ShLOW!
Show me How Slow

Reducing Excessive and Inappropriate Speed Now: a Toolkit

ETSC
European Transport Safety Council

SEVENTH FRAMEWORK PROGRAMME

European Transport Safety Council

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Edited by:
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October 2008

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European Transport Safety Council

SEVENTH FRAMEWORK PROGRAMME

Contents

Executive Summary

'ShLOW!' is a two year pan European project funded by the European Commission. 'ShLOW!' aims at mobilising transport research into speed management to demonstrate how excessive and inappropriate speed on our roads network can be reduced through existing measures.

'ShLOW!' will focus on the work of committed young students who will be encouraged to run a local speed management action to reduce speeding in road transport with the support of ETSC and its partners. The project is coordinated by the European Transport Safety Council in conjunction with a consortium of 13 organisations spread across 10 EU countries.

Reductions in driving speeds (even minor ones) make an important contribution to reducing the numbers of road traffic deaths and injuries, as well as contributing to the abatement of C02 and other pollutant emissions. Yet, proven and available speed managements methods are still scarcely and often inappropriately used. The present publication is intended as a toolkit of measures for the students participating in this 2 year project, but will also be useful for any individual interested in speed management.

1 Introduction

In 2007 for the first time in years there has been no reduction in the number of road deaths in the EU. This worrying performance means that the road safety target of the EU (to reduce road death by half by 2010 compared to 2001) will not be met. We are still stagnating at around 40,000 annual deaths across the EU (i.e.: on average more than 100 persons die every day on the EU road network). Speeding, encompassing excessive (including driving above speed limits) or inappropriate speed (driving too fast for the prevailing conditions) is thought to contribute to about one third of road crashes, and is therefore most probably the biggest contributing factor in fatal road crashes. To this we also have to add an additional reason for concern: a large proportion of the victims of lethal crashes related to excessive speed are young adults.

Addressing excessive and inappropriate speed is therefore an emergency. But tackling speed goes even beyond road safety: research on atmospheric pollution caused by CO2 emissions has shown that reducing speed is one of the most productive, cost-effective, and possibly popular route to protect our climate.

Against this background, ETSC and its various partners are determined to take concrete action to fight excessive and inappropriate speeds on our roads and attain a safer and sustainable future.

WHAT IS 'SHLOW!'?

'ShLOW!' is a two year pan European project funded by the European Commission. The project is coordinated by the European Transport Safety Council in conjunction with a consortium of 13 organisations spread across 10 EU countries.

'ShLOW!' will focus on the work of committed young students who will be encouraged to run a local speed management action to reduce speeding in road transport with the support of ETSC and its partners.

HOW DOES IT WORK?

The 'ShLOW!' consortium will tour universities across Europe to deliver Lectures on Speed Management and to recruit students who would like to participate in the project. Students then apply online to take part in 'ShLOW!' and 50 selected students are invited to a one week training course in Brussels: the 'Speed Management Camp', where they will receive training from European experts on speed management, from across different sectors (academia, industry, public authorities, etc.).

Thanks to the knowledge acquired during the Camp, the students will return to their home and the 'ShLOW!' Challenge will begin: students will have to carry out their individual activity on Speed Management at the local level. For this students will receive the support of the consortium throughout their efforts. At the end of the project, the most successful student will be invited to Brussels to receive an award during the 'ShLOW!' Ceremony.

WHAT SHOULD THE STUDENTS DO?

The students should commit to run a local initiative or campaign to demonstrate how speed reductions can be obtained, or directly achieve speed reductions through concrete actions. Examples, among others, include:

- Running an Intelligence Speed Assistance demonstration
- Lobbying local municipalities to install traffic calming devices
- Running a small scale awareness raising campaign

- Approaching fleet operators to incite them to adopt speed management technologies and policies

The most successful students will be the ones who manage to get a formal commitment from a company or local authority to take concrete actions to reduce speed.

The present document is as a list of potential measures that can be undertaken at a relatively small scale with partners such as local authorities or fleet operators (i.e.: as opposed to working at the higher 'national' level). It is aimed at inspiring the students who will take part in 'ShLOW!' who will design their own speed management activity. It is also, however, a source of information for anyone interested in Speed Management.

The Final section of this publication presents the Speed management situation (including success stories and areas of work that need more efforts) for the 10 countries participating in 'ShlOW!'.

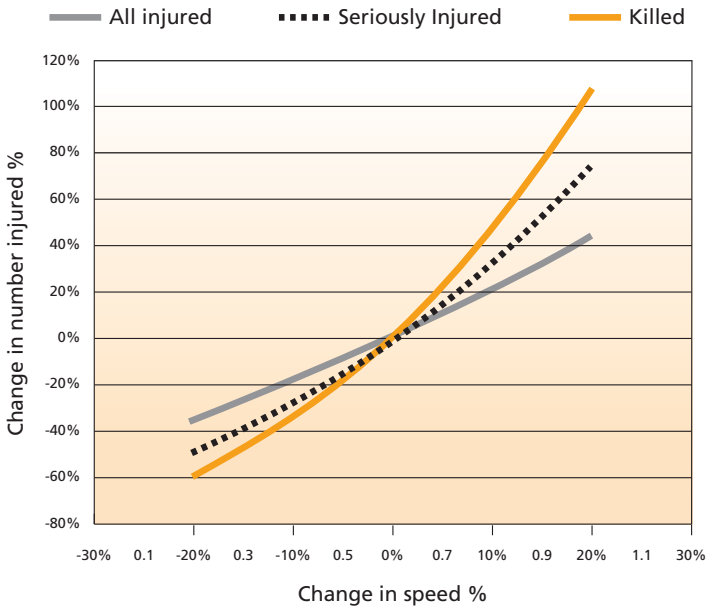
THE RELATIONSHIP BETWEEN SPEED AND ROAD CRASHES:

In depth investigation of the relationship between speed and accidents has been undertaken in recent years, and all reviews from these studies (Haworth and Symmons 2001; DETR 2000; Taylor, Lynam & Baruya et al 2000, Elvik et al 2004, Aarts and van Schagen 2006; Kallberg, Allsop, Ward, Van der Host & Varhelyi 1998; Kallberg & Toivanen 1998) concord on the following:

- Small changes in mean speeds can be expected to result in measurable and significant changes in crash outcomes
- Severe crashes (serious injuries and deaths) are much more sensitive to speed changes than crashes in general

While the risk linked to speed varies across road types, a sound rule of thumb is that, on average, a 1% reduction in the mean speed of traffic leads to a 2% reduction in injury accidents, a 3% reduction in severe injury accidents and a 4% in fatal accidents (Aarts and van Schagen 2006, based on Nilsson 1982). It follows from the high risk associated with speed that reductions in driving speeds (even minor ones) will make an important contribution to reducing the numbers of road traffic deaths and injuries.

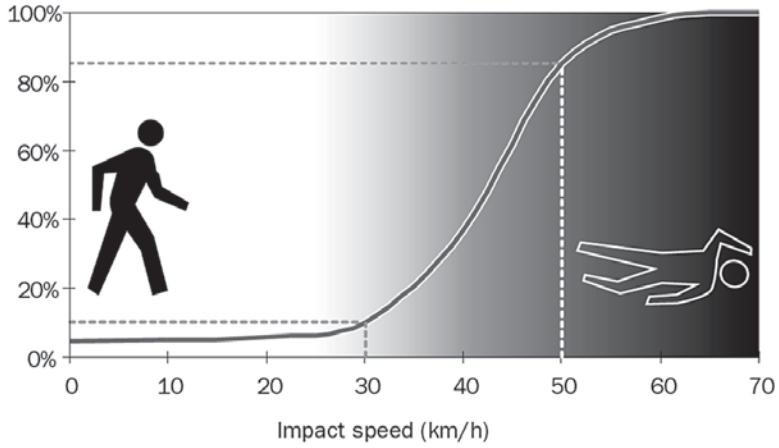
RELATIONSHIP BETWEEN CHANGE IN SPEED AND CHANGE IN THE NUMBER KILLED AND SERIOUSLY INJURED (NILSSON, 2004A)



Consequently, a reduction of the average travel speed can contribute significantly to reduce the number of killed and injured persons in traffic. The OECD considers reducing the travel speed a "Guaranteed Way" (OECD 2006) to make real progress towards achieving road safety. The Safety Net Project states, "Reducing speed is the first thing to do to reduce both the number of accidents and the number of injured and dead people" (Hakkert et al. 2007)

But as studies carried out on European level show, drivers in Europe still underestimate the inherent risk of speed. They do not consider high speeds as risky, whenever their own behaviour is concerned. The speeding behaviour of other drivers however is considered very risky (SARTRE 3; 2004). The average travel speed in EU frequently exceeds the legal limits, and often the enforcement of the speed limits in force is rather insufficient (ETSC 2006, Elvik et al 2004): Despite the overwhelming evidence on the negative impact of excessive and inappropriate speed, if we look at compliance levels with speed limits The OECD estimates that **at any one moment, 50% of drivers exceed legal speed limits** (OECD/ECMT, 2006)**.** Addressing illegal speeding therefore requires a large number of non-compliers to adopt a behaviour change (whereas compliance to legal blood-alcohol content levels and wearing seat belts concerns a very small proportion of drivers who need to change their behaviour).

