

GlpSyNOISE®: European Project "LIFE Environment" 2002

A Geographical Information System tool adapted to the European Directive on Assessment and Management of Environmental Noise 2002/49/CE

Project supported in France by the Noise Mission of the Department of Ecology and Sustainable Development

Recipient : Greater Lyon, France

OBJECTIVES OF THE PROJECT

To develop a decision-aid oriented software tool :

- Calculation of the indicators of noise of day and night for the sources road, railway and industrial,
- Cartography, characterization of the sound environment, and assessment of the exposed populations...
- Simulation of the future situations within the framework of the actions plans envisaged by the European Directive,
- Development of decision-aid tools by the estimate of the profits of exposure of the populations according to the assumptions of actions,
- Analysis of the modelling of the nuisance, by the study and the quantification of the relations dose(noise)/ answers (potential embarrassment),
- Prepare the communication towards the public, by a thought with the agglomerations and the population (investigations) on the cartographic supports of information.

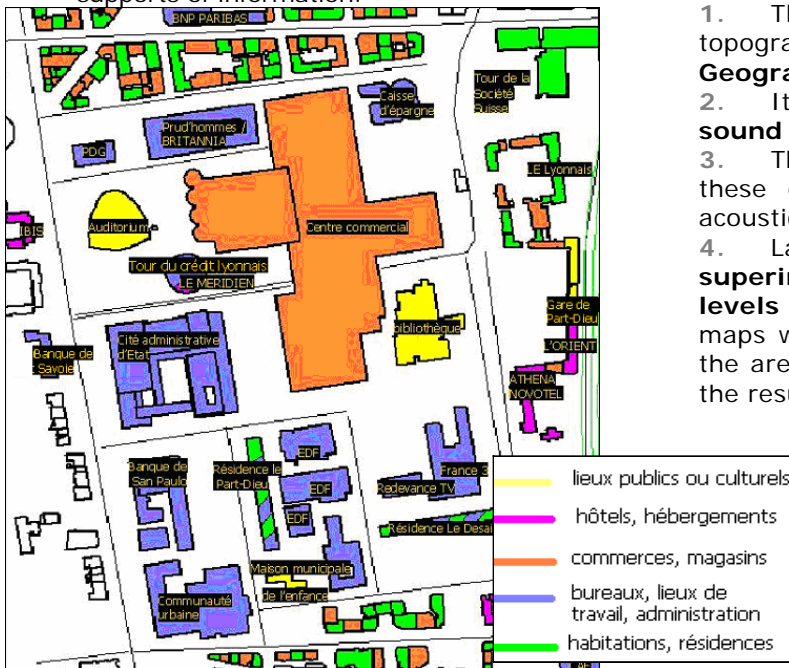
One of the objectives of the GlpSyNOISE® project consists in contributing to the diffusion of this Directive near General public. On Greater Lyon, publicity and heightening public awareness campaigns were carried out (stand, conferences, articles of press and specialized, information flash...). In the same way, partners cities largely contributed to the diffusion of the main trends of the Directive.

With the frequent meetings with the public, we could observe, between 2002 and 2005, a better knowledge of this directive. It seemed important "to prepare" the publication of the noise cartographies by a heightening public awareness to these supports but also to some great "principles" of acoustics.

Various operations are to be realized by the local collectivities (for July 2007, only the agglomerations of more than 250.000 citizens are concerned) to establish a noise map using GlpSyNoise®.

Operations progress :

1. The city lays out or gathers data topographic, urban, demographic, through its **Geographical Information system**.
2. It parameter then data concerning the **sound sources**: road, rail, industries.
3. The following step consists in sending all these data to the engine of **calculation** of acoustic propagation.
4. Lastly, calculated information is **superimposed** on data GIS to obtain **noise levels map**, or in the form of tables; these maps will be then used for the identification of the area to treat, and for the communication of the results to the public.



