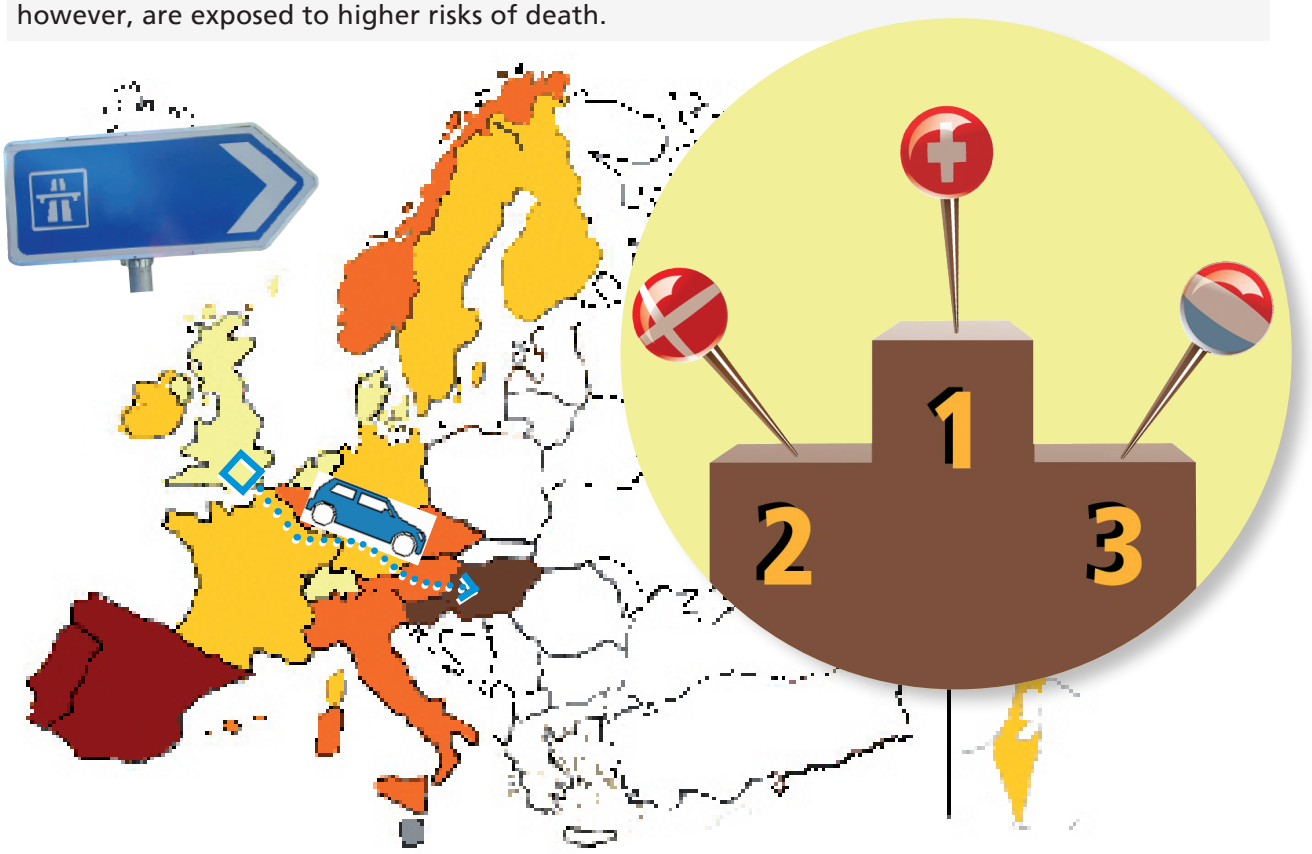
Reducing deaths on motorways

Motorways are the safest roads by design. Yet in 2006 at least 3270 people were killed on the motorway network in the EU 25, representing about 8% of the total number of road deaths[1]. Although motorways account for only 1% of the length of all paved roads, more than one quarter of all kilometres are driven on this part of the road network[2]. The proportion of the traffic driven on motorways has been increasing over the past decade.

This new ranking carried out under the Road Safety Performance Index (PIN) shows that, among the PIN countries, motorways are safest in **Switzerland**, **Denmark** and the **Netherlands**. In the past decade, **Switzerland** and **Slovenia** scored the highest average year-to-year reductions in deaths per billion vehicle-km on motorways. Drivers on Southern and Central European countries' motorways, however, are exposed to higher risks of death.



Number of deaths on motorways per billion vehicle-km in 2006

< 2 | 2 – 4 | 4 – 6 | 6-8 | > 8

It is not acceptable that the safety on motorways differs so considerably among European countries especially at the time of the development of the Trans-European Transport Network. The EU should not miss this opportunity and should adopt an infrastructure safety Directive that would guarantee that safe infrastructure management is applied across Europe.

The proposal for a Directive is well timed as many new Member States are in the process of upgrading and expanding their road networks, including motorways. Furthermore, the Commission should consider safety impact assessment, safety audits, network safety management and safety inspections to be a condition for all EU-funding of infrastructure. Every year between 1.5 and 2 bln EUR are spent on EU major roads through various European funds.