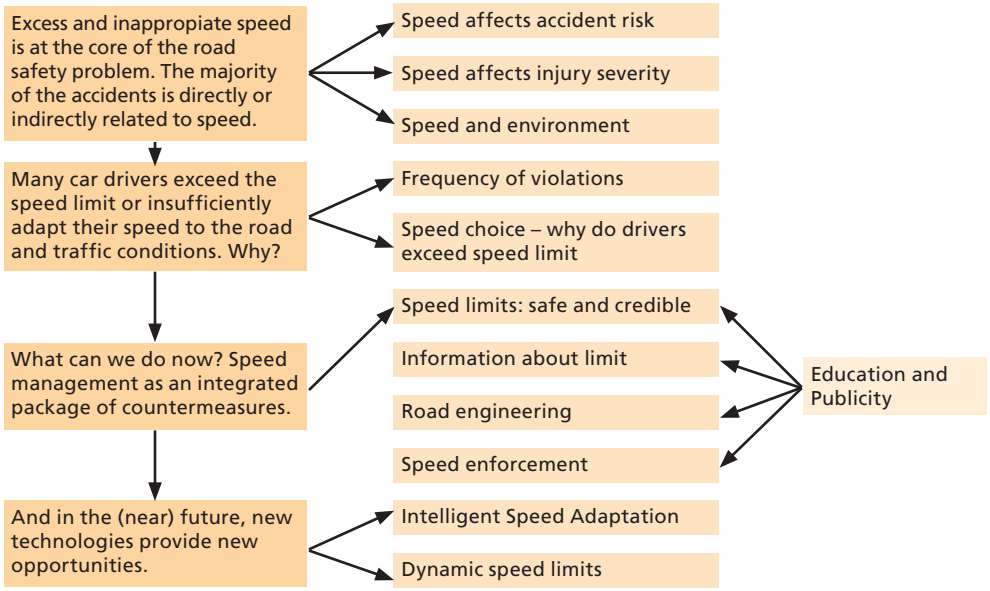
Speeding is also a great source of concern when it comes to addressing collisions with vulnerable road users such as pedestrians (an increasing source of casualties, especially in urban areas). In such circumstances it is obvious that excessive and inappropriate speeds have a dramatic impact on the probability of collisions resulting in fatal injury.



WHO/FiA Foundation/GRSP/The WorldBank, (2008)

2 Reducing Speed: A Toolkit

Speeding is a complex issue that requires a holistic approach. There is no single solution to the problem of excess and inappropriate speed. A package of countermeasures is necessary, increasing the effectiveness of each of the individual measures. The most appropriate combination of measures will differ with circumstances.



Source: ERSO, www.erso.eu

Action can be taken on all of the road safety pillars (the infrastructure, the drivers and the vehicles) to address excessive and inappropriate speed. Speed management starts with setting appropriate speed limits, but because speeding is such a widespread phenomenon and one that concerns us all, speed management goes well beyond that: there is a plethora of measures that can be undertaken to make drivers comply with limits or to help them choose speeds that are in line with prevailing conditions. Every actor in society can play a role in that process (starting from the single driver all the way up to the highest decision-makers, and encompassing relevant stakeholders such as the car manufacturing industry and transport service providers).

For the sake of convenience we will list a number of measures under three categories: engineering, enforcement and education. But clearly this is not an exhaustive list of all possible measures and any one measure there could easily fall under more than one category.

2.1 ENGINEERING

2.1.1 Infrastructure

Experience shows that in many countries speed reductions have been achieved successfully through the use of infrastructure engineering measures. In particular the Netherlands have been successful in integrating infrastructure schemes as part of a wider road safety philosophy called 'sustainable safety'.

A Sustainable Safe road system aims to prevent crashes and, if they still occur, to minimise their consequences. It is based on the idea that people make mistakes and are physically vulnerable. There are five main principles: functionality, homogeneity, recognisability, forgivingness, and state awareness.

Functionality

A sustainably safe road network has a functional layout, based on three main road types: 'through' roads for dispersion of traffic, 'access' roads for access to final destinations, and 'distributor' roads for a good link between these types.

Homogeneity

As much as possible roads should ensure the homogeneity in mass, speed, and direction of vehicles. This means that vehicles with large differences in mass, speed, and direction must be physically separated from each other. For example, cars and vulnerable road users are incompatible, but so are lorries and other vehicles, or motor vehicles driving in opposite directions. Conflicts between these vehicle types will almost inevitably have severe consequences. This sort of conflict can be avoided by having separate infrastructures or dual carriageways. When physical separation is not possible, for example at junctions at grade level, the speed must be reduced. It should be so low that all possible conflicts would end safely, i.e. without any severe consequences. Measures that can be used here are a lowering of the speed limit and speed reduction by other means (e.g. roundabouts or raised junctions and raised pedestrian crossings).

Recognisability

Road users should know which driving behaviour is expected from them and what they can expect from others. Road users should 'automatically' drive appropriately. Generally, people make fewer mistakes when engaging in automatic behaviour than when they drive using reasoned actions. The desired driving behaviour can only be incited with a uniform road design which is well tuned to it. People need to recognise the road type and drive accordingly. This must apply to the whole road network which should also be predictable, just like others' driving behaviour.

Forgivingness

The 2005 update of sustainable safety now includes the principle of forgivingness. Forgivingness in the physical sense means that the road design is such that any crashes will end with as little injury as possible. A vehicle that goes off the road should not hit any obstacles or other fixed objects, because this leads to severe injury. Forgivingness in Sustainable Safety also has a social meaning. The more experienced drivers should, by displaying anticipatory behaviour, offer room to the less experienced drivers. This prevents mistakes by the inexperienced being 'punished' by a collision.

State awareness

This refers to the road user's capacity, or the opportunity, to correctly judge his own fitness to drive. This means that he must know which skills he possesses and whether they are sufficient to drive safely. But road users should also be capable of knowing if they are, temporarily, unfit to drive due to alcohol, stress, or fatigue.

The Sustainable Safety vision has a large influence on road safety work in practice, for example, one of the consequences of the principle of homogeneity is that motorised traffic and vulnerable road users (pedestrians, cyclists) can only interact if speeds of motorised traffic are low. If speeds cannot be kept low, separate facilities for vulnerable road users are required. Measures to realise this included a substantial increase in the number and size of 30 km/h zones in built-up areas; the introduction of 60 km/h zones outside built-up areas, and speed reduction at intersections.

More information: http://www.sustainablesafety.nl

Traffic calming measures in urban areas:

Home Zones

The home zone concept is used in many countries, most often in western countries, and is notably spreading in the United Kingdom, the Netherladns, Germany, and other countries. The Home Zone concept also known as the Dutch word 'Woonerf' meaning 'Living Street' was pioneered in the 1970s in the Netherlands. Since then this concept has been transferred to many other countries and adopted to specific conditions of a country. In Germany and Austria, Homezones are called 'Spielstrasse' or 'verkehrsb' and refer to residential area streets, where all road participants have the same rights and are not allowed to disturb each other.

The basic idea is to let the different road users share the same area. To do this the motor vehicle speed must be low, as a rule below 10 – 15 km/h (and in Germany, at so called "walking speed", which means as low as 4-7 km/h). Home Zones are often associated with residential areas but are also suitable and used in other traffic environments like in town centres. In the UK it is restricted to residential areas 'with streets designed to be places for people, instead of just for motor traffic'. The aim is to improve the quality of life within them – the intended outcome will be that streets become safer for people to walk, cycle or children to play. Particular focus is on vulnerable road users. Home Zones promote the concept of shared road space for all and on equal conditions. Low speeds are maintained by different physical measures and with special road sign. Benches, flower beds, play areas, lamp posts fences and trees increase the aesthetic experience and give the motorist signal to drive in a careful way.

Home zone can address a fairly large target group: in Great Britain for example 29 % of all roads are minor urban roads and it is on them that Home Zones can be implemented.

Home Zones change the way in which streets are used in order to improve quality of life. The outcome is that the streets become places for people who walk or cycle. The dominance by vehicular traffic is overcome and safe and green spaces are created.

This 'Shared Space' concept, coming from The Netherlands, is also applied in other type of roads than only residential roads. However, shared space should only be applied very carefully when the environment fulfills specific preconditions or prerequisites, because it bears some uncertainties and risks.

It is hard to estimate the cost/benefit ratio of home zones. In the Handbook of Road Safety Measures (Elvik, 2004) the benefit–cost ratio is calculated based on one single example. There are safety and environmental benefits but there are also travel time costs. Whether the difference between benefit and cost will be negative or positive depends on the amount of traffic and the accessibility to alternative roads with higher speed level.

Regarding public acceptability, the experience from several countries has shown that there is a substantial support for the measure.

The "shared space" principle can be used as a niche solution and as one of the tasks to be performed in detailed town and country planning and in traffic planning. Condition for this is however to make sure that before this model is applied, traffic safety particularly of the vulnerable road users is not jeopardised. This implies among others that such measures must not be implemented in the following cases:

- High traffic volume roads (Daily Traffic Volume over 3,000 vehicles)
- Roads with heavy traffic
- High demand for parking space
- Roads in close vicinity to schools and kindergardens
- Roads used by mobility-impaired persons

Moreover detailed accident analyses and detailed analyses of the efficiency of the measures implemented / carried out will be needed.

30 km per hour zones

30 km per hour zones are used in several countries, to name a few: Austria, Belgium, Denmark, Germany, Ireland, Sweden, United Kingdom (20 miles per hour). The measure is used also in other countries such as Ireland and Belgium. This is a measure that can be used in single zones where traffic calming is needed or generalised to all zones that display a common characteristic such as school surroundings. 30 zones have been installed in residential areas, in roads passing schools and in shopping streets. The idea is to slow motor vehicle speeds to a maximum level of 30 km/h. In the United Kingdom, a 30 zone is indicated by boundary signing and physical traffic calming measures to provide a self enforcing speed reducing element. The addition of traffic calming devices (speed humps etc.) is necessary to obtain speed reductions to 30 km/h or below.

The measure is primarily designed to reduce injury accidents to vulnerable road users as pedestrians and cyclists but vehicle occupant casualties are also to be reduced. 30 zones affect accidents by reducing impact speeds and therefore severity of injuries. A commonly shared understanding is that a five percent reduction of mean speed is expected to diminish risk of fatality by at least 20 %.

In terms of costs and benefits, costs associated with the measure, besides investment and installation costs, are maintenance costs – depending on size of zone and features installed – ecological costs which may increase carbon emission (especially if features are inappropriate distance apart encouraging braking and acceleration and through traffic has not been discouraged). Benefits are less accident costs and positive health effect because of more walking and cycling instead of using car. Traffic may be reduced especially through the elimination of through traffic. Flows are reduced typically by 15 – 25 %.

The cost/benefit ratio depends on the installation costs of the zone but typically installation costs will be more than recovered in the first year of operation. Results from calculations made in the Handbook of Road Safety Measures (Elvik & Vaa, 2004) show that there are reasons to expect much higher benefits than costs for 30–zones.

Regarding public acceptability, 30–zones are widely accepted providing that consultation has had a positive outcome and ensuring that features are designed such that they do not unacceptably impede the emergency services or bys operators.

