Managing Speed

Towards Safe and Sustainable Road Transport

European Transport Safety Council

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Managing Speed

Towards Safe and Sustainable Road Transport

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Executive Summary

Excessive speed has a singularly devastating impact on the health and safety of road users, increasing both the risk of a crash and the severity of crash outcomes. Speed recurrently contributes to crashes when driving speeds are higher than permitted speed limits or higher than circumstances allow (e.g.: rain, fog, high traffic volumes).

The current concern over climate change has also put spotlight on the role of road transport in atmospheric pollution. Road transport's share of carbon dioxide emissions has been rising unlike that of other sectors. In this light, properly enforced national speed limits would be an extremely efficient carbon-abatement policy.

Reducing speed on European roads can therefore help achieve simultaneously two key EU targets: halving road deaths by 2010 and reducing green house gas emissions by 2020.

However, enforcement is difficult as speeding remains the most widespread offence. The OECD estimates that at any one moment 50% of drivers are exceeding legal speed limits. Unlike other safety violations, such as drink driving or non-use of seat belt, enforcing speed compliance requires the majority of drivers to change their behaviour.

A 'policy mix' of measures is therefore necessary to tackle the problem of speeding effectively. Thankfully Speed management can be achieved by taking action in all of the road safety pillars (vehicle, driver, and infrastructure), allowing for an effective 'policy mix'. In fact speed management is probably the only road safety area of work that offers such scope. This is an obvious asset but it can also be a handicap: adopting measures in isolation will not suffice to significantly reduce excessive speed.

1 Introduction

There is a well documented relationship between excessive speed and collisions. Excessive speed can be illegal (driving above speed limits) or inappropriate (driving too fast for the prevailing conditions) and is the single biggest contributory factor in fatal road crashes. It increases both the risk of a crash happening and the severity of injuries resulting from crashes. This policy paper sets out to demonstrate that managing speed is therefore the most important measure to reduce death and injury on our roads and, notably drawing on examples from countries that have been successful in reducing speed, how this can be achieved.

Speed management can be defined as a set of measures to limit the negative effects of illegal or inappropriate speed. There is a plethora of measures that can be used to limit speed, each bringing considerable safety benefits. Some of these measures have already been implemented in a number of countries and helped achieve significant reductions in the number of road deaths and injuries. For instance, safety cameras and automatic speed controls (together with the enforcement of sanctions for speed offenders) have helped achieve a dramatic reduction of casualties in France. But available measures that have not yet been implemented should also play a role in reducing speed. The development of Intelligent Speed Assistance (ISA) systems (navigation devices that bring speed limit information into vehicles) is one such example (ETSC, 2006a). Traffic safety work should increasingly be carried out as a combination of measures, and the area of speed management is one in which a 'policy mix' approach can and should be encouraged.

In addition, the concern for safety is not the only reason why speed management is necessary. Speed management strategies are often consistent with other policy goals since speed plays a role in a number of transport indicators such as mobility demand, fuel consumption and CO_2 emissions, air pollution, noise and congestion. The current concern over climate change and CO_2 emissions has stirred convincing arguments for lowering speed limits and improving their enforcement: it is the most prominent case for speed management together with safety. This paper will therefore also put forward the case for the strong climate benefits that can be achieved by curbing excessive speed.

The European Union has set two targets that road transport policies and strategies will have to address:

- To reduce by half the yearly number of road deaths by 2010 (compared to the year 2001)
- To reduce by 20% green house gas emissions by 2020 (compared to the year 1990).

Speed management is an imperative to be realistic about the achievement of both targets.

2 Why? Safety and sustainability

2.1 TO MAKE ROAD TRANSPORT SAFER

The relationship between speed and road accidents has been studied extensively and is very clear: **the faster the speed, the greater the probability of a crash and the severity of crashes** (SWOV, 2007). Empirical evidence results from studies that have adopted three different research designs:

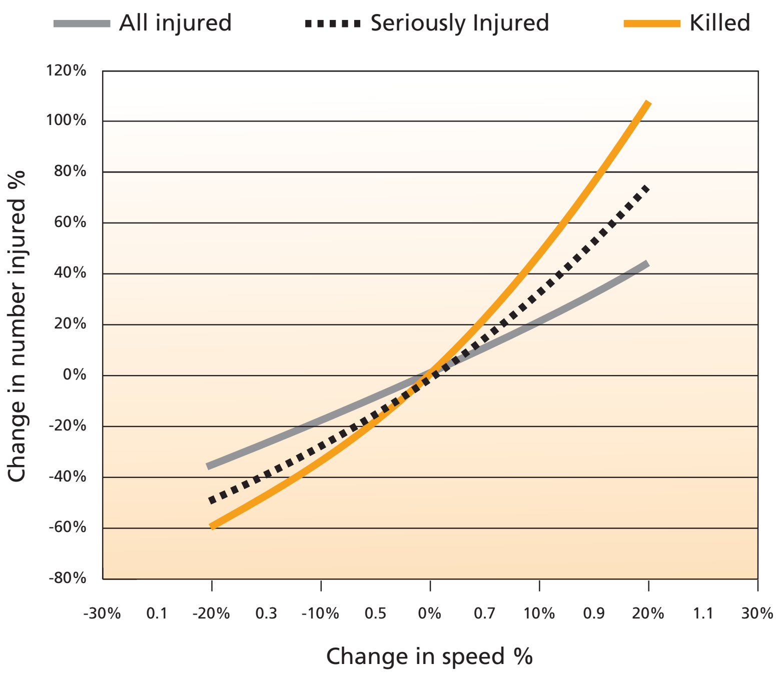
- Before and after studies of the effects of changes in speed limits
- Correlated studies of crash rates on similar roads with different speed distributions
- Case-control studies

