

System of Automatic Inspection Of Classified Activities SIAC:

**Implementation and justification of
costs/benefits**

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JUSTIFICATION

Pollution, and noise pollution in particular, is a spin-off product of economic activity. This activity uses environmental resources as production inputs, as a result of which some damage to people who are not involved in the productive activity is caused. This means that an increase of profit provoked by the activity causes a clear damage to people who have nothing to do with it. Thus, what has been defined by Pareto's optimum in relation to the market efficiency is not fulfilled. So the use of environmental resources causes a market externality.

The Pareto's optimum establishes that there is only economic efficiency when it is not possible to increase the well-being of an individual without diminishing that of another. When such a situation takes place, it is necessary that the authorities intervene in order to correct this deficiency. To do so there are several means that can be used, such as regulations, taxes, licenses. ..

When pollution affects people and the environment, it is necessary to take into account for its assessment not only the private point of view but also the social valuation. That means that social costs and benefits shall include private costs and benefits plus certain externalities.

Talking about noise pollution caused by leisure activities in towns there is a situation of balance reached by the application of legal regulations. This situation of balance, in which the use of administrative and police measures has led to an improvement of the environmental circumstances, has not, however, reached the Pareto's optimum, for from the point of view of the affected people the production of noise is being increased for the benefit of a few but the damage of a big number of individuals. This situation justifies a new correction action to the market, so that the efficiency of the leisure activities inspection is improved. Thus, the costs are charged to the one who is polluting, as if it were a new tax.

According to March 1999 CIS's opinion survey, almost 10% of the population is affected by important annoyances caused by activities noise, but only 70% of them would legally complain to solve the problem.

This confirms that most of the people who are affected by noise prefer to 'patiently stand' it rather than fighting with their neighbours. Even so, noise activities are the cause of most of the complaints which reach the environmental services of town halls. These complaints are investigated with the tasks available for the authorities, which results in complex processes that, when they find a solution, on many occasions, the problem has been altered. This makes the authorities' answer be little efficient, as there are not the necessary means to solve the problems. Besides, the given answer is not total, as it only acts on facts which have originated legal complaints, which only represent 30% of all the problems, and the other 70% remain unanswered, due to the lack of human and technical resources, despite the fact that authorities are compelled to protect the rights of all the people.

To deal with such a situation, Castilla Y León's competent authority has proposed the authorities automatic inspection as a means to solve the problem of noise.

To assume such a proposal will lead to establish a total surveillance service, in a way that affects all the activities, with no exception. But to do something like that seems not to be feasible, not only because of its economic cost but also because of the impossibility of having enough technical and human resources to carry it out.

With this, we find that, to improve the reality of leisure venues in towns, it is necessary to implement a measure that grants efficiency to the authorities' inspection by means of the implementing of an Automatic Inspection System in leisure venues.

AUTOMATIC INSPECTION OF ACTIVITIES SYSTEM (SIAC)

The Automatic Inspection Of Activities System proposed by Proceso Digital De Audio is an efficient tool for the authorities, and it is able to:

- Identify in an efficient way, the different existing activities in an area, and their attendant characteristics given by their license.
- Report in real time about the incidences which take place within the activities and that may affect the working according to the characteristics exposed in the license.
- Have the necessary reliability, so that the obtained data are fixed within reasonable limits.
- Make the inspected activity responsible, so that the burden of proof falls under the manager's responsibility.

The system gives daily information to the local authorities about the incidences, classified by:

- **Level**, detecting the sound pressure levels that exceed those allowed inside the venue.
- **Disconnection of the sensing element**. It informs about possible handling of the sensors.
- **Closing time**. It gives information about the opening and closing times.
- **Abnormal operations**: Possible damages in the elements, either
 - recorder, or
 - limiter

IMPLEMENTATION

The inspection system is based on the following premises:

- Inside every venue there must be a maximum sound pressure level, so that it fulfils all legal requirements in relation to transmission levels to the surrounding buildings, which depends on its acoustic isolation.
- The fact of keeping the sound pressure levels inside the venue under the maximum spectrum guarantees fulfilment of legal requirements.
- The existing noise inside a venue depends on the sources there are inside, and specially on the crowd capacity.