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Comparison between countries

Motorway users in **Switzerland**, **Denmark**, the **Netherlands** and **Great Britain** enjoy a lower level of risk than users in the rest of Europe (Map, Fig. 1). In these four countries, less than two people are killed on average for every billion vehicle-km. In **Sweden**, **France**, **Ireland**, **Germany**, **Finland** and **Israel** the risk of death is below the EU average of 4 deaths per billion vehicle-km[3]. In **Austria**, **Norway**, **Belgium**, the **Czech Republic**, **Italy**, **Portugal** and **Spain**, death rates are above the EU average of 4 but below 7 deaths per billion vehicle-km. On **Slovene** and **Hungarian** motorways, more than 8 people are killed for every billion vehicle-km.

Big disparities in terms of motorway safety exist in Europe. The difference between the worst and the best performing countries is a factor of 6. For example, the level of risk that a person travelling on motorways from London to Budapest experiences in Belgium is more than double what they experienced in Britain. Then in Germany it is between the two, but in Austria it is again twice what it was in Britain, and in Hungary it is twice as high again, that is more than 4 times the level in Britain!

This indicator of risk on motorways could not be calculated for **Cyprus**, **Greece**, **Luxembourg**, **Poland** or **Slovakia** due to the lack of data on the number of vehicle-km. The number of deaths on motorways is not available in **Bulgaria**, **Lithuania** or **Romania**. There are no motorways in **Estonia**, **Latvia** and **Malta**.

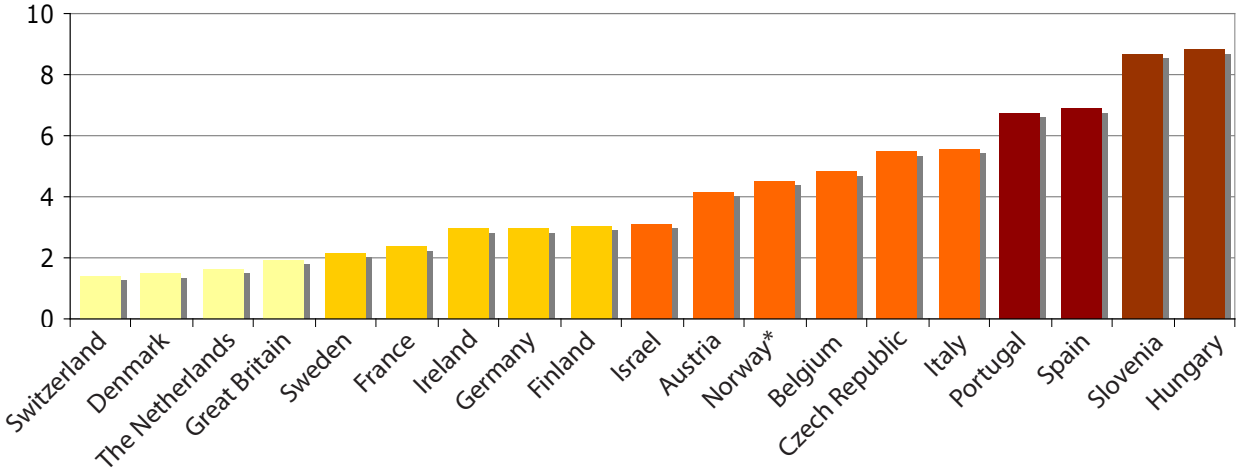


Fig. 1: Number of deaths on motorways per billion vehicle-km in 2006
* 2005 ** Motorway and Autovia (express roads) together.
Rates for Finland, Ireland, Israel and Norway are based on few deaths per year and are therefore subject to wide fluctuation

The indicator

This report uses as an indicator the risk of death per unit vehicle-distance driven, namely the number of deaths on motorways divided by the number of kilometres driven by vehicles on motorways (in billion).

Motorways are roads with dual carriageways, at least two lanes each way; entrance and exit signposted; grade separated interchanges; central barrier or central reservation; no crossing movements at the same level; no stopping permitted unless in an emergency. Use of motorways on foot and by some types of vehicle is restricted in various ways in different countries.

Although motorways are high speed roads, they are safer than other types of roads by design and regulation. Many more road users die on rural and urban roads. These are more difficult to compare internationally because of different definitions of road types and lack of detailed data on vehicle-km travelled.

This Flash looks at road users in general. In 14 countries (EU15 except Germany), the great majority of killed road users on motorways are car occupants. Powered two wheeler users account for around 10 % of all deaths, goods vehicle occupants 8% and pedestrians 7%[4].

The data collected to calculate the indicators are from the national statistics supplied by the PIN Panellist in each country. The CARE and IRTAD databases were used to supplement and verify. The full dataset is available in the background tables[5]. Altogether 19 out of the 30 countries covered under the Road Safety PIN provided data on km travelled on motorways, but they use various methodologies to collect them.

