Comparative assessment of road safety performance in Greece

Dimitris Katsochis, Civil – Transportation Engineer, M.Sc.
Yannis Handanos, Civil – Transportation Engineer, M.Sc.
George Yannis, Assistant Professor - NTUA, Ph.D.
Introduction – Research Objective

Original SUNflower program

- European Union (EU) funding (DG TREN)
- Participants: the SUN countries (Sweden / United Kingdom / Netherlands)
- Motivation: 40,000 EU-15 citizens killed annually in road traffic accidents
- Selection criterion: the high level of road safety – as a starting point
- Question: what allowed for spectacular improvement in these countries

Objective – Structure of the SUNflower+6 program

- New members: Greece – Portugal – Spain / Catalonia (southern countries), Czech Republic – Hungary – Slovenia (central countries)
- Inclusion in the EU action plan (“White Paper”) aiming at:
  - 50% reduction of fatalities due to road accidents between 2001-2010
- Analyses target: proper indicators definition – examination of data resources reliability – identification of strengths / weaknesses
Methodological framework: safety target pyramid (a)

- Social costs
- Number killed and injured
- Safety performance indicators
- Safety measures and programmes
- ‘Structure and culture’
Methodological framework: safety target pyramid (b)

- **Target pyramid** – inspired by the Road Safety Strategic Plan of New Zealand up to year 2010
- **Basic idea**: development of a framework to depict each region’s performance through a total score of indicators (from the pyramid)
- **Presupposition**: understand undergoing processes among different levels for the hierarchy of road accidents causes and consequences
- The pyramid may be viewed as *three-dimensional*
  - The first dimension (vertical) regards the formation of *levels* that facilitate the diagnosis of the prevailing problems in a certain territory (e.g. country)
  - The second dimension concerns the allocation of these problems to the main *components of the road transport system* (road – vehicle – user)
  - The third dimension concerns the investigation of these *over time*
Methodological framework: footprint scheme

• **The “footprint” scheme** concerns the formation of a:
  – (initially) practical, well grounded tool for the conduction of road safety level comparisons between different regions
  – (eventually) means of transfer of basic findings from a certain region to others, through appropriate adaptation (knowledge transfer)

• **Prerequisites for Successful comparisons** between territories:
  – Adequate knowledge of each road system’s basic aspects
  – Incorporation of the fewest possible indicators in a suitable form

• **The “footprint”** may be viewed as a depiction of:
  – The situation in terms of social cost (casualties and monetary cost)
  – The elements that allow for the formation of cause-effect relations

• **Final target:** prediction of measures’ major effects beforehand
Present road safety status in Greece (1)

✓ Trends over the past 7-8 years

- Notable improvement between 1998-2003
- Interruption of this trend in 2004-2005

<table>
<thead>
<tr>
<th></th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons killed</td>
<td>2.182</td>
<td>2.116</td>
<td>2.037</td>
<td>1.880</td>
<td>1.634</td>
<td>1.605</td>
<td>1.670</td>
<td>1.658</td>
</tr>
<tr>
<td>Vehicles (x1000)</td>
<td>4.323</td>
<td>4.690</td>
<td>5.061</td>
<td>5.390</td>
<td>5.693</td>
<td>5.968</td>
<td>6.257</td>
<td>6.579</td>
</tr>
</tbody>
</table>

- Improvement attributed (at least partly) to intensified enforcement
- Especially in alcohol tests, the EU recommendation is almost reached
Present road safety status in Greece (2)

Main barriers that hinder the improvement of road safety

• The fragmentary implementation of road safety measures and lack of coordination between the competent Authorities
• The lack of systematic enforcement of all relevant infringements
• Road network insufficiencies and inadequate maintenance inside and outside urban areas
• The lack of an efficient system for road safety training, as well as of a reliable vehicle technical inspection system
• An insufficient system for road casualty care
• The lack of systematic monitoring of the road safety level and of the appropriate assessment of measures efficiency
Personal Risk vs. Traffic Risk: shape – definition

- **Personal risk** (mortality rate): fatalities / inhabitant
- **Traffic risk** (fatality rate): fatalities / registered vehicle
- **Fatality risk** (acc. to exposure): fatalities / vehicle-km
- The direction (arrow) of the diagram suggests increase of motorization rate
- This indicator is largely determined by car ownership