Speed feedback signs

A Speed feedback sign is a device which mainly consists of a radar speed detector and a display, big enough to be read by car drivers passing by. There are several variants. The simplest one just measures speed and displays it. It is also possible to activate a speed sign if the speed limit is exceeded by someone passing by or to display messages if someone passes by over (e.g. "children, slow down") or under (e.g. "Thank you!") the legal speed limit. There are two mechanisms supposed behind such feedback signs: on the one hand, it is well known that a significant part of the drivers go too fast unintentionally, in particular on roads where the layout and appearance is not in line with the speed limit ("urban runways"). On the other, it is intended to blame drivers in front of other road users for going too fast.

Speed feedback signs can also be fitted with a data logger which is quite useful for evaluation. Evaluation studies have been carried out in Germany and Austria. KfV currently runs an evaluation study on feedback signs with verbal messages (to be finished early 2009). The measure has so far proven to be successful.

Traffic calming measures that can also be installed outside urban areas:

Roundabouts

Replacing conventional intersections by roundabouts has been proven to be effective in reducing traffic accidents. This effect is mainly based on the fact that a 4 arm roundabout has only 4 possible collision points compared to 16 of a conventional rectangular intersection. Roundabouts also, up to a certain limit, have a higher capacity than intersections with traffic light. Moreover, in times of low traffic density, roundabouts do not force vehicles to stop and wait for green light. But, above all that, a roundabout (if built appropriately) has a traffic calming effect, since it is (in contrary to rectangular crossings with priority of traffic lights) not possible to pass a roundabout at high speed. Roundabouts are also cost efficient: some studies found benefit-cost-ratios between 1.23 and 8.21, which is good to excellent (according to the definition of the European Project: ROSEBUD).

Advisory speed warning signs

One additional measure that deserves to be mentioned is the use of advisory speed warning signs. This is particularly important where the safe speed is lower than the applicable speed limit: too often road users forget that driving too fast does not necessarily mean driving over the legal speed limit, but also driving with an inappropriate speed due to specific traffic conditions such as rain or icy road surface during winter time.

Advisory signs are applicable to weather, traffic and road conditions to provide for safe travel through the hazard (e.g. steep curves). If these warning signs and advisory speed are to be used, it is important that they are consistent in their application and in the advice they give, particularly in relation to safe speed. Inconsistent application may well increase risk, rather than achieving an overall reduction in risk.

However, dynamically adaptable signs are even more suited because in few cases traditional signs can actually contribute to higher speeds at curves and critical conditions when the drivers would choose a lower speed if there were no advisory sign.

Gateways

Gateways are a low cost infrastructure measure, mainly applied where a through-road enters a village in rural areas. The principle is to rebuild a straight section into a combination of curves in order to force road users to swerve. Key design elements are the length of the gateway, the width of the road and the extent of deviation, which have to be selected according to the choice of speed which is required from road users. Gateways can be built with or without centre island and they may be combined with other elements that reinforce the impression of a gate, e.g. vegetation at the roadside and/or on a centre island, pavement, speed humps and/or road lighting.
Gateways have many times been assessed and can be considered a very effective way to influence driving speed at the entrance to rural villages.

2.1.2 Vehicles

A whole range of Driver Assistance Systems have been developed by the vehicle manufacturers during the last decades. Some of them have a direct or indirect impact on the speed behaviour of a vehicle and are therefore presented as vehicle engineering measures.

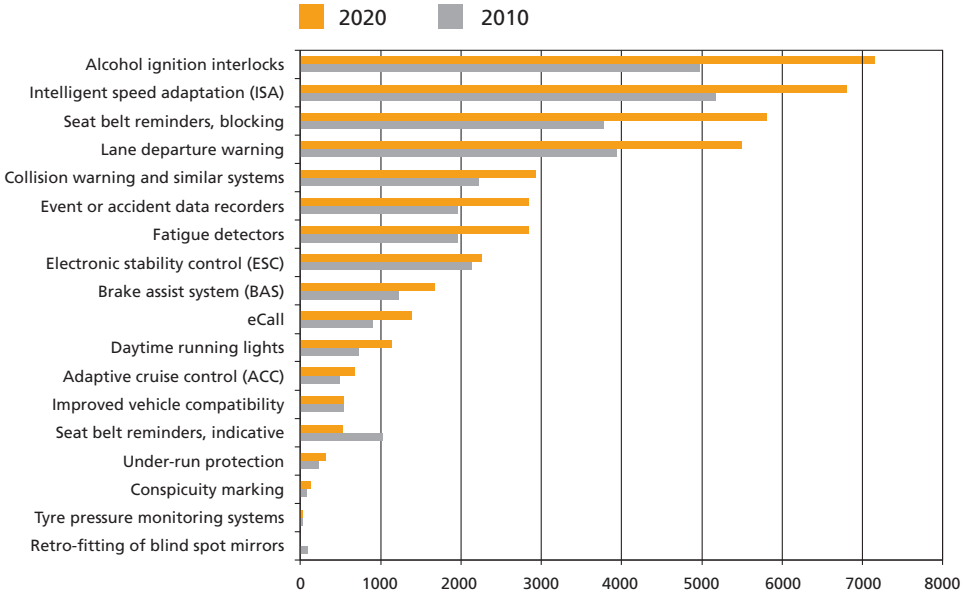
Intelligent Speed Assistance (ISA)

ISA refers to a collection of technologies which assist the driver in the task of speed control. At its core is the principle that the vehicle is aware of the prevailing speed limit and gives the driver feedback, and in some cases restrict engine throttle control, to keep the vehicle at or under the speed limit. The most commonly chosen method to make the vehicle aware of its location and the prevailing speed limit is the use of GPS devices and an on-board digital map.

What is then done with the information varies from informing the driver of the limit (advisory ISA), warning them when they are driving faster than the limit (supporting ISA, also known as 'Speed Alert') or actively aiding the driver to abide by the limit (intervening ISA).

ISA has clearly been identified as a piece of equipment that has one of the biggest life-saving potential. In fact according to a 'cost-benefit assessment and prioritisation study of vehicle safety technologies' made by the European Commission, intervening ISA falls only second in a long list of in-car technological equipments, with an estimation of about 6,800 lives that could be saved by 2020 if manufacturers were required to fit their vehicles with it.

REDUCTION IN THE NUMBER OF FATALITIES IN EU-25 IN 2010 AND 2020



http://ec.europa.eu/transport/roadsafety_library/publications/vehicle_safety_technologies_final_report.pdf

A Swedish large-scale study of the effect of informative and supportive ISA, involving nearly 4,500 vehicles, shows that if everyone had informative ISA fitted, injury accidents could be reduced by 20% in urban areas. Further, this trial has shown very high acceptability for that technology among drivers who have tested it.

For more information: http://www.isaweb.be/bestanden/Resultssweden.pdf

In the United Kingdom, it is estimated that a mandatory system (i.e.: if all cars were required to be fitted with ISA) would have a very large potential to reduce fatal and serious accidents (Carsten et al 2001). Estimates by Carsten show that mandatory ISA, combined with a dynamic speed limit regime, has the potential to reduce overall injury accidents by 36 %, fatal and serious injury accidents by 48% and fatal accidents by 59%.

Other than offering real time assistance to drivers, ISA can also be used to record information, an application that can be of particular use to fleet operators, but also to parents of novice drivers. Instead of giving real time information or assistance to drivers, recording ISA provides periodical feedback about speed behaviour after the road journeys. In Finland, a 'recording ISA' trial carried by the Technical Research Centre of Finland (VTT) has shown some encouraging results.

Finnish 'Recording ISA trial':

Small GPS-based devices, which registered speed, time and coordinates of measuring points, were inserted in test vehicles. In all, 153 taxi drivers, four drivers in a distribution company and six novice drivers participated in the trial. Test drivers, employers and parents of young test drivers were regularly sent information by e-mail on the speed observations and possible speeding in different speed limit areas. The objective of the feedback was to motivate drivers toward more moderate driving behaviour. Speeds measured during the feedback period were compared with speeds measured before the period.

The main results of the trial suggested that Recording ISA has a positive impact on traffic safety. Especially the average speed of taxicabs compared with the average speed of ordinary car and van drivers decreased in 80 kph and 100 kph speed limit areas. In a taxi company the system was found useful when selecting new drivers. In family cars all young test drivers were driving moderately even before the feedback period. However, during the feedback period one young driver used a lower top speed (v95) in all but the 100 kph speed limit areas and another young driver used a lower top speed in 50, 60 and 80 kph speed limit areas but not in the 40 and 100 kph areas. Thus the results suggest a positive safety effect also for young drivers using their parents' car.

The results of the trial in the distribution company were encouraging, too. The average of over-speed observations were about 25 per cent lower in the 50, 80 and 100 kph speed limit areas during the feedback period than before the period. The companies and their drivers accepted the idea of using the Recording ISA as a quality assurance system. In family use, the Recording ISA that gave speed information also to parents was considered acceptable when young drivers used their parents' car, but the opposite was true (both parents and young drivers) if young drivers drove their own car.

There are many ways in which ISA can be introduced into vehicles. Obviously the most efficient measure would be to have legislation requiring manufacturers to fit their vehicles with ISA, but in the meantime there are other ways of introducing this technology. In London, Transport for London (TfL) has developed a system that any 'Tom Tom' GPS device user will be able to download for free on the internet (this will be available soon on the TfL website). This system will provide informative ISA to any 'Tom Tom' user for free. Since portable GPS device users are used to update their systems via the internet, a high level of users take up is foreseen.

Fleet vehicles (be it for the transportation of goods or passengers) are also one target group that is of particular relevance, and there are already many instances of ISA being introduced on fleet vehicles (for example in Lund, Sweden, all city buses are fitted with supporting ISA). Beyond safety concerns there are financial incentives that can be used to convince fleet operators to use that technology: reducing excessive speed and aggressive driving (that often go hand in hand) means that fuel costs and vehicle maintenance costs are kept to a minimum. And, of course, reducing the risk of crashes also means protecting yourself from a potentially heavy financial burden.

Further, this technology can also be used by insurance companies that wish to offer lowered material and personal injury insurance premiums for drivers who accept to drive vehicles fitted with informative or supportive ISA. There are already pilot programmes by such companies, and discussions should be undertaken to encourage further programmes in different countries.

