Sound maps and representations. Contributions and evolution
José Luis Carles

We live in a world that is rich in sounds. We are constantly affected by sounds, and it is almost impossible to escape their influence; they provide us with a link to our surroundings; they can provoke deep emotion or profound irritation ambient sound contains a great degree of complexity, not only because of the wealth and variety contained in the blend of everyday sounds, but also because of the way sound interacts with space, topography, surfaces, meteorological features, materials, textures, etc. each of which acts on the sounds, contributing to giving each specific site its own identity by adding sensory, evocative and cultural qualities. Sound is dynamic in nature; it tells us about things that are happening, it is temporary, continuous and unpredictable. R. Murray Schafer says that the sound world is a world of events, of activities rather than artefacts, of sensations rather than reflections. In our times, however, sound, in its negative dimension as noise, has become one of the most important and troublesome of environmental problems, as noise levels continue to grow throughout the world. However, the pure sound dimension is seldom taken into account. Indeed, it is often surprisingly ignored in many areas of research (geography, the environment, architecture, sociology, etc.). The dynamic wealth of (affective and emotional) information and expression that sounds possess has been underexplored, and few methods exist that allow a broad multi-disciplinary approach to sound. Yet sound can be enormously useful in a host of disciplines, in describing space and communities, and increasingly we find artists and scientists taking an interest in the sound dimension of their respective fields. Perhaps these shortfalls are related to difficulties in describing sound, an extensively non-verbal phenomenon. Researchers, and even musicians themselves, find it difficult to express in language the reactions or feelings music provokes.

We need to ask how we address, analyse and manage our everyday sound experiences in western culture. Interest in the experience of Land Art, installations and urban stagings and audiovisual art interventions in urban spaces are examples of a new exploration of man-medium interactions that may be useful in the field of soundscape and in the new field of urban sound design. Proposals to create, manipulate and transform the space also tie in to the introduction of new media of expression. The invention of photography and cinema on the one hand, and techniques for recording, editing and broadcasting sound on the other, were scientific/technical developments which in the long term were to have a decisive impact on the way we view and even transform our reality. This article seeks to review the general state of the art in this area at this time and to offer an overview of the experiences and groups working in this area in Spain, how they have developed and their connections with other trends and experiences on a wider international stage.

Sound stories

Historically, the sound phenomenon has involved a terminological and scientific debate over the sound-music duality. From the moment when people first began to establish the basic principles of sound, as a phenomenon, with Pythagoras observing that the quality of the noise of the smith's anvil varied depending on the weight of the hammer used, there has been a long quest to explain the many physical, aesthetic, cultural, psychological and environmental implications arising out of these vibrations. Since Pythagoras's time, this discussion about the aesthetic characteristics of sound has had many different developments. At the beginning of the past century, futurists like Luigi Russolo emphasized the power and the impact of sound in the urban space and, by considering the possibility of orchestrating urban sounds, they built new musical instruments which produced new sonorities, called the «Intona rumori». John Cage defined music as «sounds, sounds around us, whether we are inside or outside a concert hall». R. Murray Schafer says: «If a concert is disturbed by the sound of traffic, then it is noise. However, if the sound of the traffic is part of the texture of the work, it ceases to be noise». The definition of sound has become increasingly blurred as composers push the boundaries of their exploration ever further. Whereas this differentiation between sound, noise and music was —until the coming of the twentieth century avant-garde— founded on certain rigid bases in the musical field, in sound-related sciences this rigidity is even greater; studies of the Sound Environment have been based almost exclusively on aspects related to issues of noise, focusing mainly on acoustic mapping, where the main variables under scrutiny are the noise level (a physical variable) and nuisance (a subjective variable).

Histories of sound representation

The basic technical tool using urban sound regulation is the acoustic map, whereby spatial and acoustic characteristics (essentially sound levels) can be mapped using lines of equal sound pressure (isobels). But an acoustic map is no more than a list of numerical values in which the significances and values of the sound sources are not taken into consideration.