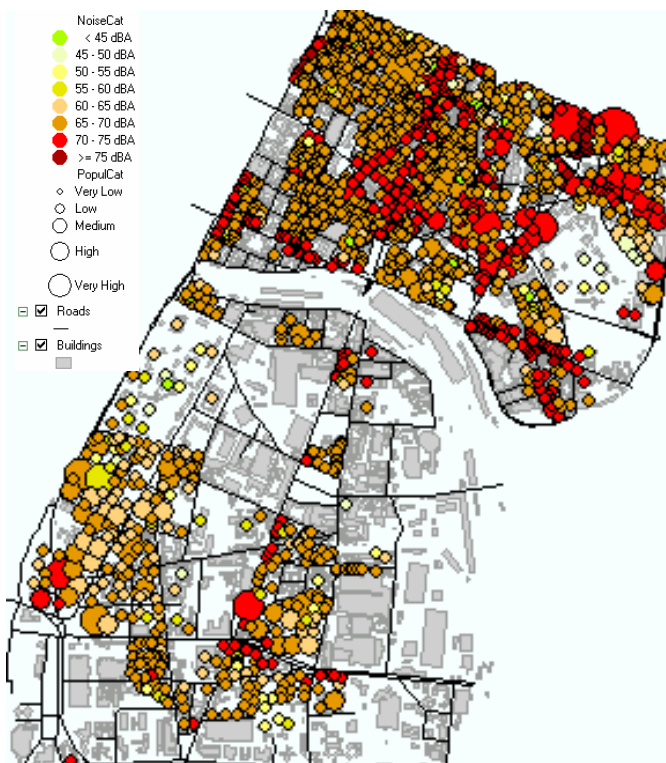
The data-gathering is an essential precondition with the realization of the maps and their exploitation. The cities must count information, organize the data formatting and the gathering of those which miss (counting vehicles, rail traffic, acoustic screens...).

EXPECTATIONS OF THE MAPS REALIZATION

During the project, the cities often expressed their interest to go **beyond the European requirements (in particular with regard to the noises of activity, of neighbourliness...)**. They also underline the **difficulty of the choice of the ranges of the colours** which must be legible, in coherence as much as possible with the codes colour of the other vigilance and alarm systems, and with the standard ISO 1996-2. The choice to vary in a chromatic way (yellow to red) and of intensity (light to dark) appears well adapted.

The **crossing of the acoustic data and the exposed population** allows, from the same map, the visualization of the influence of the noise levels on the populations. This crossing could be the subject of a logarithmic curve treatment in order to better account for the increasing and nonlinear importance of the crossing of the two factors. The description of "sensitive" areas according to criteria specific to local specificities would be better.

The **census of the populations exposed** by classes of 5dB (A) and by sound sources brings also information useful for the installation of the strategies of actions. A map integrating the summation of the various sources would make it possible to take into account the multi-exposure, not very integrated until now in the rules.



The **surfaces exposed by classes** of 5dB (A) and **by sources**, are considered to be relevant for:

- urban projects, plans of rehabilitation
- advantage of a total indicator for all the sources envisaged
- identification of the principal sources of noise
- the planning of the solutions adapted to the types of sources and the various types of buildings

The **counting of dwellings, school establishments, the hospitals** by classes of 5 dB (A) and sound sources, cover a great importance for the locating, the protection and the knowledge of the exposure levels of the sensitive areas. The possibility of showing the frequentation of the establishments, and the summation of the various sources, would bring more in term of information in a decisional logic and planning. The importance of these maps is in direct relationship to the action plans and the transport plans. The limit is in the difficulty of having a layer GIS containing an exhaustive list of these "sensitive" buildings.

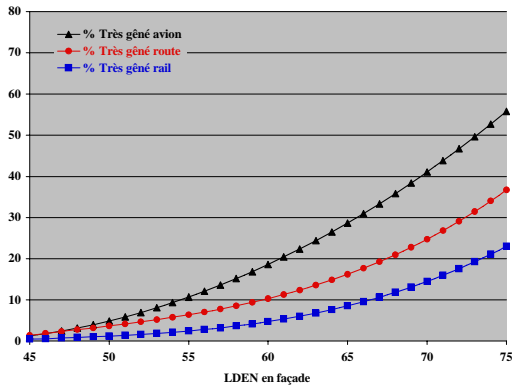
The **exposed population maps** bring direct and clear information, easily translatable in term of stakes of environmental policy.