Progress

In reducing the risk of being killed

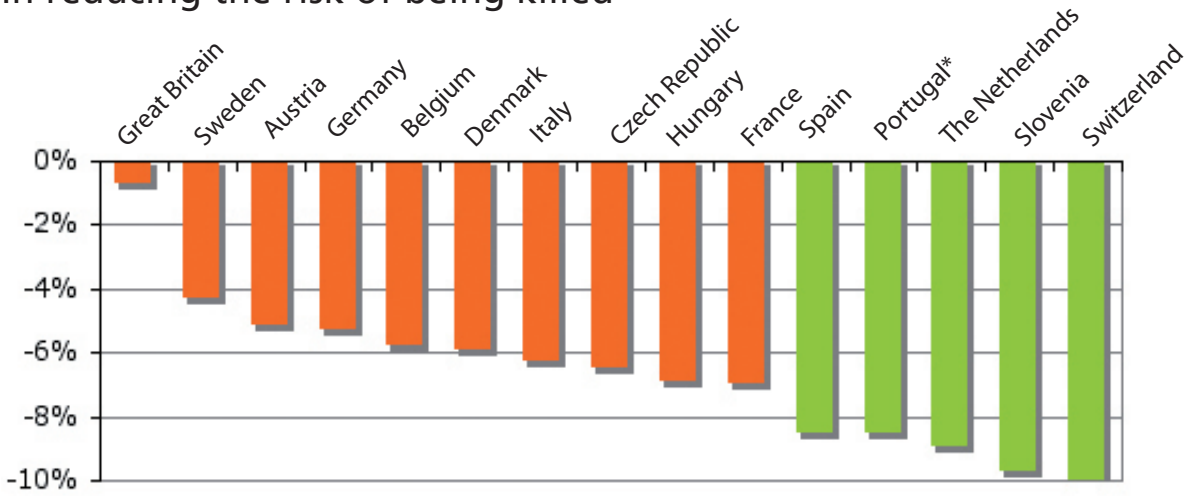


Fig. 2. Average yearly percentage change over 1997-2006 in deaths on motorways per billion vehicle-km[6] * PT (1999-2006)

In the period 1997 to 2006, the highest average yearly reductions in the risk of being killed on motorways were achieved by **Switzerland** and **Slovenia** (Fig. 2). In these two countries, the number of deaths per billion vehicle-km decreased each year on average by an outstanding 10%. **The Netherlands**, **Portugal** and **Spain** follow with annual reductions over 8%.

For the EU as a whole, the risk of death on motorways per vehicle-km has been decreasing on average by less than **6**% yearly over the last decade (Fig. 2)[7] while the number of deaths has been decreasing by less than **2**% over the same period[8].

The reduction in risk of death on motorways can be partly attributed to the improvement in vehicle passive safety, the improvements in traffic management through Intelligent Transport Systems (ITS), and also to the increase in traffic density contributing to greater speed homogeneity and traffic slowing down. Progress in better than average countries can also be attributed to better road user behaviour and infrastructure safety.

In reaching the EU target

It has been estimated that to reach the EU target of cutting road deaths by 50% between 2001 and 2010, a year-to-year reduction in deaths of at least 7.4% is needed from 2001 onwards (PIN Flash 6, Oct. 2007). Among the EU countries, the reduction of deaths on motorways is fully contributing to the overall reduction in **France**, **Austria**, **Denmark** and **Belgium** (Fig. 3).

But the average annual reduction in road deaths occurring on motorways between 2001 and 2006 was only 5% for the EU as a whole [8].

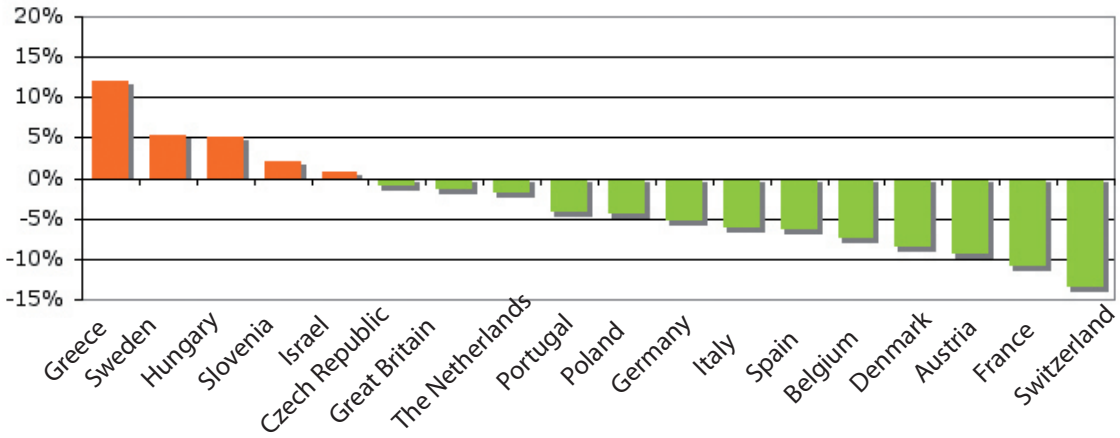


Fig. 3. Average yearly percentage change in the number of deaths on motorways over the period 2001-2006[9]

The number of deaths occurring on motorways has clearly tended to increase in **Greece**, **Sweden**, **Hungary** and **Slovenia**. In **Greece**, the increase in deaths on motorways from 86 to 147 is worrying and can be only partly attributed to an increase of the motorway network length.

