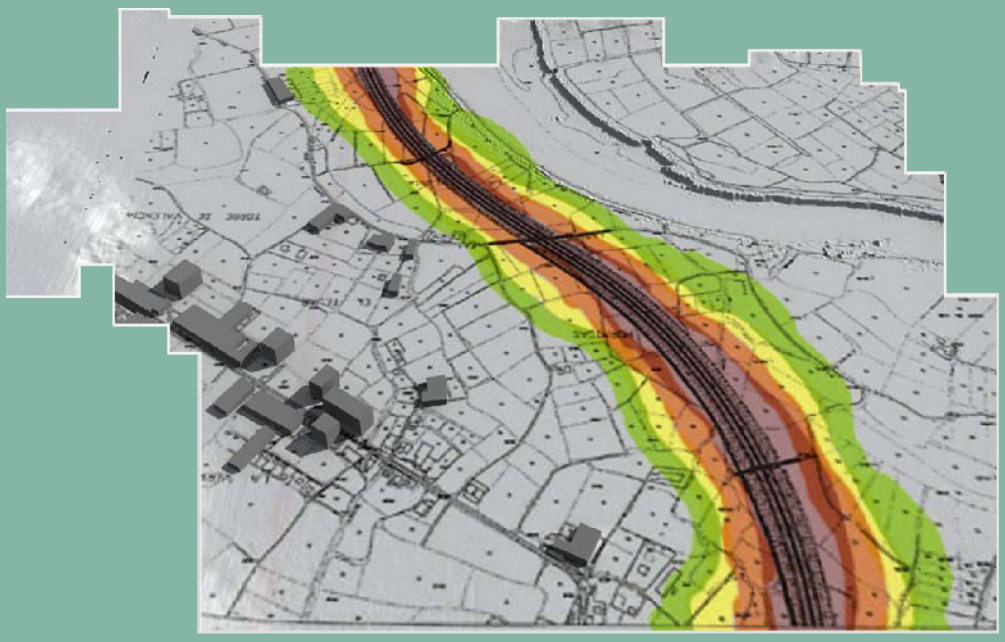

Summary of Results and Action Plan (SNAP) 2008-2012

First round of Strategic Noise Maps
for the State Owned Road Network

GOBIERNO DE ESPAÑA
MINISTERIO DE FOMENTO
egra evaluación y gestión del ruido ambiental

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SECRETARÍA GENERAL DE INFRAESTRUCTURAS
DIRECCIÓN GENERAL DE CARRETERAS
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APPENDICES *(included in the attached CD)*

1. Document background and aim

The 37/2003 Noise Law of 17 November, which incorporates into the Spanish Legal System the 2002/49/EC Directive of 25 June, relating to the assessment and management of environmental noise, has come to fill an important national regulatory gap with reference to compliance with the health and environmental protection constitutional mandate.

Previously, regulations had focused on the sources of noise, limiting emissions. Reality has demonstrated that, despite constant technological improvement, the benefits of these environmental noise measures have been reduced due to a combination of other factors which have not yet been confronted.

One of the noteworthy objectives of the new legal framework is the creation of a common structure for the assessment and management of exposure to environmental noise, as a step prior to the establishment of action plans for noise reduction.

The Law established, as a tool for environmental noise exposure recognition, the so-called Strategic Noise Map, which is defined as *"a map designed for the global assessment of noise exposure in a given area due to different noise sources or for overall predictions for such an area"*

The Law demanded the development of Strategic Noise Maps for each of the major roads, major railways, major airports and agglomerations. In terms of the road network, for this first round, the need to draw these maps has been restricted to roads with traffic levels above six million vehicles a year.

The scope, detailed content and completion periods for these maps have been defined in accordance with regulation within the 1513/2005 Royal Decree of 16 December, referring to environmental noise assessment and management.

The body responsible for the creation of strategic maps for the major state-owned roads is the Ministry of Public Works, which has acted through the General Road Directorate.

The development of Strategic Noise Maps has been organised by grouping roads into geographical areas and traffic corridors. Twenty studies have been carried out, all following the same methodology.

Each of these studies is guided by a common template. The Strategic Map Units (SMUs) are initially defined; SMUs consist of a road section, or group of adjoining sections, with the

same denomination and traffic features. Due to its characteristics, the SMU is a unit which cannot be divided when calculating the exposed population. This needs to be taken into account when handling the information. For each SMU, the appropriate calculations are carried out and noise maps drawn up. In total, Strategic Noise Maps have been developed for 213 SMUs, covering 4,779 km of state roads belonging to the National Network (the state-owned toll motorways are not included).

STUDY	LENGTH Km.	NUMBER OF SMUs
Madrid-Toledo	71.82	1
Bailén-Motril	206.54	4
Jaén-Sevilla	291.15	3
Lleida	123.48	5
Tarragona AM	57.10	6
Asturias	126.02	9
Western Andalucía	294.91	19
Eastern Andalucía	319.38	17
Galicia	279.22	26
Castellón*	102.70	5
Barcelona, Girona y Tarragona	334.40	15
Cantabria	135.03	7
Murcia	196.37	6
Aragón	186.54	5
Alicante	257.95	11
Valencia	343.05	13
Castilla la Mancha A-2/A-3	293.86	7
Castilla la Mancha A-4/A-5	375.95	13
Castilla y León	468.88	26
Comunidad de Madrid	314.85	15
TOTAL	**4,779.02**	**213**

** In the study "Roads in Castellón" an extra SMU was included. It corresponds to a section of the N-234 which has not been included in this summary because it has a traffic level below 6,000,000 vehicles a year.*

- The general structure of the studies consists of a report, appendices and a map collection, the content of which is detailed below:

Report:	- General description of the study. - Legislation. - Basic strategic maps. - Detailed strategic maps. - Analysis and conclusions regarding the acoustic evaluation of the area under study. - Actions against noise proposal.
Appendices:	- Urban planning, land uses and acoustic area definition. - Building analysis. - Obstacle inventory. - Traffic data. - Studies detailed in Phase A. - Inventory of buildings and residential areas under construction.
Maps:	- Phase A: Basic Strategic Noise Maps. ✓ Sound level Maps. ✓ Exposure Maps. ✓ Affected Area Maps. ✓ Demarcation of detailed study areas. - Phase B: Detailed Strategic Maps. ✓ Sound level Maps. ✓ Exposure Maps.

In addition, all the information in relation to strategic maps and the exposed population results has been incorporated into a Geographic Information System.

This document is a summary of the results obtained from all the Strategic Noise Maps for the major state-owned roads included in the 1st round of the 2002/49/EC Directive (traffic levels over 6,000,000 vehicles a year) implementation. The results are shown by Road Demarcations, in accordance with the territorial divisions of the General Road Directorate (DGC).

The data from País Vasco, Navarra, Islas Baleares e Islas Canarias is, therefore, not included as there are no state-owned roads in these territories. The data from La Rioja is not included either because the National Road Network in this autonomous region does not reach the traffic levels needed for this first round of strategic noise mapping.

In order to facilitate access to information regarding the methodology adopted and the main results obtained, for the administrations, bodies, professionals or members of the general public who may be interested, and to fulfil the public information demands for the strategic noise maps, the General Directorate of Roads of the Ministry of Public Works has authorised a website where one can consult the main results and most relevant noise maps from all the studies undertaken: www.cedex.es/egra/

This document does not include the results reached by the strategic noise mapping studies corresponding to the toll motorways of state concession, though they can also be consulted via the website. These studies have been prepared by each of the concession companies.

2. Strategic Noise Map and public information development process

Starting with the legislative definition of a Strategic Noise Map and the minimum content for strategic mapping, the General Road Directorate carried out a pilot study, from which the basic content of Strategic Noise Maps for the major state-owned roads was specified. It was decided that all the studies would have to draw up 3 different types of maps for each of the noise indicators considered, L_{den}, L_d, L_e and L_n.

- ✓ Noise level maps: noise contour maps based on the noise level calculations at the recipient points of the study area.
- ✓ Exposure maps: they show data relating to buildings, dwellings and population exposed to predetermined noise levels on building façades, and other information required by the 2002/49/EC Directive and the 37/2003 Law.
- ✓ Affected area maps: these are maps which gather data about total surface areas exposed to L_{den} indicator values above 55, 65 and 75 dB(A). They provide information about the total estimated number of dwellings and people (shown in hundreds) who live in each of those areas.

The development of the Strategic Noise Maps has occurred in two phases. During the first one, Phase A, the basic Strategic Noise Maps for all the SMUs were drawn up. During Phase B, detailed Strategic Noise Maps were drawn up for the areas with a higher building density, where most of the exposed population is based.

During Phase A, the basic data was gathered and generated. This was required in order to assess the level of noise emissions originating from the road, and the noise level in its immediate vicinity, and the noise exposure of the population within the study area. This resulted in obtaining the basic strategic noise maps at a 1:25,000 scale. During this phase, data was also gathered in relation to sound environment quality, noise levels, acoustic zoning, limit values and acoustic quality objectives for the municipalities within the study area

During Phase B, the detailed studies were carried out, at a 1:5,000 scale, in order to calculate the noise levels on each of the façades of the buildings exposed to noise. These maps show, in greater detail, the information relating to the noise levels and the exposure to noise in areas with a high building density and a predominantly residential use, or in particularly noise-sensitive areas (schools and hospitals).

In addition to the general methodology, the basic noise level and noise contour calculation parameters were established. The calculation method used for all the studies has been the one provisionally adopted by Spain, the national French calculation method, *"NMPB-Routes-96 (SETRA-CERTU-LCPC-CSTB)".* Different computer models, which comply with the Directive's requirements, have been used for the studies.

A table with the basic calculation parameters is shown below:

Mapping	***Phase A***		***Phase B***
	1:25,000 (CNIG)*[1]		1:5,000
Calculation Method	*NMPB - Routes - 96*		
Temperature and Humidity	15º		70%
Meteorological Conditions*	***Day***	***Evening***	***Night***
	50%	75%	100%
Ground absorption	Dependant on the terrain type		
Order of Reflection	Buildings and obstacles: Order 2		

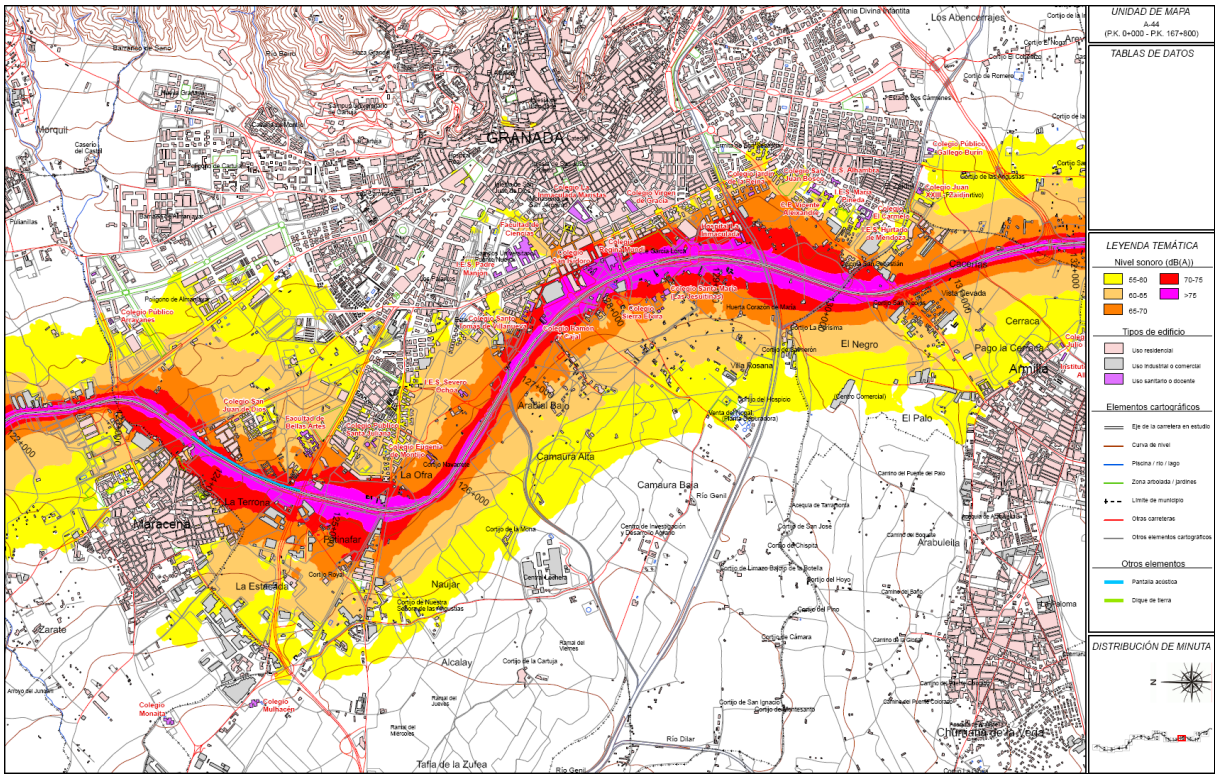
* Occurrence percentages under favourable dissemination conditions.
*[1] National Centre for Geographic Information.

In addition to the mapping demanded by the Directive, L_{den} and L_{night}, all the studies carried out have also included maps corresponding to the L_{day} and $L_{evening}$ indicators. For the L_{den}, L_{day} and $L_{evening}$ indicators, levels between 55 and 75 dB(A) or above have been analysed at 5dB(A) intervals. For the L_{night} indicator, 5dB(A) ranges were defined between 50 and 70 dB(A) or above.

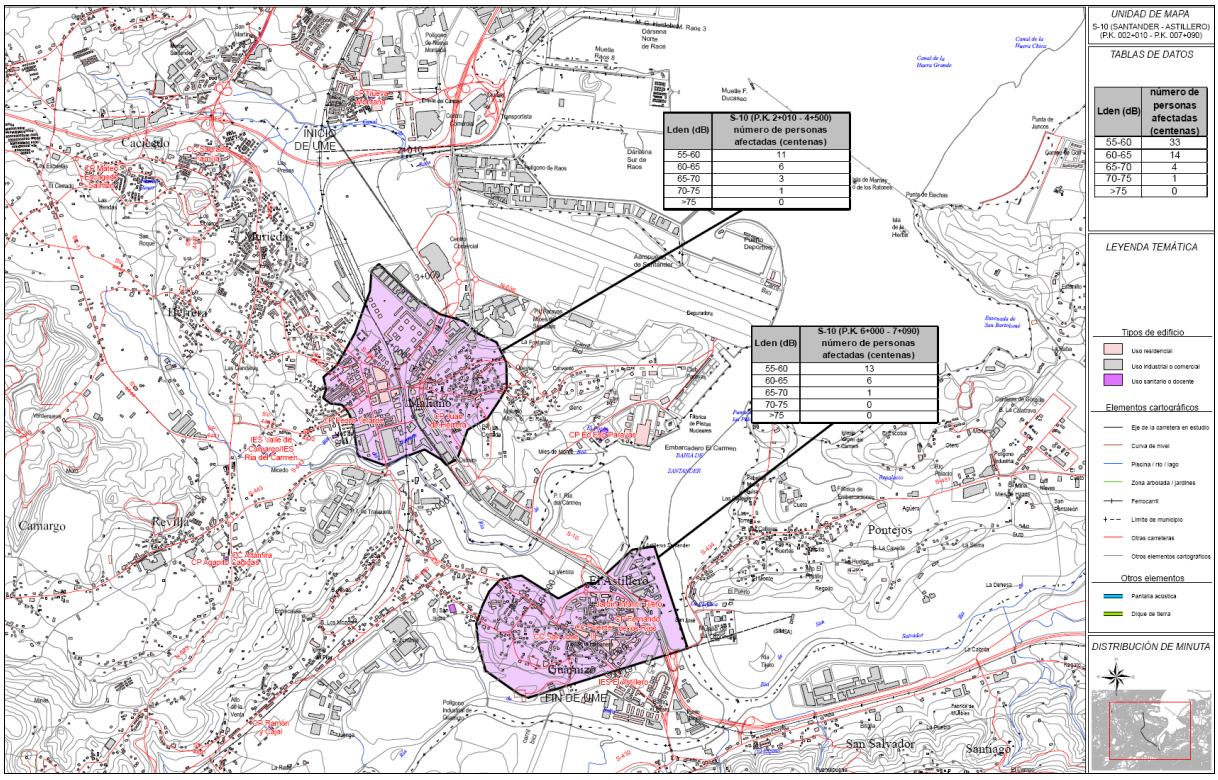
To guarantee appropriate work quality, a quality assurance plan has been developed. In this way, each of the work stages has undergone quality control.

