



HARMONICA project (HARMONised Noise Information for Citizens and Authorities)

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The HARMONICA project comes from the following observation: the general public and public authorities are insufficiently aware of noise pollution and its consequences. In order to increase awareness and therefore the efficiency of noise prevention and reduction policies, the project will aim to prove the usefulness of a new noise index. Based upon measured and estimated data, this index will be easier to understand for populations than the usual noise indicators, in a similar way to the ones used for air quality. The project will be implemented and evaluated by the two observatories involved in the project, Bruitparif and Acoucity, in their respective regions, the Ile de France region and the Greater Lyon agglomeration. This wide experimentation territory will cover a total surface area of more than 12,500 km² and a population of 13 million people. The access to noise information will also be facilitated through the creation of a platform displaying the index and a database of noise abatement actions, available on the portal www.noiseineu.com. Started in October 2011, this 3-year project will provide a new index and new tools, freely usable by any agglomeration in Europe. The HARMONICA project is cofinanced by the European programme LIFE + 2010.

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1 INTRODUCTION

In 2010, two local organisations in France, Bruitparif and Acoucity, specialised in the observation of environmental noise and specifically involved in facilitating the implementation of the 2002/49/EC European directive relating to the assessment and management of environmental noise (commonly abbreviated as END) on their respective territories, have decided to join forces to set up the HARMONICA project. The acronym HARMONICA stands for HARMONised Noise Information for Citizens and Authorities. The HARMONICA project aims to develop a new approach: providing information about environmental noise closer to the reality felt by the populations, more understandable by the general public and public authorities to increase the assimilation of the issue and to constitute leverage for noise abatement policies.

The two partners have applied for a European Union grant under the LIFE + 2010 programme and the project proposal was approved. This 3-year project started in October 2011. The HARMONICA project is also supported by the Working Group Noise (WGN) of EUROcities.

2 PRESENTATION OF THE PARTNERS

Coordinator of the HARMONICA project, Bruitparif was created in autumn 2004 by the Ile-de-France Region, as requested by the environmental associations, in order to characterise objectively the sound environment of Ile-de-France. Bruitparif has been developing the RUMEUR noise monitoring network: these data are available on www.bruitparif.fr. Moreover, Bruitparif supports public authorities in taking noise into account in urban development and transportation policies and organises awareness actions on the importance of the quality of the sound environment and the risks related to noise.

Second beneficiary, Acoucity was created in 1996 at the initiative of Greater Lyon and the founding members (IFSTTAR, ENTPE, CERTU, CSTB...). Acoucity aims to work towards the development of professional knowledge and expertise in urban soundscape. It is a competence centre on the urban sound environment, which has the role to support the exchanges between the operational research centres and the cities, in particular in regards to the management of the urban noises related to transportation. Since 2006, Acoucity has been setting up a noise monitoring system in Greater Lyon (www.acoucity.org).

The Working Group Noise (WGN) is chaired by DCMR Rotterdam (Mr Henk Wolfert) and was launched in 2006. The working group has around 30 members from cities and institutes all over Europe and deals with the noise issue - <http://workinggroupnoise weblog.nl/>. There is a specific network about noise monitoring for cities: FONOMOC.

3 CONTEXT

3.1 Noise impacts on health

For the last two decades, many publications have established a direct link between environmental noise exposure and health effects. The most documented effects are annoyance and sleep troubles. But other effects include cardio-vascular diseases, stress and its various

consequences. In addition, children's exposure to noise causes delays in the learning process and behavioural problems that have already been demonstrated.

Noise generated by human activities is a very present environmental nuisance, especially in urban areas as they gather most of the citizens of the Member States. According to the Green Paper published in 1996 by the European Commission, around 40% of EU citizens (i.e. 80 million people) were suffering from noise levels which were considered as unacceptable by scientists and health experts. With the enlargement of the European Union, near 100 million people are now exposed to noise levels considered as dangerous for their health. These nuisances are caused by transportation infrastructures, industries and various hobbies.

In a recent report published in 2009 [1], the WHO recommends that the population should not be exposed to night noise levels above 40 dB(A), which means the sound level of a quiet street in a residential area.