Background

Experience from the countries with the safest motorway networks shows that a high level of safety on motorways is a result of a comprehensive mix of measures, including safe road design and engineering, safe infrastructure management and enforcement - particularly speed enforcement. Of course, other factors such as the vehicle fleet and mobility patterns play a role too, but these are hard to quantify.

The champions

In **Switzerland**, the number of persons killed on the motorway network has decreased by an outstanding 15% per year on average between 2001 and 2006 (Fig. 3). 31 people died on motorways in 2006 compared to 71 in 2001, making Swiss motorways the safest ones in Europe in 2006. Though a reduction in road deaths has been achieved also on urban and rural roads, it has been less impressive.

Speed enforcement on the motorway has become a high priority with the implementation of new speed cameras and increased mobile checks. The number of car checked has more than doubled between 2002 and 2006. Average speed has been reduced by 3% (Fig. 4). Finally, road safety and enforcement activities were extensively discussed in the media.

Denmark recently introduced important changes to the Traffic Law, including the introduction of a penalty point system in September 2005. A driver travelling 30% above the speed limit will get one penalty point. The licence is withdrawn after 3 points. Despite the generous allowed margin of 30%, 8 out of every 10 points imposed so far are for travelling above the speed limit.

In April 2004, the general speed limit on motorways was increased from 110 to 130 km/h after major infrastructure safety upgrades. For around half of the network the drivers are still required to keep to the 110 km/h limit. The stricter limit is clearly posted. The speed limit for heavy good

vehicles (HGV) was also increased from 70 to 80 km/h to reduce the problem of speed heterogeneity. Police enforcement was increased, together with awareness campaigns.

"19 people died on Danish motorways in 2006. This is the lowest level for 30 years. Unfortunately we have most probably not been able to sustain such a decrease because 2007 witnessed an increase in road deaths." Jesper Solund, Danish Road Safety Council

The good performance of the **Netherlands** is the consequence of the work carried out in developing an integrated approach of safe road design and traffic management, vehicle safety and awareness campaigns combined with police enforcement. As a result, road deaths on motorways have continued to decrease - by almost 5% per year on average between 1997 and 2006.

This excellent record has been achieved without road safety audits and road safety inspections being mandatory. Dutch researchers have estimated that further improvements could be achieved if the requirement for road safety audits (RSA) and inspections (RSI) were strengthened. Relatively few are carried since it is up to the road authority whether or not to have an RSA or RSI[10].

Dutch motorways are equipped with accident detection cameras transmitting information at once to traffic management centres. In case of accidents or congestion, drivers are alerted via variable messages and required to slow down to 50 or 70 km/h. Other ITS applications include dynamic route information panels, ramp metering and rush hour lanes, mainly to reduce congestion.

The Dutch government is about to bring in pay-as-you-drive road pricing for trucks in 2011, and cars by 2016. Pay-as-you-drive systems charge road users according to the distance driven. This is expected to alter congestion and reduce road use, both having safety benefits.

The **UK** has the longest experience with safety audits. They have been compulsory since 1991 for all new national roads and improvements on existing trunk roads and motorways. They have become a well-accepted practice in modifying the road network.

"Mean speeds on UK motorways have remained reasonably stable but this could be due to increased congestion. Unfortunately exceeding the 70miles/h speed limit is still a widespread phenomenon in free flowing traffic. The government's target of reducing killed and serious injuries is being met but whereas serious injuries have been falling, deaths have remained fairly stable. We are currently investigating why this is but, as yet, we do not have the answers."
Brian Barton, UK Highways Agency

Hard shoulder running during peak hours

Hard shoulder running during peak hours may be an efficient instrument for rapidly achieving improvement of the traffic flow on heavily congested motorways at reasonable financial cost. Experiences in the UK, the Netherlands, France and Germany show that road accidents, travel time and pollution can also be reduced.

The M42 near Birmingham is one of Britain's busiest motorways, leading to high congestion levels at peak times and accident rates higher than the national average. The Active Traffic Management scheme (ATM) implemented there aims to utilise new technologies and infrastructure alongside improved management techniques. The ATM scheme includes:

- Driver information signs
- Mandatory lower speed limits during periods of congestion and when approaching incidents
- Use of the hard shoulder during periods of congestion
- Incident management control centres
- The provision of emergency refuge areas every 500 m each with emergency roadside telephones

Since the introduction of the ATM scheme, no one was killed on the M42 and accident rates decreased by 25%.[11]

30 rush-hour lanes are also in operation in the Netherlands. Serious accidents decreased by 40% over the period 2004-2006 compared to 2001-2003, while the overall reduction on the whole motorway network was 30% [12].

The fast movers

Over the past decade, **Slovenia** achieved the second best reduction of the number of deaths per billion vehicle-km after Switzerland. Still the risk of dying on the motorway is the highest among the countries that provided data. Most of the motorway network has been built since 1994 and the implementation of the National Motorway Construction Programme. Safety standards have already been implemented, but the formal implementation of the latest best practice in infrastructure design will allow further improvements.

"The current generation of drivers has more traffic experience than the generation of their parents; a phenomenon that is known as "collective learning"" says Tomaz Pavcic. However, speeding is a widespread phenomenon as drivers do not expect traffic surveillance and tend to drive faster cars. *"We hope to improve the situation in future years with the first cameras being implemented on motorways as part of the Strategic National Safety Plan"*.