The **noise maps and tables**, in a representation of locating bring the detail, on a smaller scale, of all the indicators necessary to a decision-making. The contribution of each sound source, and their summation, will make it possible to carry out various classifications of the parcels territory, according to acoustic criteria.

The **conflict maps** (presenting a difference between what exists and objectives qualitative and/or rules) will make it possible to identify the sectors, the urban areas on which the sound environment must be taken into account firstly. Those will facilitate a direct reading of the cartographies, in action logic.

The edition of an **automatic report** "data transmitted to the European Commission" will consist in generating, once all the integrated source data, a report integrating all the maps and the tables waited by the European Commission in a form standardized according to the parameters of entry of the European base.

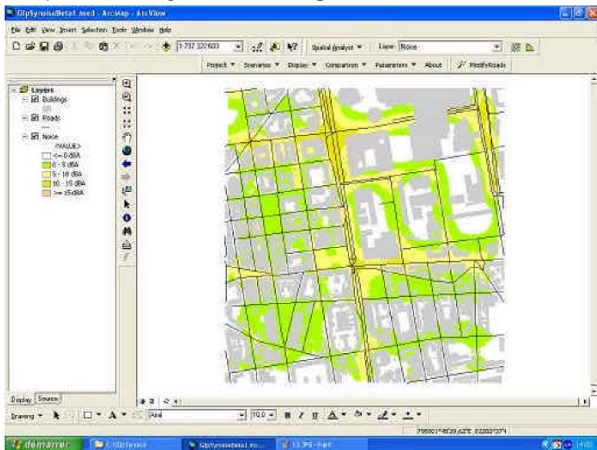
The risks maps and tables of inconvenience and disturbance of the sleep consist of a crossing of the acoustic data calculated with the curves of relation dose-answers published by the European Commission.



Source : Position Paper WG 2, 20 Février 2002

Lastly, noise maps and tables, in a representation of scenario of action plans, will make it possible to visualize the impact in term of exposure of urban areas and the populations, of various actions carried out in order to limit noise exposure (reduction of the traffic, installation of new buildings...).

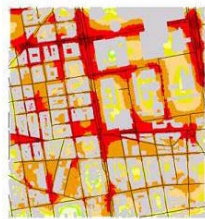
Some light gaps exist between expectations of the European Commission on the one hand and those of partner cities on the other hand. One of expectations of the cities relates to in particular the possibility of obtaining "microscopic" information. But these variations are more complementary than divergent.



GlpSyNOISE® prototype: example of conflict map exceeding a threshold



Initial state



Scenario



Acoustic profit

What noise?

- **A physical phenomenon:** an object or air, is put in vibration; the pressure of the air fluctuates. This vibration is propagated
- **A hearing feeling** related to the perception of this fluctuation in pressure
- **A perception** of the physical phenomenon (power, frequency...), variable according to the person and the context.

COMMUNICATION

The research centers and the partners cities largely contributed to make known the project.

As examples:

- The town of Huelva made publish 4 articles in the local press in February 2004.
- The town of Szeged in Hungary took part in a national briefing on the cartography of the noise, organized by the Ministry for the interior businesses of Hungary. The GlpSyNOISE® project was presented to the Hungarian agglomerations. Each partner devoted a heading of his Internet site to a presentation of the project.

The project and its results were widely presented and diffused near the scientific and technical community international, in the field of acoustic, but also in congresses dedicated to the Geographical Information Systems. Between 2002 and 2005, a score of communications were presented (INTERNOISE 2004 in Prague, INTERNOISE 2005 in Rio, Assises Noise in Avignon in 2005...).

What makes a noise is a nuisance?

- Its physical properties (power, frequency...)
- The context, the environment (period, place...)
- Individual sensitivity (stress, significance...)

Which indicators uses?