Fig. 1

Any study of the Sound Environment must take into account not only the acoustic variable, but also the context in which it occurs as well as the cognitive processes involved in evaluating the sound. In this regard such studies go far beyond noise studies focusing on the relationship between noise and nuisance. In his studies of soundscapes in Canada, Murray Schafer proposed that the Sound Environment offers dimensions and connotations that differ widely from a traditional approach centring on noise/nuisance. We need to orient our hearing towards the new contemporary soundscape. In his book *The Tuning of the World* Schafer invites us constantly to listen to the sounds around us and consider them: «The sound universe that surrounds us could be the subject of a new sort of musical study», a new theory of music. We can distinguish between two distinct trends in the analysis of the Sound Environment: on the one hand the Canadian movement, based on the Schaferian concept of the soundscape and acoustic communication, as propounded by Barry Truax; and, on the other, the French concept championed by the CRESSON laboratory (University of Grenoble), which is more interested in urban sound planning and uses a new interdisciplinary methodological tool, the sound effect; both approaches have influenced the work being carried out in a number of fields in Spain. The first steps in the field in this country dates back to 1986, when the Institute of Acoustics (CSIC) began working on soundscapes, along the lines set out by R. Murray Schafer. An initial project of this kind was launched by the Ministry of Culture, entitled *Estudio del Patrimonio Sonoro en España*. Subsequently, following a visit by José Luis Carles to the CRESSON laboratory in Grenoble, the methods developed by researchers J F Augoyard and Pascal Amphoux were used as the basis for an analysis of the sound quality of several Spanish cities, and a study of sound quality in the city of Valencia was published (López Barrio and Carles, J.L., Fundación Bancaixa 1997). These works employ a new qualitative method with a multi-disciplinary approach. Essentially they involve taking comprehensive recordings (at different times of the day and year) in different spaces and sound settings, with surveys, reactivated listening, perceptive analyses, and analyses of contents used to rate the urban sounds. Other experts from the field of architecture in Spain are using qualitative methodologies in their approach to the urban Sound Environment. For example, the architect and acous-

tics expert, Francesc Daumal, at Barcelona Architecture School, who is also a habitual collaborator with CRESSON-based activities, implements in the practise and design of everyday architecture what he calls Acoustic Poetics, a subject he has written about in a number of publications in the field of acoustics and architecture, and has developed in several architectural applications. The architect Pilar Chias, director of the School of Architecture at the University of Alcalá de Henares works on the subject of sound representation in architecture (Chías Navarro, Pilar: «Los espacios sonoros [I]. La percepción del espacio: evocación de sensaciones sonoras». *Cuadernos del instituto Juan de Herrera*. ETSAM, Madrid, 2002, p. 49).

Cristina Palmese, an Italian architect living in Madrid, develops new methods for incorporating sound elements into the architectural and urban project, mainly using new perceptive knowledge based on inter-relations between image and sound. In doing so, she concerns herself with the use of audiovisual technologies and possibilities of applying them to the development of new ways of representing space. Palmese's work centres on developing new tools that address the audio-visual complexity of the city and its application to urban design. She uses audiovisual technologies to complement and reach beyond traditional cartographic means of representing space. Together with her research into the field of architectural design, Palmese also takes part in specialist works in the field of the soundscape. These include the artist's book *Paisajes Sonoros de Madrid*, made with José Luis Carles, and *Paisajes Sonoros de Cuenca*, made with José Luis Carles and Antonio Alcázar for the University of Castilla La Mancha.

Fig. 2
Fig. 3

The two publications have the additional interest of referencing changes in the development and representation of the urban soundscape. This is another example of the search for a new sound map, incorporating perceptive and qualitative elements into the representation of space. Cristina Palmese works with the research group from the Madrid School of Architecture, headed by Professor Luis Antonio Gutiérrez Cabrero (who is in charge of subjects such as Architecture of Spectacle and Transitory Architecture) on various projects based on the use of audiovisual technologies and on understanding the city. The existence of new technologies for depicting and simulating environments, together with new forms of project modelling and new everyday techniques (mobile phones, Internet, Google Earth) inevitably raise new problems, new principles of experimentation, new themes for research and new teaching on the theme of the environment... In this regard, it is worth mentioning the video installation *Madrid-Paris*, which examines significant places on the No. 5 metro line in Madrid and Paris. The installation offers a perception of the new space-time now being demarcated

on the Net and in general, on an observation of cyberspace. It works with virtual places, using data taken from the Pages Jaunes and QDQ websites and Google Earth for the two cities. The soundtrack is taken from on-site recordings in the two cities. Urban planning and acoustics, music and architecture intersect in their notion of space, which is particularly interesting because of its many cross-links. In 2008, a team comprising Damien Masson, Ricardo Atienza, Cristina Palmese and José Luis Carles developed an *Lutheria sonora urbana* [Urban sound factory] project for a sound space in the Sucrerie district (Chalon-sur-Saône, France). The idea was to enrich the sound space for the design of an urban space, encouraging planners to conceive and build public spaces as sound boxes for the sonorities of the city.