Spain still holds a sad record of people killed per vehicle-km on motorways but the government is taking action to tackle the problem. 2006 saw the first road safety inspections on motorways and national roads. Yet road safety audits and inspections are not mandatory. The Royal Automobile Club of Catalunya (RACC) also assessed the passive safety elements of 7,000 km of motorways and autovias, on the basis of the EuroRAP Road Protection Score protocol.

"We found that more than 50% of the road assessed had room for improvement, especially regarding roadside protection. Run off accidents account for 40% of fatal accidents outside built-up areas in Spain" says Lluis Puerto from the RACC Foundation. High risk sites are also progressively being treated. *"The adoption of an EU Directive would certainly give the sharp edge to incite the government to accelerate progress."*

"It is generally agreed that part of the good reduction of the total number of road deaths in Portugal over the past decade has been due to the transfer of high speed traffic from rural roads to newly built motorways. However, even some of the newly built motorways do not allways provide the highest safety level for the same level of construction costs. The adoption of an EU Directive would be instrumental in preventing other countries from repeating the same mistakes".

Joao Cardoso, LNEC, Portugal

In **France**, where a fully automated speed camera system was introduced in late 2003 and speeding sanctions stepped up, average speed of cars has dropped by 6% from 2002 to 2006 (PIN Annual Report 2007). In the same period, the number of deaths per vehicle-km has been decreasing each year by an outstanding 17% on average (and deaths by 16%) on motorways. This confirms the research findings, according to which the relative change in the number of fatal crashes is proportional to the 4th power of the relative change in speed[13].

However, excessive and inappropriate speed remains present in one fatal accident out of 3. In 2006, half of the vehicles were travelling above the legal speed limit on 110 km/h motorways and almost one third on 130 km/h stretches.

Room for improvement

"Recently efforts have been made to increase awareness of the danger of tailgating and enforce safe following distance in several countries. In the Czech Republic, however, every third vehicle travelling on the motorway is not keeping safe distance from the vehicle travelling in front."

Vojtech Eksler, CDV, Czech Republic

"Deaths on motorways have been on the rise since 2001 in Hungary following the very unfortunate decision to raise the maximum speed limit from 120 km/h to 130 km/h. Most of the drivers break the limit as they do not expect being caught. Many fail to wear a seat belt. The government must now increase police enforcement and provide appropriate rescue service."

Peter Hollo, KTI, Hungary

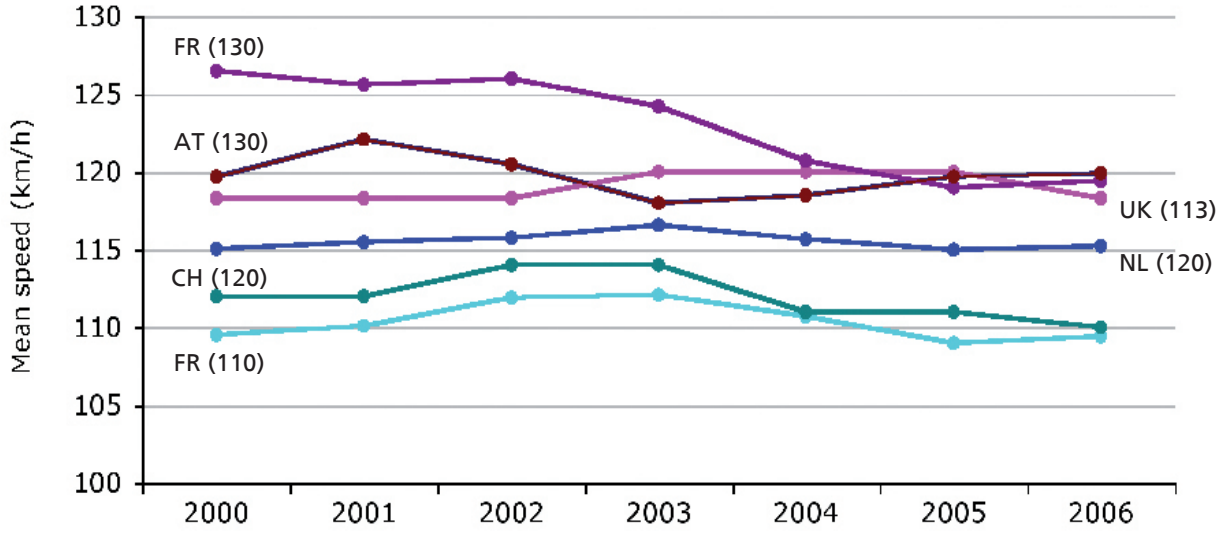


Fig. 4. Development in mean speed on motorways for some countries showing decreased motorway deaths

In 2004, 99% of the new vehicles sold could reach 150 km/h or more, which is above every permanent motorway speed limit in Europe.

