From Strategic Noise Maps to Action Plan: perspective of Spanish Main Roads

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**STRATEGIC NOISE MAPS**

1st phase: year 2007
- National Road Network
- 6 M veh/y
- 6,000 km

2nd phase: year 2012
- National Road Network
- 3 M veh/y
- 12,000 km
The first concern is to define a **Unit of Strategic Map (UME)** of each road.

The **criteria** are continuity and geometric design of the roadway.

**All the information** that the END requests of exposed population, dwellings, schools and hospitals, is analyzed for each UME separately.
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STRATEGIC NOISE MAPS

The General Directorate of Roads has carried out 20 studies. Each study includes several major roads of a region.

The strategic noise maps are presented as graphical plots with numerical data in tables of the number of people, dwellings, schools and hospitals that are exposed to specific values of the indicator $L_{den}$ and $L_{night}$.

In addition, the same analysis is done for the indicators $L_{day}$ and $L_{evening}$.
The strategic noise maps of the national roads are available in the website www.cedex.es/egra

All the information can be consulted and downloaded from this website.

In each study there is a description of each UME that has more than 6 M annual vehicles.

The zone of study is located in the region of Cantabria. In a first approach two corridors can be distinguished. They go from East to West and North to South and they intersect at Torrelavega, where all road sections of this study are located.

From East to West, the study area begins in the limit with the Province of Biscay and finalizes in the neighborhoods of Cabezón de la Sal. From North to South, the corridor begins in Santander and finalizes in Los Corrales de Buelna.

The study has been divided in the following seven UME’s:

- **UME 01. S-10**, (old N-635), from the access to Santander to Astillero, PK 2,010 to PK 7,090.

- **UME 02. S-20**, from north access to Santander to Bezaña, PK 0,000 to PK 5,150.
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THE CREATION OF EGRA

The information that requires END is in EGRA:

- A report summary that summarizes the main characteristics of the study
- Maps of noise
Maps of noise.

There are three types of maps for each UME standardized according to the Spanish sheet division of the National Geographic Institute:

- Noise map of isophones $L_{den}$
- Noise map of isophones $L_{night}$
- Map of affected zone.

It contains information related to $L_{den}$ and includes a table with the number of people, dwellings and surfaces exposed to $L_{den}$ values higher than 55, 65 and 75 dB.
Belinchón

<table>
<thead>
<tr>
<th>Superficies afectadas por los valores de $L_{den}$ indicados</th>
</tr>
</thead>
<tbody>
<tr>
<td>$&gt;$ 55 dB</td>
</tr>
<tr>
<td>$&gt;$ 65 dB</td>
</tr>
<tr>
<td>$&gt;$ 75 dB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Población expuesta a los valores de $L_{den}$ indicados</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viviendas</strong></td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>$&gt;$ 55 dB</td>
</tr>
<tr>
<td>$&gt;$ 65 dB</td>
</tr>
<tr>
<td>$&gt;$ 75 dB</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Hospital y colegios expuestos a los valores de $L_{den}$ indicados</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hospitales</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>$&gt;$ 55 dB</td>
</tr>
<tr>
<td>$&gt;$ 65 dB</td>
</tr>
<tr>
<td>$&gt;$ 75 dB</td>
</tr>
</tbody>
</table>
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THE CREATION OF EGRA

Each Unit of Strategic map presents a table with the population exposed to the indicators, Lden and Lnight in 5 dB ranges.

Example of tables with the number of people (in hundreds) exposed to bands of Lden and Lnight.
The report summary is a document that summarizes:

- the main characteristics of the study
- the local and regional legislation in the zone
- the description of the roads, and an analysis of the conflict areas with the possible solutions.

Process:

1. The identification of the most exposed zones
2. To establish a diagnosis
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### DIAGNOSIS AND ACTION PLAN

<table>
<thead>
<tr>
<th>UME</th>
<th>Length (meters)</th>
<th>Name Conflict Zone</th>
<th>Length (meters)</th>
<th>% UME length</th>
<th>Conflict</th>
<th>Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-10</td>
<td>5.080</td>
<td>Maliño</td>
<td>1.000</td>
<td>7 %</td>
<td>Population closet o the road</td>
<td>Noise Barrier</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Astillero</td>
<td>1.500</td>
<td>29 %</td>
<td>High number of dwellings near to the road</td>
<td>Complex solution</td>
</tr>
<tr>
<td>S-20</td>
<td>5.150</td>
<td>Santander</td>
<td>1.000</td>
<td>20 %</td>
<td>New buildings. Close to a future technologic park</td>
<td>New buildings in the future, noise barriers</td>
</tr>
<tr>
<td>N-623</td>
<td>6.780</td>
<td>Muriera</td>
<td>1.000</td>
<td>14 %</td>
<td>Dispersion of people.</td>
<td>Complex solution</td>
</tr>
<tr>
<td>A-67-01</td>
<td>12.500</td>
<td>Los Corrales de Buelna</td>
<td>1.000</td>
<td>9 %</td>
<td>Buildings with different heights</td>
<td>There are noise barriers</td>
</tr>
</tbody>
</table>
The possible solutions in the exposed areas are the followings:

- **Acoustical barriers**
- **“Other complex solutions”**

The solution should be taken not only by the road, but also by the other sources.