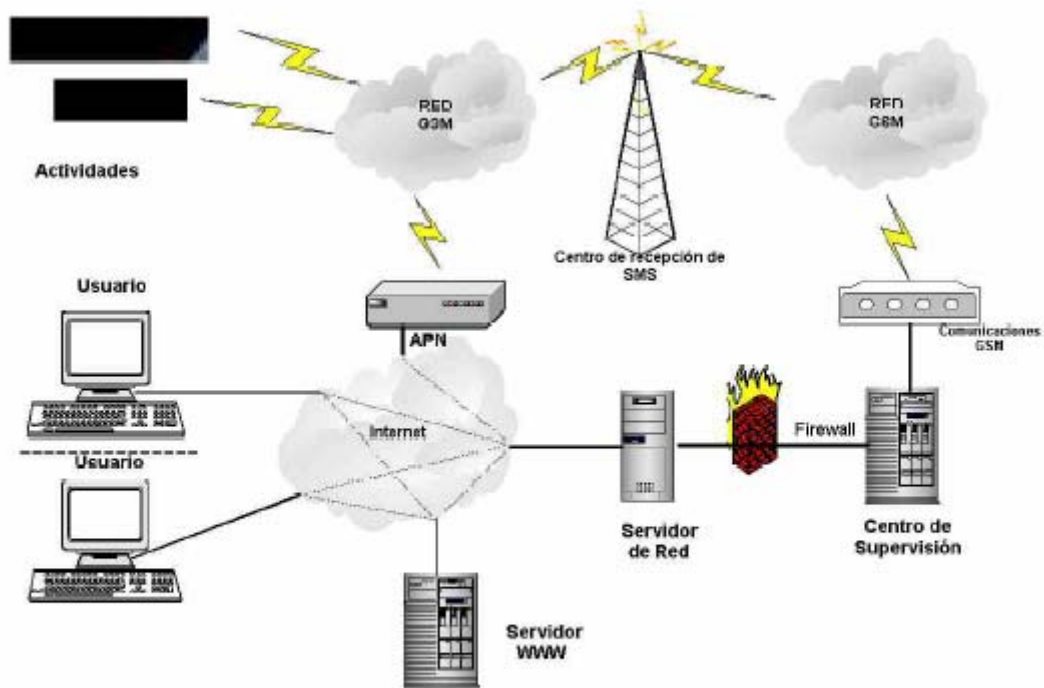
The existing noise levels inside the venues, specially talking about leisure activities, are due to an undetermined number of sources, some of which can be controlled (hi-fi equipments...) and some cannot, such as the crowd capacity. If the sound level produced by all these sources is under a maximum level, which depends on the construction characteristics of the place, as well as on the levels that can be transmitted outside, it can be guaranteed that this activity, when happening, does not transmit to its surroundings noise levels, higher to those legally required. Thus,

it is enough to know the sound pressure levels the activity implies to control if these levels exceed the maximum limit, and following their evolution the working hours of that source can also be controlled.

According to what has just been explained, we can state that the highest level defines an activity in relation to annoyances and transmissions to the surroundings. Therefore, we can:

- Classify the venue in acoustic terms, and thus obtain the maximum spectrum.
- Grant the license according to the highest noise spectrum.
- Control the activity, for which a device that reports about the activity (sonograph) will be installed.
- Require from the activity's manager the right working of the sensing device.

With the inspection given by the sensing devices connected to the network, it is possible to set up an inspection system.



This system reports about the incidences that take place every day within the inspected activities. What is new about this proposal is not only how easy it is to know what is happening in relation to the activity but also the way how these incidences are broadcast from an administrative point of view.