All reviews for 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. Speed management is therefore a key element in reaching the EU road safety target.

Figure 1: relationship between change in speed and change in the number killed and seriously injured (Nilsson, 2004a)



Speed recurrently contributes to crashes when driving speeds are higher than permitted speed limits (illegal speed) or higher than circumstances allow (inappropriate speed, e.g.: because of rain, fog, large traffic volumes). However, statistics on the contribution of speed to road crashes are hard to obtain for a number of reasons. Police reports focus only on crash causes (i.e.: not the contribution of speed to the severity of the crash) and are also likely to under-enumerate cases where illegal speeds are within a few km/h of the limit (Brooks, 2002). Further, the police rarely register speed as the crash cause because the exact speed at the moment of collisions is hard to identify and because inappropriate speed is especially difficult to determine objectively (SWOV, 2007). Despite this, the OECD estimates that **speeding contributes to as much as one third of all fatal accidents** (OECD/ ECMT, 2006). It is therefore reasonable to consider speeding as the most important contributory factor of road accident deaths and injuries across Europe.

In the past we have had first hand demonstrations of the safety benefits that can be obtained by reducing speeds. From 1984 to 1987, field trials limiting the speed to 100 km/h on the motorways in the federal state of Hessen led to a 25% to 50% reduction in fatal/serious injury accidents per billion km travelled (Umweltbundesamt, 2003). More recently a field trial setting the same limit on the A2 motorway in Germany led to a drop in total accidents rate of nearly 50% (accidents/million kms travelled) (Umweltbundesamt, 2003).

The relation between speed and safety rests on two pillars: the relation between speed and crash rates, and the relation between collision speed and the severity of crashes. Both pillars provide conclusive evidence for the negative impact of excessive speed.

2.1.1 The relation between speed and crash rates

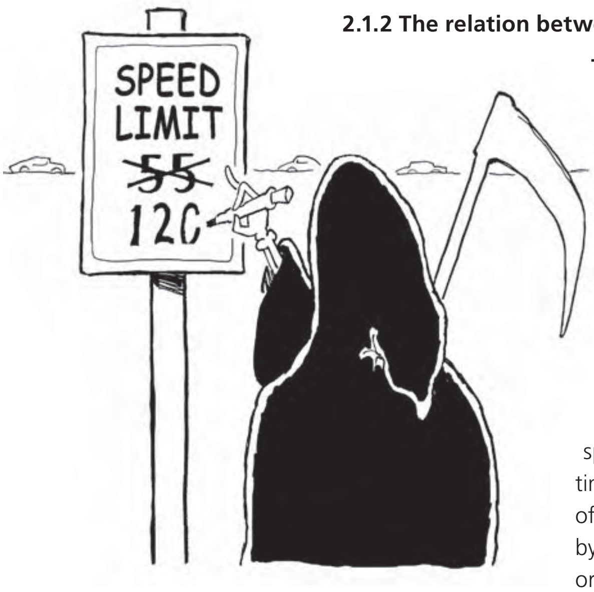
The faster drivers drive, the greater their chance of being involved in a crash. Many studies have examined the relation between absolute speed and crash rates. Irrespective of the research method used, practically all the studies concluded that **the relation between speed and crash rates is not linear but can best be described as having a power function or an exponential function: as speed increases the crash rate increases much faster than the increase in speed** (SWOV, 2007).

Very well known Swedish studies that can be quoted in this context are those of Nilsson (1982; 2004) which examined the effects on the number of crashes given the increases and decreases of average speeds on a road section with changes in speed limit ('before' and 'after' situations). Nilsson developed an equation, known as the 'power rule', that has been widely confirmed by further literature on speed. According to the power equation, a small percentage change in average travel speeds results roughly in:

- A two-fold percentage change in minor injury crashes
- A three-fold percentage change in serious injury crashes
- A four-fold percentage change in fatal crashes

For example, **a 5% increase in average speed leads to approximately a 10% increase in injury accidents (1.05 * 1.05 = 1.10), a 16% increase in serious injury accidents (1.05 * 1.05 * 1.05 = 1.16), and a 22% increase in fatal accidents (1.05 * 1.05 * 1.05 * 1.05 = 1.22).** This means that even minor reductions in driving speeds will lead to considerable casualty reductions. One Finnish study confirmed the importance of 'minor' speeding by demonstrating that vehicles travelling up to 10 to 20 km/h above the speed limit on roads with 80 and 100 km/h limits contributed to one half of all speeding accidents (Kallberg, 2004). **The role of 'minor' speeding offences is underestimated** and should not be overlooked in speed enforcement plans. **'Low level' speeding is also important to overall safety outcomes because it is far more common than extreme speeds.**