3.2 The European Union is fighting against noise pollution with its noise policy

After the publication of the Green Paper in 1996, the European Union has set up a common approach in terms of noise policy, with several directives: 3 of them deal with noise sources (2007/34/EC, 2002/30/EC and 2000/14/EC directives) and another one (2002/49/EC directive, adopted on June 25th, 2002) intends to avoid, prevent and reduce the harmful effects of exposure to environmental noise. A first level of information on the sound environment of agglomerations over 250,000 inhabitants is now available thanks to the publication of the strategic noise maps made for the 2002/49/EC European directive [2]. However, it is necessary to complete this information with measurements and to make it more pedagogical.

3.3 Complementarity between noise maps and noise measurements

As a complement to the noise maps, measurements make the diagnosis more precise, define the contributions of each noise source and above all show the temporal variability of noise, from a daily to a yearly scale. In contexts of multi-exposure to several noise sources, measurements help decision-makers prioritise the actions to implement. They are also useful to identify, qualify and preserve quiet areas on their territories. Truer to the reality of noise, measurements offer a wide range of information. They follow the temporal evolutions of noise during the day and at night, the background noise levels and the identification of particular events such as horns, planes, trains or noisy motor vehicles.

4 SEVERAL OBSERVATIONS

4.1 Noise maps do not reflect the reality felt by populations

Faced with the urgency of the situation due to the health impacts of noise, the limited overview of the sound situation in Europe and the lack of knowledge on the exposure of the populations, the writers of the 2002/49/EC directive have opted for the use of strategic noise maps made through modelling. The major advantage of noise maps is that they can represent the sound environment on a big territory, with harmonised indicators. They are an amazing decision-making tool.

But paradoxically, this advantage is one of the main reasons for the lack of assimilation of the issue by the populations. Indeed, with the use of models and average data, the information available may seem far from the feeling of the populations, but also technicians and elected representatives. Moreover, modelling is done by noise source, which makes the information produced even further from the expectations of the general public and from the reality of territories where noise sources are mixed.

If the harmonised noise maps made for the 2002/49/EC directive helped local authorities take into account the sound environment, the partners of the HARMONICA project know from experience that the assimilation of the issue by the general public and public authorities still needs developing. The writers of the directive had already identified this requirement and had placed the information to the public at the heart of the process.

4.2 Lack of understanding of the acoustic indicators despite the contribution of the END

Currently, the information provided by observatories, whether as noise maps or as measurement data, is difficult to understand by non-specialists. Indeed, many indicators are used (Lden, Ln, LAeq, LA10, LA90, LAmax, NA... to mention only a few), they are difficult to explain and rather far from the feeling of the populations. Possible noise abatement actions, especially preventive actions, are still little known from the general public and public authorities.

4.3 Lack of a sense of urgency (and lack of pressure from society or action groups)

For other environmental issues, in particular air quality, the information to the public and the assimilation of the issue seem easier. The general public and public authorities are more aware of these issues and more involved in contributing to the improvement of the situation in their daily lives. This awareness relies mainly on the implementation and the publication of indices for the general public, first at the national level (e.g. the ATMO [3] index in France) then in a harmonised way at the European level (e.g. the INTERREG “CITEAIR I and II” projects [4]).

The general public seems to be quite fatalistic and consequently little involved concerning noise issues. There is no sense of urgency to reduce noise in the environment. This is all the more paradoxical that the noise issue is often mentioned among the 3 main environmental nuisances in the different surveys. For instance, a recent perception survey carried out in 2009 by the European Commission [5] in 75 major cities shows that more than half of the respondents consider noise as a major nuisance on the same level as air pollution. The proportion varies from 51% in Rotterdam and Strasbourg to 72% in Paris and 95% in Athens. More recently the direct link between environmental noise exposure and health effects has been further strengthened in the Paris agglomeration. By using the data available at the town level (for both noise exposure and health outcomes) and by applying the WHO method [6], Bruitparif together with the Regional Health Observatory (ORS Ile-de-France) have obtained a first minimum estimation of the health impact of environmental noise related to transportation. In total, around 66,000 healthy life years are lost every year in the Paris agglomeration. The main health outcome of environmental noise exposure is sleep disturbance, which represents on its own nearly two thirds of the years lost (DALYs –disability-adjusted life-years). Annoyance is the second health outcome with more than 25,000 healthy years lost [7].