Section speed control

Section speed control is a relatively new way of enforcing speed limits. Automatic section controls are in use especially on motorways and tunnels in several countries in Europe, including the Netherlands, Italy, the Czech Republic and Austria. First results show safety benefits from this type of speed enforcement. While a camera enforces vehicle speed at a single point, section control allows measuring the average speed of a vehicle over a distance of usually 3 km. This helps to make drivers adhere to speeds along entire road sections, which results in more fluid traffic.

For road users, speed enforcement on motorways can provide highly visible evidence reinforcing their subjective assessments of the risks of being caught speeding.

TUTOR: Section speed control in Italy

A fully automated section speed control scheme has been implemented on high-risk sections of the motorways operated by Autostrade per l'Italia (1250 km of motorways at the end of 2007). The system called "Tutor" checks the mean speed of vehicles over a 5 to 30 km road section and automatically generates a fine in case of speeding. The risk of death was halved during the first year of implementation on 460 km of motorways. Accident and injury rates also went down by 19 and 27% respectively. The mean speed decreased by 16%.

In 2008, the application of the Tutor system will be extended to an additional 902 km of motorway sections, covering more than 30% of the Italian motorway network.

	Sep 2005 - Aug 2006	Sep 2006 - Aug 2007	Change
Death rate	0.84	0.41	-50.9%
Injury rate	23.60	17.28	-26.8%
Accident rate	50.04	40.47	-19.1%

Heavy good vehicles posing safety risk

The heavy good vehicle (HGV) traffic on motorways has been increasing faster than car traffic in most European countries. HGVs have to respect lower speed limits than light vehicles and thus might cause heterogeneity of speeds in free flowing traffic. Every day in Europe some motorway sections are blocked for many hours due to accidents involving HGVs. HGVs are forbidden to overtake on most part of the **Dutch** motorways during day time. **Belgium**, **France** and **Czech Republic** are currently considering forbidding HGVs to overtake other HGVs on 2-lane motorway carriageways.

Variable road pricing for HGVs could be another solution for reducing HGVs' traffic during peak hours. Toll prices could vary depending on the section travelled and the period of the day.

The need for action at the EU level

Present road designs result from many decades of construction and maintenance in times when safety issues were not considered to the same extent. Today, several road features no longer meet the latest safety requirements. Moreover, traffic conditions may have changed since the road was designed and built. Even recently upgraded motorway networks in some Southern and Central European countries register high risks of death. This suggests that knowledge about safe design and effective risk management may not yet be fully applied.

Against this background, the European Commission adopted a proposal for a Directive on road infrastructure safety management. The Directive would require Member States to apply the following four instruments on the Trans-European Road Network (TERN):

- **Road safety impact assessments**: demonstrate the road safety implications of different planning alternatives for a road project, whether construction of new infrastructure or rehabilitation of existing infrastructure, as in the case of environmental impact assessment
- **Road safety audits**: an independent technical check aiming at identifying unsafe features of a road project, including proposals for remedy
- **Network safety management** targeting remedial measures to parts of the network with high concentrations of accidents (high-risk road sections) and/or a high potential to avoid accidents in the future.
- **Safety inspections**: as part of regular road maintenance, enable the detection and hence reduction of accident risk in a preventive way through low cost measures.

These procedures already exist and are applied at varying degrees in some Member States. Aim of this proposal for a Directive is therefore to extend the above-mentioned measures to the whole of the EU, without defining technical standards or requirements, but leaving the Member States free to keep already existing procedures if they have them in place or to introduce procedures in their own way if not.

Non-binding guidelines would have limited effectiveness in accelerating progress on road infrastructure safety beyond what national governments are already committed to do, or are likely to commit themselves to do without a requirement to do so as part of the EU.

According to the principle of subsidiarity, the application of these rules would be mandatory only on those 85,000 km of main roads belonging to the TERN. It is hoped that this Directive would have a spill-over effect that will also bring about an associated improvement in the safety management of the rest of the road network.

The EU project ROSEBUD estimated that the application of the four procedures to the Trans-European roads would reduce the number of deaths by more than 600 and injuries by 7000 every year. ROSEBUD also estimated that 400 lives per year could be saved if the safety management was applied to motorways only, and 1300 if applied to motorways and main roads[14].

Cost-effective approach to infrastructure safety management

A methodology known as Network Safety Management (NSM) has been developed jointly by the Federal Highway Research Institute (BAST) in Germany and the Technical Department for Transport, Road and Bridge Engineering and Road Safety of the French Ministry for Ecology (SETRA). NSM is a tool for road administrators to help them in identifying highway sections to be treated with high priority. In NSM, the key parameter to assess the safety performance of road sections is the so-called safety potential. The safety potential describes the potential savings in accident costs that could be reached by remedial measures. It is defined as the amount by which accident costs per km length of road would be reduced if a road section had a best practice design.

The advantage of the safety potential compared to the classic accident parameters is that it allows different road types and roads with different traffic volumes to be assessed at the same time. Furthermore, as the safety potential is given in terms of accident cost, it can be related to the cost of the improvement measures. Since resources are limited, those sections where improvements can be expected to have the highest benefit-cost ratio can to be treated first.[15]

The EuroRAP experience

ETSC: How did EuroRAP start?

EuroRAP was created following the success of EuroNCAP in raising the safety standard of the typical new car from two to four stars. EuroRAP has been able to bring together all the stakeholders in a safe road system – motoring and touring clubs, road authorities and manufacturers - and create, for the first time, a common international system to measure the safety of roads independent of national proprietary standards.