Fig. 4

In this field, mention should also be made of researchers Karmele Herranz and Igone García from the LABEIN laboratory (a centre run by the Basque Government that specialises in environmental technologies) who are examining the subject of the urban soundscape. As experts with extensive scientific experience in the psychosocial dimension of noise, they are trying to develop new mapping applications that will incorporate and extend the qualitative dimension of sound into the general objective of improving the city's environmental quality. They are also developing a methodology which they apply to the area of the Alhóndiga building in Bilbao. The purpose of the analysis is to come up with guidelines for defining a methodology and indicators for identifying and evaluating quiet spots in the municipal area of Bilbao. The idea is to complement the traditional indicator of noise pollution with another indicator related to the soundscape.

Ricardo Atienza, an architect who is currently working with the CRESSON laboratory, is involved both in research projects looking at urban sound planning and in the creative area of Sound Art. He has developed cross-theme and multi-disciplinary projects for characterising the interactions between sound and space. This is a subject he has addressed in his PhD thesis and a number of publications, reflecting on the importance of the concept of sound identity and how it can be applied to urban planning. Ricardo Atienza has created a number of installations in which he develops the dialogue between space and sound. These include *Sound Ambiences*, a collective installation with members of the CRESSON team, installed in 2004 in La Briqueterie, an Ecomuseum, in Ciry-le-Noble (Burgundy). The project addresses the connections between identity and heritage. The specific aim is to evoke the identity of the site through its memory, its present situation and a projection into the future. His most recent project is *Resonanser* (Stockholm, 2010), in which he will use dialogue with a series of examples from the field of Sound Art and music as the basis for addressing this concept of

«sound space» and its implications in terms of the way we listen and relate to our everyday surroundings. *Resonanser* explores this concept, seen as a necessary fusion between a physical venue and its sound expression, between a contained volume and the practices that inhabit it.

Sound education

As well as its technical and scientific implications, the soundscape is also an important tool of awareness; sound education is not only important in music, but also in environmental education. There are several teams of experts at Spanish universities developing the educational possibilities of sound creation. Notable among them are Antonio Alcázar, working at the School of Musical Education at the University of Castilla La Mancha (Cuenca Campus), Inmaculada Cárdenas at the University of Santiago de Compostela (Lugo Campus) and Pilar Cabeza from the University of Valladolid. From a perspective close to contemporary music, these experts base themselves on the vast creative possibilities of the environment, developing a series of teaching activities that are enormously useful for promoting creativity, either through the selection of materials from their temporary organisation, from the adoption of an aesthetic and a combined idea and from the deployment of individual and original criteria, reviving the aesthetic approaches of musical education.

Experimental music. Sound Art. Soundscape

In addition to these activities from the areas of science, architectural academia, music education and musical creation, another fundamental area involves the work of artists using microphones to capture the world around them. These trends in the area of Sound Art are manifested in various ways of interpreting the soundscape. The system for analysing the soundscape therefore embraces many different aspects: from sound production-creation-broadcast to the reception and perception of sound, and the context, space or environment in which the sound takes place. These activities, therefore, arise out of the interaction and integration between soundscapes, and electroacoustic technologies and other audio technologies in general. Soundscapes can be seen as part of electronic art, given their dependency on electronic technology for recording, telecommunications and information processing. There are numerous individuals and organisations addressing the subject of the soundscape to some extent or another. José Antonio Sarmiento gives courses on Sound Art at the Fine School Art on the Cuenca campus of the University of Castilla La Mancha, where he does important work disseminating the idea of Sound Art. With the collaboration

of Javier Ariza, this department has a broad vision of the subject, and its academic activities and programmes reflect an interest in work on the aesthetics of the soundscape. The department's activity centres on interdisciplinary research into the relations between sound and the visual arts; Sarmiento and Ariza edit the magazines *Sin Título* and *RAS*, as well as the →artesonoro.org website which together present a broad panorama of the creative possibilities of Sound Art.