An example of the map categories included in the studies is shown below:

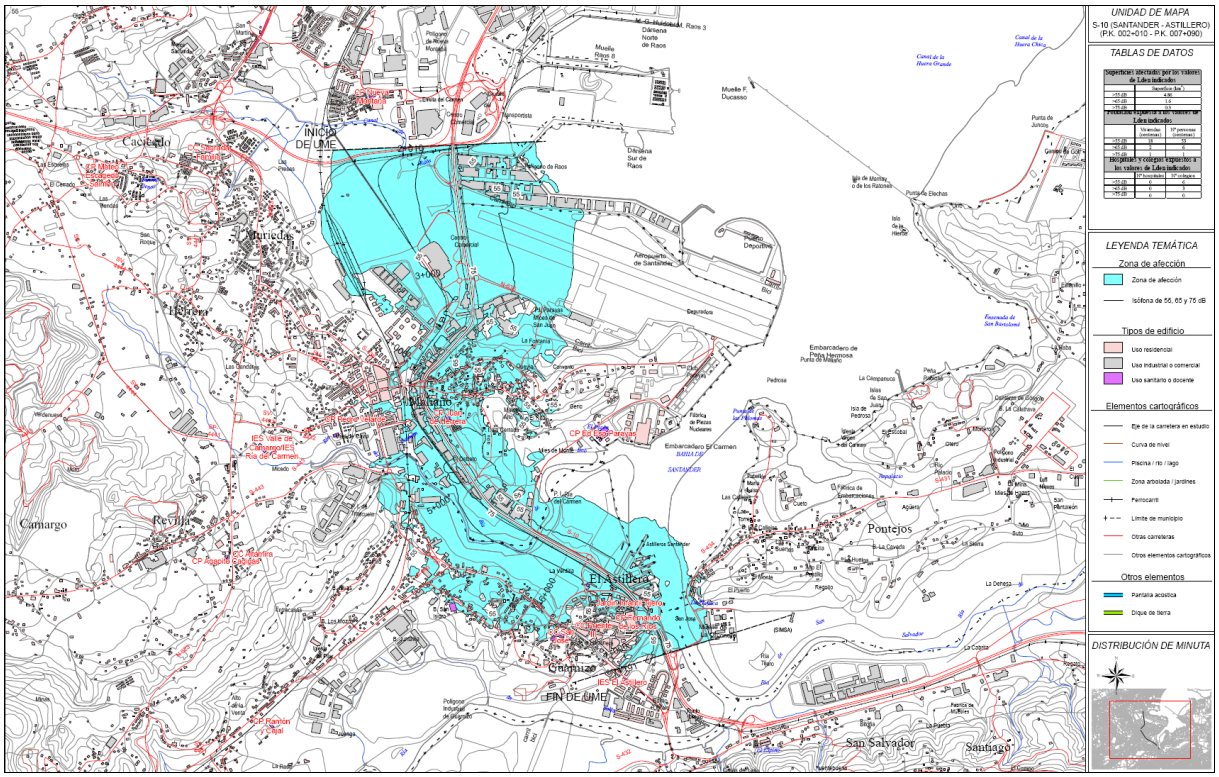
Basic sound level map (1/25,000)



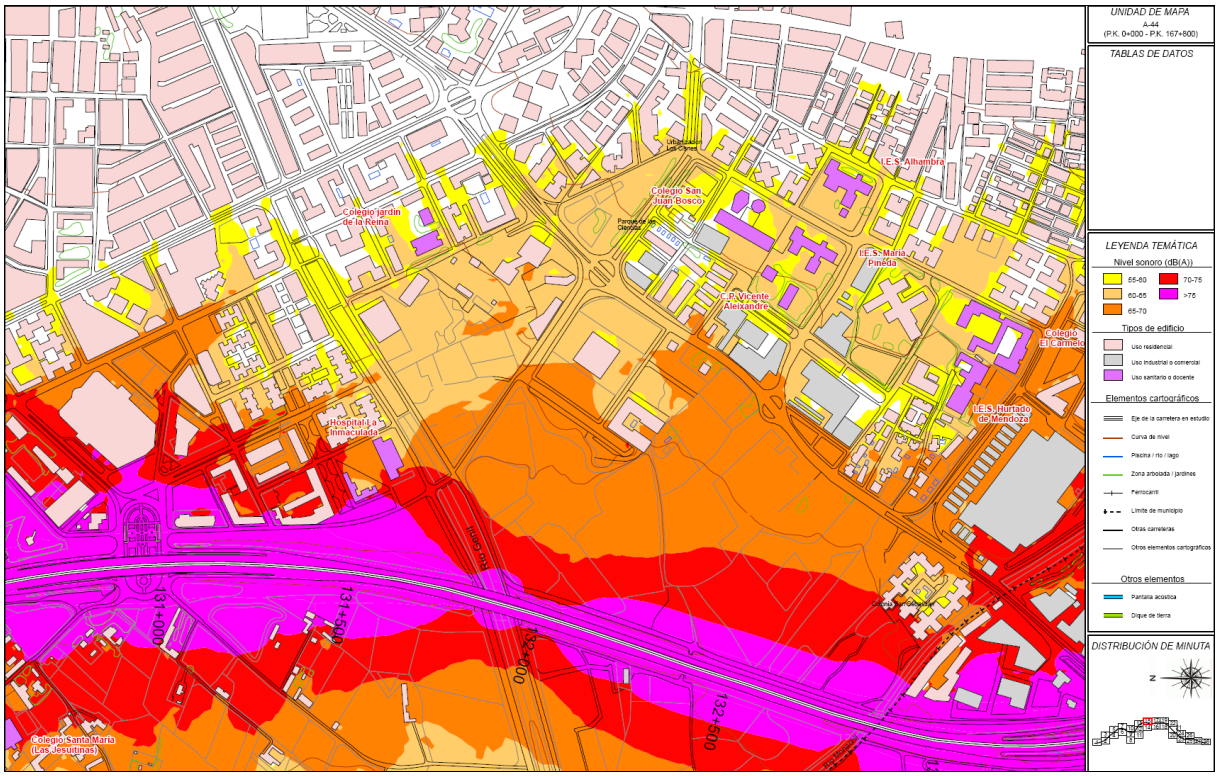
Basic exposure map (1/25,000)



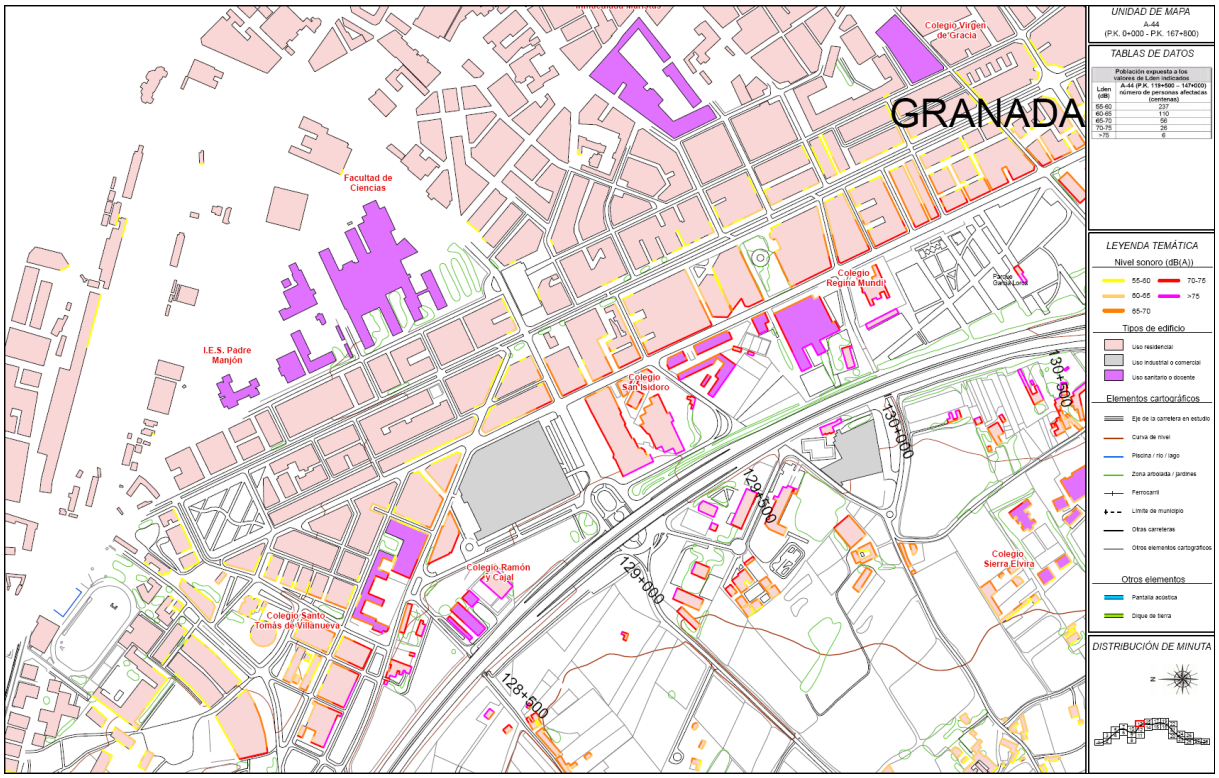
Affected area map (1/25,000)



Detailed sound level map (1/5,000)

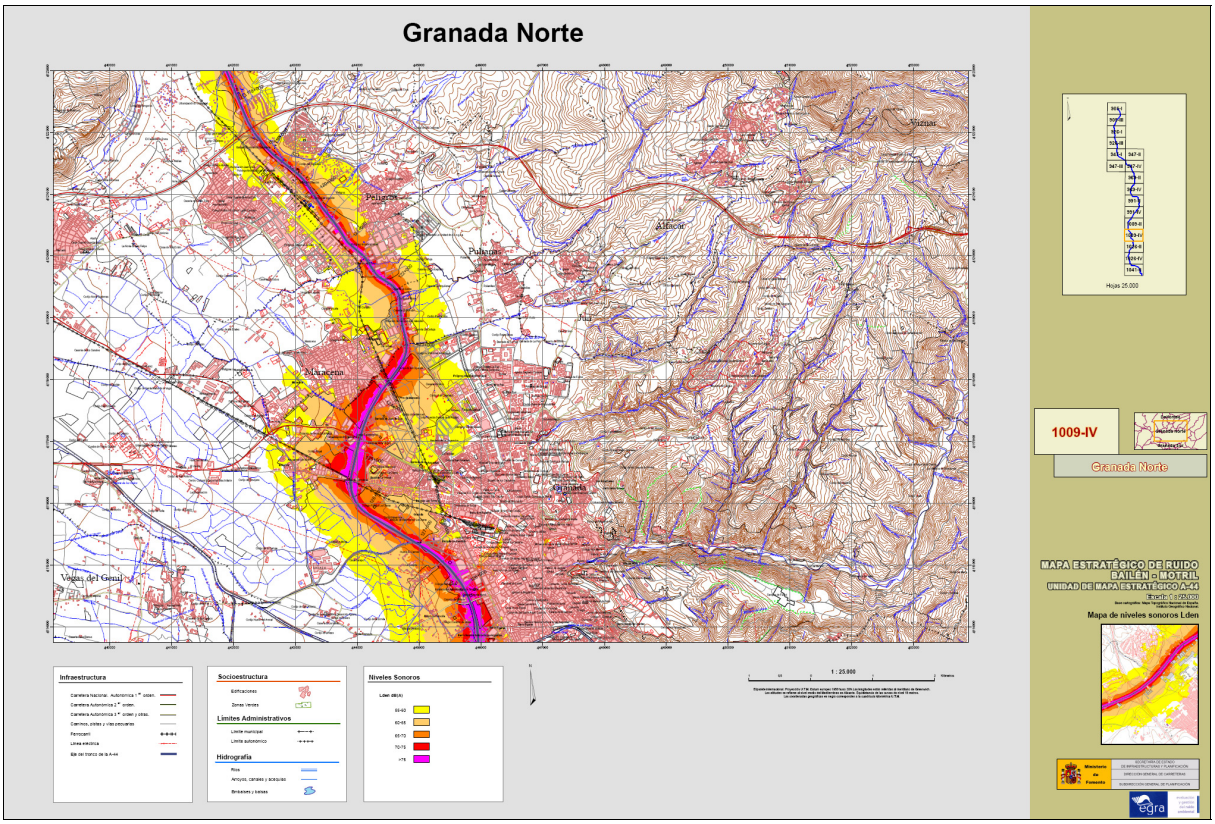


Detailed exposure map (1/5,000)

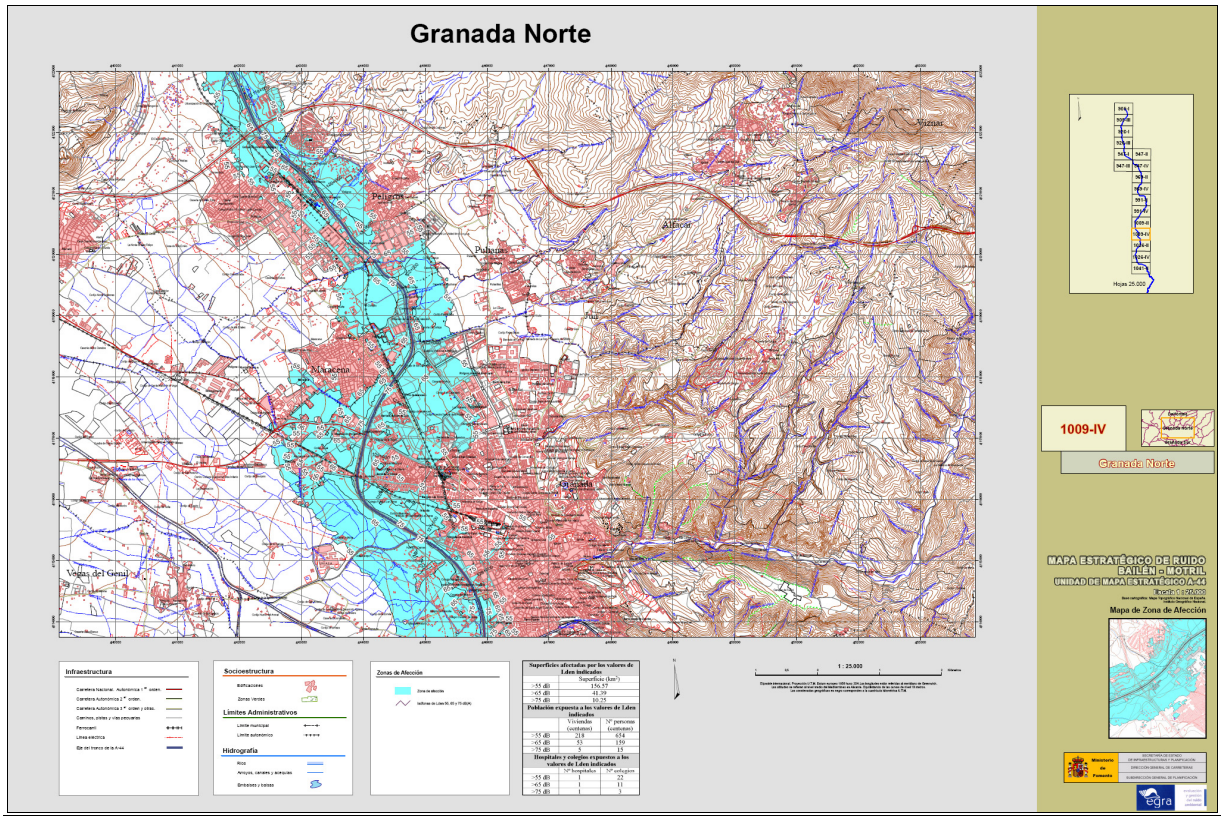


Also, to homogenise the information resulting from all the studies, and to facilitate its subsequent use for planning, environmental, and land zoning studies, L_{den} and L_{night} sound level maps and affected area maps, have been drawn up for all the SMUs, at a 1/25,000 scale, using the format and page distribution of the National Geographic Institute (IGN). The maps, in conjunction with the exposed population tables and the summary-document, contain all the information demanded by the European Commission.

Noise level map, IGN format (1/25,000)



Affected area map, IGN format (1/25,000)



The strategic maps for the 20 studies have been made publicly available and can be consulted at the following Internet address: http://www.cedex.es/egra.

The opening of the public information processes took place with the publication in the Official State Bulletin (BOE) of the relevant announcements, on the following dates: 24/07/2007, 8/01/2008, 30/04/2008 and 21/07/2008

During the periods when information was publicly available, a total of 7 appeals were presented, 6 by town or city councils, 1 by a private individual.

The town and city councils which made an appeal are the following:

- Madrid City Council
- Casabermeja Council, in Málaga
- Molina de Segura Council, in Murcia
- Corvera Council, in Asturias
- L´Alcudia Council, in Valencia
- Quart de Poblet Council, in Valencia

The appeals were considered within the relevant dossiers.

3. Information communicated to the Ministry of the Environment and the European Commission

In order to comply with the 2002/49/EC Directive, the member states of the European Union sent the relevant reports regarding the status of environmental noise to the European Commission, in accordance with the requirements within appendix VI of the aforementioned Directive. The General Road Directorate submitted a copy of all the studies to the Ministry of the Environment, which is the body in charge of gathering all the information to be forwarded to the European Commission.

The European Commission's reporting mechanism for the Member States has consisted of the completion of a questionnaire; the structure and content of which leads to compliance with the requirements stipulated in Appendix VI of the Directive.

The questionnaire established a set of minimum requirements. These are detailed below:

- Index page: this is the index of the document; it allows the reader to navigate the content.
- General description: includes the name of the road, its code and the main features of the SMU, such as its length and traffic levels.
- Road characterisation: the description of the immediate environment of the mapped roads.
- Total number of people exposed for the L_{den} indicator: shows the total estimate of people exposed to the 55-59, 60-64, 65-69, 70-74 and >75 dB(A) ranges, at a height four metres above ground level and on the most exposed façade.
- Total number of people exposed for the L_{night} indicator: gives information about the total estimate of people exposed to the 50-54, 55-59, 60-64, 65-69 and >70 dB(A) ranges, at a height four metres above ground level and on the most exposed façade.
- Total area, dwellings and population exposed to the L_{den} indicator: it provides the total surface in Km^2 subjected to L_{den} values above 55, 65 and 75 dB(A). For each of the stated areas, data regarding the total estimated number of dwellings and people (in hundreds) is included.

- Total number of people exposed to the L_{day} and $L_{evening}$ indicators: shows the total number of estimated people exposed to the 55-59, 60-64, 65-69, 70-74 and >75 dB(A) ranges, at a height four metres above ground level and on the most exposed façade.

The information supplied about the estimated number of people, for the four indicators considered, distinguishes between population within or outside the agglomeration.

All the information provided to the European Commission appears in Appendix I: Data provided to the European Commission, which has been included in the CD attached to this document.

This information can also be consulted on the www.cedex.es/egra website.

4. Results analysis

The studies undertaken provided detailed information per road and road section. The information received still needs to be integrated in order to obtain a wider vision of all the results considered in conjunction.

To achieve this objective, it has been necessary to organise and structure the information obtained, integrating firstly the studies developed within the scope of each General Road Directorate Demarcation, in order to later carry out a national evaluation.

This section focuses on presenting these results. More detailed information in relation to each of the Demarcations can be found in Appendix II (attached CD), which includes detailed data for each road included in the strategic mapping.

4.1. Results by Road Demarcations

To summarise the information, three data records have been created for each Demarcation. Their content is described below:

- ***Descriptive record for the road sections studied***

Firstly, a summary is included which shows the location and description of all the SMUs (Strategic Map Units) studied within the Road Demarcation.

The analysed SMUs are identified by the study in which they are included, the name of the road they represent, the number of sections considered and the length of the mapped road.

- ***Compilation of the exposure level data***

This section shows the global noise exposure values, by Demarcation. In a similar way to the national analysis, this section includes data for all the indicators considered in the 2002/49/EC Directive.

The data relating to L_{den}, L_{day} and $L_{evening}$ and L_{night} are detailed in 5 dB(A) intervals, with ranges from 55 to over 75 dB(A) for the first three, and from 50 to over 70 dB(A) for the last one.

- ***Compilation of the variables included in the affected area maps***

This third section shows the data included in the affected area maps. It gathers the data relating to noise contours with L_{den} above 55, 65 and 75 dB(A).

To complete the information relating to the exposure maps, a table gathers the total number (in units) of hospitals and schools included in the 55 dB(A) contour for the L_{den} indicator which delimits the study area. It is again worth warning that the data has been dealt with in hundreds, in accordance with the European Commission requirements. Slight imbalances might therefore occur due to rounding up.