2.1.2 The relation between speed and severity of crashes



The higher the collision speed, the more severe the consequences in terms of injury and material damage. This is because the energy dissipated in a crash goes up with the square of collision speed. During the past decades technological progress has allowed vehicles to become better equipped (with crush areas, airbags and seatbelts) in order to absorb the energy released during crashes, for the protection of vehicle occupants. However they have also made it possible to travel faster on the roads and collision speed is of tremendous importance for the crash outcome. An English study demonstrated that the probability of serious injury to a belted car occupant in a front seat at an impact speed of 30 mph (48 km/h) is three times greater than at 20 mph (32 km/h). At 40 mph it is over five times greater (Hobbs and Mills 1984). With a collision speed of 80 km/hour, the chance that car occupants are killed is about 20 times greater than with a speed of 30 km/h (IHHS, 1987). Further, even if a lot of measures are taken to protect the car occupants from injury, forces caused by sudden decelerations may lead to serious injury in the form of fractures or injuries to important body organs (Nilsson, 2004). Such safety measures also do not do much to protect vulnerable users outside the vehicles (e.g. a collision with a pedestrian). **Active and passive safety devices are therefore no substitutes for speed reduction.**

The mass of vehicles involved is also important. In collisions of two vehicles of different masses, the occupants of the lighter vehicles are in general considerably worse off than those in the heavier vehicles. This 'incompatibility' is a large and increasing road safety problem in an environment in which road users are confronted with ever bigger vehicles (e.g.: SUVs). The incompatibility in collisions between vulnerable road users and practically any motor vehicle type is even more dramatic. In a collision between a car and a pedestrian, the survival rate of the pedestrian decreases dramatically as the car speed increases: at a speed of 30 km/hour, 'only' 5% of pedestrians are killed; at 50 km/hour this is 45% and at 65 km/hour the number goes up to 85% (ETSC, 1995). Given these incompatibilities, all should be done to prevent collisions from happening in the first place, and eliminating unnecessary speeding is therefore the logical starting point.

2.2 TO FIGHT CLIMATE CHANGE

Traffic safety and other societal aspects linked to road transport have traditionally been considered individually using a fragmented approach. However, integrating road safety to environmental and health concerns should be at the forefront of modern transport policies. Coordinating actions allows for the identification of possible conflicts or inconsistencies that should be avoided; increases benefits when actions can contribute to address more than a single issue; and helps achieve optimisation of costs and resources in solving problems.

A World Health Organisation report identified speed management precisely as the policy option most likely to bring about synergies between horizontal concerns including accidents reduction and climate change mitigation:

Table 1: synergies between transport policies and their related health effects (WHO 'Preventing Road Traffic Injury: A Public Health Perspective for Europe').

Examples of transport policies and their synergistic effect in bringing about various transport related health effects						
Policy	Reducing crashes	Reducing air pollution	Reducing noise	Mitigating climate change	Promoting physical activity	Promoting community cohesion
Speed management	☺	☺	☺	☺	☺	☺
Traffic calming and speed reduction in residential areas	☺	☺	☺	☺	☺	☺
Reducing transport demand (such as by telecommunication)	☺	☺	☺	☺	☺	☺
Road pricing	☺	☺	☺	☺	☺	☺
Cleaner fuels and more efficient vehicles	😐	☺	😐	☺	😐	😐
Promotion of safe cycling, walking and public transport	☺	☺	☺	☺	☺	☺
Safer cars (including fronts protecting pedestrians)	☺	😐	😐	😐	☺	☺
Implementing noise reduction barriers	😐	😐	☺	😐	😐	☺
Investment in safe infrastructure for cyclists and pedestrians	☺	☺	☺	☺	☺	☺
Urban parking management	☺	☺	☺	☺	☺	☺
Environmentally differentiated fees for motorized transport in urban areas	😐	☺	😐	☺	😐	Unclear
Reducing the power of vehicles	☺	☺	😐	☺	😐	Unclear

☺ Positive effect ☹ Negative effect 😐 Not relevant Unclear: unclear effect

Other than safety, one of the most pressing concerns arising from road transport is its climate impact. Road transport generates about one fifth of the EU's CO_2 emissions, with passenger cars responsible for around 12%. While the EU-25 reduced overall emissions of greenhouse gases by almost 5% between 1990 and 2004, CO_2 emissions from road transport rose by 26% (OECD/ECMT, 2007). Today road transport is **by far the largest transport mode contributing to CO_2 emissions**. Fuel consumption and carbon dioxide emissions are a function of speed. **Managing driving speeds is therefore a very effective carbon abatement policy.** According to Anable et al (2006), lower or better enforced speed limits are **'one of the most certain, equitable, cost effective and potentially popular routes to a lower carbon economy'**. It is therefore surprising that speed management is rarely mentioned in discussions about carbon abatements, and this is probably because limiting speeds is mistakenly seen as a non-innovative or non-politically viable solution.