The joint of these proposals will form the action plan and will provide the effective tools for noise pollution abatement.
**Criteria applied in the noise protection.**

The criteria applied are not universal for the whole road network. Although the source –the road- the terrain and the buildings are perfectly defined, different cases appear to define a typology of situations and solutions.

The criteria have been based on the number of people exposed to the $L_{\text{night}}$ indicator of 55 dB in consolidated residential zones and the number of schools exposed to levels of 60 dB $L_{\text{day}}$ and the number of hospitals. This new parameter is called exposure degree. This parameter takes into account the sensitive land uses to protect them from noise pollution.
When the area has mainly residential use:

- Proposals based on the number of people exposed to the indicator $L_{\text{night}}$. 
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DIAGNOSIS AND ACTION PLAN

In other situations there are zones with different uses (residential, educative, sanitary) combined in both edges of the road and it is necessary to evaluate indicators during all the periods.
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• “SECOND RESIDENCES”
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DIAGNOSIS AND ACTION PLAN
Priorities in the proposals

A new concept is established and it is called “environmental benefit” or “sonorous benefit”.

It means the effectiveness forecast for the implementation of the solution. Noise barriers can be extremely effective tools for noise pollution abatement, but certain locations and topographies are not suitable for use of any reasonable noise barrier.
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DIAGNOSIS AND ACTION PLAN

Priorities in the proposals

The **environmental benefit is high** when it is expected to obtain good results with the execution;

The **environmental benefit is medium** when it is expected to obtain an improvement on the current situation although this improvement is not able to eliminate the affection totally.

The **environmental benefit is low** when it is foreseen that the improvements obtained with these solutions are going to be limited.
Based on the **exposure degree** and **the effectiveness** in the implementation of the solution or environmental benefit, priorities are established classified in three levels: high, medium or low.

Finally, NEXT STEPS...
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**DIAGNOSIS AND ACTION PLAN**

<table>
<thead>
<tr>
<th>UME</th>
<th>PK</th>
<th>Name</th>
<th>Edge</th>
<th>Building type</th>
<th>Length (meters)</th>
<th>Proposal</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-66</td>
<td>12</td>
<td>La Vega</td>
<td>Right</td>
<td>Detached, 1-2 heights</td>
<td>200</td>
<td>Noise barrier</td>
<td></td>
</tr>
<tr>
<td>A-66</td>
<td>14</td>
<td>Santa Rosa</td>
<td>Right</td>
<td>Semidetached, 1-2 heights</td>
<td>250</td>
<td>Noise barrier</td>
<td></td>
</tr>
<tr>
<td>A-66</td>
<td>18</td>
<td>Fonciello</td>
<td>Left</td>
<td>School</td>
<td>100</td>
<td>Noise barrier</td>
<td></td>
</tr>
<tr>
<td>A-66</td>
<td>21,5</td>
<td>La Fresneda</td>
<td>Both</td>
<td>Buildings of 4-5 heights</td>
<td>700</td>
<td>Complex solution</td>
<td></td>
</tr>
</tbody>
</table>
In the studies made in 6,000 kilometres of the Spanish national road network there have been detected zones with consolidated constructions, distinguishing residential, sanitary and educative uses and determining the possible solutions for each UME.

An action priority has been marked where it is estimated that the noise affects more population and a priority classified in three levels (high, medium and low) is marked.
The exposure population, the presence of specific buildings (hospitals and schools), the indicator named as a **exposure degree**, - index defined by the values of exposed population to $L_{\text{night}}$ by unit of length and the number of schools exposed to $L_{\text{day}}$ by km of length, and the number of hospitals exposed to noise during the three periods (day-evening and night)- and the **viability of the proposals**, are defined in these studies.

A priority has been established for each area.

The priority weighs the necessity of an action and the viability and the effectiveness of the proposal.
CONCLUSIONS

1. It is underlined the importance of the creation of a website to exchange information of the strategic maps of environmental noise.

2. It is necessary to have a tool that allows evaluating the benefit of the measures and to establish priorities in the proposals.

3. The criteria established in the noise maps have been specific for each zone. It is necessary to define a reference parameter to evaluate the efficiency of the propose measures.

4. It is necessary to incorporate a pursuit so that once the noise barriers are built, the effect of the measurements should be quantified.
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Thank you
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