The results obtained for each of the Road Demarcations are shown below:

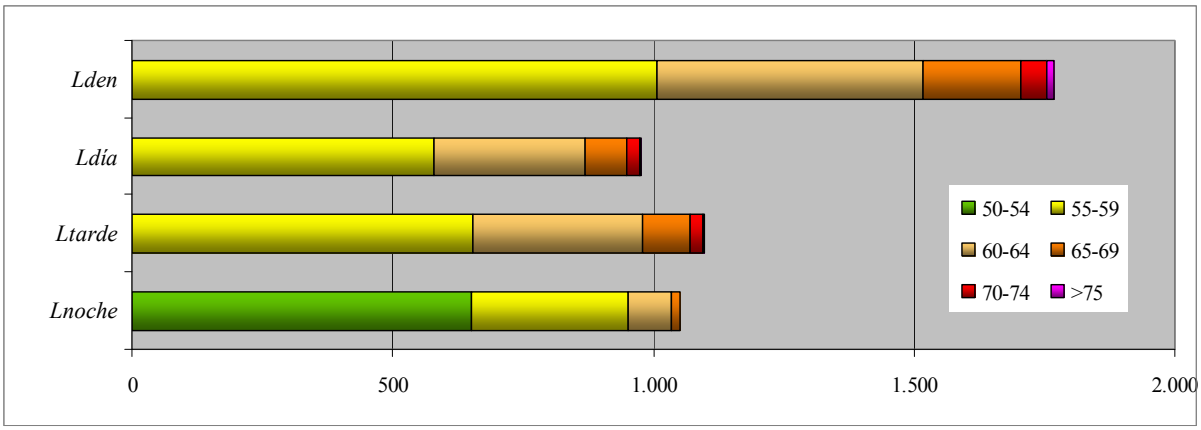
STATE-OWNED ROAD DEMARCATION IN WESTERN ANDALUCÍA

Study	SMU	No. of sections	Length (km)	Study	SMU	No. of sections	Length (km)
Western Andalucía (Sevilla-Huelva-Cádiz)	A-4	2	40.8	Western Andalucía (Sevilla-Huelva-Cádiz)	N-443	1	6.9
	A-48	1	26.1		N-630	1	1.6
	A-49	1	77.4		N-630a	1	1.9
	A-66	1	11.5		N-IV	3	25.8
	A-7	1	31.3		SE-020	1	9.9
	CA-33	1	12.9		SE-30	1	29.1
	CA-34	1	4.1	Autovía del Sur Jaén-Sevilla	A-4	1	273.0
	H-30	1	7.6		CO-31	1	2.9
	H-31	1	6.8		N-4a	1	15.3
	N-350	1	1.3				

NOTE: The *"Autovía del Sur, A-4: Jaén-Sevilla"* has been included in the Road Demarcation for the State of Western Andalucía, however, part of the SMU A-4 is in Jaén (Road Demarcation for the State of Eastern Andalucía).

WESTERN ANDALUCÍA. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	1,006	511	187	51	13
L_{day}	578	291	79	26	3
$L_{evening}$	653	325	92	24	3

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	652	299	83	18	0

Population distribution per road

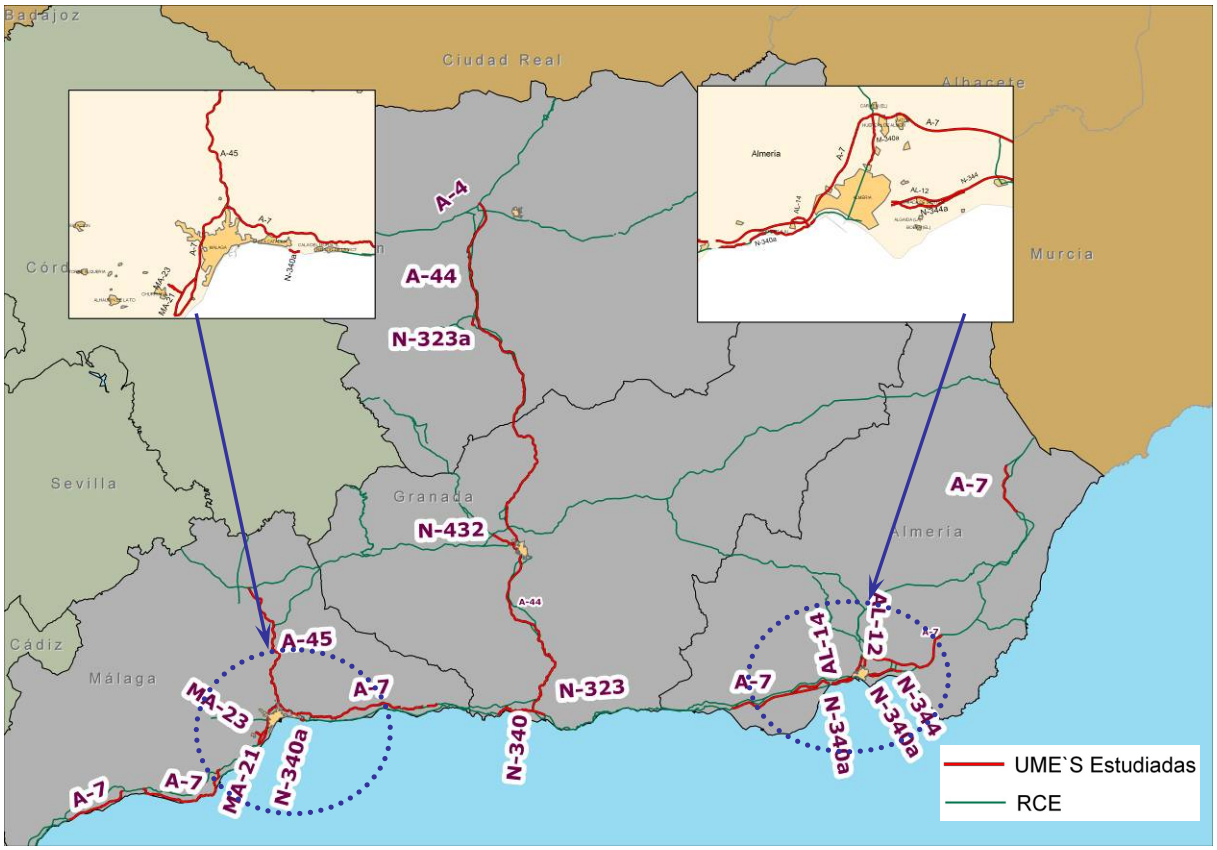
Road	Length studied	Population * L_{den}>55 dB(A)	No. inhab. exposed per km	Road	Length studied	Population * L_{den}>55 dB(A)	No. inhab. exposed per km
A-4	313.8	468	149	H-31	6.8	0	0
A-48	26.1	10	38	N-350	1.3	19	1,450
A-49	77.4	242	313	N-443	6.9	11	160
A-66	11.5	8	70	N-4a	15.3	11	72
A-7	31.3	125	400	N-630a	1.6	0	0
CA-33	12.9	115	889	N-630a	1.9	34	1,828
CA-34	4.1	10	243	N-IV	25.8	99	383
CO-31	2.9	15	517	SE-020	9.9	30	303
H-30	7.6	26	343	SE-30	29.1	545	1,872

NOTE*: L_{den}>55dB(A) population in hundreds.

WESTERN ANDALUCÍA. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	617.69	739	9	141
>65	159.24	105	3	33
>75	38.03	6	1	5

STATE-OWNED ROAD DEMARCATION IN EASTERN ANDALUCÍA

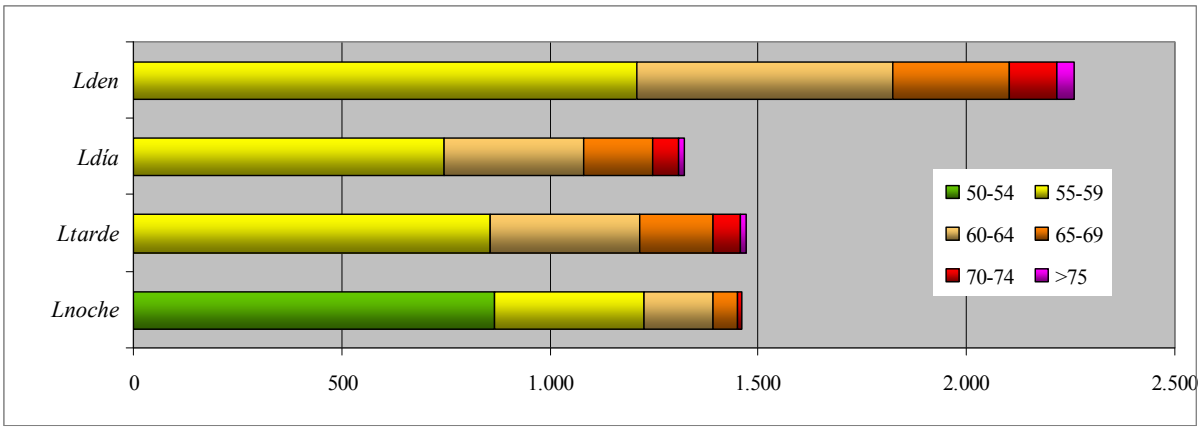


Study	SMU	No. of sections	Length (km)	Study	SMU	No. of sections	Length (km)
Eastern Andalusia (Málaga-Granada-Almería)	A-45	1	44.3	Eastern Andalusia (Málaga-Granada-Almería)	N-340a	4	20.5
	A-7	5	211.0		N-344	1	5.7
					N-344a	1	5.5
	AL-12	1	5.2	Sierra Nevada Motorway (A-44) and N-323: Bailén-Motril	A-44	1	167.8
	AL-14	1	1.7		N-323	1	29.7
	MA-21	1	5.0		N-432	1	6.8
	MA-23	1	27		N-323a	1	2.3
	N-340	1	18.0				

NOTE: In the study *"Autovía del Sur, A-4: Jaén-Sevilla"* there is a stretch belonging to the Eastern Andalucía Demarcation which has been included in the Western Andalucía Demarcation because most of the SMU is within that geographical area and because of the impossibility of dividing an SMU.

EASTERN ANDALUCÍA. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	1,207	617	279	115	41
L_{day}	747	333	165	62	17
$L_{evening}$	857	357	176	68	13

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	867	360	164	59	9

Population distribution per road

Road	Length studied	Population * L_{den}>55 dB(A)	No. inhab. exposed by km
A-44	167.8	655	390
A-45	44.25	40	90
A-7	211.02	1,368	648
AL-12	5.15	8	155
AL-14	1.65	-	-
MA-21	5	9	180
MA-23	2.7	-	-

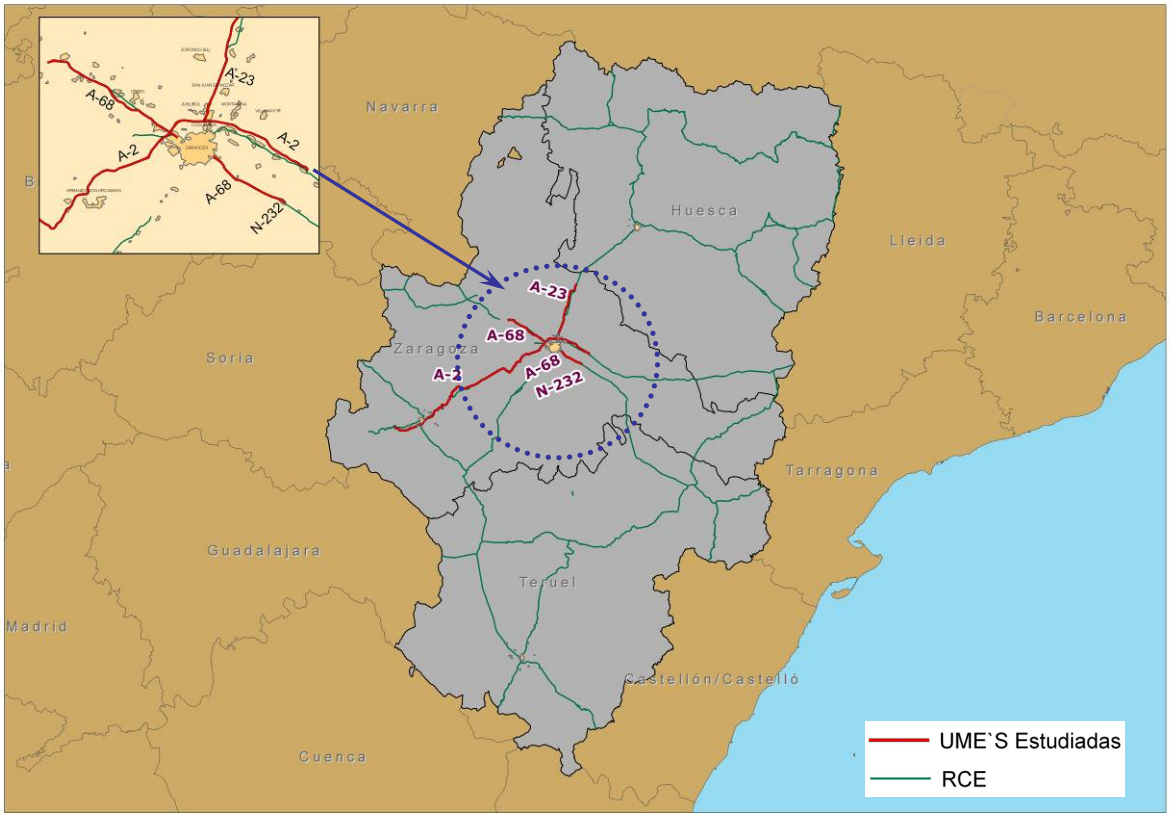
Road	Length studied	Population * L_{den}>55 dB(A)	No. inhab. exposed by km
N-323	29.65	5	17
N-323a	2.29	10	437
N-340	17.99	29	161
N-340a	25.97	85	327
N-344	5.65	14	248
N-432	6.8	36	529
N-344a	5.5	24	436

NOTE *: L_{den}>55dB(A) population in hundreds.

EASTERN ANDALUCÍA . AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	454.94	1,085	19	192
>65	123.74	236	11	63
>75	30.27	27	3	8

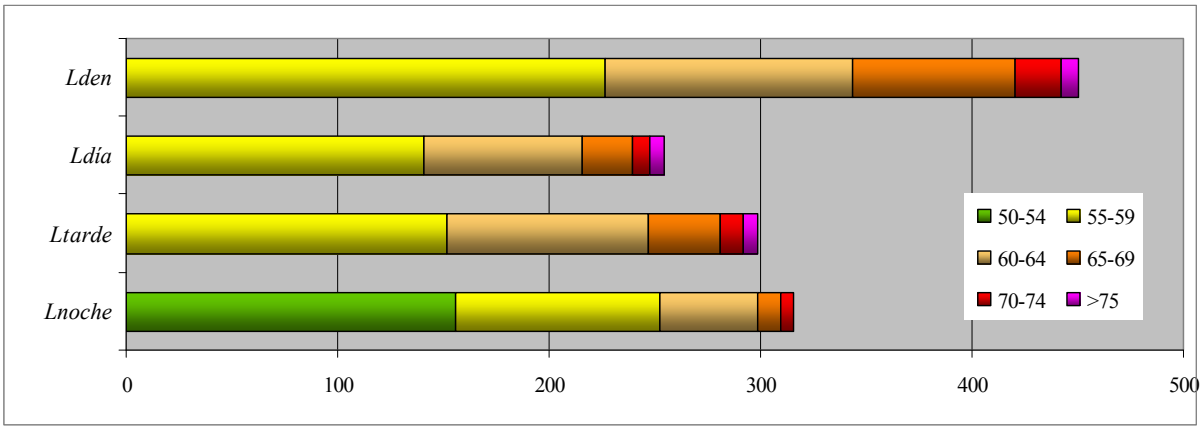
STATE-OWNED ROAD DEMARCATION IN ARAGÓN



Study	SMU	No. of sections	Length (km)
Aragón	A-2	1	121.60
	A-23	1	29.00
	A-68	2	33.64
	N-232	1	2.3

ARAGÓN. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	226	118	77	22	8
L_{day}	141	75	24	8	7
$L_{evening}$	151	95	34	11	7

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	156	97	46	10	6

Population distribution per road

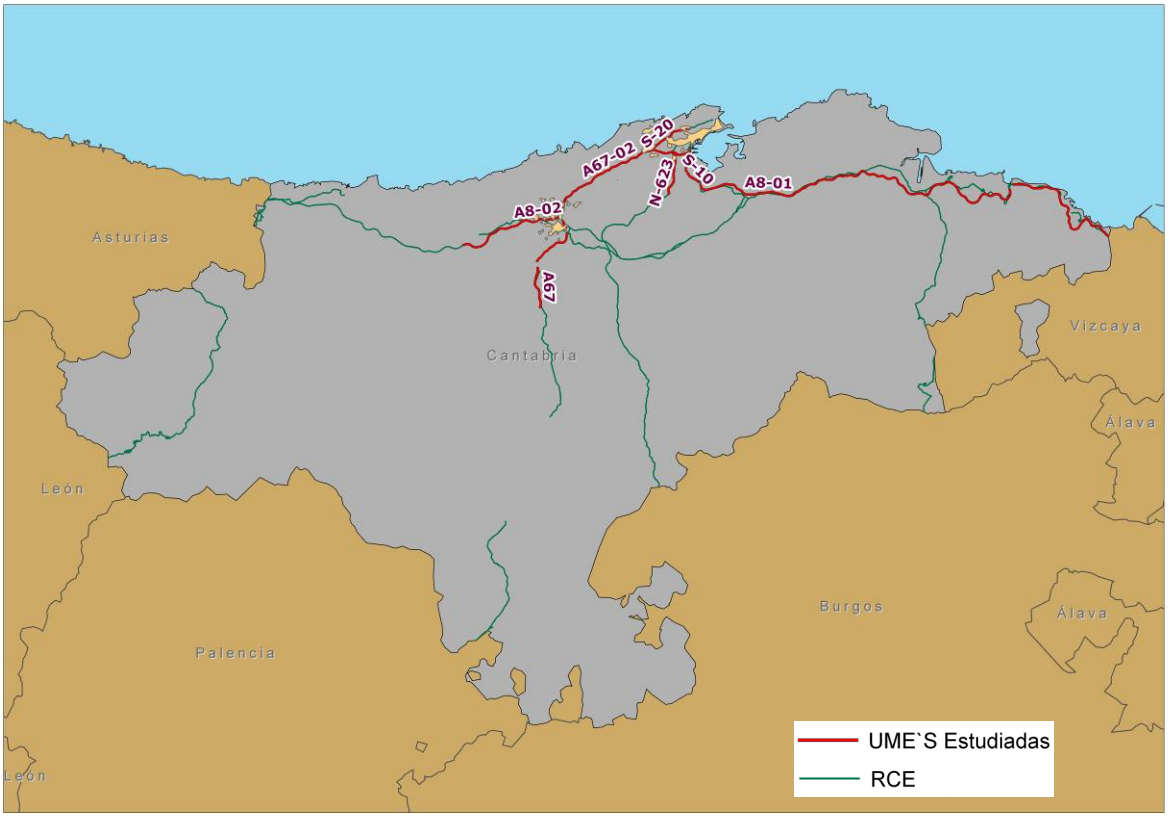
Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
A-2	121.60	288.63	237
A-23	29.00	15.2	52
A-68	33.64	140.16	417
N-232	2.30	6.37	277

NOTE*: L_{den}>55dB(A) population in hundreds.