Anable et al. (2006) developed a model to calculate the emission savings in the U.K. between 2006 and 2010 for two scenarios: i) enforcing the 70mph (112km/h) speed limit and ii) reducing this limit to 60 mph (96km/h). They concluded that:

- a properly enforced 70 mph (112km/h) speed limit would cut carbon emissions from road transport by nearly 1 million tonnes of carbon per annum
- a new 60mph (96 km/h) speed limit would nearly double this reduction, reducing emissions by an average of 1.88 million tonnes of carbon per annum

In France, the environment ministry in its 'Plan Climat' (2004) concluded that the potential impact of full compliance with speed limits has been worked out at 2.1 million tonnes of CO_2 for private cars, 0.4 million tonnes for heavy goods vehicles and 0.5 million tonnes for light utility vehicles, amounting to a total of 3 million tonnes of CO_2 per annum. This is equivalent to a 2% CO_2 emissions reduction. This is a high figure compared to other measures implemented by France (see table 2 below). Unlike other measures it was not foreseen as something achievable over a long time horizon, but as something capable of offering immediate and gradually increasing reductions (thanks to France's efforts to increase compliance with speed limits).

Table 2: results of measures to reduce emissions, French 'Plan Climat' 2004.

Measures	Reductions 2010 (Mt CO2.eq.)	Pilot	Horizon
Reduction in emissions relating to action on vehicle engine technology	3.0	Ministry of Transport	2008
Application of the directive on biofuels	7.0	MINEFI	Gradual up to 2010
Clear information on energy consumption (Energy Label)	0.2	Ministry of Transport	2005
Bonus/surcharge for vehicle purchase	1	MINEFI/Ministry of the Interior/MEDD	As soon as possible
Compliance with speed limits	**3.0**	**Ministry of Transport**	**Gradual since 2002**
Awareness of the effect of a less aggressive driving style as a topic in the driving test	0.7	Ministry of Transport	2005
Development of collective urban transport systems	0.2	Local municipalities	2005
Improvement in company logistics	0.5	ADEME	2005
Rail freight		Ministry of Transport	Gains after 2010: 0.7 Mt
Hight speed train network		Ministry of Transport	Gain after 2010: 0.6 Mt
Maritime Highways	0.2	Ministry of Transport	2006
Air transport	0.5	Ministry of Transport	2007
Reminder: Air conditioning			
Total sustalnable transport	**16.3**		

According to a CO_2 abatement policy benchmarking study undertaken by the Dutch Ministry of Transport and other partners (COWI & ECN, 2003), the largest potential and most cost effective CO_2 abatement opportunities in transport appear to lie in actions to reduce energy intensity. Among these actions, 'Eco-driving' (which includes refraining from accelerating unnecessarily) and 'speed limit enforcement' ranked high in terms of CO_2 abatement and cost effectiveness (table 3).

Table 3: COWI & ECN, 2003: International CO_2 policy benchmark for the road transport sector

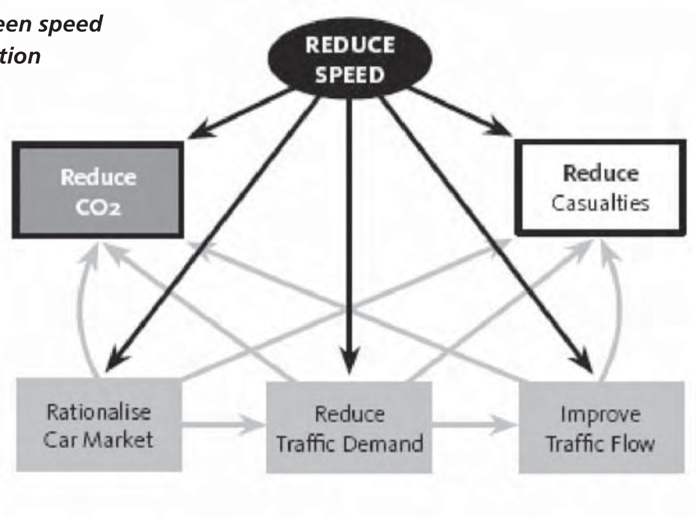
Instrument	Impact Type	CO_2 effect	Cost-effectiveness
CO_2 emissions standards	Energy intensity — technical fuel efficiency	>5%	High
Eco-driving	Energy intensity — on-road fuel efficiency	2-5%	High
Speed limit enforcement	Energy intensity — on-road fuel efficiency	2-5%	High
Fuel tax	Energy intensity — technical and on-road fuel efficiency	<5%	High
Freight logistics	Energy intensity — on-road fuel efficiency	<5%	High
CO2 differentiation of vehicle taxation	Energy intensity — technical fuel efficiency	2-5%	Varies
Road pricing	Demand	>5%	Medium
Stimulation of biofuels	Carbon intensity	>5%	Low
Modal shift — public	Modal shift	<2%	Low
Modal shift — freight	Modal shift	<2%	Medium
Tradable CO_2 permits	All	<2%	High

