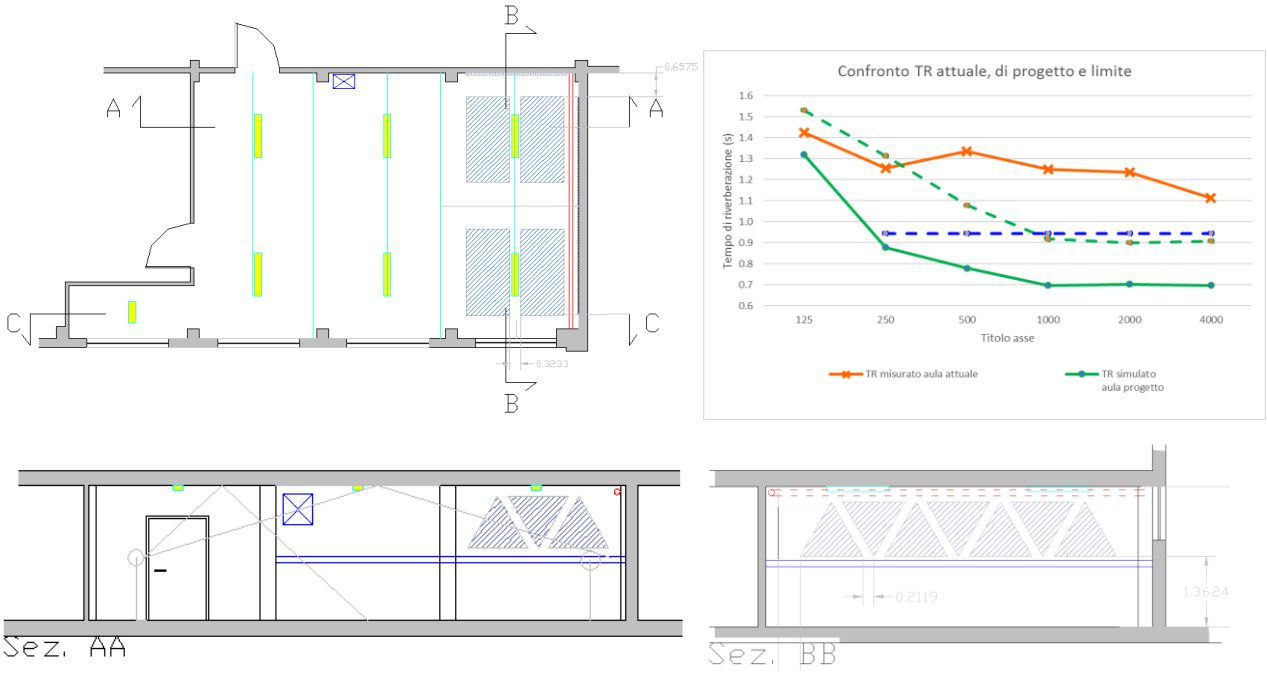
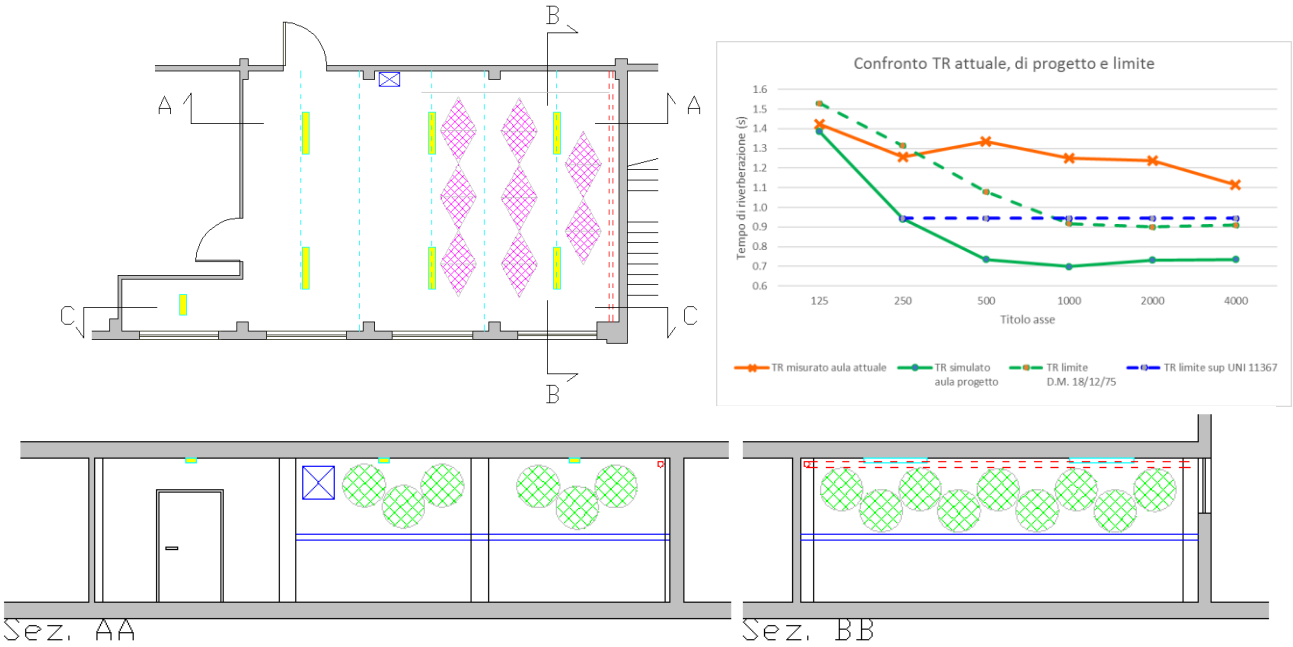