ARAGÓN. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	245.00	377	4	38
>65	65.00	68	2	17
>75	17.00	6	-	5

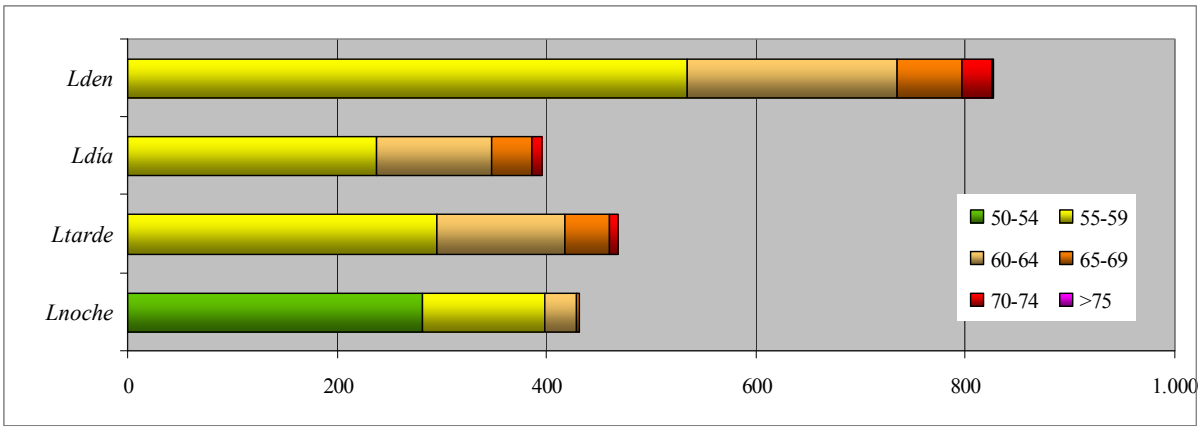
STATE-OWNED ROAD DEMARCATION IN CANTABRIA



Study	SMU	No. of sections	Length (km)
Autonomous Region of Cantabria	A-67	2	34.29
	A-8	2	83.73
	N-623	1	6.78
	S-10	1	5.08
	S-20	1	5.15

CANTABRIA. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	535	200	62	28	2
L_{day}	237	110	39	9	0
$L_{evening}$	296	122	42	8	0

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	281	118	29	4	0

Population distribution per road

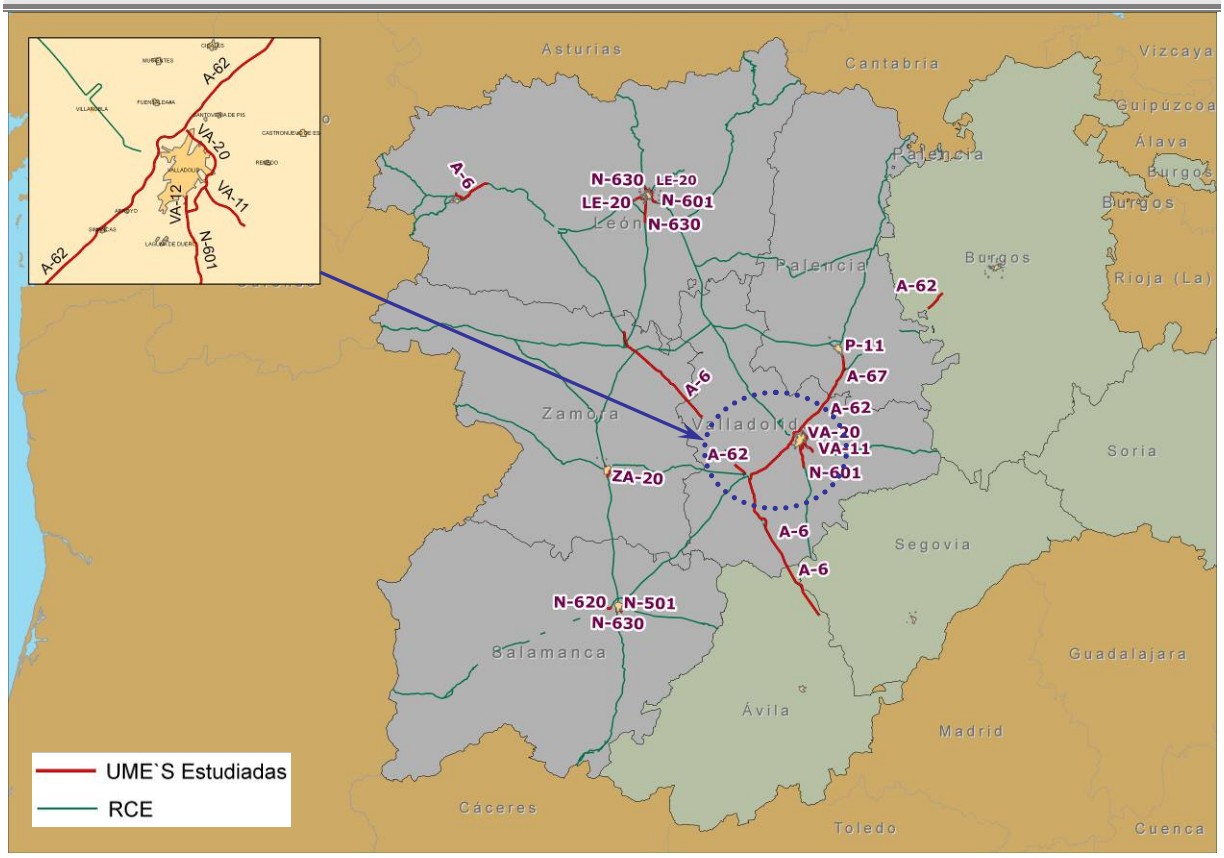
Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
A-67	34.29	296	863
A-8	83.73	229	273
N-623	6.78	32	472
S-10	5.08	144	2,835
S-20	5.15	126	2,447

NOTE*: L_{den}>55dB(A) population in hundreds.

CANTABRIA. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	92.77	246	2	42
>65	21.61	32	-	10
>75	5.74	3	-	-

STATE-OWNED ROAD DEMARCATION IN WESTERN CASTILLA Y LEÓN

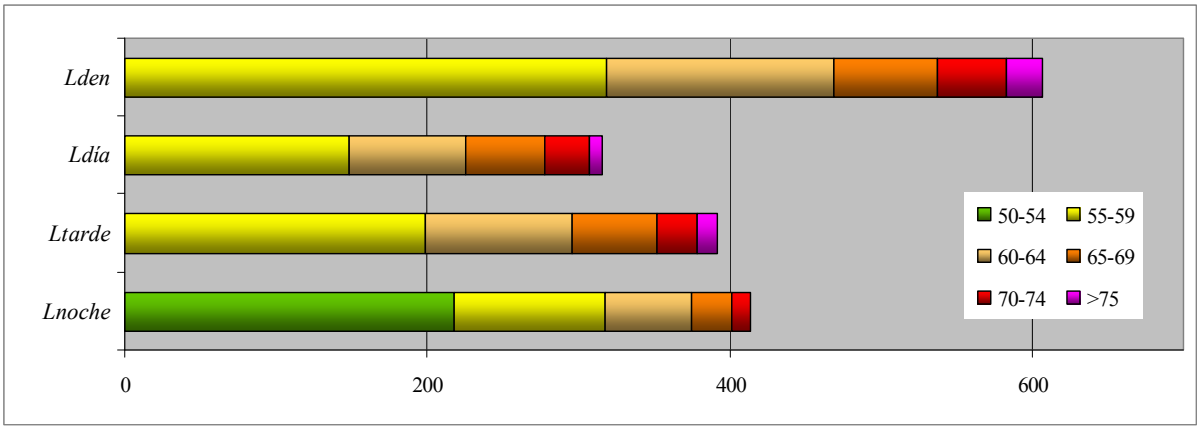


Study	SMU	No. of sections	Length (km)
Castilla y León	A-6	4	147.26
	A-62	4	88.5
	A-67	1	4.01
	LE-20	2	12.85
	N-501	1	3.9
	N-601	2	11.22
	N-620	1	1.79
	N-630	3	16.4
	P-11	1	2.8
	VA-11	1	12.03
	VA-12	1	2.06
	VA-20	1	11.3
	ZA-20	1	5.9

NOTE: The study *"Roads in Castilla y León"* does not consider the division by demarcations. To adapt the information to the geographical area of the study, the original study has been divided into the two Demarcations which make up this region. As a result, part of the A-6 and A-62 SMUs belonging to Castilla y León oriental have been included in the western part, to give continuity to the study.

WESTERN CASTILLA Y LEÓN. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	319	150	68	46	24
L_{day}	148	77	53	29	9
$L_{evening}$	199	97	56	27	13

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	218	100	57	26	13

Population distribution per road

Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
A-6	147.26	76	52
A-62	88.50	87	98
A-67	4.01	12	299
LE-20	12.85	108	840
N-501	3.90	32	821
N-601	11.22	53	472
N-620	1.79	4	223

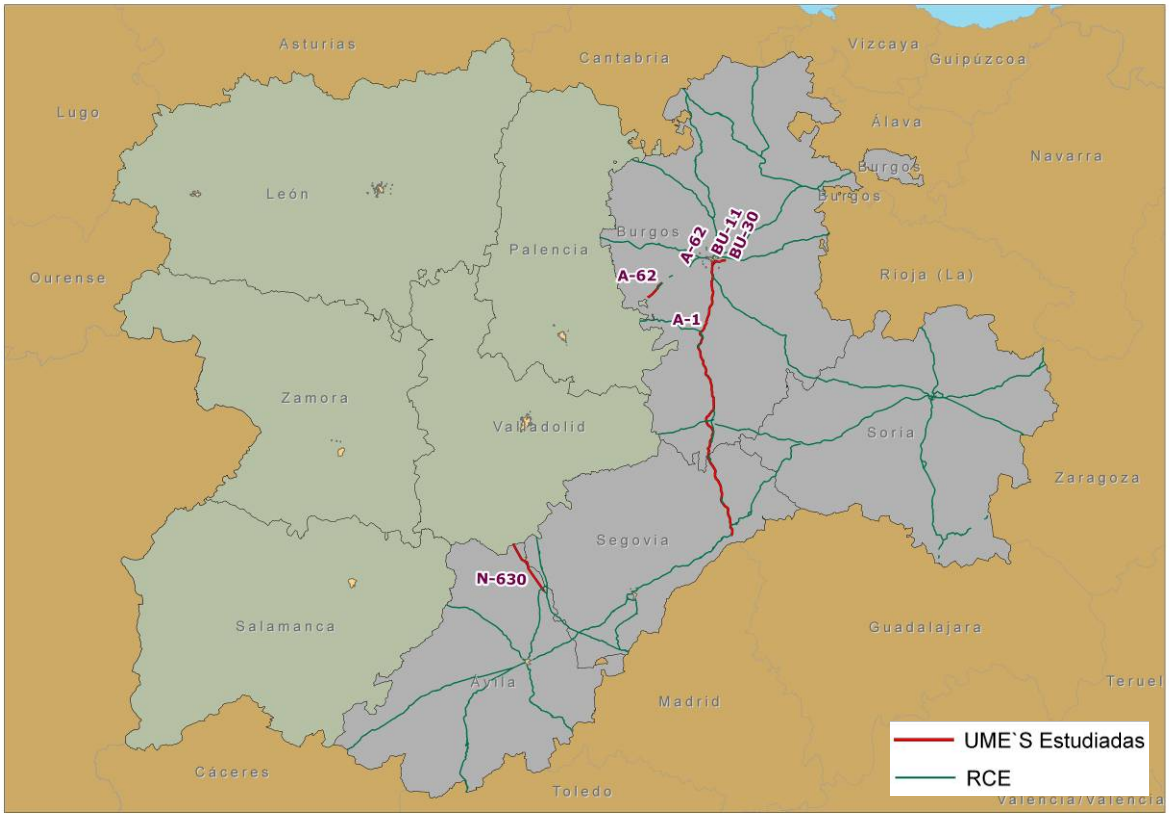
Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
N-630	16.40	98	598
P-11	2.80	5	174
VA-11	12.03	5	44
VA-12	2.06	1	48
VA-20	11.30	55	484
ZA-20	5.90	63	1,061

NOTE*: L_{den}>55dB(A) population in hundreds.

WESTERN CASTILLA Y LEÓN. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	337.97	191	19	96
>65	83.52	44	4	18
>75	21.09	10	0	4

STATE-OWNED ROAD DEMARCATION IN EASTERN CASTILLA Y LEÓN

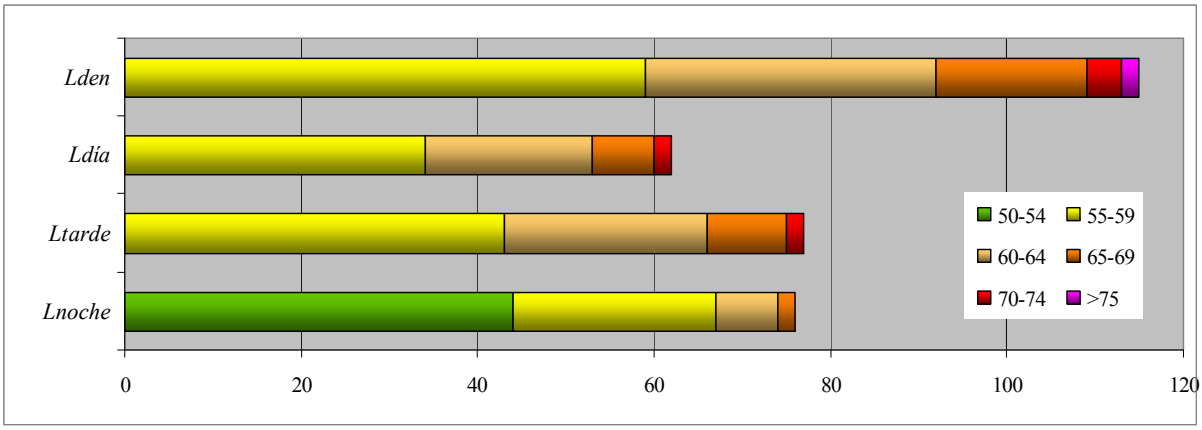


Study	SMU	No. of sections	Length (km)
Castilla and León	A-1	1	137.41
	BU-11	1	3.55
	BU-30	1	7.9

NOTE: The study *"Castilla and León Roads"* does not consider the division by Demarcations. To adapt the information to the geographical area of the study, the original study has been divided into the two Demarcations which make up this region. As a result, part of the A-6 and A-62 SMUs, initially belonging to Eastern Castilla and León, has been included in the western part.

EASTERN CASTILLA Y LEÓN. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	59	33	17	4	2
L_{day}	34	19	7	2	0
$L_{evening}$	43	23	9	2	0

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	44	23	7	2	0

Population distribution per road

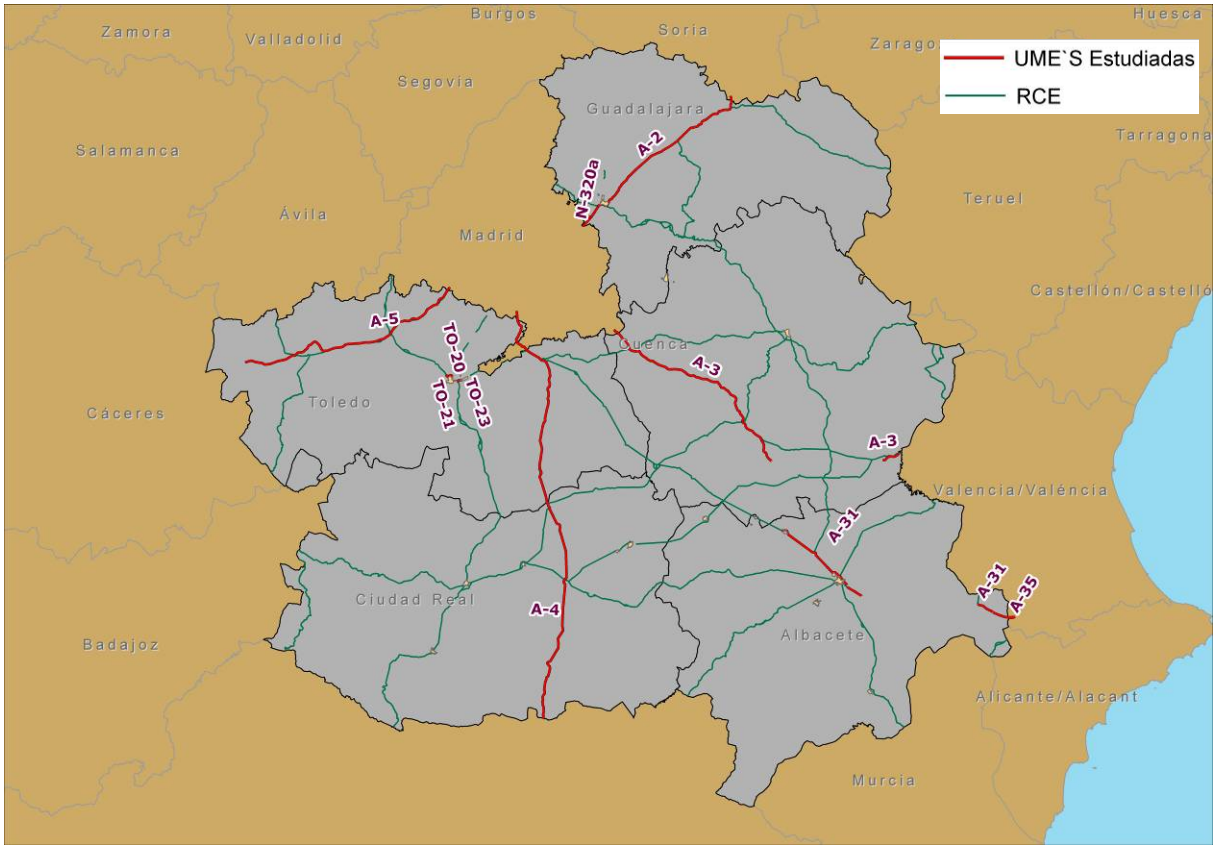
Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
A-1	137.41	54	39
BU-11	3.55	52	1,465
BU-30	7.90	9	114

NOTE*: L_{den}>55dB(A) population in hundreds.