5 THE HARMONICA PROJECT

5.1 General objectives: Analysis and proposals

The HARMONICA project comes from the previous observations and the following general objective: noise pollution and the means to correct it are insufficiently known from the general public and public authorities. In order to increase the assimilation of the issue and consequently the efficiency of noise prevention or reduction policies, the project suggests the creation of a simple noise index, closer to the feeling of the populations than the usual averaged indicators, in a similar way to the ones used for air quality. Besides, a database on noise abatement actions will be created; it will be published along with the noise pollution index on an interactive platform. Thanks to this innovative tool, all relevant information should be made available in an easy-to-understand way, and the assessment of the impact of noise abatement actions should be facilitated. The tool will be assessed by the general public and public authorities and optimised before its dissemination. The heart of the project will rely on an implementation and evaluation stage on the territories of the two partners. It will be a full scale application.

The improved access to information on noise pollution and abatement initiatives should increase assimilation of the environmental noise issue by the general public and public authorities in the project areas. It should also facilitate the transfer of information to additional European agglomerations, who will hopefully join the platform in the future.

The following sections describe the main operational objectives of the project.

5.2 Harmonise technical aspects of noise monitoring systems and prepare the transfer of information to other European agglomerations

This preparatory phase of the project consists in analysing and assessing the existing noise monitoring networks within the territories of the two partners, as well as in other European agglomerations. A full detailed questionnaire has been sent to gather the information from identified technical partners around Europe. This questionnaire had a specific focus on the technical aspects related to the setting up of noise monitoring terminals. The answers have been collected with email, phone conversations and on-site visits. As a complement to the technical questionnaire, a simplified questionnaire was created with the help of the Working Group Noise of EUROCITIES aimed at the authorities of the European cities that are members of the EUROCITIES network (this network gathers more than 140 cities in 30 different European countries). The questionnaire was sent in April 2012. At the time this article was written, 6 cities had already replied to it: Antwerp, Dublin, Helsinki, Oslo, Riga and the Hague.

The analysis of the information collected during this preparatory phase defines a common nomenclature of noise monitoring terminals based on their monitoring objectives (evaluation of impacts of noise abatement actions, long-term evolution strategy...), the context in terms of noise sources and the physical installation of the microphone (distance from the dominant noise emission source, placement regarding the nearby buildings, height of the microphone from ground...). The objective is to suggest a way to harmonise monitoring data results taking into account the specifications of each noise monitoring terminal.

This work was done during the first 8 months of the project in order to be able to present the results of all noise monitoring terminals into a common interface, which would ensure the comparability of the noise situations met on the different measurement sites.

5.3 Build original tools to publish information on environmental noise in an easy-to-understand way

The HARMONICA project intends to develop original noise tools in order to harmonise noise monitoring methods and therefore make easier the comparison between the different European territories. The access to noise information will be simpler for the general public. These tools will be the Common Noise Index (CNI), the platform to display the index and the database on noise abatement actions. These will be available at the end of 2013 on the portal www.noiseineu.com.

5.3.1 The Common Noise Index (CNI)

The CNI should be, in so far as possible, adimensional, closer to the feeling of the populations and easily understandable. The building of the index will take into account the intensity of the noise (through indicators of sound energy) but also the contextual aspects of the noise (emergences coming from the sudden appearance of particular sound events that come on top of the background noise: aircraft overflights, trains, especially noisy motor vehicles, horns...) and the diversity of the different noise sources.

This common noise index will be built based on the recommendations made by the partners and validated by a representative panel of the general public and public authorities. The assessment campaign of the index will be based on both on-site and laboratory surveys. The on-site surveys will be aimed at the inhabitants of the 8 territories selected to assess the index. They will be based on face-to-face interviews and carried out door-to-door in order to gather the reactions of the inhabitants of the 8 territories on the different index proposals. The interviews will follow a methodological guide developed by Acoucté. There will be a minimum number of 30 interviews per site, for a total of about 240 surveys.

The laboratory surveys will be aimed at three different groups: a representative panel of the general public, a group with representatives from associations and a group with representatives from local authorities. The methodology will rely on a face-to-face reconstitution for the three different groups on each territory. There will be about 20 people per group, for a total of 60 respondents on the Greater Lyon territory and 60 respondents on the Ile-de-France territory. The results of this work will be available in February 2013.