- Territories with low motorization rate (developing countries, often) exhibit large traffic risk opposed to low personal risk
- As the size of vehicle fleet increases traffic risk goes down, while personal risk increases to go down again after a certain turning point is reached
Personal Risk vs. Traffic Risk: interpretation – use

- Much more complete interpretation for countries standing close in the diagram
- SUN countries along the left (declining) branch of their diagrams for 20 years
- Southern countries probably passed their turning point during 1990s
- More detailed comparisons may be feasible by shifting (superposing) curves
Personal Risk vs. Traffic Risk: the case of Greece

- A 2nd order polynomial model appears statistically significant ($R^2 = 0.84 \& 0.95$)
- Decline in fatalities increase since 1994-95 at 330veh and 200 cars/1000 people (485 vehicles make a realistic assumption if mopeds are included)
- Turning point for mortality rate 1998-99 at 415veh and 260 cars/1000 people (385 vehicles make a realistic assumption if mopeds are included)
Case study: Greece – Slovenia (1)

- Certain differences are recorded in the structure of road networks
  - Passenger cars are prevailing in Slovenia, while PTW are proportionately much fewer than in Greece
  - Seat belt and helmet use from drivers seems to be twice more frequent in Slovenia (90% and 75% compared to 45% and 40% respectively)
  - Motorways correspond to 3% of total road network length in Slovenia and just 1% in Greece (tending to increase significantly, though)

- Still, several interesting common features are identified as well
  - Extremely comparable mortality rates in each age group
  - Fatality rate values are similar in passenger cars, but rather different in PTW (much higher in Slovenia)
  - Motorways exhibit fatality shares exceeding 4fold their shares on total network length as road types in both countries
Case study: Greece – Slovenia (2)

Safety Performance Indicators (SPI)

Final outcomes (casualties)

Fatalities per million vehicles for the different modes

- Car occupant
- Cyclist
- Motorcyclist
- Mopedist

Graph showing fleet composition (share per mode) and fatalities for different modes in Greece and Slovenia.
Case study: Greece – Slovenia (3)

<table>
<thead>
<tr>
<th></th>
<th>Single vehicle</th>
<th>Passenger car</th>
<th>Lorry</th>
<th>Coach</th>
<th>Motorcycle</th>
<th>Moped – bicycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>36,0</td>
<td>28,7</td>
<td>14,9</td>
<td>3,2</td>
<td>4,0</td>
<td>0,3</td>
</tr>
<tr>
<td>Slovenia</td>
<td>35,1</td>
<td>41,3</td>
<td>14,9</td>
<td>4,1</td>
<td>0,8</td>
<td>0,4</td>
</tr>
</tbody>
</table>
Comparison with the other southern countries (1)