EuroRAP provides three protocols that can be applied to any country:

- **Risk Rate Mapping**: the numbers of killed and seriously injured road users per billion vehicle-km are shown on a colour-coded road map
- **Performance Tracking**: Identifies whether fewer people are being killed or seriously injured on a road over time and identifies the countermeasures that are most effective
- **Road Protection Scores (RPS)**: assesses how much or how little protection a road environment will provide the occupants of a car in the event of a crash. On the basis of this score, each road is given a star rating varying from 1 to 4, with 4-star representing a road which is engineered to minimise the likelihood of a crash resulting in a fatal injury to car occupants.
  RPS provides information that is not readily available through accidents histories. Accidents are always random and accident rates subject to statistical fluctuation. Over time as accident numbers decrease, identification of higher risk sites through variations in observed accident numbers will become more difficult. The RPS aims to provide a consistent assessment of the potential long-term risk of a given road design.

The power of being able to measure the safety of roads in a way that is understandable to both professionals and the public has meant EuroRAP has quickly become active in many European countries and has generated sister programmes on every other continent in both developed and developing countries.

ETSC: Who are you reaching out to with EuroRAP?

The key channel of communication is through motoring clubs or research charities. The star rating is a familiar consumer measure used by clubs for decades to rate all kinds of services. Mapping, atlases, club magazines, websites and now online planners and route guidance systems already distribute the risk maps and star rating results on the safety of roads to millions of consumers.

The new EuroRAP *Road Safety Atlas* project will provide a formal reference document to support distribution of the information across the continent.

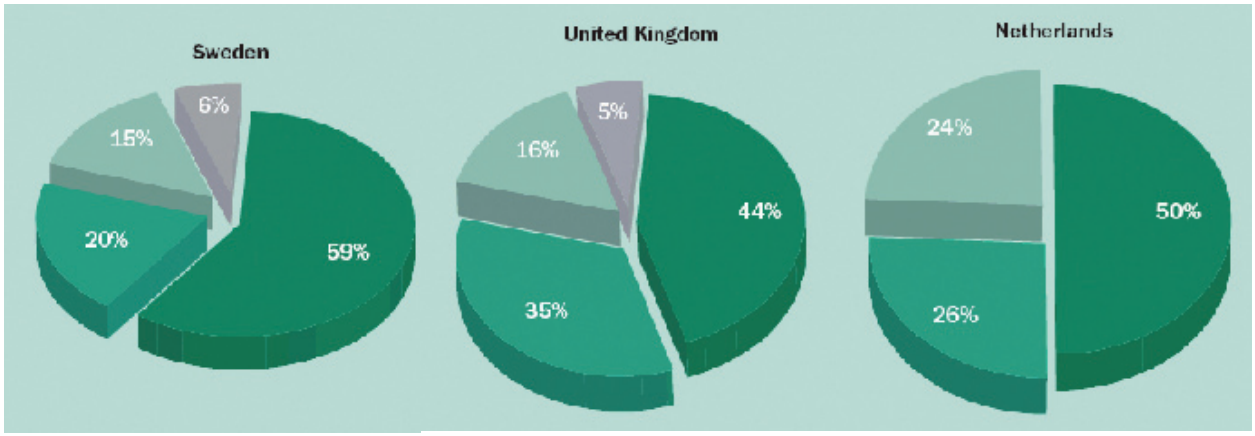
Road casualties bleed away 2% of European GDP. Improving the safety of roads infrastructure is one of the easiest, most affordable and highest return ways of improving European competitive performance. The reduction of road deaths and injuries offers higher economic rates of returns than available in any other field of public policy.

ETSC: The latest PIN ranking of motorway safety shows that Switzerland, Denmark and the Netherlands are leading the way. Also Slovenia, Portugal and Spain have been particularly successful in cutting death rates over the past decade. What, in your view, can explain their good results?

The differing safety levels of national motorways or any roads result from the system - a combination of the quality of roads, drivers and vehicles.

The **UK**, the **Netherlands** and **Sweden** have been frontrunners in designing safer roads. This combines with important factors such as high seat belt wearing and use of modern safer cars. The safety quality of underperforming countries' motorways is highly variable. For example, in **Spain** there are sections where the safety quality is good but much where it falls well below usual motorway standard. Even some relatively newly built sections are not 4-star.

Still in the safest EuroRAP countries, improved roads are expected to be the major source of future casualty reduction. Analysis of national road casualty reduction strategies shows that road infrastructure improvements are expected to deliver the greatest savings compared to improvements to vehicles, and even driver and road user behaviour. This is particularly so in countries where, however imperfectly, traffic law is already generally respected.



Percentage of total savings in each country. EuroRAP From Arctic to Mediterranean First Pan-European Progress Report. Derived from Koornstra et al. (2002). SUNflower

In the top three safest EuroRAP countries, improved roads are expected to be the major source of future casualty reduction.