The administration process implies the use of a lot of resources for local councils, specially in relation to the obtaining of the proof. With our proposal, this process is simplified most of the times.

One of the mentioned requirements is that the activity not only should have a sensing element, but it has also to work properly. If the system detects an incidence, a proceeding is started by the sending of a letter that indicates as follows: A possible malfunction of your sensing element has been detected, and a time is granted for the owner of the place to appeal. The reception of this document implies the proof period's ending. This is followed by:

- Acceptance of the incidence, if the sensing element is, in fact, working properly.
- Out of order or improper working of the sensing element.

COSTS AND BENEFITS

Due to the system's characteristics, the immediate benefits are:

- The application of the system will make it more efficient to fulfil the legal requirements, which means a decrease in the number of complaints, with the subsequent social benefit.
- The burden of the proof falls now under the responsibility of the person who has been the object of the complaint. This will improve the efficiency of the inspection services, saving time and money.
- The application of the system will lead to a higher knowledge of the situation, which will make it easier to take planning actions, in a more efficient and cheaper way.
- The system will let us act on situations which are perfectly known because of the existence of a complaint, but also on unknown situations (when there are no complaints). This will increase the social benefit, for we take Pareto's optimum closer to all the situations.

The implementation of the system implies the following costs:

- The cost of the system, which is transferred to activities and affects the private costs in the production process.
- The social cost externality.
- The cost derived from the management of the system, and which is assumed by the local council.

It is obvious that from the point of view of the cost/benefit analysis, the simple fact of taking the situation of noise pollution to the optimum defined by the regulations, which reflect the wishes of the citizens (where social costs and benefits are equal), justifies the private costs, both the entrepreneurs and authorities' costs.

Costs

The involved costs are:

- Installation costs:
 - Equipment of the venues.
 - Local council's equipment.

- Maintenance costs:
 - Transmission costs.
 - Information storage costs.
 - Revision, calibration and maintenance of the equipments.

The entrepreneurs who cause the noise pollution are responsible for the costs which affect the acquisition and maintenance of the equipments, as it is expressed in the documents that deal with sustainable development, and defined by the principle: 'The one who pollutes must pay'. This is somehow preserved by the future noise law, as it compels the owners of the sources to have self-control elements. The other costs are half inspection costs, which will be assumed by the local council, and half a tax on private profit to compensate the externality to the market. This tax concept also appears in the aforementioned noise law, as it authorizes local tax departments to transfer inspection costs to the owners of the noise sources.

Framework relations Activities-Local Council

A possible framework relation could be:

- *Costs assumed by the local council*
 - Municipal equipment. It only happens once in the system's lifetime.
 - Information storage costs; a yearly cost.
 - Transmission costs, a yearly cost.

However, the last two costs could be transferred to the entrepreneur via tax.

- *Costs assumed by the entrepreneurs:*
 - Venues equipment costs.
 - Revision, calibration and maintenance.

An alternative possibility could be:

- *Costs assumed by the local council*
 - Municipal equipment. It only happens once in the system's lifetime.
 - Information storage costs, a yearly cost.
- *Costs assumed by the entrepreneurs*
 - Venues equipment costs.
 - Transmission costs, a yearly cost.
 - Revision, calibration and maintenance.

In order to make this situation efficient, it is necessary that the application of regulations has to be strict about the need of equipments being present in the surveillance network. This means that every single device that does not appear in that network has to imply the automatic closing of the musical activity.

SET-UP MECHANISMS

The following steps have to be done to set up the Automatic Leisure Activities Inspection System:

1. To define the relation framework between the local council and the firm.
2. To broaden the legal framework, justifying the assumption of an automatic inspection system by the local council and define its characteristics.
3. To define the systems organs:
 - Local council's:
 - Elements and inspection mechanisms.
 - Enterprise's:
 - Elements to carry out the maintenance tasks.