EASTERN CASTILLA Y LEÓN. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	454.94	1,085	2	5
>65	123.74	236	1	0
>75	30.27	27	0	0

STATE-OWNED ROAD DEMARCATION IN CASTILLA-LA MANCHA



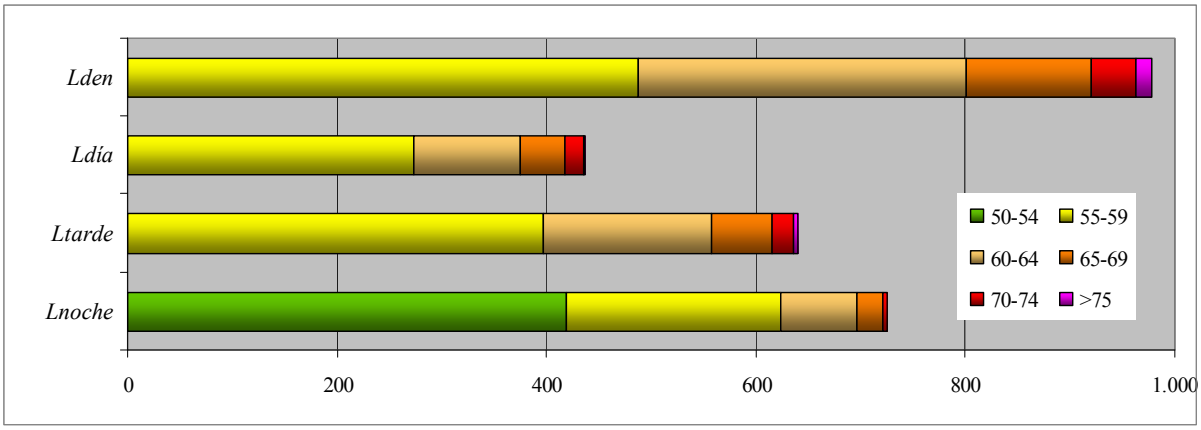
Study	SMU	No. of sections	Length (km)
Autonomous region of Castilla - La Mancha. A-2 and A-3 Corridors	A-2	1	101.70
	A-3	2	118.82
	A-31	2	59.83
	A-35	1	11.40
	N-320a	1	2.11
Autonomous region of Castilla - La Mancha - Extremadura. A-4 and A-5 Corridors	A-4	1	215.37
	A-5	1	113
	TO-20	1	2.8
	TO-21	1	2
	TO-23	1	5.35

NOTE: The study *"Castilla - La Mancha – Extremadura: A-4 and A-5 Corridors"* includes SMUs in the Autonomous Regions of Castilla La Mancha and Extremadura. The SMU sectioning carried out allows the corresponding results to be separated for each of them, only including in this case the results relevant to Castilla La Mancha.

Similarly, the "*A-42 Motorway. Stretch: Madrid M-40 – Toledo*" study, only analyses one SMU which stretches across the communities of Madrid and Castilla La Mancha (Toledo). Its results have been fully included within the Community of Madrid.

CASTILLA-LA MANCHA. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	487	313	120	43	15
L_{day}	273	102	43	17	3
$L_{evening}$	397	161	58	21	4

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	419	205	73	26	4

Population distribution per road

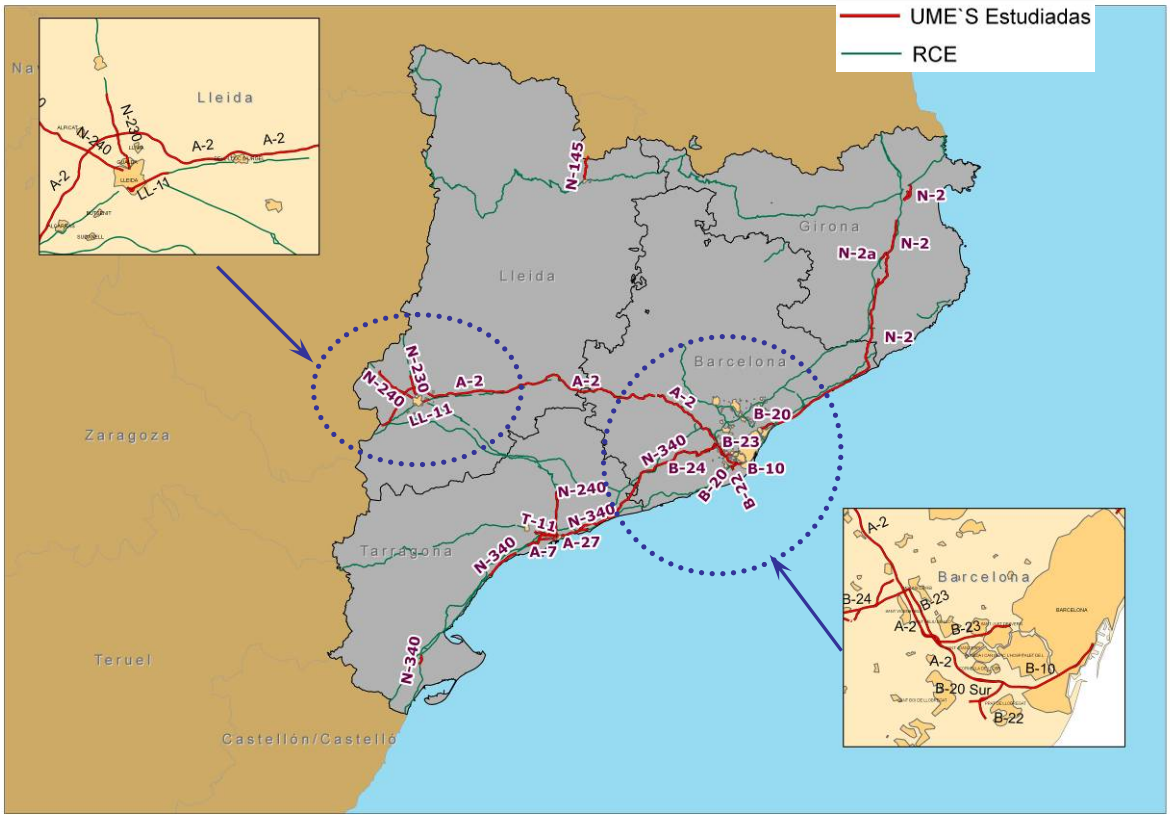
Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
A-2	101.70	345	339
A-3	118.82	52	44
A-31	59.83	199	333
A-35	11.40	4	35
A-4	215.37	256	119
A-5	113.00	53	47
N-320a	2.11	9	427
TO-20	2.80	28	1000
TO-21	2.00	6	300
TO-23	5.35	25	467

NOTE*: L_{den}>55dB(A) population in hundreds.

CASTILLA-LA MANCHA. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	860.74	404	3	88
>65	244.07	70	-	20
>75	57.48	6	-	-

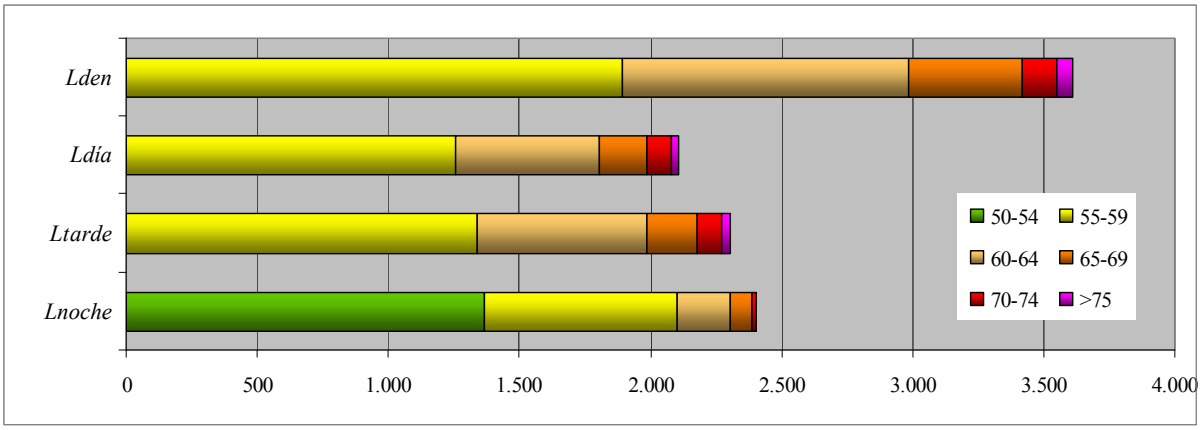
STATE-OWNED ROAD DEMARCATION IN CATALUÑA



Study	SMU	No. of sections	Length (km)	Study	SMU	No. of sections	Length (km)
Metropolitana Area of Tarragona	A-27	1	2.00	Barcelona, Girona and Tarragona Provinces	N-240	1	17.34
	A-7	1	17.00		A-2	1	80.49
	N-240	1	16.30		B-10	1	6.33
	N-340	1	8.00		B-20	2	10.82
	N-340a	1	6.10		B-22	1	2.12
	T-11	1	7.70		B-23	1	10.10
	A-2	1	86.00		B-24	1	6.68
Lleida Province	LL-11	1	3.00		N-2	2	115.48
	N-145	1	9.13		N-2a	3	12.14
	N-230	1	8.01		N-340	3	90.23

CATALUÑA. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	1,894	1,088	436	131	60
L_{day}	1,258	548	179	95	26
$L_{evening}$	1,340	648	192	92	31

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	1,364	739	203	79	16

Population distribution per road

Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
A-2	166.49	1,351	811
A-27	2.00	4	200
A-7	17.00	10	59
B-10	6.33	109	1,716
B-20	10.82	332	3,070
B-22	2.12	4	195
B-23	10.10	790	7,822
B-24	6.68	53	799
LL-11	3.00	49	1,633

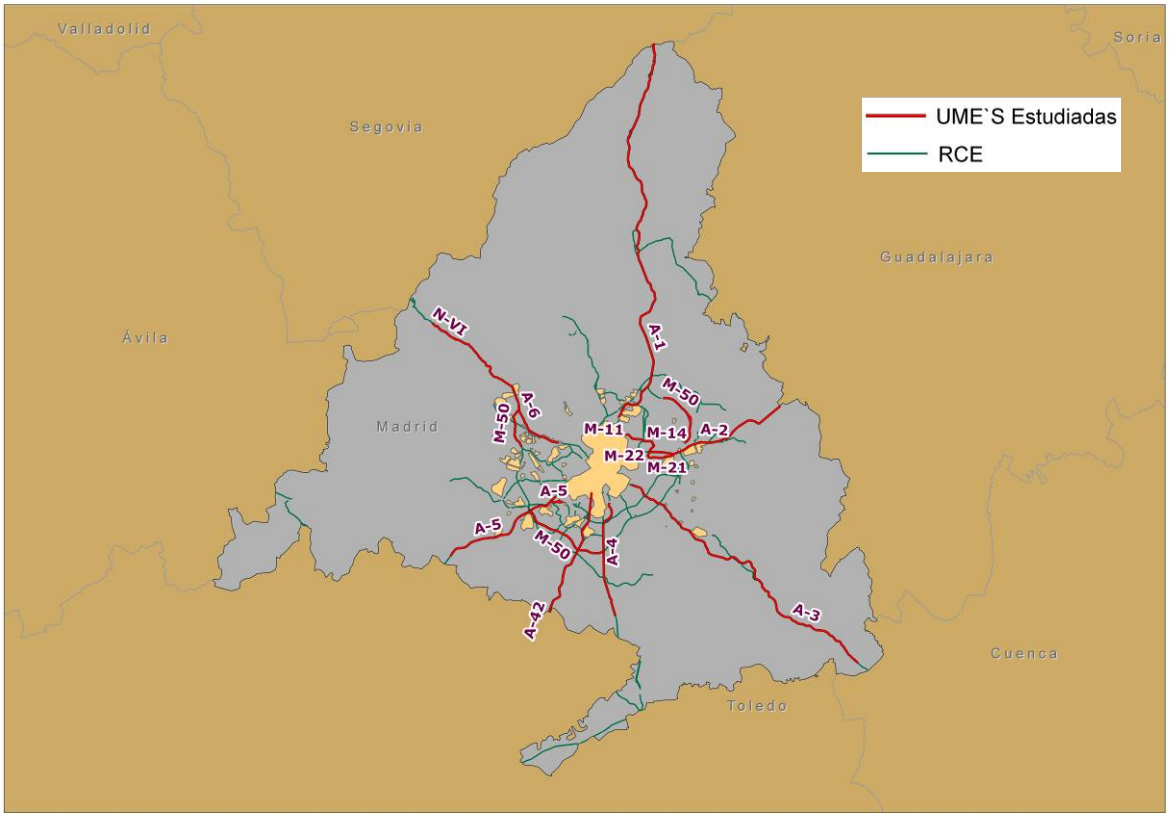
Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
N-145	9.13	4	44
N-2	115.48	437	378
N-230	8.01	46	574
N-240	33.64	58	172
N-2a	12.14	20	167
N-340	94.28	232	236
N-340a	6.10	65	1,066
T-11	7.70	45	584

NOTE*: L_{den}>55dB(A) population in hundreds.

CATALUÑA. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	524.33	1,792	27	220
>65	145.97	335	11	65
>75	30.50	35	2	7

STATE-OWNED ROAD DEMARCATION IN MADRID

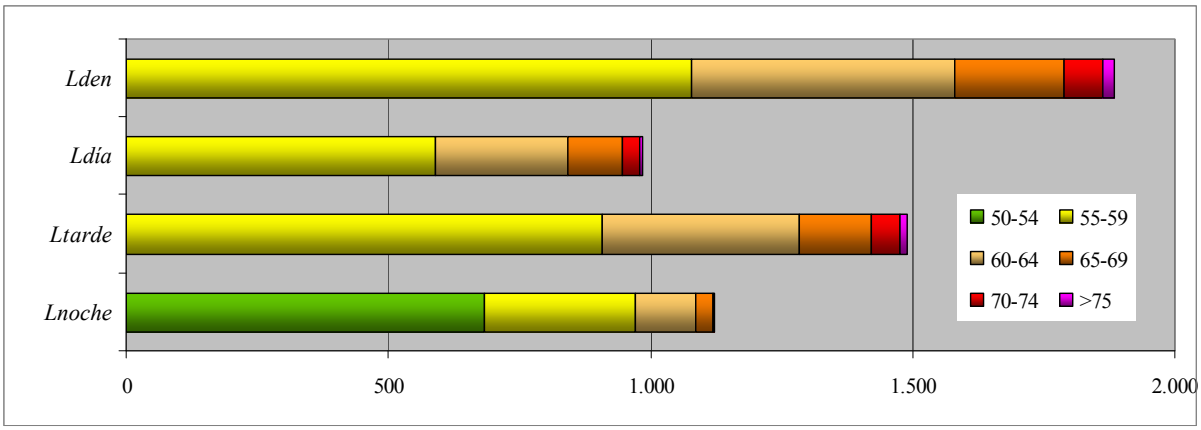


Study	SMU	No. of sections	Length (km)	Study	SMU	No. of sections	Length (km)
A-42 Motorway Stretch: Madrid M-40 – Toledo	A-42	1	71.82	Community of Madrid	A-6	1	30.50
Community of Madrid	A-1	1	86.65		M-11	1	6.55
	A-2	1	28.15		M-14	1	1.60
	A-3	1	61.40		M-21	1	5.20
	A-4	1	22.90		M-22	1	1.15
	A-5	1	24.40		M-50	3	37.40
	A-5/1	1	2.60		N-6	1	6.35

NOTE: The *"A-2 Motorway. Stretch: Madrid M-40 – Toledo"* study has a single SMU which stretches across the communities of Madrid and Castilla La Mancha. Since the published data should ideally be kept together, the results for the Toledo province have been considered within the Community of Madrid.

MADRID. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	1.078	501	209	75	23
L_{day}	589	254	103	34	6
$L_{evening}$	908	377	136	54	16

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	682	289	115	33	4

Population distribution per road

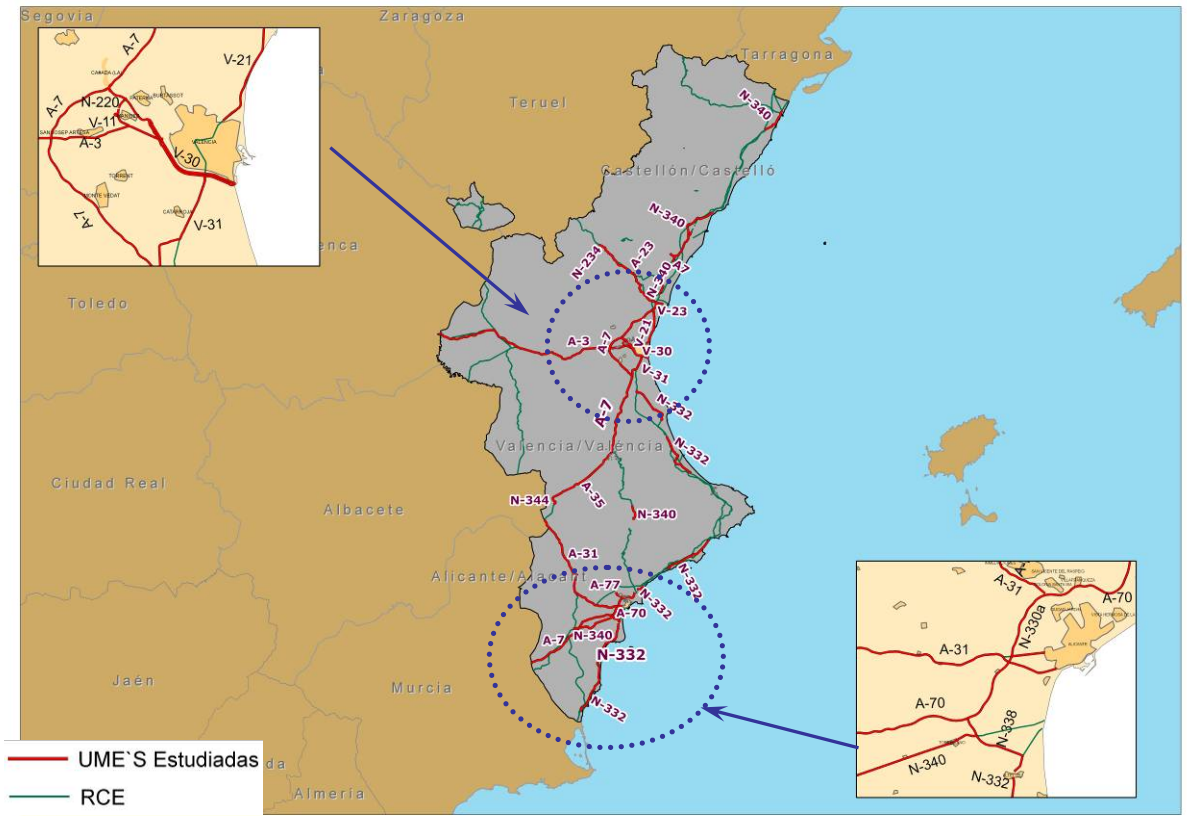
Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km
A-1	86.65	182	210
A-2	28.15	337	1,197
A-3	61.40	186	303
A-4	22.90	167	729
A-42	71.82	243	338
A-5	24.40	174	713
A-5/1	2.60	8	308
A-6	30.50	424	1,390
M-11	6.55	54	824
M-14	1.60	33	2,063
M-21	5.20	6	115
M-22	1.15	8	696
M-50	37.40	53	142
N-6	6.35	11	173

NOTE*: L_{den}>55dB(A) population in hundreds.