ACC (Adaptive Cruise Control)

ACC is a more advanced cruise control that can automatically adjust a car's speed to maintain a safe following distance. This new technology uses a forward-looking radar, installed behind the grill of a vehicle, to detect the speed and distance of the vehicle ahead of it.
Adaptive cruise control is similar to conventional cruise control in that it maintains the vehicle's pre-set

speed. However, unlike conventional cruise control, this new system can automatically adjust speed in order to maintain a proper distance between vehicles in the same lane. This is achieved through a radar headway sensor, digital signal processor and longitudinal controller. If the lead vehicle slows down, or if another object is detected, the system sends a signal to the engine or braking system to decelerate. Then, when the road is clear, the system will re-accelerate the vehicle back to the set speed.

ESC (Electronic Stability Control)

ESC works by using a number of intelligent sensors that detect loss of control. 25 times per second ESC checks the driver's steering intention against the actual vehicle direction. When these are not in sync, and the car is starting to slide out of control, ESC intervenes by braking the relevant wheel. ESC works together with computerised anti-lock braking systems to correct oversteer (when the back of the car slides out) or understeer (when car loses grip from the front). In this way ESC helps bring the car back under control, heading the direction the driver intended.

At least 40% of fatal road accidents are the result of skidding. Studies show that ESC could reduce skidding accidents by up to 80%. In Europe ESC is available as standard equipment in premium cars. In medium and small cars it is mainly available as an option. The European Commission is supporting a campaign called 'Choose ESC!' to promote the use of this technical measure that has a high saving potential (see www.chooseesc.eu)

Adaptive Brake Assistance

The Adaptive Brake Assistant adjusts the amount of brake power applied to the wheels during emergency braking so that the vehicle comes safely to a standstill. The Adaptive Brake Assistant is a practical adjunct to the Adaptive Cruise Control (ACC) system. The radar sensors at the front of the vehicle measure both the distance to the vehicle ahead and its current speed. If the vehicle ahead stops suddenly, or if an obstacle appears in the lane ahead, the Adaptive Brake Assistant calculates whether emergency braking must be applied, and the necessary amount of brake pressure. Having calculated the optimum braking power, the system activates the brakes only after the driver has applied the brake pedal. It also gives the driver warning signals: depending on the model, visual warnings are provided on the dashboard or on the Head-Up Display. The type of warning differentiates between a cautionary signal (e.g. if the vehicle ahead is too close) or an acute alert to a critical situation (e.g. the vehicle ahead brakes suddenly).

In order to minimise brake reaction times, the brake pressure is permanently maintained high enough to hold the brake pads as close as possible to the discs without actually impeded wheel movement. The system can also momentarily delay brake application and apply engine braking to make braking distance as short as possible relative to the situation.

Information about Driver Assistance Systems

In Germany, the information campaign "bester Beifahrer" (www.bester-beifahrer.de) is being implemented since three years to spread the knowledge about what safety related Driver Assistance Systems are, how they work and what a safety prevention potential they have. The campaign is targeted towards drivers and the media, mainly through demonstration project.

2.2 ENFORCEMENT

Available data show that legal speed limits are insufficiently enforced even in the best performing EU Member States such as the U.K. and Sweden (ETSC, 2006a). Because illegal speeding is such a widespread phenomenon it is difficult with limited police resources to ensure sufficient levels of continuous and widespread enforcement. This is why automated methods (fixed radars) are increasingly deployed, but many countries are still missing a well functioning and fully automated system for speed checks.

While the enforcement of traffic rules should unquestionably be left to the police, a few initiatives allow for other members of society to play a role too.

Community Speed Watch

Community Speed Watch is a scheme in place in some councils in the United Kingdom to help people reduce speeding traffic though their community. The scheme enables volunteers to work within their community to raise awareness of the dangers of speeding and to help control the problem locally.

Community Speed Watch involves direct action using radar speed guns and vehicle activated signs, but also poster campaigns. The speed guns are operated by citizens (trained by the police) and do not lead to prosecution - drivers get a letter from the police instead - but help to underline the community's commitment to reducing speed.

This scheme has proven itself popular in the United Kingdom in circumstances where concerned citizens were asking for the installation of fixed speed cameras in their local area but that request could not be met.

This is a way of empowering citizens who care to do something to reduce speeding traffic in their surroundings. It also helps the police forces by having citizens communicate the places and times where more speeding is observed (through the checks carried with the speed guns) for the police to carry 'real' checks afterwards. Finally, it also means that the police equipment can be used more frequently (i.e.: even when the police is not carrying checks).

More information: http://www.speedorsafety.com/community-speed-watch/

Similar approaches are carried out by road safety organisations of volunteers in the Netherland, Germany and Austria where speed checks combined with personal or individual communication are carried together with the police near schools, kindergardens and shopping areas.

Another example of a similar practice also comes from Germany: the City of Karlsruhe has a website where citizens can fill in a form with the places they would like to have more speed enforcement explaining the reason for it:
http://www.karlsruhe.de/rathaus/buergerdienste/bus/stvk/geschwindigkeitskontrolle.

Driver Assessment Programmes and 'Driver Reporting'

As mentioned already, driving styles clearly have an important impact on levels of fuel consumption and exposure to crash risk. Assessing driving styles can therefore be an important instrument for fleet managers, insurance companies, vehicle owners and other actors who wish to enforce proper driving behaviour.

There are many ways in which driver assessment can be undertaken. Probably one of the simplest ways of assessing drivers is to engage in 'driver reporting' programmes: one example includes having employers seek public feedback regarding their driver's behaviour by installing bumper stickers on van and other fleet vehicles. The 'How is my driving' stickers are already familiar with road users in the United Kingdom and the United States of America; these stickers come together with a telephone number or the address for a website. In this way drivers know that if they display aggressive behaviour or drive above speed limits, other road users might report this to their employers. This is a very simple measure to implement, with potential safety and financial benefits that clearly outrun the low costs involved.

A more complex solution involves using in-car technical equipments: Event Data Recording systems (EDRs). These have traditionally been designed for aircraft 'black box' type of use, providing information regarding the circumstances surrounding a crash. The knowledge that their behaviour is being monitored is likely to prone drivers to positively adapt their behaviour. A typical example regards the use of black boxes to authenticate insurance claims (e.g.: drivers that caused a crash because of illegal speeding would see their claims turned down).

The EU funded project SAMOVAR (safety assessment monitoring on-vehicle with automatic recording) dealt with the impact of EDRs on the accident probability, risk reduction and change of behaviour. SAMOVAR has shown that significant road safety benefits, in terms of decreased accident rate, can accrue through the use of specialised data recorders on road vehicles. In addition, there can be significant financial savings to the operator of a fleet.

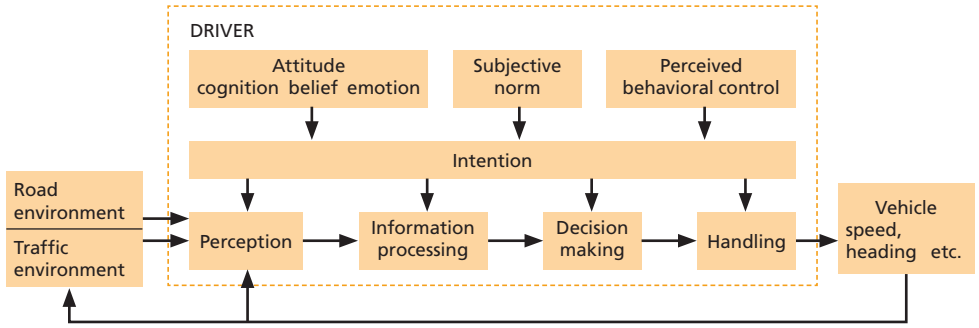
These conclusions were reached on the basis of field trials on normally operated commercial vehicles. The total number equipped with recorders, and whose data was used to produce results, was 400. One practical problem was that SAMOVAR trial design could not be allowed to significantly modify the daily routine and operation of the drivers or vehicles.

However EDRs can also be used to monitor all kinds of driving manoeuvres and therefore be used to assess driving styles (regardless of whether crashes do occur). Some manufacturers in Europe propose a solution to determine whether drivers display aggressive driving styles. This works through the use of in car devices such as sensors and GPS systems that monitor the acceleration, speed, and movement of vehicles. Through these, the system analyses different types of manoeuvres and identifies for each manoeuvre performed during a trip whether it has been performed correctly or too aggressively (changing lanes abruptly, accelerating suddenly and so on). On the basis of this the system can identify 'risky drivers', and at the same time empower drivers to manage their own safety by giving instantaneous in-vehicle feedback. This technology could also of course be used to report driving styles to fleet managers.

Driving styles can be changed positively while adopting a cleaner, less fuel consuming and defensive driving style. In many European countries this kind of driving style is promoted, not only for environmental reasons, but also for the sake of safety. See as an example the 'Neues-fahren' programme (http://www.neues-fahren.de/neues-fahren/default.htm). In the context of this programme supported by the Federal Ministry of Transport, Building and Urban Development in Germany, different activities are offered to improve a cleaner, safer and more efficient driving style: individual coaching, trainings with own cars by small participant groups, training for fleet operators or lorry drivers.

2.3 EDUCATION

To inform or educate drivers in an appropriate and effective way, it is necessary to understand how the speed level is chosen. The European project MASTER dealt with speed management methods, and presented as one result the following model to indicate factors that influence speed behaviour:

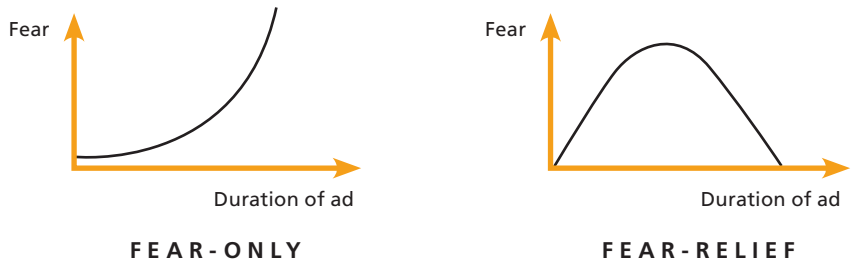


Source: MASTER Final Report

Public Education/ Campaigning

Evaluation studies present mixed findings about links between public education and the risks associated with speeding, and subsequent changes in behaviour. However there are good reasons to carry out public education, for example to win public support for new enforcement measures (tougher penalties, speed cameras). Further, the recent achievements of social marketing (i.e.: the use of traditional 'business-like' marketing tools to obtain socially desirable goals), such as in the field of anti smoking campaigning, leave room for hope. The difficulty, unlike in commercial marketing which seeks to simply change purchasing patterns, is that social marketing seeks to change strongly ingrained behaviour or firmly held beliefs.