The work by the composer José Iges also deserves a mention. Iges is particularly interested in the use of the word and sound poetry. His work with the inter-media artist Concha Jerez in 1994, *City of Water*, combines sound documents from the Alhambra soundscape and, particularly, the sound of water, with musical and interpretative features. In another work, *The Resonant City* [1999], Iges uses the sounds of Madrid, combined with those of many other cities and partially transformed by the almost permanent interaction with improvised live electronics by Pedro López. Of particular interest for its landscape intentionality is a recent project by Iges and Jerez, entitled *Resonant Islands* [2009], a Sound Art approach to the rich cultural, historical, environmental and human situation of the Canary Islands. The work examines these realities from the strategies of modern Sound Art and, more specifically, from radio art. The project consists of producing seven works depicting different aspects of Canarian soundscapes, or to put it another way, of the acoustic environment of each of the seven islands in the archipelago, encompassing spaces with a special sonority and also the specific sound practices of the inhabitants, including their speech and the sound of specific habitats. The works resulting from those experiences and field recordings cover a broad spectrum. They range from an almost documentary approach to a greater quasi-musical abstraction, common in the soundscape genre. The project also includes a publication with texts by José Luis Carles and Miguel Alvarez Fernández. Any reference to the involvement of the electroacoustic community must make mention of the work of the composers who have emerged from the Phonos laboratory of Electroacoustic Music. José Manuel Berenguer, an expert on avant-garde trends with an interest in soundscapes has (together with the Coclea cultural association) been behind several important initiatives, events and activities in this field (Orquesta del Caos, En-Red-O, Zeppelín CCCB Festival Barcelona, 13 Cremallera Music Festival).

In the work by composer Francisco López, the Sound Environment is seen to all intents and purposes as being a real «synthesiser», in which López finds all the sound material he needs for his work. Another artist from the field of experimental music, who examines soundscape theories in their specific application to the urban sound space, is Llorenç Barber, who has created works inspired

by the relationship between sound and an essentially urban context. These include his spectacular bell concerts, his *naumachiae* (inspired by and centring on port environments) and his urban concerts. The result of these projects is a continuous reinvention of the collective space through sound and, thus the proposal of new artistic forms of behaviour. Although the clearest manifestation of this urban music by Llorenç Barber are his bell concerts, since the mid 1990s, he has been incorporating other sound sources: wooden rattles, car horns, fireworks, artillery salvoes, drums, boat whistles and sirens, metals, cannon blasts, harmonic pipes and above all, music bands: symphonic bands, military bands, processional bands, bullfighting bands, municipal bands, *pasodoble* bands and school bands. In the field of the study of bells (although centring more on the ethnological than the purely musical field), it is worth noting the work of the Gremi de Campaners [Bellringers Guild] of Valencia, a group coordinated by the anthropologist Françesc Llop which is doing important work to recover and publicise traditional bell-ringing, essentially in the city of Valencia. Their website → http://campaners.com offers interesting information.

New Trends and New Technologies

Important and innovative work is being carried out by new generations of artists and experts with a particular interest in the soundscape. They come from the field of music, visual arts, Sound Art, architecture, the technical world, etc... They display a marked flexibility and a capacity to adapt in interdisciplinary work, in the combination of languages and techniques from different disciplines and in a significant use of new technologies. The area of the interaction between architecture and sound, for example, includes figures such as Pablo Padilla, Alex Arteaga and Ricardo Atienza, architects with a musical education who combine architecture with sound installations. Other artists, such as Pablo Sanz, José Luis Espejo, Maria Andueza, Miguel Alvarez-González, Chiu Longina, Juan Gil, Julio Gómez, Pedro Jiménez, etc. combine Sound Art, sound activism, cultural management, the organisation of exhibition/ workshops, radio programming and broadcasts, publications, etc. They include musicians, sound artists, sound activists, and people in charge of projects related to sound and electronic music. Their projects can be viewed on several sites → www.artesonoro.org and → www.mediateletipos.net., digital sound clusters with news, information and sound projects.

In this area of IT usage, important work is being carried out in Galicia by → escoitar.org which for some years has been documenting the soundscapes of Galicia and posting them on its website, using Google Maps. Other artists using Google Maps to insert sounds

into the map of a space include the Arteleku Audiolab which is working to create a sound map of the Basque Country. These are both participative projects in which anyone interested can record the sounds of a setting and then contribute the resulting field recordings for listening and sharing. They can be listened to online → www.soinumapa.net, and downloaded. Logically, these are qualitative sound maps, in opposition or as a complement to the conventional acoustic maps created by noise pollution officers in local government which show not the sound sources, but only the numerical data on the physical parameters of the noise. Similar projects are being undertaken elsewhere, including Andalusia → www.andaluciasoundscape.net, Madrid → madridsoundscape.org and Barcelona (→ http://ciudadsonora.wordpress.com →www.ciudadsonora.net and → www.antropologia.cat/node/3488.