MADRID. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	479.19	996	10	265
>65	129.93	214	6	86
>75	34.47	16	0	10

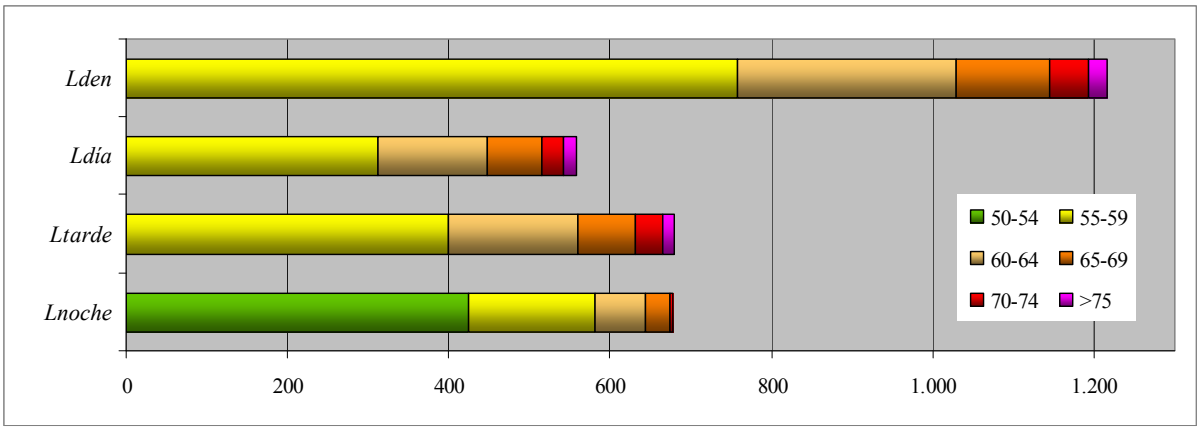
STATE-OWNED ROAD DEMARCATION IN VALENCIA



Study	SMU	No. of sections	Length (km)	Study	SMU	No. of sections	Length (km)
Alicante Province	A-31	1	68.20	Valencia Province	A3	1	104.70
	A-7	1	40.35		A-35	1	32.85
	A-70	1	29.11		A-7	1	91.80
	A-77	1	4.50		N-220	1	1.90
	N-330a	1	1.91		N-332	2	45.20
	N-332	3	82.13		N-340	1	4.20
	N-338	1	5.00		N-344	1	5.64
	N-340	2	26.75		V-11	1	2.00
Castellón Province	A-23	1	37.65		V-21	1	18.00
	A-7	1	18.41		V-23	1	9.00
	N-340	2	44.30		V-30	1	16.96
	N-340a	1	2.34		V-31	1	10.8

VALENCIA. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	758	271	116	48	24
L_{day}	312	136	67	27	17
$L_{evening}$	399	161	71	34	14

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	425	157	61	31	4

Population distribution per road

Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
A-23	37.65	23	61
A3	104.70	120	115
A-31	68.20	157	230
A-35	32.85	10	30
A-7	150.56	203	135
A-70	29.11	45	155
A-77	4.50	6	133
N-220	1.90	7	368
N-330a	1.91	1	52
N-332	127.33	202	159

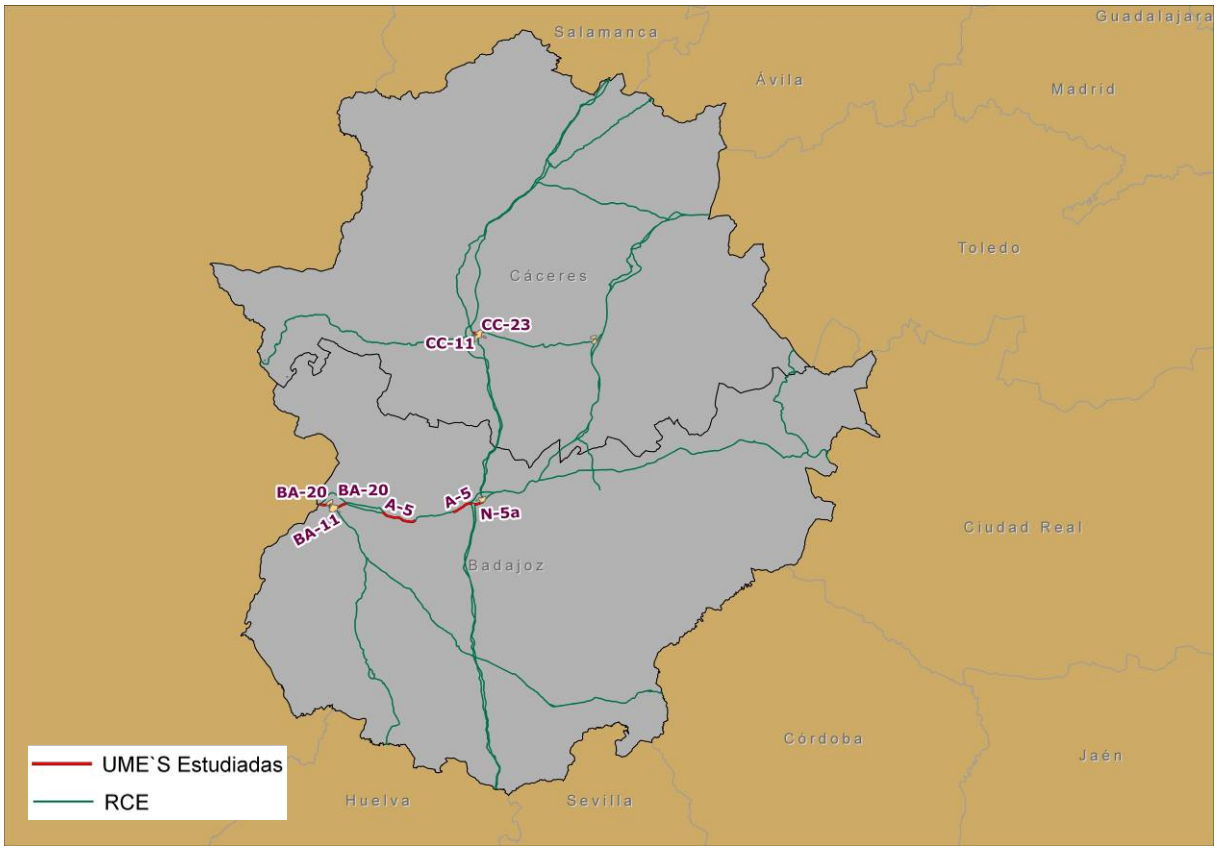
Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
N-338	5.00	-	-
N-340	75.26	133	177
N-340a	2.34	1	43
N-344	5.64	6	106
V-11	2.00	6	300
V-21	18.00	47	261
V-23	9.00	0	0
V-30	16.96	202	1,191
V-31	10.80	48	444

NOTE*: L_{den}>55dB(A) population in hundreds.

VALENCIA. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	878.98	933	10	171
>65	232.76	192	2	31
>75	54.09	37	-	3

STATE-OWNED ROAD DEMARCATION IN EXTREMADURA

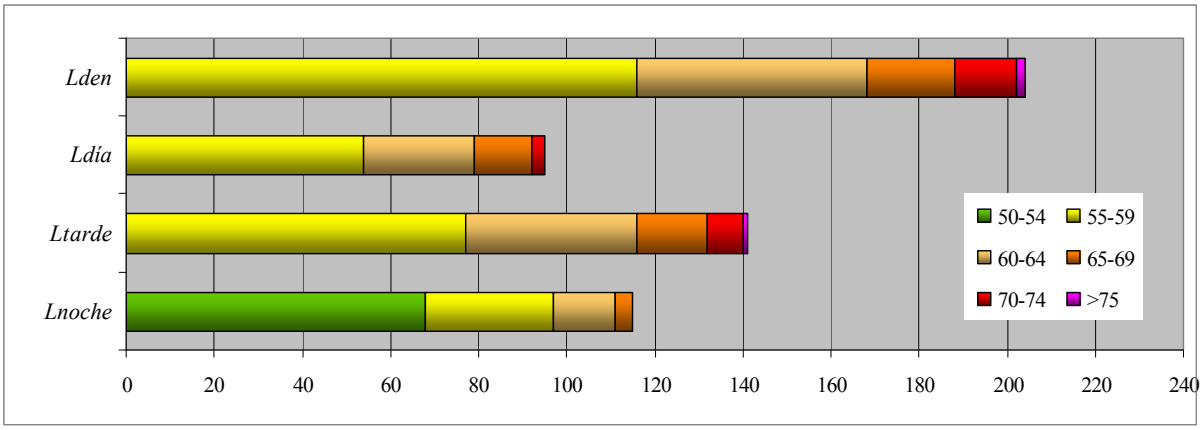


Study	SMU	No. of sections	Length (km)
Autonomous Region of Castilla - La Mancha - Extremadura. A-4 and A-5 Corridors	A-5	2	20.10
	BA-11	1	1
	BA-20	2	8.75
	CC-11	1	1.70
	CC-23	1	2.40
	N-5a	1	3.48

NOTE: The *"Castilla - La Mancha – Extremadura: A-4 and A-5 Corridors"* study includes SMUs in the Autonomous Regions of Castilla La Mancha and Extremadura. The SMU sectioning allows the results for each of them to be separated, only including, in this case, the results for Extremadura.

EXTREMADURA. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	116	52	20	14	2
L_{day}	54	25	13	3	0
$L_{evening}$	77	39	16	8	1

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	68	29	14	4	0

Population distribution per road

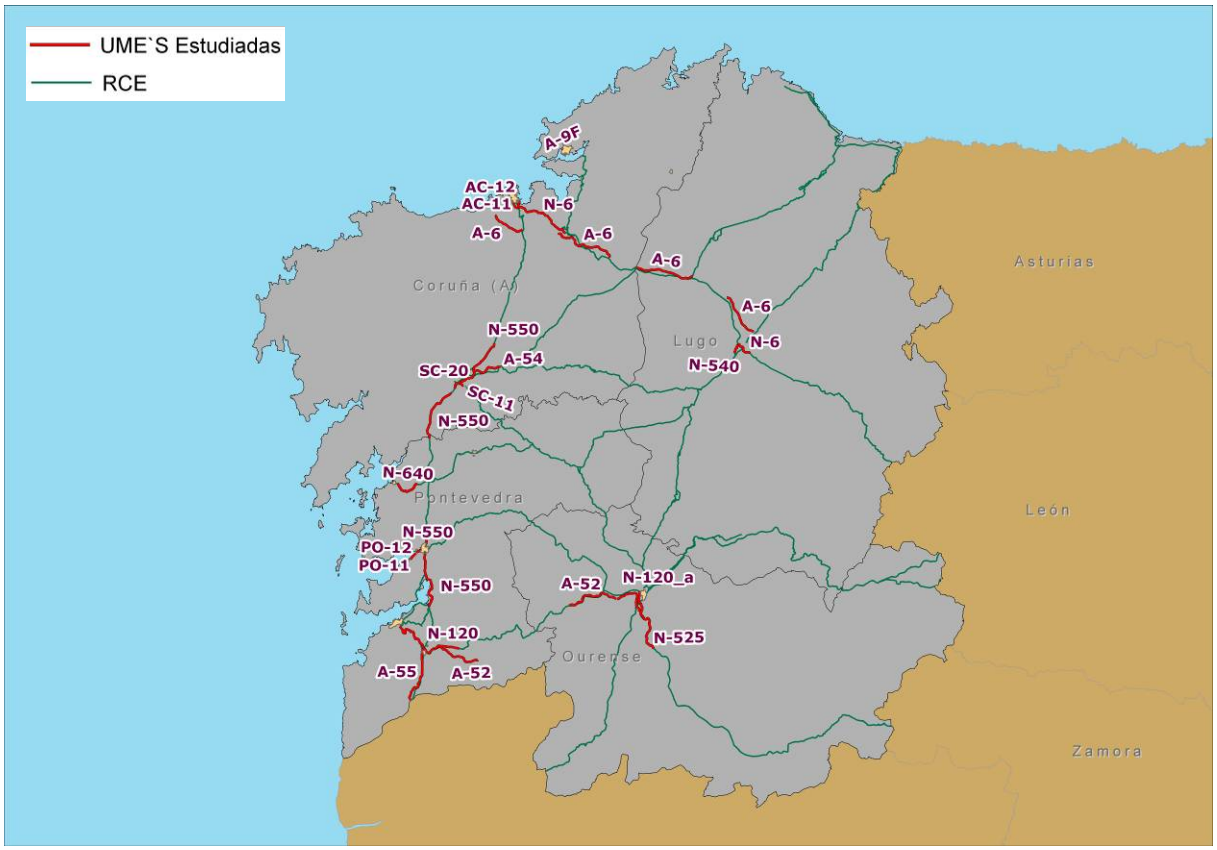
Road	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
A-5	20.10	10	50
BA-11	1.00	33	3,300
BA-20	8.75	28	320
CC-11	1.70	19	1,118
CC-23	2.40	15	625
N-5a	3.48	99	2,845

NOTE*: L_{den}>55dB(A) population in hundreds.

EXTREMADURA. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	29.55	76	-	21
>65	7.24	12	-	10
>75	1.35	-	-	1

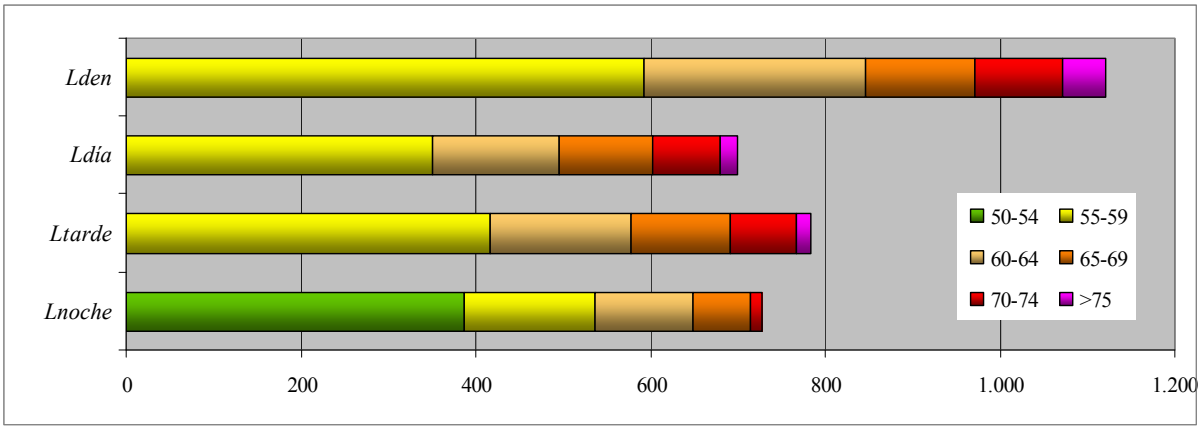
STATE-OWNED ROAD DEMARCATION IN GALICIA



Study	SMU	No. of sections	Length (km)	Study	SMU	No. of sections	Length (km)
Galicia	A-52	2	47.1	Galicia	N-525	1	18.54
	A-54	1	9.00		N-540	1	3.20
	A-55	1	30.00		N-550	4	45.98
	A-6	4	59.90		N-6	2	18.99
	A-9F	1	3.27		N-640	1	8.20
	AC-11	1	4.00		PO-11	1	2.53
	AC-12	1	7.00		PO-12	1	2.00
	N-120	1	6.90		SC-11	1	1.45
	N-120a	1	0.80		SC-20	1	10.36

GALICIA. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	592	254	125	101	49
L_{day}	351	144	107	78	19
$L_{evening}$	416	162	113	76	17

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	387	149	112	66	13

Population distribution per road

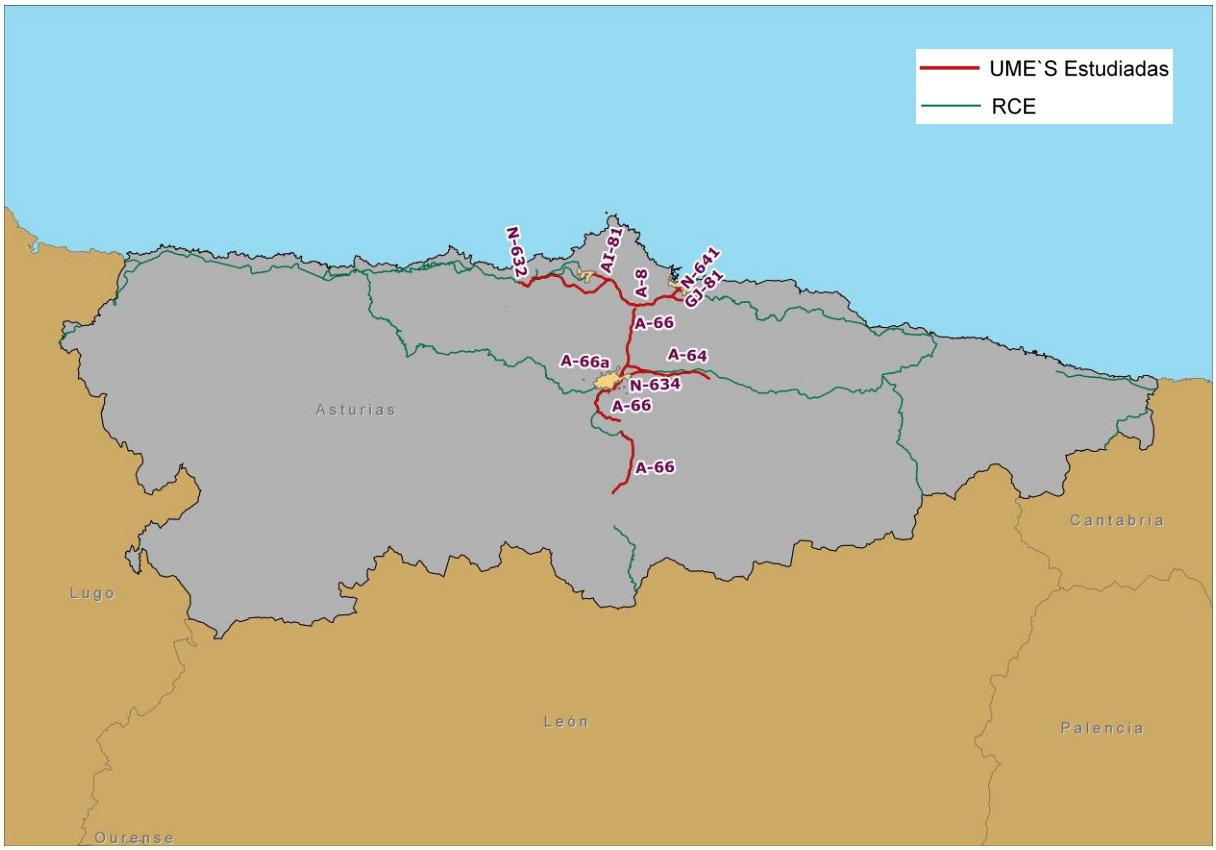
Road	Length studied	Population * L_{den}>55 dB(A)	No. inhab. exposed per km	Road	Length studied	Population * L_{den}>55 dB(A)	No. inhab. exposed per km
A-52	47.10	70	149	N-525	18.54	59	318
A-54	9.00	7	78	N-540	3.20	5	156
A-55	30.00	163	543	N-550	45.98	146	318
A-6	59.90	42	70	N-6	18.99	63	332
A-9F	3.27	18	550	N-640	8.20	18	220
AC-11	4.00	236	5,900	PO-11	2.53	10	395
AC-12	7.00	131	1,871	PO-12	2.00	8	400
N-120	6.90	26	377	SC-11	1.45	8	552
N-120a	0.80	11	1,375	SC-20	10.36	100	965

NOTE*: L_{den}>55dB(A) population in hundreds.