- Importance of social and general transport context

<table>
<thead>
<tr>
<th></th>
<th>Greece</th>
<th>Portugal</th>
<th>Spain</th>
<th>Catalonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>'2002</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road traffic fatalities</td>
<td>1.634</td>
<td>1.675</td>
<td>5.347</td>
<td>812</td>
</tr>
<tr>
<td>Population (million)</td>
<td>10.99</td>
<td>9.89</td>
<td>41.55</td>
<td>6.79</td>
</tr>
<tr>
<td>Road length (thousand km)</td>
<td>120</td>
<td>125</td>
<td>665.2</td>
<td>61.7</td>
</tr>
<tr>
<td>Motorway length (km)</td>
<td>742</td>
<td>1,835</td>
<td>9,739</td>
<td>937</td>
</tr>
<tr>
<td>Area (thousand km²)</td>
<td>131.96</td>
<td>89.04</td>
<td>505.99</td>
<td>32.11</td>
</tr>
<tr>
<td>Motor vehicles (million)</td>
<td>5.74</td>
<td>5.29</td>
<td>25.07</td>
<td>4.22</td>
</tr>
<tr>
<td>Passenger cars (million)</td>
<td>3.69</td>
<td>4.98</td>
<td>18.7</td>
<td>3</td>
</tr>
<tr>
<td>Lorries (3,5 tones) (thousand)</td>
<td>1.109</td>
<td>1.935</td>
<td>281</td>
<td></td>
</tr>
<tr>
<td>Motorcycles (million)</td>
<td>0.91</td>
<td>0.15</td>
<td>1.52</td>
<td>0.43</td>
</tr>
<tr>
<td>Mopeds (million)</td>
<td>1.61</td>
<td>0.46</td>
<td>2.04</td>
<td>0.31</td>
</tr>
<tr>
<td>Motor vehicle km (x 10⁵)</td>
<td>67.94</td>
<td>73.75</td>
<td>345.52</td>
<td>49.61</td>
</tr>
<tr>
<td>Motor veh-km on motorways (x 10⁵)</td>
<td>10.23</td>
<td>74.34</td>
<td>17.89</td>
<td></td>
</tr>
<tr>
<td>Motorcyclist kilometers (x 10⁵)</td>
<td></td>
<td>0.635</td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>Road user person-km (x 10⁵)</td>
<td>136.33</td>
<td>109.1</td>
<td>788.75</td>
<td></td>
</tr>
<tr>
<td>Meter road length per capita</td>
<td>10.6</td>
<td>12.6</td>
<td>16</td>
<td>9.1</td>
</tr>
<tr>
<td>Motor vehicles per inhabitant</td>
<td>0.52</td>
<td>0.535</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Motor veh-km (‘000) per motor vehicle</td>
<td>11.84</td>
<td>13.95</td>
<td>13.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Kilometers travelled per person</td>
<td>12.4</td>
<td>11.03</td>
<td>18.98</td>
<td></td>
</tr>
</tbody>
</table>
Comparison with the other southern countries (2)

- **Positive reduction in fatalities**
  - In mortality rates, from 17% in Greece to 41% in the case of Portugal (21% for Spain, 27% for Catalonia);
  - In fatality rates, from 40% in Spain to 64% in the case of Portugal (44% for Catalonia, 53% for Greece);
  - In fatality risks, from 40% in Catalonia to 57% in the case of Portugal (47% for Spain, 51% for Greece)

- **Importance of drinking & driving problem**
  - GR: Drivers over limit appear to be present in 22-23% of fatal accidents
  - In all 3 countries: 32-33% of toxicology tests on killed drivers positive
  - Respective upper values prescribed by Euro Care: 20% and 25%
**Comparison with the other southern countries (3)**

- **PTW riders constitute a specific problem**
  - Share in total fatalities: 15% in Portugal and 23% in Greece & Spain
  - Especially Greece exhibits a pretty low ratio of PTW fatalities/vehicles
  - Still, helmet use is disappointingly low (20-30% for various types)
  - At least use has increased 3-fold in 5 years (and so did penalty notices)

- **Young drivers: a truly vulnerable group of road users**
  - In spite of the reduction in “relative ratio” values, drivers between 18-25 are 1.5-2.0 times more often involved in fatal accidents
  - Drivers aged 18-20 and 21-24 exhibit highest accident involvement (10.6 and 7.8 per 1000 license holders, opposed to an average of 3.8)
Conclusions: Footprint Methodology added value

• The principles for the design of a representative road safety “footprint” for different territories (e.g. countries) are relatively simple.

• Comparative assessments by means of this methodology:
  – Allow for the detection of countries declining from a reference situation.
  – Are not necessarily intended to interpret emerging observations, but certainly pinpoint road safety aspects that ask for further investigation.

• The SUN countries demonstrate much higher road safety level.

• The value of this tool lies on the possibility to correlate findings concerning different levels of the target hierarchy pyramid:
  – It is desirable to achieve actual transition between different levels.
  – By the time the method reaches its highest potential it will be possible to predict the effects of particular actions/measures beforehand.
Recommendations: Greece – present status / perspective

• Limited exposure data hinder comparison between southern countries
• Given this limitation, it appears that the southern countries have similar road safety performance and suffer similar problems
• Greece experienced a phase of improvement between 1998-2003
  – 415veh or 258 cars/1000 people were some site-specific threshold
• Many lives would be saved if compliance with legislation were higher
  – Only 40-45% of car drivers involved in serious accidents use their seat belt
  – In spite of a notable improvement, 3.5% of total alcohol tests are positive
  – The same holds for excessive speed, although monitoring is not effective
• The large share of vulnerable road users affects total performance
  – PTW riders account for about 23% of total fatalities
• Limited coordination between Authorities – drivers training discrepancies