“ROAD SAFETY, A CONTINUOUS CHALLENGE” WORKSHOP CEDR-DIRCAIBEA

IMPROVEMENTS OF ROAD SAFETY IN SPAIN

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PRESENTACIÓN

- Área: 504.645 km²
- Población: 46,5 Mhab
- Número de vehículos: 32,1 Mveh
- Red nacional de carreteras: ≈ 166.000 km
INJURED ACCIDENTS EVOLUTION IN SPAIN

SPAIN. 2016:

1,039 falta accidents (2.8 FA/day) 366 fatal accidents RCE (1.0 FA/day)

1,161 fatal victims (3.2 FV/día) 432 fatal victims RCE (1.2 FV/day)
Spain achieved the target **one year before (2009)**: PIN award in 2009

Only 8 countries have achieved European Union target (Latvia, Estonia, Lithuania, Spain, Luxembourg, Sweden, France and Slovenia)

**New target in 2020:**
50% fatal victims reduction (from 2010)
Nowadays, only 5 countries achieve the estimated average reduction to reach the 2020 target. Spain is one of them, being the fourth country with the greatest reduction of fatalities: -32%.
CHARACTERISTICS OF THE NATIONAL ROAD NETWORK (RCE)

- Road network management by Road General Directorate (Ministry of Fomento)
- Road network length > 26,000 km.
- High quality road network: almost half of roads are motorways (∼12,000 km). It means 70% of Spanish motorways
- Vertebrate road network

<table>
<thead>
<tr>
<th>Roads</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(km)</td>
</tr>
<tr>
<td>Motorways</td>
<td>11.943</td>
</tr>
<tr>
<td>Ordinary roads</td>
<td>14.387</td>
</tr>
<tr>
<td>TOTAL</td>
<td>26.330</td>
</tr>
</tbody>
</table>

More than a half (52%) of the country's total interurban traffic and 63% of heavy goods traffic use RCE

Characteristics that distinguish R.C.E. of the rest of Spanish road networks:
- A composition of the traffic with higher percentage of heavy vehicles (13% frente al 8%)
- Higher travel distances: Road network canalizes long distance travel
- Higher circulation speeds
ACCIDENTALITY EVOLUTION IN THE NATIONAL ROAD NETWORK (I)

More than a half injured accident reduction (-53%) from 1989 to 2016
Fatal victims reduction to one-seventh (-86%) from 1989 to 2016
Traffic duplication (Million vehicles-km) from 1989 to 2016

*Datos 2016 provisionales*
-76% el accident risk (IP) reduction and -92% risk of being a fatal victims as a result of an accident (IM) reduction from 1989 to 2016
Demerit Point Systems (DPS)

- From 1st of July of **2006** (12 points/8 points for novel drivers)
- Assessment before 5 years:
  - 16% drivers demerit point (4,062,003 drivers)
  - 0.43% drivers demerit all their points (107,152 drivers)
  - 48% fines due to speeding

Vigilance and control increase

- **Speed**
  - 518 new radars
  - Reduction of the average speed of 5 km/h and reduction of those that exceed the limits (>140 km/h from 7% to 0.7%)
- **Alcohol**: duplicación de controles preventivos (reducción a la mitad de positivos)
- Use of security belt (97%) and motorcycle helmet driver (99%)

Infrastructure improvement

- **New infrastructure** construction and ordinary roads improvement
- Road **maintenance** improvement
- Improvement of procedures relating to road infrastructure safety
  - Road safety impact assessments, road safety audits and safety inspections
  - High accident concentration sections and high improvement potential sections
NEW INFRASTRUCTURE CONSTRUCTION AND ORDINARY ROADS TRANSFORMATION

- **Road safety improvement**: eliminate frontal and front-side impacts typical of traditional overtaking
- Transformation of single-carriageway roads into dual carriageway roads
- **New motorway** construction

\[
\begin{align*}
\text{IP}_{GC} &= \frac{1}{2} \text{IP}_{CC} \\
\text{IM}_{GC} &= \frac{1}{5} \text{IM}_{CC}
\end{align*}
\]
NEW MOTORWAY CONSTRUCTIONS

A-22. Variante de Barbastro (Huesca)

Variante Oeste de Córdoba CO-32 (Córdoba)

Autovía de la Plata A-66. Tramo Béjar L.P. de Cáceres (Salamanca)

A-75. Tramo Verín-Portugal (Pontevedra)
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CORRELATION BETWEEN MOTORWAY LENGTH AND FATAL VICTIMS

Correlation between the number of fatal victims and the increase of motorway network length.
ORDINARY ROAD CONDITIONING

- Improve road safety to facilitate movement conditions and to prevent dangerous situations

- **Actions** (improve travel times, service level and road safety)
  - Widening (lanes/shoulder)
  - Tracing improvement
  - Pavement rehabilitation
RING ROADS

- It bypasses the center of villages
- Long length traffic improves its fluency
- Urban roads improves their road safety and environmental quality
ROAD MAINTENANCE