There have been some major developments in the available bibliography in recent years. Some important work has been published in the field of experimental music and sound that includes the subject of the soundscape. A catalogue of Sound Art (ARTe SONoro), recently published by La Casa Encendida includes contributions from leading experts in the field. Another important bibliographical project also appeared in 2010: *La mosca tras la oreja. De la música experimental al arte sonoro en España* by Llorenç Barber and Montserrat Palacios, published by La Fundación Autor. Another recent publication was a catalogue of the exhibition *Los Encuentros de Pamplona 1972. Fin de fiesta del arte experimental* presented between October 2009 and February 2010 at the Reina Sofía Museum in Madrid. In 2008, the Vigo Museum of Contemporary Art (MARCO) published *Audio Hacklab*, a book based on the project of the same name organised by → escoitar.org. Other important works include the book (with CD) *Desacuerdos* —a group project by Arteleku, the José Guerrero Centre, MACBA and the University of Seville— and the catalogue for the *Muestra de Arte Sonoro Español* (MASE), curated by José Iges in Lucena in 2006. Finally, it is also worth mentioning the work being carried out at a number of different centres and groups in Latin America. The Paisaje Sonoro Uruguay (Uruguay Soundscape) offers a complete website with important documentation on the subject of the soundscape in Spanish, including interviews, information, and translations of articles by some leading authors in the field. The group is based in the University School of Music at the University of Uruguay in Montevideo → http://www.eumus.edu.uy. Other important work in the field of the soundscape has been undertaken by the National Sound Library of Mexico → www.fonotecanacional.gob.mx, by the group Buenos Aires Sonora in Argentina → http://buenosairessonora.blogspot.com and by the creators of the sound map of Rosario → http://www.sonidosderosario.com.ar and in Peru, by Lima Sonora (→ http://www.limasonora.com.

Bibliography

AMPHOUX, Pascal (1991), «Aux écoutes de la ville». *CRESSON*. Rapport nº 94, Grenoble.

AUGOYARD, J.-F.; TORGUE, H. (1995), *À l'écoute de l'environnement*, Marseille: Parenthèses.

BAYLE, François (1993), *Musique acousmatique. Propositions… …Positions*, Paris: INA-GRM/Buchet-Chastel.

CHION, Michel (1991), *L'art des sons fixés ou La Musique Concrètement*, Fontaine: Metamkine/Nota-Bene/Sono-Concept, (Spanish translation: Carmen Pardo, *El arte de los sonidos fijados*, Cuenca: Centro de Creación Experimental. Facultad de Bellas Artes, 2001).

CARLES, J. L. (1995), *La dimensión sonora del medio ambiente. Relación entre modalidad sonora y modalidad visual en la percepción del paisaje*. PhD thesis. Ecology Department. Universidad Autónoma de Madrid.

CARLES, J. L. and PALMESE, C. (2005), *Paisajes Sonoros de Madrid*, «Colección de Libros de Artista Las Cajas de Uruk», Arts Department, Madrid City Council.

SCHAEFFER, Pierre (1977), *Traité des objets musicaux. Essai interdisciplines*, 2ª ed., Paris: Ed. du Seuil (1st ed. 1966) (abridged version in Spanish by Araceli Cabezón, *Tratado de los objetos musicales*, Madrid: Alianza Música, 1988).

SCHAFER, R. Murray (1977), *The Tuning of the World*, New York: A. Knopf Inc.

SCHAFER, R. Murray (2005), *Hacia una educación sonora*, México: Conaculta/Radio Educación.

TRUAX, B. (1983), *Acoustic Communication*, New Jersey: Ablex Publishing Co.

Fig. 1

Example of conventional acoustic mapping. Strategic noise map. Continuous equivalent daytime noise level. Retiro District. Madrid.
Source: Madrid City Council.

Ejemplo de cartografía acústica convencional. Mapa estratégico de ruido. Nivel continuo equivalente de ruido diurno. Distrito Retiro. Madrid.
Fuente: Ayuntamiento de Madrid.

→ www.munimadrid.es

Fig. 2

Plan of recording points. Study of the soundscape of the Retiro Park. Madrid.