5.3.2 The platform to display the index

Designing and development of the platform to display the index will be achieved at the end of 2013. With this interactive web service, available to all, it will be possible to compare the sound situation of the different territories on the long term and to make it public in a pedagogical way. The platform is not intended to replace the existing websites of the partners, but to complete them with a common space to consult and compare the sound environment data of the two territories more easily. At the beginning, the platform will be based both on the monitoring networks of the two partners and on the strategic noise maps made for the 2002/49/EC European

directive in the agglomerations in question. The platform aims to integrate the data produced by other European agglomerations equipped with noise monitoring networks. Thus, it will be easy to join the service for all the existing networks. The partners will keep expanding the web service over a 10-year period after the end of the project to let new European agglomerations join the service. From a technical point of view, every agglomeration that wants to will be able to transfer its measurement data by FTP (file transfer protocol) to the central server hosted by Bruitparif, where the function to calculate the index will be implemented.

5.3.3 The database on noise abatement actions

Designing and development of the web database will be done at the end of 2012. The database will create an operational repository of effective noise abatement actions. The objectives are to compare the situation before and after the noise abatement actions and to assess the effectiveness of these solutions thanks to the Common Noise Index (CNI).

The database will be structured so that the operations can be classified according to their typologies: Traffic management actions - Actions on the infrastructures - Awareness actions - Actions on the equipment.

The actions will be presented in detail in reviews including the context, the entities involved, the objectives and the stakes of the action, the cost and the duration of the works. They will be illustrated with photo/audio/video reports. It will be possible to provide additional information, in particular when perception surveys have been carried out.

The database will be filled with different noise abatement actions that have been assessed before (around 20 actions) or during the project (around 10) by measurement campaigns conducted by the partners of the project. The CNI will be used to qualify the sound level before/after the operations. A multimedia report will also be done in order to present each site. Here are a few examples of pilot noise abatement actions conducted by public stakeholders where measurement campaigns are currently carried out for their assessment within the project:

- Pilot experimentation of low noise road pavement on the Paris ring road
- Reduction of the speed limit to 30 km/h on a major Paris road (avenue de Clichy)
- Increase in the altitudes of the airplanes going to Ile-de-France airports
- Awareness actions with the clients of businesses like pubs and consultation actions organised with the different stakeholders

5.4 Organise a large study case with a wide experimentation territory

The final objective of the HARMONICA project is the operational use by the general public and public authorities of the tools developed during the project for an easier assimilation of the noise issue and a better knowledge of noise abatement solutions. It is therefore very important to implement these tools on a large territory and to assess them with different audiences.

The two territories where the demonstration will be done are the Ile-de-France region and the Greater Lyon agglomeration. They represent a wide experimentation territory, with a total surface area of more than 12,500 km² and a population of 13 million people.

A major stake will be to quickly make the project and its tools well-known to the main targets: the general public and public authorities such as the technicians and elected

representatives involved in the implementation of the 2002/49/EC European directive. To do so, the partners will use complementary communication tools: the communication media of the two observatories (websites / newsletters...) and the website of the Harmonica project www.harmonica-project.eu. They will rely on the press and their local partners (cities, Regional and General councils, associations...).

In order to validate that the project is operational for the general public and public authorities, three survey campaigns will be drawn up and conducted on the territories of the partners:

- At least 10 qualitative interviews will be carried out in order to draw up each survey;
- 30 pre-tests per survey will be carried out in order to validate the media and the methods;
- The surveys will be conducted with a minimum of 250 respondents.

A specific survey campaign will assess the impact of the project. It will compare the state of the respondents' knowledge on environmental noise before the tools are made public and after. It will also assess the basic knowledge level of the public on noise in general and their assimilation of the issue.