Figure 13 – Work group E



These works were used in order to elaborate the final acoustic project that the school, except to find the economic resources, can potentially use to carry out the proposed interventions to improve acoustic comfort of the computer lab.

The delivered project to the "Mapelli" school contains technical description, drawings and bill of quantities of the interventions.

Figure 14 – Project report

life MONZA
Methodologies fOr Noise low emission Zones introduction And management

Alternanza Scuola/Lavoro

PROGETTO DI MIGLIORAMENTO DEL COMFORT ACUSTICO

Caso studio:
Aula di Informatica
Istituto Mapelli Monza

DATA:
2 Maggio 2018

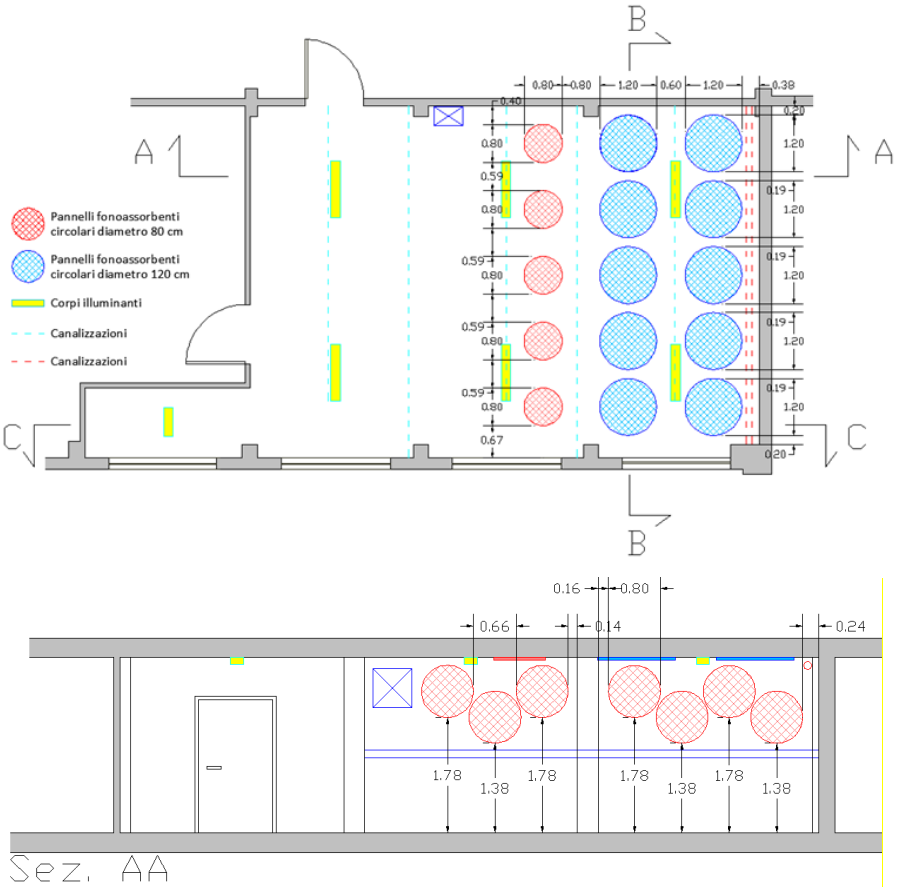
Vie en.ro.se. Ingegneria

life MONZA
Methodologies fOr Noise low emission Zones introduction And management