Plano Puntos de grabación Estudio del Paisaje sonoro del Parque del Retiro. Madrid. Fuente: *Paisajes Sonoros de Madrid* (J.L. Carles y C. Palmese). Las Cajas de Uruk. Área de las Artes. Ayuntamiento de Madrid. 2006.

Fig. 3

Two examples of cognitive sound maps. Soundscapes of Cuenca.

Dos ejemplos de Mapas cognitivos sonoros. Paisajes sonoros de Cuenca.

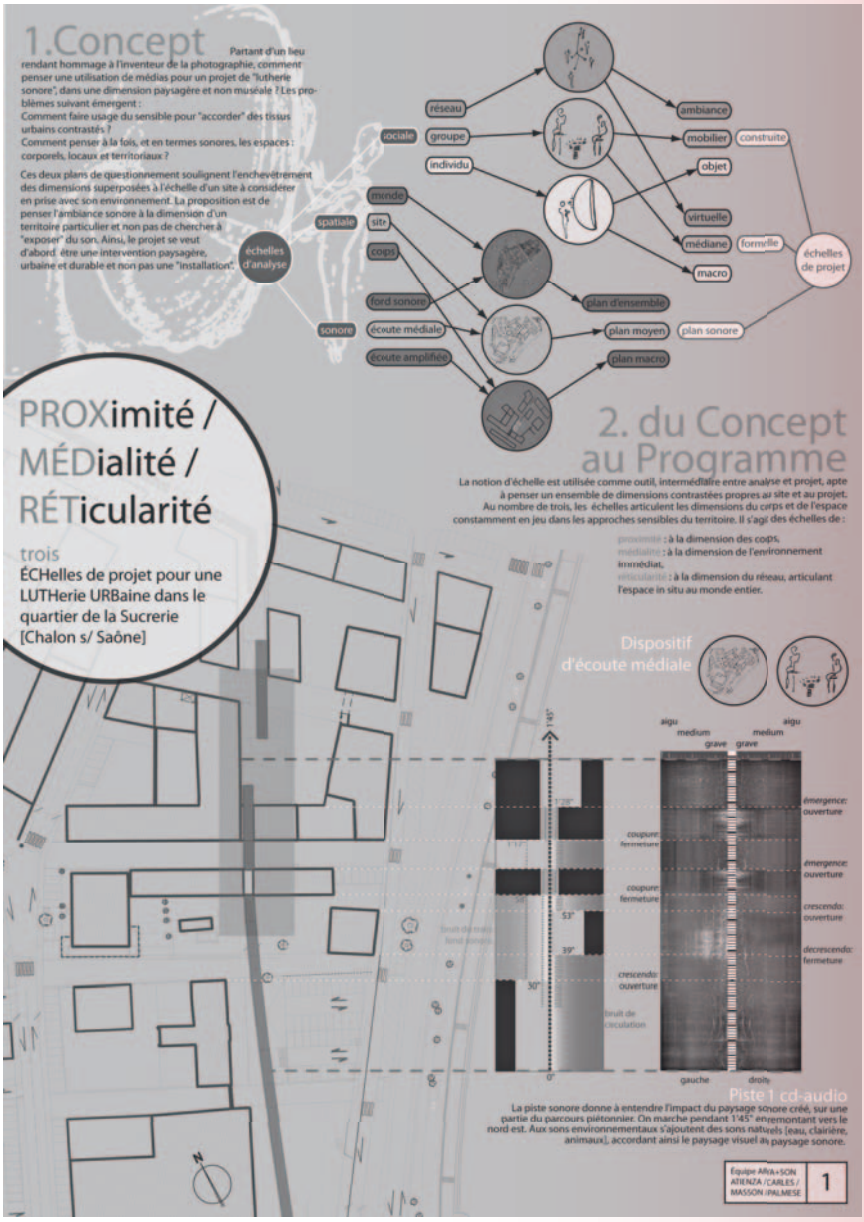

Fig. 3

Lutheria sonora urbana workshop (Urban sound factory). *Les oreilles de Nicephore* ideas competition. Chalon-sur-Saône, France. Project submitted by Damien Masson, Cristina Palmese, Ricardo Atienza and José Luis Carles.

Proyecto *Lutheria sonora urbana*. Concurso de ideas *Les oreilles de Nicephore*. Chalon-sur-Saône, Francia. Proyecto presentado por Damien Masson, Cristina Palmese, Ricardo Atienza y José Luis Carles.