Driven speeds on motorways in particular are well above the optimum level for fuel efficiency (Anable et al., 2006). A number of studies demonstrated that lowering speed limits on motorways is an essential tool to bring down CO_2 emissions. For example, it has been calculated that a 120 and 100 km/h speed limit on German motorways would reduce CO_2 emissions from cars on motorways by 10% and 20% respectively (Umweltbundesamt, 2003). An Austrian study also concluded that an 11% reduction in CO_2 emissions could be obtained on a 30km long section of the A 12 Motorway by limiting speed at 100 instead of 130 km/h. The section is currently at 130 km/h but interrupted by many tunnels with a 100 km/h limit, hence the interest for adopting a homogeneous limit throughout (TUG, 2005).

Controlling the speed of heavy vehicles such as vans and light trucks can also play an important role in cutting CO_2. Practical trials in the Netherlands demonstrated that fitting vans and light trucks with speed limiters limiting speeds to 110 km/h allows for 5% fuel savings (Vermeulen, Klimbie, 2002). The effectiveness of this measure increases over time because transport on motorways is increasing, and because the power output of vans and light trucks also increases, allowing for speeds above 100 km/h to be reached more easily and more frequently.

In addition to all these findings, the potential indirect effects of lower or better enforced speed limits can lead to even more significant CO_2 reductions. For example, it is not unreasonable to expect that lower top speeds and their resulting safety benefits would incentivise the market for lighter and less powerful cars, thus increasing carbon savings over the long run. Anable et al. (2006) have put forward the case for a wider effect of speed reductions based on a number of positive feedbacks:

Figure 2: relationship between speed enforcement and CO_2 reduction (Anable et al., 2006)



Such indirect effects are unquantifiable at present, but nevertheless important to acknowledge.

Last but not least, a number of studies have indicated that fitting cars with Intelligent Speed Assistance (ISA) systems would do much to reduce CO_2 emissions. Carsten et al. (2001) demonstrated that in the U.K., CO_2 emissions from cars using ISA could fall by 8%.

2.3 LITTLE PROGRESS SO FAR

Despite the overwhelming evidence condemning excessive speed, speeding remains a widespread phenomenon. **The OECD estimates that at any one moment 50% of drivers exceed legal speed limits** (OECD/ECMT 2006). This is why changing speed behaviour is different from other areas: it requires a majority of drivers to adopt a different way of driving, whereas compliance with BAC limits (Blood Alcohol Content) and seat belt legislation requires only a minority of drivers to change. **The extent of the behavioural change needed illustrates the urgency and indicates that regulatory action is the most sensible approach to tackle speed.**

The available data suggest that only few countries have been successful in reducing speeds on their roads. Greatest reductions are reported from France (in which 75% of reductions achieved in road deaths are attributable to curbed speed), but also in Belgium, where speeds have recently decreased across all types of road. Great Britain has been successful in decreasing excess speeds on urban roads, and the Netherlands on motorways. Outside the EU 27, Norway and Switzerland have also been successful in achieving speed reductions.

Further, young drivers are over-represented in speeding behaviour, crashes, and deaths in most countries (OECD, 2007). This particular category of drivers remains a very large threat to safety and requires specific attention.

IN SHORT:

- Speeding contributes to as much as one third of all fatal accidents.
- Speeding increases the probability and the severity of accidents.
- The relation between speed and crash rates is not linear but can best be described as having an exponential function or a power function: as speed increases the crash rate increases faster than the increase in speed.
- The role of 'minor' speeding offences is largely underestimated. Even minor increases have great consequences.
- Active and passive safety devices are no substitutes for speed reduction.
- Managing driving speeds is a very effective carbon abatement policy in terms of climate impact and cost effectiveness.
- At any one moment 50% of drivers exceed legal speed limits.
- Given the extent of the behaviour change needed, it seems that regulatory action is the most sensible approach (see section 4 for Policy recommendations).

3 How? Possible measures

A very large proportion of road accident deaths are preventable. As always, political will and science based policies are imperatives.

3.1 INGREDIENTS OF A SOUND SPEED POLICY, A 'POLICY MIX' APPROACH

Experience shows that there is not one single measure to reduce speed on the roads. It rather takes a combination of measures including credible speed limits, enforcement and education, and 'self-explaining' and tailored roads and vehicles (OECD 2006; Wegman and Aarts 2006).

Road safety work is based on three pillars on which to intervene, and speed management can be applied to every pillar (see table 4 below):

- The driver/road user
- The infrastructure
- The vehicles

The strong benefit that comes with speed management is that **clear action can be taken in all of the road safety pillars, allowing for an effective 'policy mix' approach. In fact speed management is probably the only road safety area of work that offers such scope**. This is an obvious asset but it can also be a handicap: adopting measures in isolation will not suffice to significantly reduce speed.