Many road safety campaigns have very much relied on the media (TV, radio adverts, posters) to deliver a rapid and easily understandable threat appeal. The idea is to evoke fear to prevent road users from engaging in dangerous behaviour. The latest research in social marketing has demonstrated that one should focus on the 'pattern of fear' when a message is delivered. A pattern of fear refers to the sequence of fear and relief felt by the audience during an advertisement:



Source: Rossiter & Thornton (2004)

Studies indicate that the 'Fear-Relief' pattern is more successful in generating a behaviour change. One example is a study conducted by Rossiter and Thornton (2004) that investigates the patterns of fear and relief generated during television anti-speeding adverts, and the impact of these adverts on speed choice in a video speed test. The participants were randomly assigned to watch either a shock-based anti-speeding advert or a fear-relief advert. The second advert was more successful in triggering the desired response from participants.

As a guiding rule it seems more constructive to develop campaigns that end with positive images or messages just after a threat appeal (e.g.: what one can do to avoid a crash). Further, with the growing rise of additional concerns such as the climatic impact of road transport or the 'oil crisis', it is becoming easier to find positive messages to link with the speed problematic (save the planet; make savings).

For examples of anti speed campaigns: http://www.speedorsafety.com/educational-campaigns/

Apple & Lemon

'Apple and Lemon!' is an activity normally carried out in cooperation between school or Kindergarten and the police. Police and pupils place themselves at the roadside, usually somewhere close to their school (or Kindergarten). Police measures speed of all vehicles passing by. As many as possible are stopped. The drivers who had not exceeded the speed limit are given an apple as an incentive to be good next time as well. Drivers having been too fast are given a lemon. In most cases pupils ask them why they have been driving too fast, although they could have known that they put children at risk. It is quite easy to imagine that most of the drivers will not feel very well when having to answer such questions. The police does not punish the drivers within these activities, but it is quite frequent that they show up at the same site shortly after again and then enforce what had been communicated in a friendly way before.

Safe Driving Courses

Safe Driving Courses will mainly be applied by companies, embedded into a corporate safety strategy or manual. They may be introduced on a voluntary or mandatory basis, including a schedule for regular retraining. Typically, a specific target group of employees is assigned to go through this kind of training at the beginning of their employment, e.g. by defining a threshold for kilometres driven for the company ("frequent drivers"). Safe driving courses should include both theoretical and practical elements, i.e. a classroom session and in-car training.

Both theoretical and practical training should include the following topics:

- Information on accident statistics and accident causation
- Estimating reaction time and braking distances
- Visual skills: scanning the scene in all directions, particular focus on hidden areas
- Hazard perception
- Risk awareness
- Safe communication with other road users
- Techniques for choice of safe speed
- Safe use of driver assistance systems
- Safety implications due to drivers' state of health
- Impact of fatigue, distraction and stress
- Impact of all kinds of intoxication
- Techniques for self-assessment
- Countermeasures

It may be assumed, that safe driving training, if applied appropriately, has a significant impact on driving speed.

Eco-Driving may also be considered a useful measure towards reduction of driving speed, since most of the behavioural changes that lead to less fuel consumption also will impact on safety and choice of speed is one of the core elements of eco-driving.

Speed awareness courses/rehabilitation

In the United Kingdom, one increasingly popular method to address speeding is to employ Speed Awareness Courses for offenders. These courses are designed to offer an educational alternative to traditional punishment. Very importantly, all existing courses that have measured re-offending show a statistically significant reduction following attendance on the course (DFT, 2006).

Speed awareness courses in the UK are delivered in one of 3 ways:

- classroom-based presentations and discussions together with a driving demonstration and practice;
- classroom-based presentations and discussions without the practice element; and
- a seminar.

Classroom based courses have less participants to allow for discussions, while seminars are larger. Classroom-based courses are therefore most probably more efficient.

Speed awareness courses should address the following issues:

- the reasons people have for speeding;
- the consequences of speeding (to self and others, financial, injury), sometimes including a video testimony of parents of a child killed by a speeding driver;
- awareness of each driver's individual responsibility for driving safely;
- stopping distances, and how much they increase with speed;
- the likelihood of death and serious injury for pedestrians hit at increasing speeds;
- the purpose of speed cameras, the criteria used for situating the cameras, and the statistics on accidents at camera sites;
- how to identify the speed limit of the area in which you are driving;
- hazard perception;
- practical tips for decreasing the risk of speeding in the future;
- how to drive more safely; and
- changing speed to suit driving conditions – selecting an appropriate speed.

For more information: http://www.perceptionandperformance.com/pubs.html

http://ec.europa.eu/transport/roadsafety_library/publications/supreme_f3_thematic_report_rehabilitation_and_diagnostics.pdf

3 Powered Two Wheelers and Speed

'Powered Two Wheelers' (PTW) is the generic term for motorbikes, mopeds and other motorised two wheel vehicles. The total number of PTW fatalities in 2005 in Europe (as represented in IRTAD) was 7030, which is 15% of all traffic fatalities. 50% of fatally injured moped riders were under the age of 25. 75% of the motorcycle riders killed in traffic were 25+. Accidents within this particular target group therefore need special attention, and this is why an entire section is devoted to them in this publication.

ISA FOR PTWS:

Intelligent Transport Systems have the potential to significantly improve road safety of all road users. However, some ITS applications will need specific development and adaptation to enable them to be used on PTWs, due to their intrinsic characteristics.
Previous research, whether on technical aspects or on user response on Intelligent Speed Assistance (ISA) has been almost exclusively for cars rather than for motor vehicles in general. There are strong arguments against moving towards an implementation that is limited to one class of vehicle, even a majority class. These arguments relate in part to equity — why should some drivers or riders be free to speed when others are not — but also to the safety and environmental impacts of ISA.
In terms of safety, high speed variance is related to risk and leaving one or more groups of vehicle without ISA in a network where most vehicles had ISA would potentially increase speed variance. This is particularly an issue for PTWs, since these would not, in most circumstances, be restrained by slow moving vehicles in front. Any policy move that would make PTWs more attractive as the only general class of vehicle on which speeding was possible would be highly undesirable.

But, if the equipping of PTWs is desirable from a policy perspective, there are technical aspects to take into consideration for reasons of vehicle stability and handling, it is inadvisable to apply deceleration inappropriately to a PTW. Therefore an ISA system for PTWs may be able to restrict acceleration, but will only be able to use deceleration in a way that causes no sudden change in engine power. A fundamental requirement for the ISA motorcycle is to have smooth, progressive power reduction that does not unsettle the rider. In addition, there are more severe space and weight issues on PTWs than on cars, so that miniaturisation of the ISA system is a prerequisite. It is recommended that further research in this area is undertaken in order to develop a safe and effective ISA system for PTWs. One of the latest reports on an ISA Trial for motorcycles was recently published by the UK Department for Transport and can be found here: http://www.dft.gov.uk/pgr/roads/vehicles/intelligentspeedadaptation/motorcycletrial.pdf

SPEED ENFORCEMENT FOR PTWS

Speed detection and measurement devices are not in all cases optimised for the detection of the speed of PTWs. Enforcement authorities should therefore be encouraged to adapt or replace their equipment-in-use in order to equally treat PTW's in speed enforcement. Enforcement activities (routes/times) should be optimised and justifiable using PTW safety data. Venues and timing of speed enforcement in general should be directed by crash figures: on roads or at junctions that show a high volume of collisions with speed as a contributing factor, speed enforcement should be increased. Finally, licence plate visibility and harmonisation across Europe. The effectiveness of enforcement depends strongly on the chance of getting caught violating the rules. To increase this risk, automated detection should be deployed, but this is only reliable when license plates have a certain size, colour and layout. The rules for the configuration of license plates vary across member state and there are many examples of plates that are hard to detect automatically.