Our latest UK star-rating reports 2006-07 shows that only 60% of the UK motorways tested scored the top 4-star grade. We urgently need to improve our run-off scores. A quarter of motorway roadsides scored only 2-star. This reflects, for example, the presence of trees fairly close to the carriageways on some unprotected motorway roadsides. Improving injury protection on a 3-star motorway to 4-star rating would reduce fatal and serious accidents by 28%.

ETSC: Should road safety improvements be left to the national authorities or should it be a coordinated EU effort? In this respect, how important may be the proposed Infrastructure Directive for achieving this goal?

Every few years, thousands of road sections across Europe see more casualties than a major rail crash, yet the cost of saving casualties represents a fraction of that spent on rail, air and factory safety, where laws are more stringent.

The European Union can lead the way by requiring that Europe's premium network of trade routes, the TERN, has 4-star minimum safety standard. It can require that national authorities demonstrate they have in place basic competence in safety management. The current Infrastructure Directive is most important to help raise standards in Central and Eastern Europe and ensure they are met by any new Member State.

EuroRAP has pledged to work with the Commission to support its transparency strategy. EuroRAP proposes to assess the TERN's safety performance using both risk mapping and inspection of crash protection standards. EuroRAP urges national authorities to make available road accident data. This would allow independent assessment of safety performance of any public funded infrastructure.

Safety improvements to eliminate 2 and 3-star roads on the TERN would provide a high-profile template for making roads safer in all EU Member States.

John Dawson is chairman of EuroRAP, the first regional assessment programme, which he has led since its genesis in 2000. John is also chairman of IRAP, the International Roads Assessment Programme, which was established in 2006. He is also Secretary of the FIA Foundation for Automobile and Society. www.eurorap.org

Notes

1. Exact value 8.3% (3270 deaths on motorways/39251 total number of deaths) for EU25 in 2006
2. Exact value 27% (Estimation based on AT, BE, CZ, DK, FI, FR, DE, HU, NL, SI, ES, SE, GB)
3. Exact value 3.7 (Countries considered AT, BE, CZ, DE, DK, ES, FI, FR, GB, HU, IE, IT, NL, PT, SE, SI)
4. ERSO, Traffic Safety Basic Facts 2006, motorways, Fig. 4, p.6 http://www.erso.eu/safetynet/fixed/WP1/2006/BFS2006_SN-NTUA-1-3-Motorways.pdf
5. PIN Flash 8 Background tables www.etsc.be/PIN
6. NO, IL and FI are excluded from Fig. 2. The annual numbers of deaths in FI and NO are below 20 and thus subject to substantial random fluctuation. IL could not be included because vehicle-km are available only for 2005 and 2006.
7. Exact value 5.6% (Average based on AT, BE, CZ, DE, ES, DK, FI, FR, GB, HU, IT, NL, SE, SI)
8. Exact value 1.4% (Average based on EU25 except EE, LT, LV, LU, MT)
9. Cyprus, Finland, Ireland, Luxembourg, Norway and Slovakia are excluded from Fig. 3 as the annual numbers of deaths are below 20 and thus subject to substantial random fluctuation.
10. "*Experience from countries that are running road safety audits and inspections (UK, Australia, New Zealand, Denmark, France, Norway...) confirms that RSA and RSI are cost effective road safety measures*". SWOV Fact Sheet, Road Safety Audti and Road Safety Inspections, March 2007
11. http://www.highways.gov.uk/news/newsroom.aspx?pressreleaseid=156569
12. AVV, Monitor ZSM 2006, August 2007
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15. Ganneau F. and Lemke K., Network Safety Management – From case study to application, http://www.setra.equipement.gouv.fr/IMG/pdf/ip304-e.pdf

European Transport Safety Council

PIN Panel

Austria	Klaus Machata, Road Safety Board (KfV)
Belgium	Patric Derweduwen, Belgian Road Safety institute (IBSR/ BIVV)
Bulgaria	Valentin Pantchev, Minstry of Transport
Cyprus	George Morfakis, Ministry of Communication
Czech Republic	Jaroslav Heinrich, Transport Research Centre (CDV)
Denmark	Jesper Solund, Danish Road Safety Council
Estonia	Dago Antov, Stratum Consultancy
Finland	Mika Hatakka, Central Organisation for Traffic Safety
France	Jean Chapelon, National Interministerial Road Safety Observatory
Germany	Sabine Degener, German Insurance Institute for Traffic Engineering (GDV)
Greece	George Yannis, Technical University of Athens
Hungary	Peter Holló, Institute for Transport Sciences (KTI)
Ireland	Noel Brett, Road Safety Authority
Italy	Luciana Iorio, Pietro Marturano, Ministry of Transport
Latvia	Aldis Lama, Ministry of Transport
Lithuania	Vidmantas Pumputis, Ministry of Transport
Luxembourg	Guy Heintz, Ministry of Transport
Malta	Maria Attard, Malta Transport Authority
Netherlands	Peter M. Mak, Transport Research Centre (AVV)
Norway	Rune Elvik, Institute of Transport Economics (TOI)
Poland	Ilona Buttler, Motor Transport Institute (ITS)
Portugal	Joao Cardoso, National Laboratory of Civil Engineering (LNEC)
Romania	Sorin Supuran, Road Authority
Slovakia	Stefan Pristas, Ministry of Transport
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