1. Framework relation between enterprise and local council

This relation would consist of a renewable services contractual relationship to 'establish and maintain an automatic leisure activities inspection'. This would be a one-year contract with the possibility of being renewed until the parts express the opposite. The contract would define the system's characteristics of costs.

2. Regulations requirements

The set up of the system requires the publishing of:

- a) The decision to incorporate an automatic leisure activities inspection system, so that the local council can establish a system of data transmission from the control devices to an inspection centre.
- b) Due to the system's characteristics, the control devices (limiters) need to incorporate a transmission system that is able to send data to the automatic inspection service. To do so, the information must be sent via GSM's SMS. This information must contain the data of the working sessions of the control device, giving:
 - Information about the limiter's working.
 - Information about the recorded levels by the recorder.

This information must follow the protocols indicated in the Annex II.

- c) It is compulsory that the control device must work perfectly. An article must be published with the following contents: The owners of the control devices have the obligation to guarantee their perfect working. To do so, the aforementioned devices will be included in a maintenance programme with authorized personnel that ensures the right working as well as the verification and calibration of the measure system. This verification must be done at least once a year. The owner of the activity has the obligation to present the attendant updated documentation.
- d) The definition of the requirements for the authorized personnel to do the maintenance of the device. These requirements could consist of:

- *Knowledge and means:*
 - They have to prove their technical capacity with a document that verifies the necessary knowledge required to do the maintenance. This document has to be provided by the manufacturer.
 - They need to have the required measurement means (phonometre), according to legal parameters.
 - *They must have a revision and calibration proceeding*, which has to be supervised and certified by a quality control organization. This proceeding has to be revised once a year.
 - *Legal liability*. As the reports will have legal proof validity, if the authorities detected that the reports had been manipulated on purpose, punishment measures would be taken according to the defined patterns.

3. To define the system's organs

- Local council's elements and inspection mechanisms.
- Enterprise's elements able to carry out the maintenance tasks.

Annex II

Transmission protocols:

In order to make all the control elements (sound limiters) compatible with the automatic inspection system it is necessary that all the given data and the way in which they have to be incorporated to the system fulfil the following requirements:

- 1) The limiters and sonographs that are installed in the activities submitted to the fulfilment of this regulations must send the new stored data at least once a year, using the GSM network system on any other which replaces it using the following protocols for each sequence of data.
- 2) The data of the devices are divided in:

Set-up data.

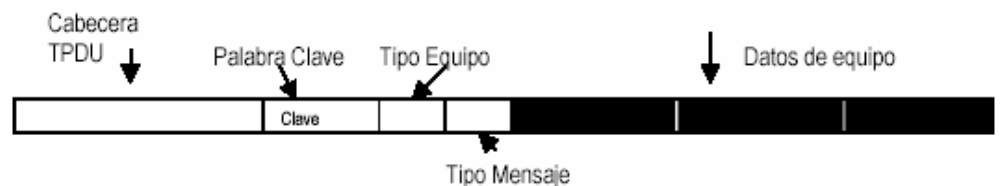
Session data.

- 3) The session data are divided in:

Sonograph session data.

Recorder session data.

- 4) All the data will be packed and sent using the SMS utility of the GSM network, as it is described by the GSM standards, using the area assigned to the message to send the data of the devices. This pack will use the 8-bit 140 characters that define the message within the SMS's structure.
- 5) To standardize the length of received messages, a fixed length will be used for each message of a total number of 112 which will adopt the following shapes depending on the type of data that has to be transmitted:



The part called headline is that described by the TPDU Standard.

Afterwards there will appear the password of the system, the type of device that sends the data, and then the kind of structure (if it is a set-up on a session). Last there will come the data of the message.

There are different structures for each kind of data.