4 The Speed Management Situation in the countries participating in ShLOW!

AUSTRIA

Problem description	Injury accidents in Austria, after a couple of years of decrease, increased again in 2007 to 41,096. Within these, 53,211 persons were injured and 691 were killed. The official police record does not systematically collect information on accident causation. However, the Federal Ministry of the Interior collects on-the-scene assessment of the most likely cause for all fatal road crashes. For 230 out of 644 fatal road crashes (i.e. 36%), inappropriate or excessive speed was considered to be the main reason. The Kuratorium fuer Verkehrssicherheit carries out speed surveys twice a year (more than 30,000 readings). The latest results from early 2008 show: ■ 81% of passenger car drivers exceed 30 km/h limits in urban area, ■ 53% of passenger car drivers exceed 50 km/h limits in urban area, ■ 39% of passenger car drivers exceed 80 km/h limits in rural area, ■ 23% of passenger car drivers exceed 100 km/h limits in rural area, ■ 18% disregard the general 130 km/h limit on highways.
Existing measures	A lot of new speed limits were introduced in Austria due to ecological reasons in the recent years and strongly discussed in the public. No need to say that this has a significant impact on safety as well, however, safety was never an issue in these discussions. Austria was one of the first countries to apply section based speed measurement ("section control"). There were major legal constraints, e.g. legal implementation of the device and data protection. Section control may now be used on sections with a particular risk. Currently, 4 devices are in operation in Austrian highways. Speed enforcement has significantly been improved in the recent years. In 2007 the number of radar detection based tickets was increased by 52% compared to 2006 to 2.9 million. From laser gun detection, almost 800,000 tickets were issued in 2007. The major problem is prosecution of drivers from foreign countries. In some areas they account for 75% of the offences. Austrian police in 2007 operated 183 mobile stationary radar devices in 457 radar cabins (consequently 274 of them empty) at 555 prepared sites, 82 cars equipped with radar devices, 188 unmarked police cars with video, 1316 laser guns and 53 speed testers for mopeds. Infrastructure measures are implemented in various ways. Most frequently, roundabouts replace conventional intersections particularly in rural areas. Main roads of smaller villages are frequently rebuilt using e.g. gateways (with or without central traffic island) at the end of villages, narrowing the road, table-junctions, speed humps, land use planning avoiding 4-direction intersections. Policeman puppet ("Vinzenz") and mobile speed feedback devices are used increasingly, however still with local and timely limitations. The city of Graz (226,000 inhabitants) was completely made a 30 km/h zone with 50km/h on priority roads only. There has not been a major campaign on driving speed in the recent years. "Bleib am Leben, geh vom Gas" (reduce speed, stay alive) was run a couple of years ago using a couple of shocking images (persons injured in road crashes) for couple of weeks and then replacing them by black background with small white inscriptions.
Success Stories	30 km/h zone in Graz was implemented in 1992 and evaluated several times. It is well accepted by the public (76% of passenger car drivers agree, 84% of pedestrians), the number of accident in total decreased by 18%, severe injuries were reduced by 26%, slight injuries by 18%. One of the very beneficial circumstances around speed management in Austria is the existence of vehicle holder responsibility and an obligation to name the driver on demand of the authorities, even if one has to accuse him/herself. The campaign Apfel/Zitrone is applied in Austria for more than two centuries very successfully. Mobile speed feedback devices are more and more frequently used. Section Control in the "Kaisermühlentunnel", a two-tube (three lanes each) urban tunnel was evaluated by KfV; a benefit-cost ratio of 5.3 was found, which is excellent. Nevertheless, this does not automatically mean that section control can be applied successfully; the local circumstances have to be considered.
What is needed for the future?	■ Aside seat belt and cell phone use, speed violation need to be added to the catalogue of offences of the Austrian penalty point system. ■ The general speed limits in Austria (50 km/h urban, 100 km/h rural and 130 km/h on highways) are among the highest throughout Europe and should be reconsidered. ■ The existing system for toll collection for trucks could be used to monitor HGV driving speeds or for enforcement.

BELGIUM

Problem Description

It is estimated that in 30% of the fatal accidents excessive speed is a major factor. This indicates that in Belgium, approximately 300 people die in crashes caused by excessive speed or speeding. In a 2006 survey (speed-monitor), the public noted inappropriate speed as an important indication of 'insecurity feelings'. Only 43% of the people declared that they respect the speed limits. Although the average measured speed has decreased since 2003, 30 km/h zones and 70 km/h zones are still problematic with levels of offences:

Speed zone	Average measured speed (2005)	% Serious offences (+ 10 kph) (2005)
30 km/h	35 km/h	36
50 km/h	50 km/h	17
70 km/h	75 km/h	29
90 km/h	89 km/h	20

Existing measures

Regarding enforcement, more speed-cameras (since 2001) are placed in Belgium, which has resulted in a better compliance with the speed limits. The local polices (e.g. Antwerp) has created a better vision and actions to reduce speed offences. Many campaigns to inform the drivers about the consequences of speeding are conducted. These are mostly organized on a national level and main highways. Almost every school area in Belgium has become a 30-km/h zone. Infrastructure measures to reduce speeding are increasing steadily.

Success stories (or case study)

The 30 areas around school environments are a huge success, especially with the support of the 'Pedestrian movement', which has conducted a campaign – the octopus plan - to increase the awareness of speed and safety around school environments for children and their parents.
The city of Ghent has created a large 30-km/h area within the ring road. Also Antwerp has a large homogenous 30-km/h area.
Between 2002 and 2004 an ISA-trial was held in the city of Ghent with 37 vehicles. 15 drivers wanted to keep the system after the trial at the same time some resolutions were voted in the national parliament: a speed map will be made for the region of Flanders, which can help to implement in-vehicle speed warning systems.

What is needed for the future?

On local roads, speed reduction can be done better, combined with a better infrastructure, enforcement, education, vehicle engineering and engagement.
There are less local speed warning campaigns and this has to be increased.
Although the success of the ISA trial and the voted resolutions, policy-makers have to be more convinced of the possibilities of ISA.
Steps are made to create a large-scale ISA trial in Belgium but more (public and private) partners need to be involved.
Also, education about road safety and speeding has to be conducted not only in primary schools, but also in secondary schools.

CZECH REPUBLIC

Problem description	Inappropriate speed causes the highest number of fatalities in road accidents on Czech roads (approximately 40 – 50 %). Speed Management and its enforcement is weak and drivers do not respect traffic rules. Further, progress is deterred by the fact that Road safety is not considered a public priority. Choosing one's speed is considered an act of personal freedom and drivers are typically concerned only as much as the problem affects them personally. Appropriate legislation is also missing; and the problem is rendered even worst by the limited capacity of the traffic police to enforce existing legislation. Speed limits are 50 km/h (urban), 90 km/h (rural) and 130 km/h (motorways). The level of speeding is approximalely as follows – 30 % on urban and rural roads (2005 – 2006) and 40 % on motorways.
Existing measures	Since 2004, the Czech road safety strategy has been included in Ministry of Transport's document called "National Road Safety Strategy" – it sets both short and long term goals and presents a government philosophy on road safety. Its final objective is to achieve the EU goal of halving the number of fatalities by 2010. Considering three road safety pillars (driver, infrastructure, and vehicle), most action is being taken within infrastructure area. Drivers' behaviour and vehicle technology are still rarely open to change: drivers are very little informed about new technologies such as ITS/ISA and are afraid of using them. Most infrastructure measures implementation is being carried in urban areas: including traffic calming measures (eg. islands, chicanes, 30 km/h zones) and speed camera installations. Their effect depends on frequency and thoroughness of police control – eg. chicanes, islands and policeman figurines were found to decrease speed by 5 – 20 %.
Success stories	There have been two major successes in reducing speeding: ■ The introduction of the 50 km/h speed limit in urban areas (1997) led to a reduction of about 25 % in annual road deaths in urban areas. Unfortunately, Its positive effect has been reduced in 2001 by the Road Act, which has introduced a series of new measures, among which the right of way (also called 'priority') for pedestrians on pedestrian crossings which has increased the road death toll. Followed by a lack of enforcement, compliance with this traffic rule is very low. ■ With introduction of penalty point system (2006), the level of speeding decreased. But once again: after a few months, fear of sanction disappeared due to a lack of enforcement and mean speeds increased again (to 20 %) though they have not exceeded 2005 levels.
What is needed for the future?	Concerning road safety, Czech Republic is 20 – 30 years behind the developed EU countries. ■ Drivers should be more educated and motivated to use ISA/ITS. ■ More speed cameras should be installed and police controls should be done more thoroughly. ■ Effective campaigns should make road safety a public priority.

GERMANY

Problem description	Inappropriate speed was the accident cause of 61.078 accidents with personal damages in the year 2007 (Total accidents with personal injuries: 335 845). In these accidents, 1.963 persons were killed and 83.791 were injured (Total number of killed: 4.949, injured: 431.419). Compared with 2006, the number of accident due to inappropriate speed has decreased 4,4%, the number of killed 9,5% and the number of injured 4,7% . Nevertheless, two of five killed persons in road accidents died because of "speeding". For the first time after years, the accident cause "inappropriate speed" (15% of all causes) was the second cause and not the first one and it decreased by 4,5%.
Existing measures	There are a lot of infrastructure related tools for urban and interurban roads as well as for highways or motorways to tackle speeding for many years , such as: ■ Rebuilding of transit roads in towns and villages ■ Installation of roundabouts ■ Installation of 30 km/h zones and traffic calming zones through speed-reducing elements such as special pavement and design of the roadside ■ Speed limit reduction in alleys ■ Guardrails in front of trees and other roadside obstacles, especially in curves and road sections ■ Installation of special lanes for turning left on dangerous intersections ■ Installation of special lanes for passing on country roads ■ Fixed and mobile Police and municipality speed enforcement Special measures for powered two wheeled drivers such as rumble strips on the road surface remind them to slow down, special guardrails on the roadside to get injured on the legs.
Success Stories	Decrease of killed road users from 7.503 persons in the year 2000 to 4.949 persons in 2007 (minus 34%): Registration of traffic offenders in the Central Register of Traffic Offenders since 1974. Basis for the registration of "overspeeders" and more than 2.000 fixed cameras all over the country as well as numerous mobile controls. Removal of so called "high risk sites" through the successful work of the local road accident commissions, integrated by the local police, the local traffic management and road maintenance authorities. They have the task to recommend and implement remedial measures such as the re-design of town/city access with speed reducing road furniture. Nationwide campaign "Runter vom Gas". Almost one third of all accidents occur due to overspeeding. The campaign is supported by the Ministry of Transport, Housing and Urban Development and implemented by DVR (German Road Safety Council). The communication approach is a shocking one and addresses the emotions of the road participants: www.runter-vom-gas.de". Campaign "Bester Beifahrer" www.bester-beifahrer.de informs car and vehicle drivers about the usefulness and safety relevance of Driver Assistance Systems such as ESC, Lane Keeping Assistance, Brake Assistance etc. and is connected to the eSafety Aware! Campaign of the FIA, Partners and the European Commission.
What is needed for the future?	A much stronger decrease of killed and injured motorcycle drivers. Every 5th killed road participant is a motorized two wheeler (including Mofas and Mopeds), this figure remains constant for years and shows the need for more action. To take stronger into account the "Vision Zero" philosophy in the sense that the road safety policy and its implementation should be adapted to the vulnerability of the road user. More emphasis should be taken to reduce the number of severely injured, not only to reduce the numbers of killed road users.