A clear demonstration of the need for a 'policy mix' comes from cases in which new speed limits were set, having little effect on real vehicle speeds. In places where speed limits have been reduced and no other action taken, the change in mean traffic speed is observed to be about a quarter of the change in posted speed limit only. For example, in one English study changing limits from 40 mph (64 km/h) to 30 mph (48 km/h) resulted in speed reduction of about 2.5 mph (4 km/h) (Finch et al 1994).

Examples of speed management measures for each pillar include:

*Table 4: speed management measures by road safety pillar. *This is not an exhaustive list of all possible measures.*

Driver/road user	Infrastructure	Vehicle
Education and information, accompanying speed limit enforcement with public wide communication and social marketing	Set safe speed limits adapted to the road environment	Fit speed limiters on vans (extend directive on speed limiters for heavy good vehicles and buses to vans)
Enforce speed compliance by imposing sanctions on offenders	Adapt the infrastructure to indicate safe speed limits	Fit vehicles with Intelligent Speed Assistance devices
Rehabilitation programmes for offenders	Install speed calming devices on roads (speed humps, roundabouts)	Limit speed by construction (downsizing the engine power of new cars' fleet)
Training seminars for drivers to develop safe driving skills	Fit roads with automatic speed control devices (digital cameras)	Fit vehicles with cruise control devices
Encourage use of public transport in urban settings to reduce exposure	Introduce section control speed checks to make users adhere to speeds across entire road sections	Fit vehicles with Automated Cruise Control
Education targeted at vulnerable road users (especially children)	Design new access roads to obtain traffic separation (no speeding in residential areas)	Fit vehicles with accident 'black boxes' to discourage driving at illegal speeds
Stricter legislation for professional drivers / fleet operators to adopt internal policies to monitor their drivers' behaviour	Road maintenance	Fit vehicles with electronic stability control

3.2 PRIORITIES FOR COMPLIANCE

As described in the previous section, a 'policy mix' approach does not mean that any policy is as good as any. Since setting appropriate speed limits alone does not suffice, and given the gigantic number of speed offenders, **additional measures should be taken in the light of the most pressing need: to make drivers comply with speed limits**. In the light of this priority, some strategic speed management tools should be given more weight.

■ *Speed enforcement: cameras, automatic speed controls, and effective strategic enforcement plans*

While speeding remains the single most important cause of traffic death and injury across Europe, available data show that legal limits are insufficiently enforced even in the best performing EU Member States such as the U.K. and Sweden (ETSC, 2006).

Speeding remains the single most important cause of traffic death and injury across Europe. Yet available data show that there is still not full compliance with the legal speed limits even in some of the best performing EU Member States in terms of road safety such as the U.K. and Sweden. Even if they apply sophisticated programmes in tackling this number one cause of death more can be done even amongst the front running countries to reduce speeding. The European Commission had a cost-benefit analysis carried out concerning the three enforcement areas of speeding, drink driving and seat belt use. It assessed that increased enforcement would result in a total annual reduction of 14,000 road deaths and 680,000 injuries in the EU 15, and in a net benefit of 37 billion Euro or 0.44% of GNP. In detail, optimised enforcement would be a major contribution to reducing traffic deaths and injuries in Europe (EU 15). In particular in the case of speeding, 5,800 deaths could be prevented every year.

Traditional methods rely on radar and laser measurements made by mobile police patrols. These offer the advantage that offenders are directly apprehended by police officers. New automated methods on the other hand use recording devices (camera, video) that are triggered automatically by speed violations. These offer high levels of continuous and widespread enforcement (whereas traditional methods tend to focus on the most severe offenders). **Automated methods should therefore be used to complement traditional methods and are necessary to deal with a large number of violations.**

Countries that apply high numbers of automated speed devices, such as The Netherlands and the UK, (about 6000 devices) tend to have low numbers of road deaths whereas countries with no or low numbers of such devices generally have much higher deaths rates.

The most impressive success comes from France where fully automated speed enforcement was introduced in late 2003. The French system introduces automated number plate recognition thanks to a tailored legislation (i.e.: vehicle owner liability), allowing for automated follow up of offences: the system issues and sends fines directly without any human intervention. As a result speeding rates dropped radically for all types of vehicles, contributing greatly to the 31% reduction in road deaths between 2001 and 2005 (ETSC, 2007a). The French Road Safety Observatory has calculated that three quarters of this reduction could be attributed to improved speed management based on the new automated camera system. The proportion of vehicles travelling at 10 km/h and more above the legal limit decreased from 35% in 2003 to 19% in 2005 across the network. The number of vehicles exceeding the limit by more than 30 km/h went down by 80%. Average speed decreased by 5 km/h (ONISR 2006).

Empirical evidence confirms the safety benefits of speed checks. In the U.K., a Home Office research report shows that accidents at sites where speed cameras were introduced were reduced by 28% (Hooke et al 1996).

Traffic law enforcement is supported by a large share of the European public. A total of 70% of European drivers are (strongly) in favour of more enforcement of traffic laws, according to an EU survey (Ewers, 2004). According to a public opinion survey in France, 77% support automatic speed enforcement as a good tool to improve road safety (2005). Also as regards public support, automatic speed enforcement may be perceived as more objective by road users, thus increasing the perceived fairness and acceptance of police enforcement (ESCAPE 2003: 101).