TYPES OF STRUCTURES

COMMON PART (it is found in all the messages):

Key word: **8 bytes**

Type of device: **1 byte**

Type of message: **1 byte**

Code of the device: **9 bytes**

HEADLINE MESSAGES FOR THE LIMITER

Headline information

Installer: **38 bytes**

Calibration. Level. **1 byte**

Installation date

 Date **3 bytes**

 Time **2 bytes**

Revision:

 Date **3 bytes**

 Installer's code **9 bytes**

Recorder **1 byte**

Phonometre **1 byte**

Filling up to 111 bytes of 8 bits

0x00 **34 bytes** are sent.

Number of the message that is being sent

Number of message **1 byte** (circular numeration from 0 to 255)

SET-UP INFORMATION MESSAGE

Isolation **16 bytes**

NC Thresholds **1 byte** (we only send the number)

Microphone **16 bytes**

Adjust dBA **1 byte**

Sensitivity **1 byte** (always negative)

Calibration **16 bytes** (after correction)

Filling up to 111 bytes of 8 bits

0x00 **26 bytes** are sent

Number of the message that is being sent

Number of message **1 byte** (circular numeration from 0 to 255)

LIMITER'S SESSION MESSAGE WITH SONOGRAPH INFORMATION

Session index	2 bytes
Date	3 bytes
Time	2 bytes
Final (minutes from the beginning)	2 bytes
Calibration	1 byte
Red	1 byte
Amber	1 byte
Maximum power	1 byte
Average level	1 byte
Maximum level	2 bytes
TiemMicMax	4 bytes
MicMin	1 byte

Filling up to 11 bytes of 8 bits

0x00 **74 bytes** are sent

Number of the message that is being sent

Number of message **1 byte** (circular numeration from 0 to 255)

SESSION MESSAGE FOR LIMITER WITH RECORDER

Session starting date	5 bytes
Session index	2 bytes
Measure interval	1 byte
Number of recorder message	1 byte

Recorder measures by message

83 measures maximum. If there is less, it will be filled with 0x00 up to **83 bytes**

Number of message that is being sent

Number of messages to 255)	1 byte (circular numeration from 0 to 255)
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Meaning of the variables

Key word: It is a word to identify the system. You have to ask for it to the local council in case you want to add a certain device to the system.

Type of device: It identifies the type of device in the system. The content is given by the local council, when in addition it is asked for.

Type of message: It identifies the type of message. The content is given by the local council when an incorporation to the system is required.

Code of the device: It unmistakably identifies the device within the system. It can be the serial number of the device.

Installer: It is a field reserved to give information about the installation

Calibration. Level: It identifies the calibration level of the device (maximum level that can be produced).

Installationdate: It is the time and date of the installation.

Revision: This is the date where an access to the device is done. It also incorporates an identifier of the installer (the latter can be replaced by a fixed code)

Recorder: It indicates if the device has a recorder installed.

Phonometre: It indicates if there is a phonometre installed.

Number of message: This is the number of the message meter that indicates the order number of the message.

Isolation: This is the isolation value of the venue in terms of octave thirds.

AdjustdBA: This is the microphone's calibration number. It can be 0, if the number that is transmitted is already a dB(A).

Sensitivity: Global sensitivity of the microphone

Calibration: These are the levels in octave thirds which identify the maximum emission of the hi-fi equipment where the limiter is installed.

Session index: Order number of the beginning session

Fechainsesion: Time and date of session start

Final: Duration time of the session. It is given as a 4-figure number (4 bits each)

Calibration: Calibration start value of the equipment

Red: Performing time of the equipment

Amber: Working time of the equipment

Maxpower: Maximum level on the line during the session

Average level: Sound pressure level measured by the microphone during the session

Maximum level: Sound pressure level in the session

TiemMicMax: Time at which the peak of sound pressure takes place

MicMin: Minimum sound pressure level in the session

Start session date: Time and date of start of the recorder's session

Session index: Order number of the recorder's session

Measure interval: Time interval between measurements