The results of the survey conducted before the tools are developed were made public at the end of June 2012. The survey was conducted by phone from February 27th to March 9th 2012 on the Greater Lyon territory and the Ile-de-France region with 800 inhabitants. This survey highlighted the following ideas:

- No strong differences appeared between the two urban territories studied.
- Road noise is the main noise nuisance for about 1/3 of the inhabitants.
- Air noise is twice as perceived in the Paris region as in Greater Lyon.
- The respondents' knowledge of acoustics (measurements, methods, noise levels, regulations...) was very fragmented.
- Information on noise levels based on emergence indicators could be a good complement to the ones based on average levels.
- The effects of noise mentioned unprompted by the respondents are related to, in order of mentioning, stress, hearing, sleep and general health.
- A quarter of the population (mostly the people declaring they are impacted by noise) expect information mainly provided by specialised organisations and local authorities.
- Finally, nearly 3/4 of the respondents are ready to change their behaviour to fight against noise and to accept actions aiming to implement traffic restrictions or change their mobility habits.

At the end of the project, a similar survey will be conducted with the website users in order to assess their understanding and assimilation of the issue.

As a complement, another specific survey campaign will be carried out in 2013 in order to assess the tools with the users of the portal. It will validate the tools in terms of ergonomics, knowledge, pedagogy, expected contents...

Finally, the results of the demonstration will be essential to the dissemination of this approach to other European agglomerations, which is at the heart of the HARMONICA project.

5.5 Disseminate this new approach and these new tools to other European agglomerations

The dissemination of the project is essential for its success. In order to make the dissemination of the project wider, the European agglomerations interested in the project will be invited to join an information sharing network specifically created for this purpose. Their contribution will enrich the platform to display the index and the database on noise abatement actions. The partners will develop and manage a community in order to create synergies through knowledge and experience sharing. They will provide decision-makers with recommendations on noise abatement actions. The expansion to other agglomerations will strengthen the value of the project and will make it more well-known. This network will rely on the Internet. A dedicated space will be developed on the portal in order to give access to the resources and the experience sharing section. The network of the project will gather the local authorities of the two territories, potential partners that have already expressed their interest in the project (Brussels Environment and members of the WGN, the beneficiaries of current LIFE+ projects on noise issues, as well as the new French observatories that have been created at the end of 2010 following a call for projects launched by the French Ministry of Ecology, Energy, Sustainable Development and Sea). The project also relies on the exchange network FONOMOC created by the WGN. FONOMOC is an acronym that stands for Focus group On Noise Monitoring Cities.

In order to ensure the dissemination of the HARMONICA project to public authorities, a methodological guide will be published. Its objective will be to inform them on the project and to create a community of users of the tools developed by the HARMONICA project.

The project website is already online: www.harmonica-project.eu. This website will be the tool to enhance the project through regular updates on the project status, the agenda of the events and the publications.

At the end of the project in September 2014, an event gathering all the European agglomerations interested in the project (members of the information sharing network), the French public authorities and the European institutions will be organised in Brussels.

5.6 Harmonica project architecture

The HARMONICA project will follow the three generic stages of a LIFE project (Preparation, Demonstration and Dissemination).

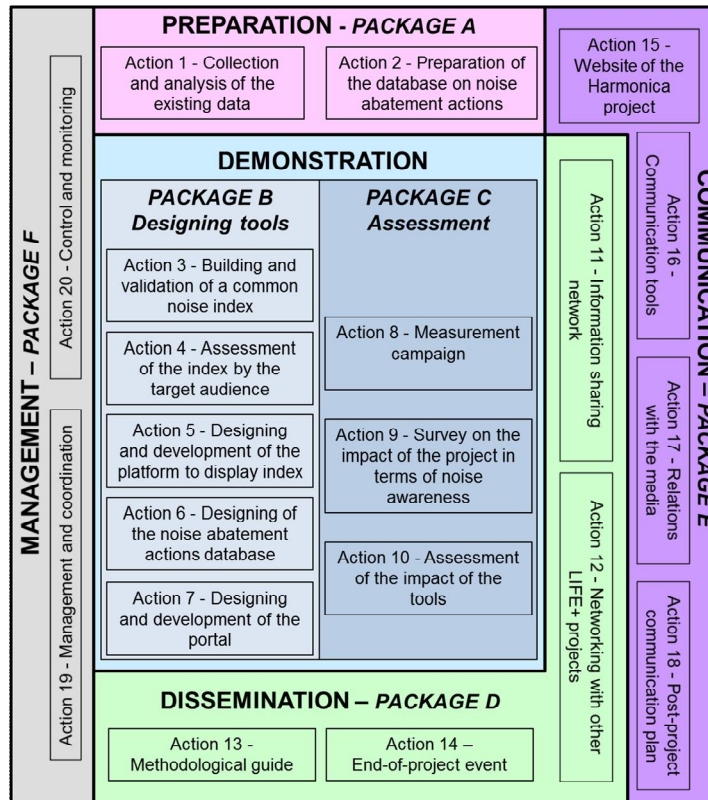


Fig. 1 – HARMONICA project architecture.