To allow for acceptance from the public, the money generated from speed offenders should be generated back into road safety work. This is even more important when enhanced enforcement is coupled with higher penalties (ETSC, 2006). Further, fixed camera should be placed at high risk sites to clearly curb the casualty risk of speeding and help the users understand that speed enforcement is designed for their own safety.

Further, to raise people’s awareness that their compliance is being checked, enforcement must be highly visible and publicised. Research indicates that it is the drivers’ subjective risk of being caught that must be increased (ESCAPE, 2003). **A good enforcement plan should therefore focus on increasing the subjective risk of being caught just as much as it focuses on the sanctioning itself.**

One problem that remains with automatic speed checks is related to driver identification: violations must be brought home to the driver. Hence, a system should be introduced to make the owner of vehicles liable (disregarding who is driving the vehicle at the time of the offence). Identification can then be made automatically via the registration system (Nilsson, 2004). In the Netherlands, 100% of fines are paid as the owner has to pay the fine no matter who was driving the car (full owner liability). This is also the case in France. In other countries such as Germany and Poland, follow up relies on driver liability. If the driver differs from the owner of the car, police have to undertake an investigation. Although the appeal rate is under 10% in Germany, those cases take up valuable police time. According to data reported from the Region Baden Württemberg, two-thirds of proceedings are stalled (including non-residents and motorcyclists) (ETSC 2007).

Conspicuous safety cameras

Further, tougher sanctions for speeding must be applied to drivers most at risk of jeopardising safety: novice drivers and recidivists. And speeding must be accompanied by sanctions within the penalty point systems where they exist.

The European Commission has adopted a proposal for a Directive to improve police enforcement for the cross border enforcement of speeding offences (March 2008). This follows both its public consultation on a proposal (November 2006) and its Recommendation (2004) on traffic law enforcement. This Recommendation asked countries to apply in a national enforcement plan what is known to be best practice in the enforcement of the three key areas of speed, drink driving and seat belt use. To control speed, automated enforcement systems must be used and offences must be followed up by procedures able to manage with a large number of violations. The EC Recommendation certainly helped to raise the profile of traffic law enforcement in the EU and has led to improved co-operation between different actors. The Recommendation also stated that by 2007 the Commission would evaluate progress in countries and if improvements are not sufficient that the Commission reserves the right to propose more binding legislation.

Communicating speed enforcement

ETSC monitored the impact of the implementation of the Enforcement Recommendation over the past years. In the area of speed, fixed camera networks continue to be rolled out in different countries. As a result of this average speeds are coming down. Particularly impressive is the analysis from France of their reduction in deaths directly due to the installation of safety cameras. Different countries such as Sweden are doing their best to publicise the introduction of new fixed cameras. New practices such as section control continue to be extended as a way to tackling speeding especially on motorways and in tunnels. As far as the follow up of offences some countries have been setting up effective follow up systems especially to tackle the priority area of speed. Sweden is the latest country to introduce a fully automated system to follow up speeding offences.

Speed is particularly relevant when considering the need for cross border enforcement of traffic offences. Speed is an area where enforcement can work as a powerful means to encourage drivers to reduce speed based on the experience in certain countries. There is a particular problem of following up speeding sanctions committed by non-residents within automatic systems. At present there is a far from perfect patchwork system of bilateral agreements for following up non-resident offences.

Certain transit countries also have a high level of non-resident offences and percentage of accidents. For example, in Luxembourg, non-resident drivers account for 30% of road traffic offences and 23% of fatal accidents. In France in 2005 1 million of the 8.6 million offences registered by the automatic radars were committed by non-resident drivers, of which 25 % were from Germany.

ETSC is convinced that a Directive is needed that includes the minimum requirements covered by the Recommendation as the only way to ensure that all Member States achieve high standards in enforcement. This means automated speed enforcement with fixed cameras and mobile checks. Also that checks are carried out on stretches of roads where non-compliance occurs regularly and where this brings about an increased risk of accidents, as well as the follow up of offences between Member States across borders.

■ *Technological improvements*

A number of new in-car technologies have been developed and have great safety potential.
Intelligent speed assistance (ISA) in particular is a technology that should play a great role in mitigating accidents in the future. ISA is the general term for advanced systems in which the vehicle ''knows'' the speed limit for any given location and is capable of using that information to give feedback to the driver or directly limit the vehicle speed. Navigation devices in the vehicle give a precise location and heading whilst an on-board map database compares the vehicle speed with the location's known speed limit. Drivers are then informed of the speed limit (advisory ISA), warned when they exceed the limit (supportive ISA), or actively aided to abide to the limit (intervening ISA).