The noise maps, the tables, use standardized indicators:

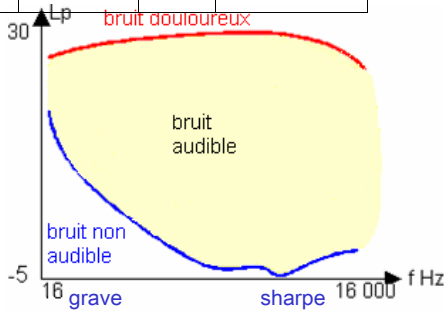
- **LAeq** : average value of energy: "amount of noise" over a given time.
- **LDay 6h-18h, LEvening 18h-22h, LNight 22h-6h**, indicators for the intervals of times indicated.
- **Lden** : acoustic index Day Evening Night, "amount of noise" received on 24 h. The noise of evening and of night is added with a penalty.
- **L90** : level exceeded during 90% of time; indicate the "background noise".
- **L10** : mean level of noise which emerges from the background noise.

Which measuring units?

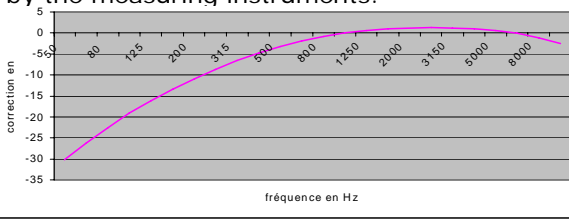
The decibel (dB) : unit used to measure the noise. Indicate if the noise is weak or strong.

Type de bruits « agréables »	Niveaux de bruit en dB(A)	Echelle de couleurs	Type de bruits « désagréables »
Concert rock en plein air	110	Black	Avion au décollage à 200m
	100	Brown	Avertisseur sonore
Ambiance d'une fête foraine	90	Purple	Motocyclette sans silencieux à 2m Poids lourd à 1m
Tempête	80	Red	Circulation intense à 1m
Sortie d'école Rue piétonne Vent violent	70	Orange	Circulation importante à 5m
Ambiance d'un marché Rue résidentielle	60	Yellow	Automobile au ralenti à 10m
Rue calme sans trafic routier	50	Green	
Place tranquille Cour intérieure Jardin abrité	40	White	

The Hertz (Hz) Frequency or Height determines whether a sound is grave or sharp



Weighting (A) : the human ear attenuates certain frequencies. A correction is then made by the measuring instruments.



The indicators of noises of the environment are expressed in weighting decibels dB (A)

What a GIS?

It's software which associates into 2 or 3 dimensions in a dynamic way a computer map with a data base and whose objects and information are geo referred. A road will thus be characterized by its number of ways, its covering, its name (e.g. N20)... A GIS thus will produce maps, will return scenarios in visual form, and will propose solutions according to the assumptions which will be subjected.

GlpSynoise® architecture

GlpSynoise® is an interface, developed in free software, between 2 commercial products:
 - ArcView® as regards GIS, who manages the cartography and data
 - CadnaA® for acoustic calculations, in order to generate the noise levels
 GlpSynoise® noise gathers all the routines necessary to the realization of cartographies and tables in conformity with the requirements of the European directive of June 2002, downloadable on the site of the free software to the following address:
<http://adullact.net/projects/gipsynoise/>

PROJECT PARTNER

- Communauté d'agglomération du Grand Angers <http://www.agglo-angers.fr>
- Communauté urbaine de Bordeaux <http://www.lacub.com/accueil/accueil.asp>
- Communauté urbaine de Lille <http://www.lillemetropole.fr>
- Communauté d'agglomération Montbéliard <http://www.agglo-montbeliard.fr>
- Communauté d'agglomération de Nice <http://www.agglo-nice.fr>
- Communauté urbaine de Nantes <http://www.nantesmetropole.fr>
- City of Boulogne-Billancourt <http://www.boulognebillancourt.com>
- City of St Etienne <http://www.mairie-st-etienne.fr>
- Ajuntament de Barcelona <http://www.bcn.es>
- Ayuntamiento de Huelva <http://www.ayuntamientohuelva.es>
- Câmara Municipal do Porto <http://www.cm-porto.pt>
- ENVICONSULT pour la Ville de Prague <http://www.praha-mesto.cz>
- City of SZEGED <http://www.szegedvaros.hu>

More informations?

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