GREECE

Problem description	Excessive speed is one of the main causes of road accidents in Greece. The analysis of the accident data of the years 2005-2006 showed that: ■ Excessive speed has contributed to 8% of the Greek accidents during 2005 and to 9% during 2006. ■ The fatal accidents caused by inappropriate speed corresponded to 21% of the total during 2005 and to 22% during 2006. ■ Excessive speed accidents with pedestrian involvement represented 1,3% of the total road accident population during 2005 (from which 12% were fatal) and 2% during 2006 (from which 17% were fatal). *(Source of data: National Statistics Database)*
Existing measures	In terms of the development of the National Road Safety Strategic Plan, a study is realised in order to determine the methodological framework for the determination of new road speed limits in the main network of Greece. From the first results of the above study, some road speed limits have already been changed in order to be appropriate for modern vehicle technology and for new road infrastructures. In addition, the last ten years in the main axis of Greece, speed monitoring systems are placed, in order to record the vehicle speed and detect offenders. Until now, there are 70 locations of road network that are equipped with the above ITS technology and another 290 are going to be equipped during the next years. In specific road segments where a lot of accidents have occurred, special equipment is used in order to inform drivers of their driving speed or for the speed limit at this segment. Radio and TV campaigns are also used in order to incentivise drivers to adopt the proper driving behaviour regarding speed. In 2005, the Ministry of Transport sponsored the publication of "Traffic Behaviour" books for the students of the secondary school classes. The new Road Traffic Code, which is enforced since 2007, imposes fines from 80 until 350 Euros for the speed offences and driving license suspension up to 60 days. The Penalty Point System is another countermeasure that came into force on April 2007. Drivers can be penalised with minimum 5 points (depending on the speed offence).
Success Stories	The most successful actions in reducing speed offences and accidents are the following: <u>Monitoring and recording vehicle speed technologies :</u> ■ Since the ITS technology is used in order to monitor and record the speed of vehicles, a reduction of speed infractions and accidents up to 3% per year is observed. ■ The ITS technology in combination with the proper police enforcement and the new increased fines contributed to the above mentioned reduction. <u>Determination of speed limits :</u> ■ The new methodological framework for the determination of speed limits resulted to more realistic limits -especially for the new axis of Greek network -that are accepted by the drivers and much more easily adopted.
What is needed for the future?	The road safety problem is one of the major issues that the Greek government has to handle. The actions that have been decided in order to improve the level of safety in Greece are shared between different Ministries and Administrations. All these actors have to establish a common Road Safety Council that will be in charge to monitor and to improve traffic safety in the country. This council should be appointed to implement the National Road Safety Strategic Plan. Another step that may lead to the improvement of traffic safety and to appropriate driving speed is the usage of methods by the authorities, which will mobilise the public towards careful/calm driving. This can be achieved through campaigns for the public, TV and Radio spots, seminars, dissemination actions and training. The implementation of the methodological framework, in order to determine the new speed limits and also the locations of the road network that speed monitoring systems must be placed, is also crucial for the success of the Road Safety Strategic Plan and the reduction of accidents.

THE NETHERLANDS

Problem Description	Accurate information regarding the percentage of accidents in the Netherlands that is caused directly by speeding or inappropriate speed is not available. The reason for this is that it is very difficult to determine whether the cause of an accident involved inappropriate speed, as few police officers report inappropriate speed as cause of an accident (SWOV, 2006). In general, inappropriate speed is estimated to be a major cause in 1/3 of all the fatal accidents (e.g. OECD, 2006; SWOV, 2007). There are different estimates regarding the percentage of speeding drivers in the Netherlands. The OECD (2006) estimated that on Dutch Highways 40%-45% of the drivers drive above the speed limit, on rural roads this is approximately 45% and on urban roads this percentage lies between 45% (local street) and 73% (arterial road). In a bi-annual driving behaviour study (based on self reporting), drivers indicated that their average speed on roads with 120 km/h speed limit was 123 km/h and on rural roads (80 km/h speed limit) the average speed was 82,4 km/h. Within the build environment the average speeds on roads with 50 km/h and 30 km/h speed limits were respectively 51.6 km/h and 32.8 km/h (Ministerie van Verkeer en Waterstaat, 2005). In the same study, drivers indicated the following motives for speeding: traffic conditions or rounding (35%), unawareness of the speed limit (15%), hurry (25%), for fun (22%), and out of boredom (4%). Some 44% of the drivers indicated always to comply with the speed limit. When it comes to speeding the results of research in the Netherlands (see, Ministry of Transport Public Works and Water Management, 2005) shows three categories of drivers, based upon their speed choices. Table 1 gives the main characteristics of the three groups labeled “speed limit compliers”, “incidental offenders” and “notorious offenders”.

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THE NETHERLANDS

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Existing measures	In the Netherlands several policies against speeding have been implemented at national, regional and local levels. On a national level, safety goals have been set in the Dutch National Mobility Plan (2004). Based upon these goals and targets, the national government makes agreements with the individual provinces regarding traffic safety targets and budget for coming years. Reality shows that an estimated one third of all fatalities are due to speeding, so on all levels of public authority speed enforcement and speed management are considered important policy options and priorities (see http://www.esafetysupport.org/en/esafety_activities/national_level/the_netherlands.htm). This resulted in 1) infrastructural changes (infrastructural traffic calming measures) such as roundabouts, speed humps and chicanes etc. 2) increased enforcement, speed cameras – on motorways, secondary roads and urban areas while new enforcement techniques are being developed, tested and implemented for e.g. trajectory speed enforcement etc. 3) pilots with in-vehicle solutions (such as Intelligent Speed Assistance). To give an extra impulse to road traffic safety the "sustainable road safety program" was created. In this policy program the local authorities (municipalities), provinces, district water boards and the national government committed to agreed traffic safety targets, i.e. a first reduction of traffic casualties in 2000 (reference year 1985) and a second reduction of 40% road traffic injuries and 50% road traffic fatalities in 2010 (reference year 1986). The first phase of the "sustainable road safety program" finished in 2001. The first phase was very successful and with a limited budget significant traffic safety gains were accomplished, which resulted in meeting the set target for 2000 (a reduction of 25% casualties compared to 1985). Concrete measures were, for example: ■ The total road infrastructure divided into arterial roads and residential areas, as a first step to categorizing the road network. ■ Within the build environment, 30km/h zones were expanded (both in number and size). ■ In the rural environment, the 60km/h zones were expanded (both in number and size). ■ Police enforcement will be stimulated by working together on a regional basis. The national government will look into the possibilities of governmental maintaining possibilities. ■ The national government will also take care of big national traffic safety campaigns. Currently phase II of the sustainable road safety program has come to effect. Phase II focuses on: Safely arranged infrastructure, Traffic education and information, Influencing behaviour, Enforcement and rules, In-vehicle technologies. Next to the sustainable safety program there is also the "Roads to the Future: bringing the future closer through innovative pilots" program. Roads to the Future examines the innovative challenges for the Dutch Directorate-General for Public Works and Water Management, develops perspectives and initiates concrete pilot projects (see http://www.wegennaardetoekomst.nl). During the program several in-vehicle technologies, aimed at reducing speeding, have been tested as part of the "roads to the future program", examples are: ■ "Belonitor", a system of rewarding good drivers (amongst others, monitoring speed behaviour) ■ "Driving assistant" (cars equipped with, lane departure warning and adaptive cruise control) ■ Development of a database with speed limit information. Next to these programs there are several local initiatives that are deployed, for instance: ■ The informative road of the province "Noord Brabant", informing drivers regarding their speed, speed headway and travel time info. ■ The ISA trial that was conducted in Tilburg. ■ The ISI trial currently taking place in Waalwijk. An in vehicle device Informing drivers around schools when they bare speeding ■ Some enforcement units of municipalities acquired laser guns for civilians to be used to monitor speeds at places were they think speeding is a big problem (e.g. the municipality of Helmond). ■ Pilots with trajectory control (especially in cases of roadworks). ■ Numerous other local initiatives.
Success stories (or case study)	Traffic casualties keep on declining in the Netherlands, the overall policy package seems to be successful (also see the mentioned success of "sustainable road safety program").
What is needed for the future	What is lacking is an effective measure to reduce speeding by the drivers in the notorious offender's category (see table 1).

POLAND

Problem description

	2003		2004		2005		2006		2007	
	Number	%	Number	%	Number	%	Number	%	Number	%
Accident	11265	27,3	12082	29,1	11419	28,8	10987	29,4	11978	31,2
Killed	1650	37,8	1645	38,4	1687	40,0	1574	42,2	1749	46,6
Injured	16407	30,0	17889	32,1	16728	31,4	16164	32,5	17933	34,3

Consequences of failure to drive at a speed appropriate for the conditions in Poland between 2003 – 2007 (Source: Police Headquarters; 2004-2008).

The Police Headquarters builds the statistics based on traffic police officers' reports from the scene of the accident. The cause of a road accident is determined by police officers. Once written in their report, the information is never double-checked. The table shows that Poland has failed to implement effective measures to reduce the risks caused by speeding. Of particular concern is the strong increase in numbers killed.
Surveys of traffic volume and speed in selected locations on rural roads, roads passing through small towns and city streets have been conducted periodically in Poland since August 2002. At first surveys were conducted every two months but now 4 measurement cycles are planned per year.

For every measurement series, data were registered at 32 points (road and street sections) with 16 installed stationary measurement stations and at 16 points situated in different places in each series (portable measurement stations). Overall, one typical measurement series produces data from 48 measurement points, representing single-carriageway rural roads with 90 km/h speed limit as well as roads and streets in built-up areas with a 50/60 km/h speed limit. Measurement points are chosen from the viewpoint of collecting speed data on roads and streets of different character in relation to function and cross-section. Below are the results from a recent measurement:

Road category	Mean speed	% of vehicles > limit	Including speed limits exceeded by (km/h):				
			1 - 10	11 - 20	21 - 30	31 - 40	> 40
Urban roads	58,8	74,3	41,5	34,7	16,6	5,3	1,8
Rural roads (Z1+ Z2)	90,4	66,3	41,6	32,3	15,3	6,7	4,2
Rural roads (2 X 2 Ex)	108,5	58,3	44,3	26,0	15,5	8,5	5,7
Rural roads (2 X 2)	106,5	93,9	14,2	29,4	22,7	14,0	19,7

Table. Selected speed parameters in free flowing traffic (26 series; January 2008. 26 series NRSC study)

Road or street symbols:

- **Urban roads** - cross-section of street with separate one-way carriageways – two or three 3.5-meter-wide traffic lanes in both directions
- **Rural roads (Z1+Z2)** – cross-section 7.0 meters wide, a two-lane road with bituminous or soft shoulders
- **Rural roads (2 X 2 Ex)** – Express roads - cross-section 7.0 meters wide, a two-lane road with bituminous shoulders
- **Rural roads (2 x 2)** - cross-section 7.0 meters wide, a two-lane road with bituminous shoulders