GALICIA. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	194.63	366	12	56
>65	45.81	91	5	16
>75	12.45	24	3	2

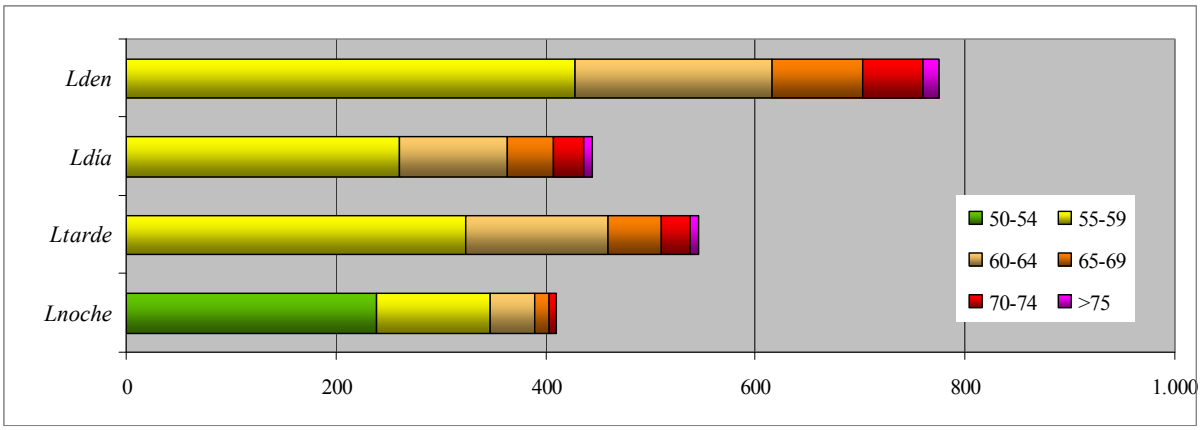
STATE-OWNED ROAD DEMARCATION IN ASTURIAS



Study	SMU	No. of sections	Length (km)
Principado de Asturias	A-64	1	17,23
	A-66	1	47,51
	A-66a	1	3,54
	A-8	1	40,00
	AI-81	1	3,00
	GJ-81	1	2,10
	N-632	1	4,76
	N-634	1	6,48
	N-641	1	1,40

ASTURIAS. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	428	188	86	58	15
L_{day}	261	103	44	28	8
$L_{evening}$	324	135	51	28	8

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	238	109	43	13	7

Population distribution per road

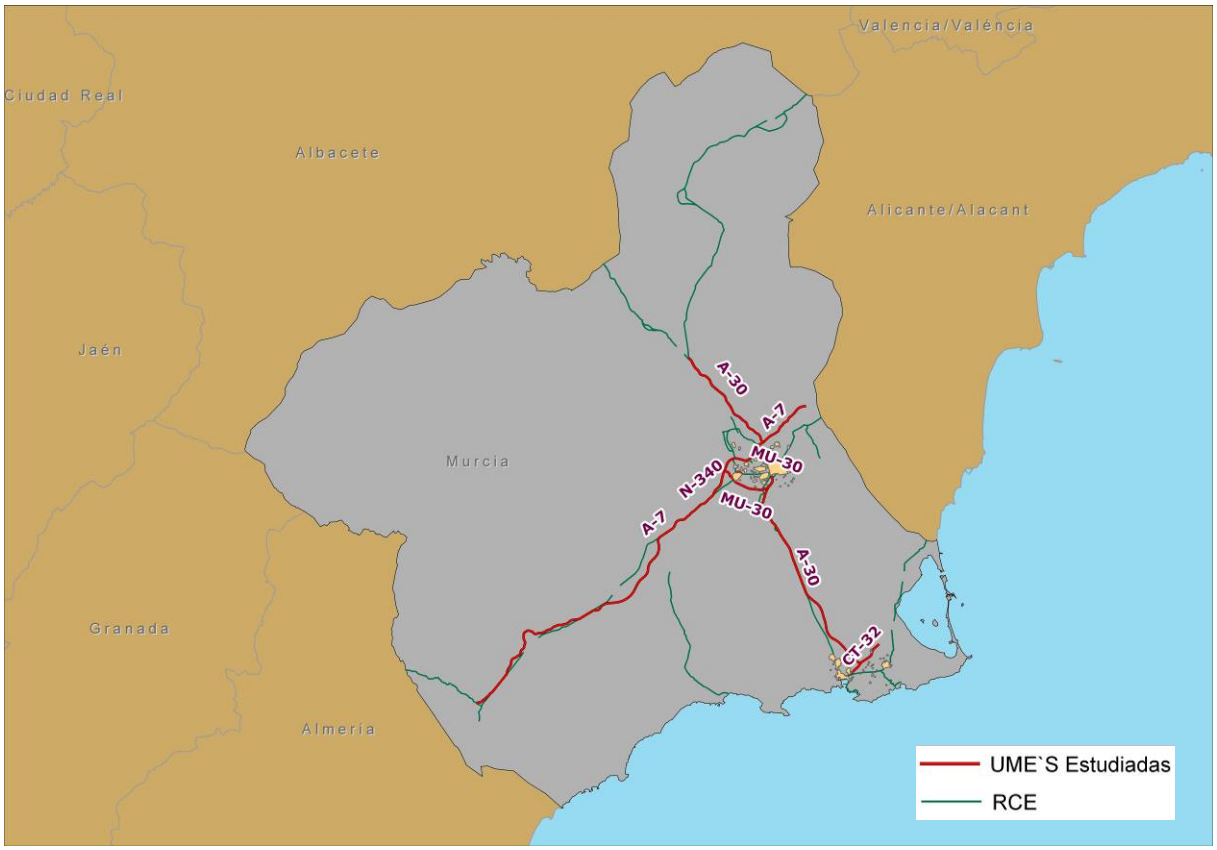
Road	Length studied	Population * L_{den}>55 dB(A)	No. inhab. exposed per km.
A-64	17.23	62	28
A-66	47.51	365	13
A-66a	3.54	118	3
A-8	40.00	42	95
AI-81	3.00	29	10
GJ-81	2.10	91	2
N-632	4.76	5	95
N-634	6.48	25	26
N-641	1.40	38	4

NOTE*: L_{den}>55dB(A) population in hundreds.

ASTURIAS. AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	114.04	255	2	36
>65	30.74	51	1	5
>75	7.95	8	-	-

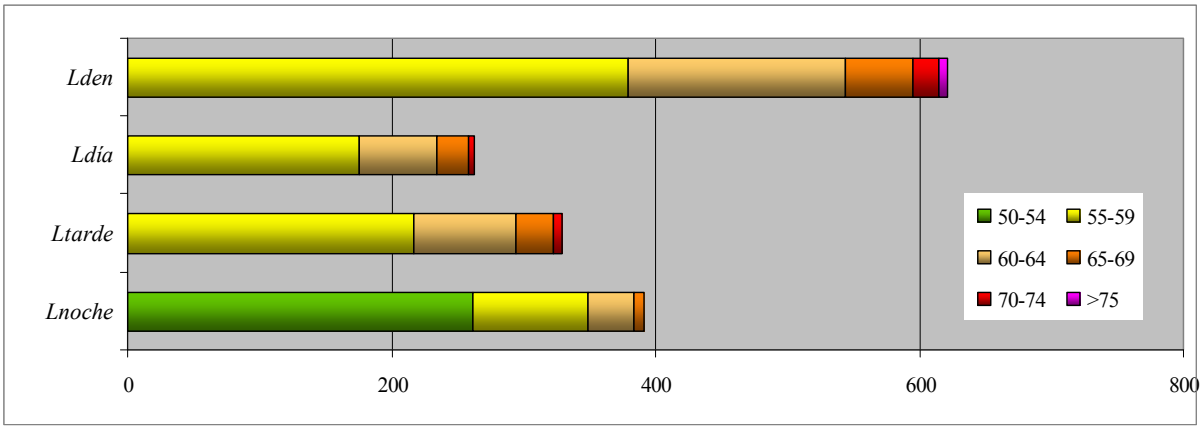
STATE-OWNED ROAD DEMARCATION IN MURCIA



Study	SMU	No. of sections	Length (km)
Murcia Region	A-30	1	81.40
	A-7	2	95.40
	CT-32	1	5.41
	MU-30	1	9.90
	N-340	1	4.26

MURCIA. EXPOSURE LEVELS.

Exposed population per indicator, in hundreds



Indicator	55-59	60-64	65-69	70-74	>75
L_{den}	379	165	51	20	6
L_{day}	175	59	24	5	0
$L_{evening}$	217	77	29	6	0

Indicator	50-54	55-59	60-64	65-69	>70
L_{night}	262	87	35	7	0

Population distribution per road

Road	Length studied	Population * L_{den}>55 dB(A)	No. inhab. exposed per km
A-30	81.40	386	474
A-7	95.40	134	140
CT-32	5.41	4	74
MU-30	9.90	63	636
N-340	4.26	34	798

NOTE*: L_{den}>55dB(A) population in hundreds.

MURCIA .AFFECTED AREA.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	267.00	257	4	52
>65	63.00	30	1	15
>75	13.00	1	-	-

4.2. Global results

The global diagnosis of Strategic Noise Maps involves the analysis of noise exposure values. These values address the number of people submitted to certain noise levels caused by traffic on the roads considered.

The 2002/49/EC Directive and the 37/2003 Noise Law, establish two indicators to be considered in the Strategic Noise Maps with the aim of evaluating the degree of annoyance and sleep disturbance: L_{den} and L_{night} respectively. To complete the analysis, L_{day} and $L_{evening}$ were added. Along with L_{night}, these are the assessment indicators considered in the acoustic quality objective fulfilment study, in accordance with the 1367/2007 Royal Decree, of October 19.

It is necessary to underline that the exposed population considered in the strategic noise maps is not necessarily the population that withstands noise levels above the quality objectives, nor the limits established by law.

213 SMUs have been studied totalling 4,779 km. For this, basic maps have been designed (scale 1:25,000). In addition, the sections included in the detailed studies, those crossing predominantly residential areas, where most of the population is concentrated, cover a total of 728.79 km, which approximately represents 15% of the total. The exposed population is mainly concentrated in the kilometres analysed within the detailed study.

The global results obtained can be found in the following tables classified by indicator. The summary of the data for the exposed population (in hundreds) is organised in accordance with the indicators considered in 5 dB(A) intervals, from 55 dB(A) for L_{den}, L_{day} and $L_{evening}$ and from 50 dB(A) for L_{night}.

Exposed population in hundreds. L_{den} Indicator.

Demarcation	L_{den}				
	55-59	60-64	65-69	70-74	>75
Western Andalucía	1,006	511	187	51	13
Eastern Andalucía	1,207	617	279	115	41
Aragón	226	118	77	22	8
Cantabria	535	200	62	28	2
Western Castilla y León	319	150	68	46	24
Eastern Castilla y León	59	33	17	4	2
Castilla La-Mancha	487	313	120	43	15
Cataluña	1,894	1,088	436	131	60
Madrid	1,078	501	209	75	23
Valencia	758	271	116	48	24
Extremadura	116	52	20	14	2
Galicia	592	254	125	101	49
Asturias	428	188	86	58	15
Murcia	379	165	51	20	6
TOTAL	**9,084**	**4,461**	**1,852**	**756**	**283**

Exposed population in hundreds. L_{night} Indicator.

Demarcation	L_{night}				
	50-54	55-59	60-64	65-69	>70
Western Andalucía	652	299	83	18	0
Eastern Andalucía	867	360	164	59	9
Aragón	156	97	46	10	6
Cantabria	281	118	29	4	0
Western Castilla y León	218	100	57	26	13
Eastern Castilla y León	44	23	7	2	0
Castilla La-Mancha	419	205	73	26	4
Cataluña	1,364	739	203	79	16
Madrid	682	289	115	33	4
Valencia	425	157	61	31	4
Extremadura	68	29	14	4	0
Galicia	387	149	112	66	13
Asturias	238	109	43	13	7
Murcia	262	87	35	7	0
TOTAL	**6,062**	**2,761**	**1,042**	**378**	**76**

Exposed population in hundreds. L_{day} Indicator.

Demarcation	L_{day}				
	55-59	60-64	65-69	70-74	>75
Western Andalucía	578	291	79	26	3
Eastern Andalucía	747	333	165	62	17
Aragón	141	75	24	8	7
Cantabria	237	110	39	9	0
Western Castilla y León	148	77	53	29	9
Eastern Castilla y León	34	19	7	2	0
Castilla La-Mancha	273	102	43	17	3
Cataluña	1,258	548	179	95	26
Madrid	589	254	103	34	6
Valencia	312	136	67	27	17
Extremadura	54	25	13	3	0
Galicia	351	144	107	78	19
Asturias	261	103	44	28	8
Murcia	175	59	24	5	0
TOTAL	**5,157**	**2,276**	**946**	**423**	**115**

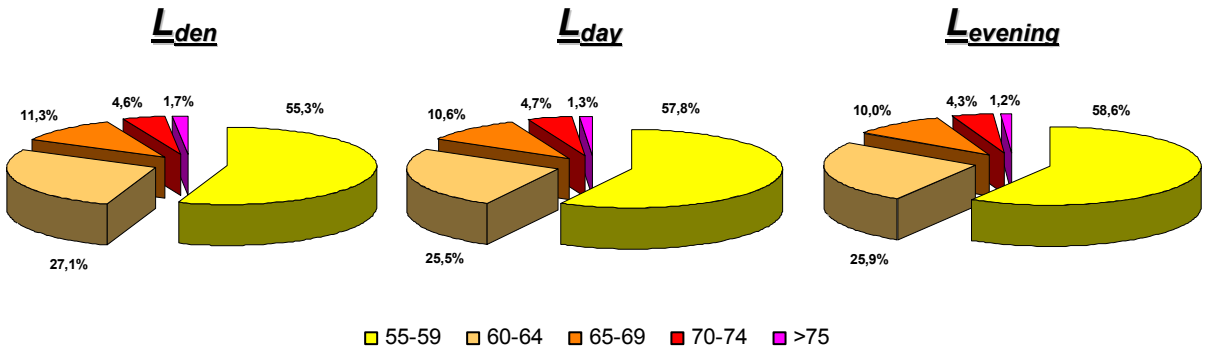
Exposed population in hundreds. $L_{evening}$ Indicator.

Demarcation	$L_{evening}$				
	55-59	60-64	65-69	70-74	>75
Western Andalucía	653	325	92	24	3
Eastern Andalucía	857	357	176	68	13
Aragón	151	95	34	11	7
Cantabria	296	122	42	8	0
Western Castilla y León	199	97	56	27	13
Eastern Castilla y León	43	23	9	2	0
Castilla La-Mancha	397	161	58	21	4
Cataluña	1,340	648	192	92	31
Madrid	908	377	136	54	16
Valencia	399	161	71	34	14
Extremadura	77	39	16	8	1
Galicia	416	162	113	76	17
Asturias	324	135	51	28	8
Murcia	217	77	29	6	0
TOTAL	**6,277**	**2,779**	**1,075**	**459**	**126**

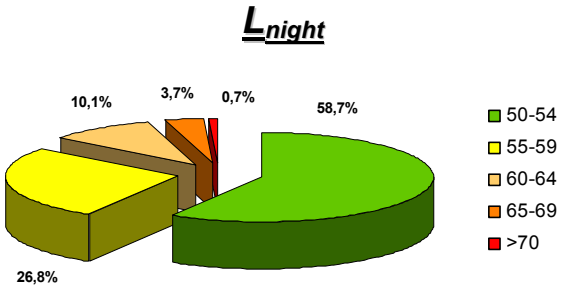
The total exposed population results for the group of National Network roads included in the first implementation round of the 2002/42/EC Directive are those found below:

Exposed population in hundreds.

Indicator	55-59	60-64	65-69	70-74	>75	TOTAL
L_{den}	9,084	4,461	1,852	756	283	16,436
L_{day}	5,157	2,276	946	423	115	8,917
$L_{evening}$	6,277	2,779	1,075	459	126	10,716



Indicator	50-54	55-59	60-64	65-69	>70	TOTAL
L_{night}	6,062	2,761	1,042	378	76	10,319



The SMUs studied vary notably, from less than 1 km up to more than 100 km. To find the concentration level of the exposed population, the relationship between the total exposed population (number of people exposed to values L_{den}>55 dB(A)) and the length of the detailed mapping has been calculated. This data shows the amount of people who are concentrated in one km of road in a densely built-up area.

Population distribution per road length studied

Demarcation	Length studied	Population* L_{den}>55 dB(A)	No. inhab. exposed per km.
Western Andalucía	586.06	1,768	302
Eastern Andalucía	525.92	2,259	430
Aragón	186.54	450	241
Cantabria	135.03	827	612
Western Castilla y León	320.02	607	190
Eastern Castilla y León	148.86	115	77
Castilla La-Mancha	632.38	978	155
Cataluña	514.98	3,609	701
Madrid	386.67	1,886	488
Valencia	703.70	1,217	173
Extremadura	37.43	204	545
Galicia	279.22	1,121	401
Asturias	126.02	775	615
Murcia	196.37	621	316
TOTAL	**4,779.20**	**16,437**	**344**

NOTE*: L_{den}>55dB(A) population in hundreds.

The affected area maps represent L_{den} indicator noise contours for values equal to or above 55, 65 and 75 dB (A). This information must be evaluated and transmitted to the European Union. Apart from the graphic representation, the map must incorporate data referring to the number of dwellings (estimated in hundreds), number of schools and hospitals (in units) and the surface area data (in km^2) included in the areas delimited by these noise contours.

Totals for the affected areas.

L_{den} LEVEL	AREA (km^2)	DWELLINGS (hundreds)	No. of HOSPITALS	No. of SCHOOLS
>55	5,254.52	7,753	123	1,423
>65	1,393.22	1,486	47	389
>75	334.70	180	9	45

5. Conclusions derived from the SNM Results

The following conclusions can be drawn from the global results:

- The European framework against environmental noise, in accordance with the 2002/49/EC Directive, includes the need to draw up Strategic Noise Maps. As a result, all the Spanish state-owned roads with traffic levels (2003 data) above 6 million annual vehicles have been studied. Approximately 4,779 km of roads have been mapped, excluding toll motorways.