The actions will be grouped in packages (A, B, C, D, E and F) to facilitate the understanding of the project organisation especially during the demonstration phase.

Package A will be about **preparatory actions** over a period of 6 months. It will include collecting and analysing information to harmonise the technical aspects and prepare the implementation of the index, the platform to display the index and the database on noise abatement actions (**Action 1**) and choosing noise abatement actions to evaluate during the project that will fit different typologies defined by the two partners (**Action 2**). This package will also include the survey before the implementation of the tools of the general public's knowledge and expectations on the noise pollution issue (**Action 9, Step 1**).

The demonstration stage will be organised in two packages (B and C) over a period of 24 months.

Package B will be dedicated to the **designing** and development of new tools. It will consist in:

- the creation of the innovative common noise index (CNI), easy-to-understand by the general public, built from the elements suggested by the two partners and validated through perception surveys (**Actions 3 and 4**). The index will be produced by processing the information from the noise monitoring networks and the strategic noise maps made for the 2002/49/EC European directive;

- the development of the platform to display the index (**Action 5**), a common platform for the dissemination of the information to everyone on the Internet and the comparison of situations in different territories;
- the development of the database on noise abatement actions (**Action 6**);
- the development of the European portal <http://www.noiseineu.com> (**Action 7**) for the access to the different tools.

Package C will be devoted to the **assessment** of the impact of this new approach and the tools developed during the project. The first method will consist in using the CNI to assess pilot noise abatement actions (**Action 8**). The second method will be by the means of different surveys aimed at the general public and public authorities. A survey campaign will focus on noise awareness and the assimilation of the issue. It will be conducted in two stages before the tools are made public and at the end of the project. This will assess the impact of the project (**Action 9**). Another survey campaign will be conducted to assess the tools (**Action 10**).

The actions of the **dissemination** stage are grouped in **Package D** over a period of six months. They focus on setting up an information sharing network with other European agglomerations relying among other things on the organisation of workshops (**Action 11**) as well as networking with other projects of the LIFE III and/or LIFE+ programmes (**Action 12**). A methodological guide will be published in order to implement this approach (**Action 13**) and an end-of-project event will be organised in Brussels (**Action 14**).

Two packages (E and F) will be effective throughout the duration of the project.

Package E on **communication** will enhance every part of the project: the website of the HARMONICA project (**Action 15**), the communication tools (**Action 16**), the relations with the media (**Action 17**) and the post-project communication plan (**Action 18**).

Package F will deal with the **management** of the project: the overall project management and coordination (**Action 19**) and its control and monitoring (**Action 20**).

6 EXPECTED RESULTS

The first expected result will be a successful production (technical aspects and user assessment) of the new tools for an easier access to environmental noise information. Those new tools will be:

- The noise pollution index validated by the general public, closer to their feeling and easy-to-understand.
- The platform to display the index and compare noise situations.
- The database on noise abatement actions.

All these tools will be available on the portal <http://www.noiseineu.com>.

The second expected result will be the use of these tools in a harmonised way to compare situations in time and on different territories and to share information about noise abatement actions. The ability to assess noise abatement actions in a harmonised way and to promote effective actions will help the authorities to draw up their action plans to implement the 2002/49/EC directive.

The third expected result will be an increased assimilation of the environmental noise issue by the general public and public authorities, thanks to the information published on the portal which will help develop a common and shared culture about sound environment.

The fourth and last expected result will be that other European agglomerations will be convinced by this approach and will use the tools developed during the project. The dissemination aspect will be taken into account early in the project, during the development of the tools, and technical aspects will be harmonised in order to allow a large transfer of the tools among the European agglomerations.

7 REFERENCES

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