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POLAND

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Existing measures	In April 2005 the Polish government approved a governmental road safety programme (GAMBIT 2005). The programme assumes that within the next 10 years (from 2003 do 2013) the relation between vehicles exceeding speed limits and the overall number of vehicles using traffic will drop from 46 % to 30%. The programme proposes: ■ Revised speed legislation, ■ improved education and increased public awareness of safe speeds, improved speed enforcement (increased use of modern speed cameras, improved and intensified random speed checks, selecting spots for intensified speed checks, introducing an automatic speed check system and a fast and efficient enforcement system), ■ Carrying out a general review of speed limits (to regain driver trust to speed limits and use general speed limits for traffic conditions and roadside conditions), ■ Carrying out systematic speed surveys. ■ Following up on the GAMBIT 2005 programme, the Police Headquarters develops its own annual programmes of action, which include some activities in the area of "speed". In recent years the police have been organising a national operation once every quarter called "Action Speed". The operation involves intensified speed checks across the country. It was assumed that an operation will be considered successful if the percentage of road offences will drop by 25 % in a year, but it seems that no one is monitoring the results. Apart from that regional police headquarters organise speed checks on their own but access to the results may at times be time consuming.
Success stories	Speed cameras are considered a success in Poland (e.g. data for January – June 2007 from 360 check points showed that the numbers killed dropped by 19%) as well as the work on 'road 8' (in 2007 the number of people killed compared to the previous year dropped by 22 people (13%).
What is needed for the future?	Poland hasn't solved its speed problems, but at least over the last two years speed measures are now appreciated. This year's discussions in Poland are mainly about establishing a Centre for Automatic Traffic Enforcement and the development of a system of speed cameras. Parliament has received the first law draft for such a system.

SPAIN

Problem description	Every year in Spain, speeding is a present variable in about 20% of injury accidents. The results of some researches carried out in Spain show that: ■ Accidents caused by speeding: the rate of fatally injured is 8 every 100 accidents, whereas in those produced by other factors, this rate is only 4 every 100 accidents. ■ The average of road fatalities gets 60% higher when drivers exceed the speed limit. The percentage of fatal accidents rises 3% for every kilometre per hour increased. ■ Regarding the age and the sex: males aged between14-21 and 30-39 are the most implicated in speeding accidents. ■ The rate of pedestrian fatally injured with cars driving at 30 km/h is about 5%. However, when driving at 50 km/h this rate can be up to 50%.
Existing measures	Publicity campaigns to make drivers aware of the risk of speeding: thanks to a campaign developed last summer, 1,328,000 vehicles were monitored in order to detect speed excesses. 34,000 offenders were reported. For the long weekend of May 2008, the Traffic General Directorate (DGT) has carried out a surveillance campaign in order to monitor speeding and aggressive driving. A radio broadcast campaign has been incorporated to put across some advices and to warn drivers about the consequences of speeding. 305 surveillance radars are used to spot drivers who break the law. The expected impact is to control the speed of 1.5 million vehicles, in 2,000 km stretches of road and to avert about 600 fatalities.
Success Stories	Two main systems developed in Spain have contributed to the reduction of the number of traffic accidents, especially, those related to speed casualties. **The Penalty Point System:** ■ Since it came into force, on July 2006, the percentage of casualties has decreased by 11%. ■ 38% of all the points withdrawn and 40% of the reported penalties corresponded to speed traffic offences. ■ Depending on the exceeded speed limit, drivers can loose from two to six points. ■ 92% of the surveyed persons thought that this system is one of the most important measures developed in Spain to reduce traffic accidents. **Robust new laws to tackle road traffic offences:** ■ The Organic Law 10/1995 of the Penal Code was updated on November 2007 in order to toughen penalties. ■ By means of this road safety reform, speeding over 200 km/h in dual carriageways, 180 km/h in highways and 110 km/h in urban areas will be considered a traffic crime. ■ Moreover, reckless drivers will be sentenced to prison (from 6 months to 5 years). ■ Under the point-based system, drivers can also have their licence withdrawn between 1 and 6 years.
What is needed for the future?	One way to lessen the incidence of road traffic collisions is to reduce traffic speed. Improvements in driver behaviour have the potential to cut these statistics dramatically. Another possibility, it is the implementation of the "Intelligent Speed Adaptation (ISA)" system that not only allows reducing the accidents due to the speed control but also could contribute to reduce pollutants and consumption. However, one of the main problems, among other ones, is to identify the main responsible actors for supplying information about speed limits. In addition to that, more safety cameras could be installed, police controls should be prioritised, more action against recidivists should be taken.

SWEDEN

Problem description

Problem description
The proportion of vehicle mileage above speed limit on average for all roads is 57%. If all vehicles kept the speed limit more than100 lives lost in road accidents per year could be saved.

Average speeds on roads with various speed limits in Sweden

Speed limit (km/h)	Average speed (p<0.05)
50	52.3 +/-1.3
70	68.1 +/- 1.0
90	87.9 +/- 1.0
110	107.5 +/- 1.1

Existing measures

A new speed limit system with 10 km/h steps is being introduced, so that the speed limit can be more in harmony with the actual road characteristics.
Trials with changed speed limits in built-up areas. Six cities were involved. New speed limits; 40 and 60 km/h; were tried for the first time. The cities decided on their strategy themselves. The main results were:

Change of mean speeds and 85-percentile speed for all roads where changes of the speed limit was carried out, all vehicles, weekdays 6AM to 6PM.

Speed limit Before/After	Number of measurements	Mean speed (km/h)			85-percentile (km/h)		
		BEFORE	AFTER	Diff	BEFORE	AFTER	Diff
50/30	14	34.6	32.2	-2.4	42.4	40.4	-2.0
50/40	70	40.5	38.3	-2.2	47.7	46.1	-1.6
70/60	6	63.8	60.1	-3.7	72.9	69.7	-3.2
30/40	3	38.7	39.2	0.5	46.8	46.7	-0.1
50/60	23	53.4	54.5	1.2	62.0	63.0	1.1
Average	116	43.5	42.0	-1.6	51.1	50.0	-1.2

The main conclusion is that the effects on speeds were quite small, and depending on the speeds in the before situation. The higher the speeds before, the greater the effect. Based on this the conclusion is that cities selected streets that already had rather low speeds.

Municipalities
Municipalities have large autonomy to decide the introduction of 30 km/h speed limit zones and traffic calming measures.

Police
800 speed cameras installed along the most accident prone roads. The number of killed road users decreased by 60% on the test stretches with automatic speed camera enforcement
The police also carries out manual police speed enforcement regularly

SWEDEN

Success Stories	The city of Gothenburg, approx half a million inhabitants, started more than ten years ago a traffic calming strategy, where they introduced more than 2300 measures, mainly speed humps, raised zebra crossings and small round-abouts. The safety effects are quite significant compared with other cities. In ten years time the number of injured pedestrians has dropped by 50% and the number of bicyclists have dropped by 70%. A research report concludes that approx 75% of this effect is thanks to traffic calming. Small roundabouts as speed reducing measure: In 1991 a large scale trial was made using small roundabouts in the city of Växjö, Sweden. 21 roundabouts were built in 2 weeks time and were then kept for 6 months. The implications of the positive results indicated – both in terms of safety and mobility **for all road users** – were that to-day there are more than 1500 such small roundabouts. The safety effects of these are estimated to 40 fewer killed per year, 170 fewer seriously injured and 180 fewer slightly injured. A cost-benefit analysis shows that speed-reducing measures in Swedish cities have been quite cost effective. The benefits are estimated to be 17,1 billion SEK and the costs 6,9 billion SEK.
What is needed for the future?	Motorcycles cannot be caught for speeding with automatic speed cameras, because the driver has to be identified according to the legislation. A change in legislation putting the responsibility on the vehicle owner would change the increasing trend of motorcycle fatalities in Sweden. Automatic speed camera enforcement along stretches of roads could be introduced. Relating fines for speeding to income would make the system more efficient too.

UNITED KINGDOM

Problem description	Exceeding the speed limit and traveling too fast for prevailing conditions still cause a large proportion of accidents in the U.K. (26% of fatal accidents in 2005). These figures probably underestimate the true role of excessive speed. According to *RAC Motoring Report* two-thirds of people break the limit daily. There has been a marked improvement in recent years in compliance with the 30 mph limit (48km/h). However, inappropriate speed remains a major problem on rural roads. Some two-thirds of deaths occurred on rural roads in 2005, with 28% of these deaths involving a driver or rider exceeding the speed limit or traveling too fast for the conditions.
Existing measures	The United Kingdom has focused on safety cameras, with 6000 automated speed check devices across its territory. In terms of legislation, 'Netting-off' – allowing police to retain a charge from speed cameras to pay for the cost of camera enforcement during the period of heavy investment in camera systems, and changes to the penalty point structure under the Road Safety Act 2006 are other positive innovations. The promotion of safe and considerate driving and encouraging road users to adopt appropriate speeds on UK roads are major elements of the government's work to reduce road traffic collisions and injuries. New guidance to traffic authorities on setting local speed limits in August 2006 have been published, and traffic authorities have been asked to review the speed limits on all of their A and B roads and implement any resulting changes by 2011 in accordance with the new guidance. In particular, the guidance strengthens the importance of self-explaining limits where the road's function, traffic mix and characteristics determine an appropriate speed limit reflecting what the road looks like to the road users.
Success Stories	Compliance rates in urban areas (30mph/50kph limits) is far better than a decade ago: 51% of drivers in free flowing traffic now comply; this is in great part due to the introduction of safety cameras. 20mph zones are also becoming more widespread, this probably chimes with public opinion that wants to see improved safety for children and for vulnerable road users.
What is needed for the future?	The Parliamentary Advisory Council for Transport Safety (PACTS) supports and encourages the implementation of 20 mph limits and 20 mph zones in urban areas (32km/h), and 30 mph speed limits in rural villages (48km/h); the installation of ISA systems on all fleet vehicles and the use of section control speed checks are also much awaited engineering measures for which the technology is already available. A lot of efforts are still needed to win the hearts and minds of the public too: too many commentators in the media deny the link between speed choice and crash potential.

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