- During Phase A, noise maps at a 1:25,000 scale have been developed for all the road sections considered. In addition, detailed studies at a 1:5,000 scale (Phase B) have been undertaken in areas with higher population concentrations, where a more exhaustive study is needed. Phase B covers 730 km of road, which represents 15% of the total road length studied. These areas are mainly concentrated in big cities and metropolitan areas such as Sevilla Madrid, Barcelona and Valencia.

- The population included in the study area, which is the number of people potentially exposed to values above 55 dB(A) L_{den}, is approximately 3,140,000 people. After calculating the exposure levels on façades, the population truly affected by these noise levels is close to 1,644,000. These results confirm the need to calculate the noise that affects building façades, in order to identify dwellings which are not directly exposed to road noise.

- The Directive requires the different exposure ranges to be calculated for each of the indicators. The main conclusions per indicator are analysed separately below:

  - For the L_{den} indicator, the total population exposed to values above 55 dB(A) is 1,643,600. Over half of this population (55.3%) is found in the 55-59 dB(A) range. In the subsequent ranges, the exposure of the population is considerably reduced, being distributed as follows: 27.1% in the 60-64 dB(A) range, 11.3% in the 65-69 dB(A) range, 4.6% in the 70-74 dB(A) range and only 1.7% of the population considered would be exposed to levels above 75 dB(A).

  - The L_{night} indicator involves ranges below those of the other indicators (L_{den}, L_{day}, $L_{evening}$) in accordance with the Directive. The total population exposed to values above 50 dB(A) is 1,031,900. The largest exposed population concentration occurs in the ranges of a lesser magnitude. 58.7% is found in the lowest range,

50-54 dB(A). 26.8% of the estimated population is in the 55-59 dB(A) range, 10.1% in the 60-64 dB(A) range, 3.7% in the 65-69 dB(A) range and 0.7% in the highest range of over 70 dB(A).

- For the L_{day} indicator, the total population exposed to values above 55 dB(A) is 891,700. The distribution is similar to that of L_{den}, with 57.8% of the population being concentrated in the 55-59 dB(A) range, 25.5% in the 60-64 dB(A) range, 10.6% in 65-69 dB(A), 7.7% in 70-74 dB(A) and 1.3% in the above 75 dB(A) range.

- The $L_{evening}$ indicator shows results that are very similar to L_{den} and L_{day}, in relation to the distribution of the exposed population by noise level range, with most of the population being concentrated in less affected ranges. The total population exposed to values above 55 dB(A) is 1,071,600. In addition, 58.6% of the exposed population is concentrated in the 55-59 dB(A) range, 25.9% in the 60-64 dB(A) range, 10% in the 65-69 dB(A) range, 4.3% in 70-74 dB(A) and 1.2% in the above 75 dB(A) range.

- With regards to the affected zones, the total area covered by the L_{den}> 55 dB(A) noise contour, reaches 5,255 km^2, of which only 26.5% is submitted to levels above 65 dB(A) and 6.3% to levels superior to 75 dB(A).

- The relationship between the population exposed to values of L_{den}>55 dB(A), and the length of the roads studied in each of the Road Demarcations, enables the establishment of comparisons in terms of the territorial concentration of the exposed population. The greater exposed population values per road kilometre are found in Cataluña, followed by Eastern Andalucía, Madrid, Western Andalucía and Valencia. The smaller values correspond to the Demarcations of Extremadura and Cantabria.

- With respect to the population exposed during the day and evening periods, it is necessary to underline that the greatest number of exposed population is obtained in the evening. This is because, for most of the roads studied, rush hour is in the evening, and the noise emissions during this period are, therefore, greater.

- In reference to the night period, it is important to remember that the Directive has established 50 dB(A) as the lower limit for the analysis, 5 dB(A) below the limit for the

other indicators. This means that comparisons between night results and results for the other periods must be managed carefully.

Independent of the legal requirements, which have demanded the drawing up of these strategic maps, the results obtained, (in terms of the exposed population and the noise maps), represent an excellent source of information for the diagnosis of the acoustic condition near national roads.

They enable the identification of the areas which are most affected by sound levels originating from major roads, and they serve as a basis to define further actions against noise, which the General Road Directorate will undertake in future years.

6. Spanish Noise Action Plan - SNAP (2008-2012)

6.1. Administrative context

The General Road Directorate of the Ministry of Public Works has gradually incorporated action criteria which take into account the noise generated by the roads of the National Network. The preventive and corrective measures for the environmental sound impact are considered in all the planning stages of the infrastructures, from the environmental impact studies, to the construction projects, until the management and road conservation stages.

Until recently, actions against noise have been developed without a general framework of reference, which was established by the Directive and Noise Law. Measures have been adopted depending on the needs and the ability to act in each instance. Planning and project services have focused on incorporating the noise variable into the new infrastructure projects. Construction, conservation and operation services have worked in the design and implementation of corrective measures, mainly noise barriers and low noise pavements.

The Sectorial Road Plan, currently being drafted, will include, for the first time, a chapter dedicated to the fight against noise in the roads of the National Network. This answers the need to frame all the actions against noise within a planned and organised outline.

On the other hand, the 2002/49/EC Directive, concerning the assessment and management of environmental noise, stipulates that the relevant administrations have to develop Action Plans derived from the Strategic Noise Maps. This involves the need for an Action Plan in the state-owned road Network. This would include the actions for the roads studied in the first implementation round of the Directive. The plan must be revised and redefined in 2012.

The proposed Plan attempts to answer both needs. Firstly, it incorporates the Action Plan demanded by the Directive. Thus, for the roads with more than 6,000,000 vehicles a year, it identifies the main conflict areas. The plan also establishes categories of viable proposed actions in order to decrease noise and the number of people exposed to levels above those defined in the current legislation. Secondly, it completes the Plan with the necessary actions for roads which have not been included in the drawing up of the strategic noise maps.

6.2. Quality objectives

The completion of the Strategic Noise Maps (SNMs) coincided with the final development of the 37/2003 Noise Law, through the 1367/2007 Royal Decree, of October 19, related to acoustic zoning, quality objectives and acoustic emissions.

The Royal Decree has defined the criteria for the assessment of the noise environment quality in the vicinity of roads. This regulation has also established the obligation to carry out actions against noise which guarantee certain quality objectives, depending on the predominant use of each area.

One of the latest aspects considered by the regulation is the definition of minimum acoustic quality objectives at a national level. In that way, for transport infrastructures, the L_d, L_e and L_n indicators must be obtained for the verification of compliance with the applicable acoustic quality objectives. These indicators are the L_{day}, $L_{evening}$ and L_{night} represented and analysed in the Strategic Noise Maps.

The values of the indices, considered as quality objectives, are based on the category of acoustic area. These acoustic areas must be defined and demarcated by the local administrations, which must take into account the main land use, in accordance with the types previously defined by the Autonomous Regions, when incorporating into their legislation the development of the Noise Law.

When dealing with an action plan against noise, the most significant acoustic zones are sectors with a predominantly residential land use which, according to the Noise Law and the regulation, are classified as “type A” acoustic areas.

As stated in article 14 of the 1367/2007 Royal Decree, in consolidated “type A” areas (existing locations), the actions must aim to reach the acoustic quality objectives which are outlined in the following table:

Acoustic quality objectives for the existing urban areas

Sectors with a predominantly residential land use

Acoustic Area	Noise Indicators		
	L_d in dB(A)	L_e in dB(A)	L_n in dB(A)
Type A Sectors with a predominantly residential land use	65	65	55

Source: Table A of Appendix II of the 1367/2007 Royal Decree, of October 19, by which the 37/2003 Noise Law, of November 17, is developed, regarding acoustic zoning, quality objectives and acoustic emissions. (National State Bulletin (BOE) num. 254, of October 23, 2007)

The European Union has not fixed any specific quality objectives for the SNM Action Plans. Each Member State must establish the objectives depending on its current legislation and the scope of the plan.

In addition, the General Road Directorate has been using, as sound environment quality objectives, in environmental impact studies and in noise barrier installations, similar values to those established in the 1367/2007 Decree: Leq (7-23h) < 65 dB(A) and Leq (23-7h) < 55 dB(A).

While waiting for the autonomous administrations and municipalities to acoustically zone their territories, the objective is established of reaching, in the exterior of the residential buildings, L_{day} and $L_{evening}$ values below 65 dB(A) and a L_{night} value below 55 dB(A). Special considerations apply when there is a hospital or a school. In those cases, the possibility of achieving levels 5 dB(A) below those established for residential buildings will be considered. (In the case of educational use, only the daily quality objective applies).

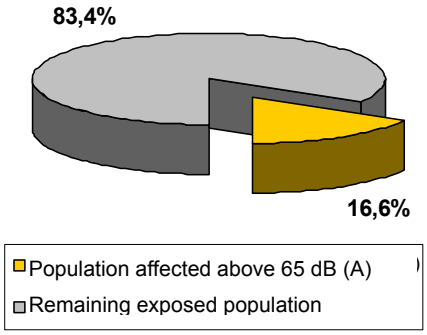
Once the quality objectives were fixed, with the enactment of the 1367/2007 Royal Decree, an analysis of the fulfilment of these objectives was carried out for the 4,780 km of roads studied in the Strategic Noise Maps. The maps, developed in accordance with the Directive, the Noise Law and the Decrees, take into consideration the population exposed to sound levels above 55 dB(A) for the L_{den}, L_{day} and $L_{evening}$ indicators and over 50 dB(A) for the L_{night} indicator. A large part of the studied population is concentrated in the lowest noise ranges. As the quality objectives established are above these levels, only the population that exceeds these objectives must be considered as being exposed to noise.

The data for all the Network, in relation to the total population that is submitted to sound levels superior to 65 dB(A), in the case of L_{day} and $L_{evening}$, and 55 dB(A), in the case of L_{night}, is as follows:

L_{day}

Indicator	Total exposed population	Population >65 dB(A)
L_{day}	8,917	1,484

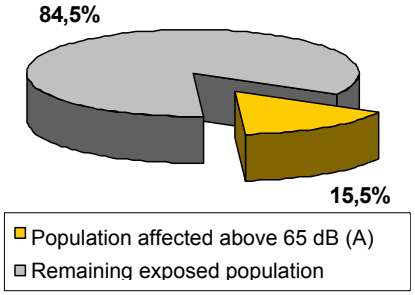
NOTE: Population in hundreds



$L_{evening}$

Indicator	Total exposed population	Population >65 dB(A)
$L_{evening}$	10,716	1,660

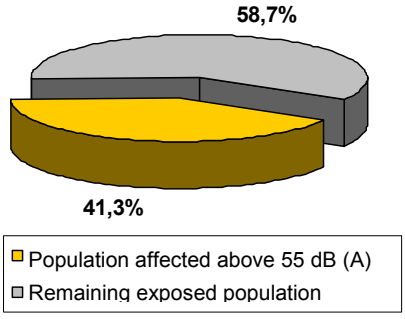
NOTE: Population in hundreds



L_{night}

Indicator	Total exposed population	Population >55 dB(A)
L_{night}	10,319	4,257

NOTE: Population in hundreds



As shown in the tables, the population exposed to sound levels superior to those established in the quality objectives is significantly less than the whole population considered in the Strategic Noise Maps. Night-time turns out to be the most critical period for all the roads studied. The population that lives in residential buildings, with sound levels over acoustic quality objectives, is around 425,000 people. The mentioned number represents approximately 25% of the exposed population considered in the SNMs. This applies to the totality of the state-owned roads included in the Strategic Noise Maps for Round 1 of the implementation of the 2002/42/EC Directive.

6.3. SNAP (2008 – 2012) scope, structure and content

This Spanish Noise Action Plan (SNAP) is part of the actions included in the Sectorial Road Plan for the state network which is currently at the elaboration stage.

The SNAP has a dual purpose. On the one hand it includes the corresponding Action Plan of Round 1 required by the 2002/42/EC Directive. On the other, it incorporates other General Road Directorate actions, both for the roads included in the Strategic Noise Maps (SNMs), and for other roads, with less traffic, which belong to the National Network.

The Basic objective of the Plan is to channel the actions for subsequent years. Many of these actions have already been foreseen, in order to facilitate coordinated financing and completion. As a result, the data needed to define possible action areas has been compiled from the Strategic Noise Maps. Having analysed the action possibilities in each area, priorities have been established, to ensure that criteria exist when they are scheduled.

The Action Plan has been conceived and managed by the administration responsible for the noise source, in this case, the National Road Network. This entails certain administrative limitations when considering possible actions.

The General Road Directorate has no competence over territorial layout and planning. Its competence is limited to the road public domain and the implications resulting from the obligations and demands of road legislation. In this context, the possibilities for action are confined to the area of responsibility of the General Road Directorate. Therefore sound insulation for building façades has not been included.

Other noise sources are often present for most densely populated areas located in the close vicinity of the roads of the National Network. In these instances, the 1513/2005 Royal

Decree, of 16 December, establishes the obligation to develop the corresponding area plan with the collaboration of the different administrations involved. It is therefore not possible to tackle the actions in these areas in a sectorial manner. These actions must be incorporated in the area plans proposed by the local administrations.

In terms of the current actions aiming to reduce noise levels and the amount of population affected by noise, the 2002/42/EC Directive indicates some measures which can be foreseen by the authorities within their areas of responsibility. In the case of road infrastructures, the application of technical measures to reduce noise at source is included, as are measures aimed at reducing sound transmission.

The current plan has focused on two aspects: noise reduction at source and reduction of noise transmission via the installation of noise barriers.

In the first case, within the responsibility of the General Directorate, the measures can only focus on road pavements, as it is outside their competence to regulate the vehicles that circulate on the roads.

Currently, the General Directorate is conducting several experimental studies to determine the acoustic efficiency and the general behaviour of different road pavements. A significant number of kilometres with sound absorbing pavements have already been installed. Their durability and effectiveness is still to be evaluated. Some experiences related to double layered pavements are resulting in a substantial reduction in noise emissions.

In the near future, the following are expected to be achieved: the acoustic classification of different pavements and the establishment of their usage criteria, in order to subsequently substitute current pavements with quieter ones for predetermined sections of the network.

The basic line of action included in this plan is the installation of noise barriers. After analysing the results of the Strategic Noise Maps, actions aiming to install acoustic barriers have been considered for 584 sections of road margins. These actions are divided in two groups according to the priorities assigned to such barriers. 109 sections have also been defined where the study of complex solutions is being considered. This action proposal has enabled the justification of the global budget until 2012.

6.4. Actions proposed in the SNAP (2008-2012)

The adoption of corrective measures against noise frequently demands actions that have important repercussions for land zoning, town planning and road use. These actions are addressed via plans specific to each area. However, there are acoustic conditions and spatial configurations which allow for the installation of noise barriers to reduce the noise levels received by part of the population.

In the analysis of the SNM results, a definition of the areas suitable for noise barrier installation was attempted. This definition establishes a priority for each specified action, using the criteria of efficiency and affected populations.

However, for some of the areas which are affected by the noise from the roads studied, with a significant amount of the population exposed to noise levels above those recommended, the installation of noise barriers is questionable. The reasons are its low effectiveness or the physical difficulties encountered for its installation. In these areas, future actions, so-called “complex actions”, must be addressed via specific plans.

For the definition of the areas established for barrier installations, the following criteria have been considered:

- Exposure levels. Areas in which the L_{night} exposure values are below 55 dB(A) have been excluded.

- Affected population. Generally, the exposed areas with a minimum of 300 affected people have been included in the proposals. However, a considerable number of areas with less population have been included, due to the singularity of the area, the presence of schools or hospitals or the characteristics of the city centre.

- Technical viability: the real possibility of barrier construction is evaluated, having rejected the proposal when there is not enough space or when the receptor is much higher than the road.

In the areas determined for the establishment of priority actions, the A and B categories have been defined based on the severity of the impact and the effectiveness of the action.

For action proposals, only the residential buildings, educational buildings and hospitals have been considered.

A summary of the actions being considered is shown below, with an estimate of the number of people who will benefit and the cost. The first two tables show the most relevant data of the noise barriers considered, including their estimated cost. The third table includes a summary of the complex action areas.

When there are action areas on both sides of the road, the two independent areas have been taken into account. The estimate of the people who will benefit includes all the population present in each area, regardless of the sound levels to which it is exposed.

Demarcation	No. of areas	Barrier length (m)	People benefitting	Cost (euros)
Western Andalucía	15	20,500	153,587	12,300,000
Eastern Andalucía	23	20,300	101,539	13,380,000
Aragón	9	8,450	28,039	5,070,000
Cantabria	5	2,200	7,063	1,320,000
Western Castilla y León	13	4,577	5,892	2,746,200
Eastern Castilla y León	3	1,006	4,336	603,600
Castilla La-Mancha	11	6,908	16,863	4,144,800
Cataluña	37	42,886	106,436	26,511,600
Madrid	3	2,200	20,693	1,320,000
Valencia	37	21,625	55,325	12,975,000
Extremadura	5	635	6,847	381,000
Galicia	42	37,500	71,802	22,500,000
Asturias	16	9,050	26,032	4,050,000
Murcia	3	1,725	12,907	1,035,000
TOTAL	**222**	**179,562**	**617,361**	**108,337,200**

Noise Barrier Proposal. Priority A.

Demarcation	No. of areas (margins)	Barrier length (m)	People benefitting	Cost (euros)
Western Andalucía	51	37,810	114,422	22,686,000
Eastern Andalucía	4	1,550	7,989	930,000
Aragón	7	2,500	6,868	1,500,000
Cantabria	3	1,600	5,060	960,000
Western Castilla y León	35	10,819	22,630	6,491,400
Eastern Castilla y León	14	6,447	12,923	3,868,200
Castilla La-Mancha	33	18,136	76,748	10,989,600
Cataluña	17	11,448	60,010	6,868,800
Madrid	14	19,550	119,864	11,730,000
Valencia	29	21,395	21,063	12,837,000
Extremadura	16	2,159	5,801	1,295,400
Galicia	101	57,100	20,614	34,260,000
Asturias	35	10,300	23,853	6,180,000
Murcia	3	2,926	12,807	1,755,600
TOTAL	**362**	**203,740**	**510,652**	**122,352,000**

Panelling Proposal. Priority B.

Demarcation	No. of areas (margins)	Length (m)	People benefitting
Western Andalucía	6	20,500	27,507
Eastern Andalucía	8	7,900	35,220
Aragón	4	6,400	3,192
Cantabria	-	-	-
Western Castilla y León	-	-	-
Eastern Castilla y León	-	-	-
Castilla La-Mancha	-	-	-
Cataluña	39	52,840	160,908
Madrid	10	11,750	56,363
Valencia	18	26,240	15,583
Extremadura	10	3,065	9,632
Galicia	6	7,600	13,312
Asturias	16	31,650	32,566
Murcia	10	17,900	65,210
TOTAL	**109**	**151,045**	**353,574**

Complex actions

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