Increase of annual investment in road maintenance to 2% network equity value

![Graph showing the relationship between road maintenance budget and fatal victims.](image-url)
ROAD SAFETY MANAGEMENT SYSTEM (R.D. 345/2011, of 11 March)

A. New roads and substantial modification of existing ones

Road safety impact assessments
Road safety audits

B. Roads in operation

Road safety management:
- High accident concentration sections (TCA)
- High improvement potential sections (TAPM)

Safety inspections
ROAD SAFETY AUDITS. AUDITOR TRAINING

Train competent technicians with experience in road safety to acquire:

• **Specialized knowledge** and
• **Practical preparation** to carry on road safety audits in RCE
• **Specific characteristics of the procedure** and **technical and administrative regulations** of Ministry of Fomento

**Specialty:**

1.- Road safety audits in the pre-project and project phases (studies)
2.- Road safety audits in the phases prior to commissioning and initial in service (works)

- **Trainning programmes:** *Initial and upgrade (periodical trainning)*
  - **Face-to-face sessions** with case resolution
  - **Real case practice**
  - **Exceedance:** Attendance + favorable evaluation
ROAD SAFETY AUDITS. AUDITOR ACCREDITATION

- Regulated by
  ORDEN MINISTERIAL FOM/1649/2012, of 19 July: procedure of proficiency accreditation and certification of road safety auditors

- Proficiency certificate
  Before conclude Initial Training Programme and accreditation tests: It is issued by Road General Directorate of Ministry of Fomento

- Validity
  5 years

- Proficiency certificate renovation
  - Pass periodic updating programs of auditor knowledges
  - Another 5 years

- Record
  List of accredited auditors with proficiency certificate in force (in each specialty)
HIGH ACCIDENT CONCENTRATION SECTIONS (TCA)

TCA LENGTH: < 0.4% road network

- Specific traffic signing: it lets road users to identify clearly that they are crossing one of these road sections and they have to be careful
- New methodology adapted to the European Union Directorate and Spanish Royal Decree on road infrastructure safety management
- Specific study and treatment of ALL TCA

PRECAUCIÓN
TRAMO DE CONCENTRACIÓN DE ACCIDENTES

8 km

FIN TRAMO DE CONCENTRACIÓN DE ACCIDENTES
TOWARDS “FORGIVING ROADS”

• **What are they?**

This roads *allow greater margin of driver error*, because they have specific characteristics and equipments that *do not entail the occurrence of a serious accident* when some kings of distractions or errors occur. That is to say, they forgive driver errors in a greater grade than currently roads.

• **Measures?**

• **Some measures are used currently:** rumble strips, lateral site cleaning, slope easer off, ditches filler/removal, etc.

• **Greater interactivity with vehicles:** *infrastructure-vehicle*

• **Greater ITS devices use:** *ramp-metering, real-time information* (traffic, detours and advisable itineraries, travel durations, conflictive situations prevention, traffic jams, weather, etc.).
ROAD MARKING PAINT AND RUMBLE STRIPS

Road marking paint with projections (motorway edges)

Greater obstacle-free amplitude for vehicle control in case of carriage run out

Rumble strips
ENERGY DISSEMINATION SYSTEMS: SAFETY BARRIER END, CRASH CUSHION
These devices are arranged in order to reduce the severity of an impact against a lighting column or a rigid sign gantry. When a vehicle impacts, these devices break down in a controlled way, damping the impact and allowing the column to fall in a predefined direction.
SAFETY DITCHES

Obstacle removal

Length 150 m

Slope 6:1

Ditch practicable by vehicles
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LATERAL SITE CLEANING AND SLOPE EASER OFF

Practicable zone obstacle free
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SLOPE EASER OFF AND DITCHES FILLER/REMOVAL

Antes de la actuación (alzado)

Después de la actuación (alzado)

Antes de la actuación (alzado)

Después de la actuación (alzado)

Material drenante

Tubo dren
SLOPE EASER OFF AND DITCHES FILLER/REMOVAL

BEFORE action

AFTER action

Deep ditch

1.5 m
DITCHES FILLER/REMOVAL

Mejora en el diseño inicial

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ITS DEVICES

Ramp metering

Road weather information system (RWIS)

Variable traffic signing
ITS IN TUNNEL CONTROL CENTRES
ROAD SAFETY ACTIONS. EFFECTIVENESS

- **High efficiency and profitability**, when deriving the actions to be carried out of detailed studies of the accident
- **Fast investment recovery**

**PRIORIZATION**

(Profit/Cost)

\[ I_{EE} = \frac{\text{Number of accidents expected to avoid}}{\text{Action budget}} \]

-  \( I_{EE} \): Expected effectiveness index
-  \( I_{PT} \): Danger rating in selected section
-  \( I_{PMts} \): Average danger rating of similar sections
-  \( L \): Section length
-  \( N \): Action useful life (years)
-  \( R \): Reduction

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THANK YOU FOR YOUR ATENTION

MUCHAS GRACIAS POR SU ATENCIÓN