Progetto di miglioramento del comfort acustico – Aula di informatica – Istituto Mapelli (MB)

INDICE

Figure 15 – Final project proposal



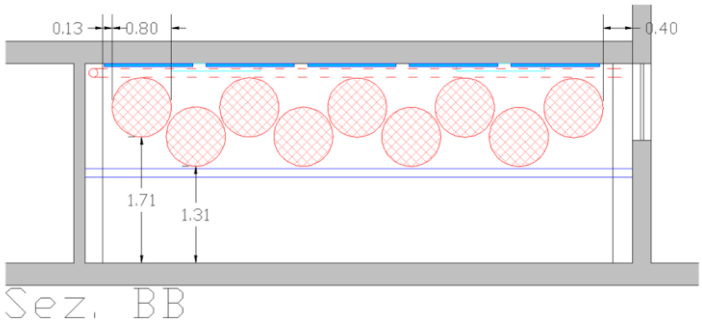


Figure 16 – Comparison between measured, calculated and reference RT values

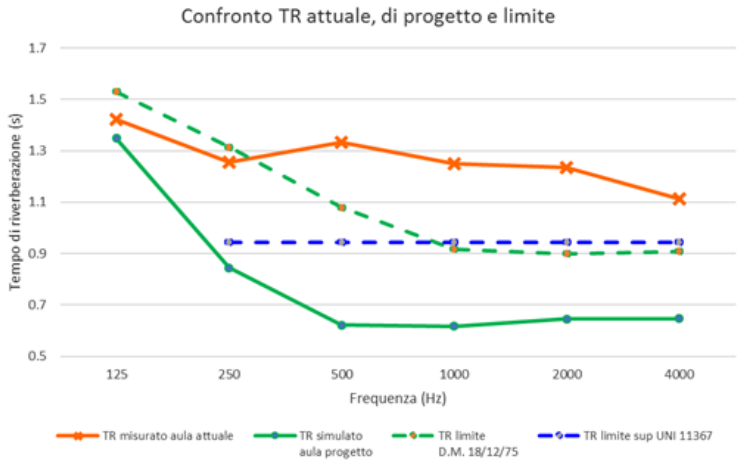


Figure 17 – Pictures of the products proposed for the improvement of the acoustic comfort of the computer lab

Figure 18 – *Economic estimate of the acoustic interventions*

Material	**Unit of measure**	**Quantity**	**Unit cost [€]**	**Cost [€]**
Ecophon panels (80 cm diameter, 4 cm thick)	each	21	165,47 €	3.474,87 €
Ecophon panels (120 cm diameter, 4 cm thick)	each	10	204,62 €	2.046,20 €
structure for fixing panels on walls and ceiling	each	31	20,00 €	620,00 €
laying	hour	31	35,00 €	1.085,00 €
			total cost [€]	7.226,07 €
			IVA -*taxes*- (22%) [€]	1.589,74 €
			total cost [€]	8.815,81 €

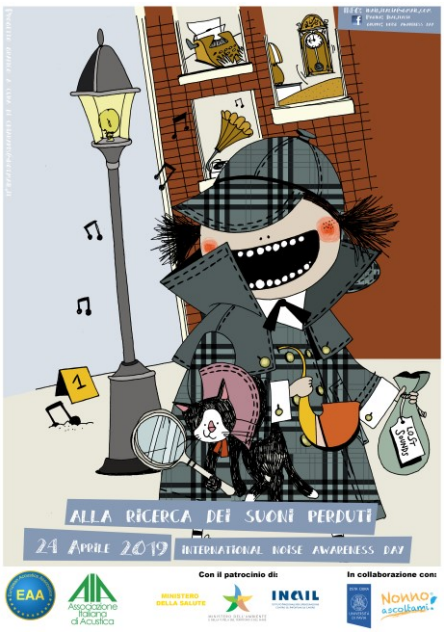
These activities described had very positive feedback:

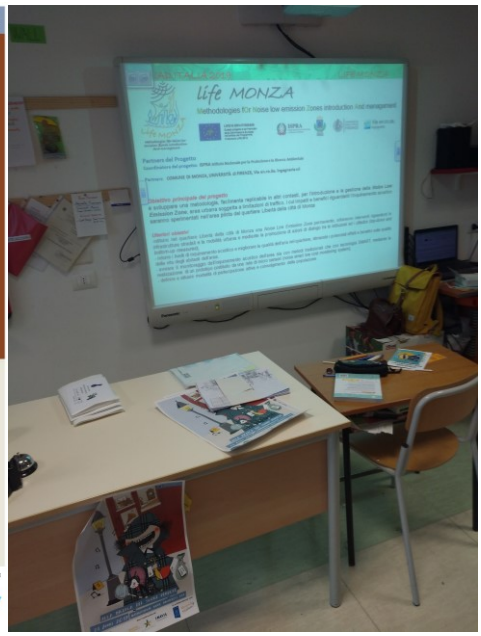
- students have learnt topics that are not in the school curriculum;
- students have shown enthusiasm for the activities carried out. Some of them have also indicated their intention to undertake university studies in faculties such as Architecture and Engineering;
- without costs, “Mapelli” school has received the acoustic project for the computer room. This kind of project generally costs a few thousand euros.

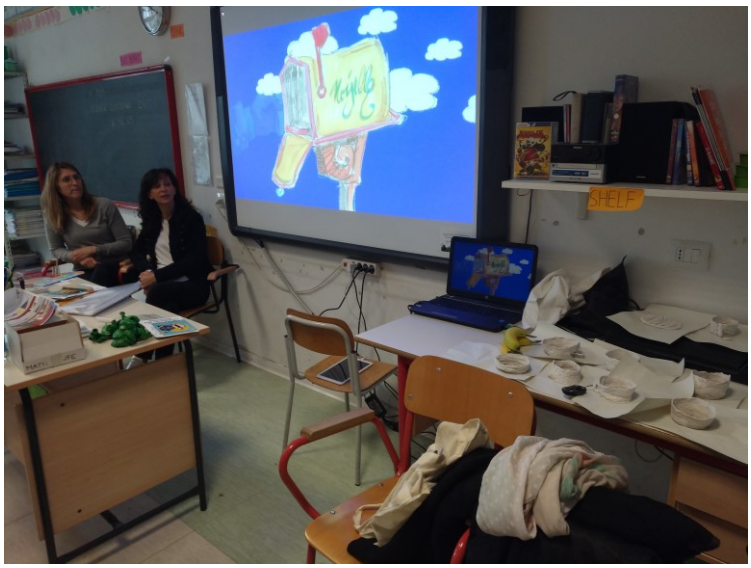
4. INAD 2019 and “The most annoying noise in my city” idea contest

The edition International Noise Awareness Day (INAD) 2019 “Looking for lost sounds” has involved three *classi terze* (corresponding to students aged 8-9) of “Gianni Rodari” Primary School. Two lessons have been attended by about 70 children. During this educational day, informative materials, provided by Associazione Italiana di Acustica (AIA), and some gadget of LIFE Monza project have been distributed to the students.
During this edition, a prize competition entitled "The most annoying noise in my city" was also promoted with the aim of making children think about noise pollution and to collect their personal perceptions.

Figure 19 – Educational day in the context of INAD 2019 “Looking for lost sounds”







During the *INAD 2019 "Looking for lost sounds"* edition, pupils of "Gianni Rodari" Primary School have been involved in a small competition of ideas called "The most annoying noise of my city" which consists of drawing the most annoying noise for them in their city, at home, in the park.
In each of the three classes involved, the best three drawings have been chosen and the winners have received a small prize.
Drawings have been judged on based of originality, pertinence with the proposed theme, recognizability and technique used for the representation.
In total 68 works have been presented. In the following figures, the best three drawings for each class are shown.

Figure 20 – Prizes of the competition "The most annoying noise of my city"

Figure 21 – Winners of the competition "The most annoying noise of my city" of the classe 3°A - *"Gianni Rodari"School*

Figure 22 – Winners of the competition "The most annoying noise of my city" of the classe 3°B - *"Gianni Rodari" School*

Figure 23 – Winners of the competition "The most annoying noise of my city" of the classe 3°C - *"Gianni Rodari" School*