ISA can deliver impressive safety benefits. Research shows that advisory ISA can achieve up to an 18% reduction in fatal accidents and intervening ISA can achieve a 37% reduction in fatal accidents in the U.K. (Carsten and Tate, 2001). Concording with the knowledge that severe crash are much more sensitive to speed changes (even minor changes), this research concludes that **ISA has a far greater impact on the most severe, fatal and serious injury crashes.**

A number of uncertainties about ISA have been resolved by research and technological advancements in the past decade:

- ISA is a mature technology: an extensive number of field trials across Europe and in other parts of the world have demonstrated that ISA is now a mature technology capable of delivering considerable safety benefits (ETSC, 2006a). Some systems have already hit the markets in Australia (systems called 'speedalert' and 'speedshield'). Advisory ISA can easily be offered via common navigation satellite systems. Further, intervening ISA systems are also very easy to introduce since cars now have electronic fuel injection (Nilsson, 2004).

- Digital speed mapping has already been undertaken in a number of countries (e.g.: Sweden, Finland) and is not so complex or demanding that it cannot be undertaken by all European countries.

- ISA is extremely cost-efficient: benefits of up to 4.8:1 can be expected depending on the country (ETSC, 2006a).

- ISA technology does not mean that control is taken away from the driver. The driver is still responsible for the control of his/her vehicle and ISA is merely a tool to enable the driver to comply with speed limits. Virtually all ISA systems can be overridden by the drivers.

- Drivers tend to support ISA systems when they are given the opportunity to test them: across Europe, between 60% and 75% of drivers who have tried ISA technologies said they would like to have a system in their own cars (Peltola & Tapio, 2004). In addition, acceptance of ISA is higher on urban roads, precisely the ones where casualties are most likely to occur because of exogenous traffic (Vagverket, 2002; Marchau et al. 2005).

Car equipped with ISA

For all these reasons **ISA is a mature technology that should be pushed forward**. As a first step, national authorities responsible for road network management should develop a digital database of all the speed limits on their network and make this database available for GPS application. Industry's efforts should also be promoted by supporting additional research and standardisation. Member states could introduce tax cuts as incentives to install ISA and act as a role model by becoming first customers of ISA technology (ISA on public authorities' fleets). Further, ISA could be introduced using 'sticks' (e.g.: requiring speeders or young drivers to fit their vehicles with ISA). As a second step, Intelligent Speed Assistance could become mandatory by law.

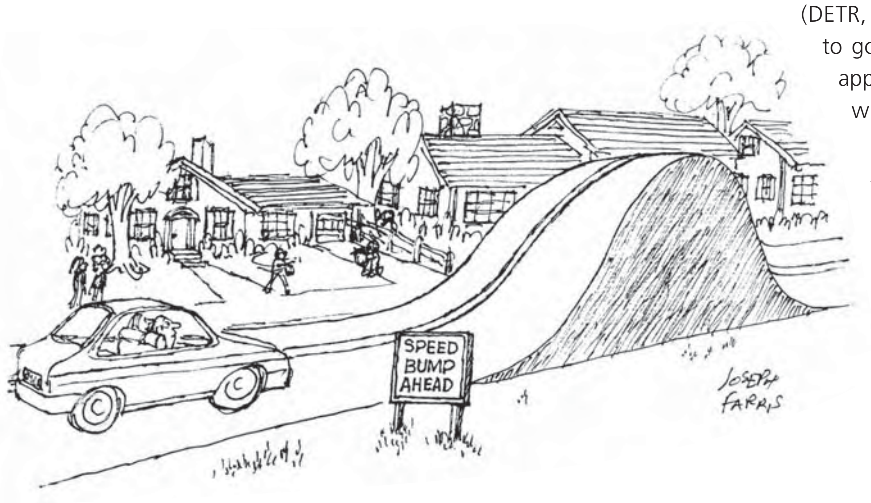
Other technological advancements include adaptive cruise control (ACC); a technology that actively intervenes in the vehicle's functioning to ensure a pre-selected time-lag between it and the vehicle in front of it. In some instances, ACC applies light, imperceptible brake pressure when there is a vehicle ahead, thus reducing braking distances if the driver subsequently brakes (OECD/ECMT, 2006). Initial analysis suggests that ACC could act as a potential countermeasure in 7.5% of crashes (OECD/ECMT, 2006).

Various types of monitoring systems also exist that can be used to register information regarding the driver's performance, the vehicle and traffic situations, in order to provide feedback to the driver or others, such as employers, parents, traffic authorities or insurance companies. Examples include event data recorders (EDRs), which, like aircraft "black boxes", can provide 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).

- ***Infrastructural improvements:***

Traffic calming devices such as road humps, chicanes and other road engineering measures are among the most effective method of reducing vehicle speeds in urban (and some rural) areas. In the U.K. they have been identified as able to reduce average speeds typically by 10 mph (16 km/h) (Mackie, 1998). Such measures are particularly effective at reducing child pedestrian casualties. Schemes can be designed to encourage a smooth driving style. However, traffic calming devices cannot be applied everywhere, such as on major through-routes, especially if regularly used by the emergency services (DETR, 2000). Road markings can also be used to good effect for changing the nature and appearance of a road, and the speed at which people choose to drive.

A fine example of the principles governing safe infrastructure design can be found in the Dutch' 'Sustainable Safety' approach, according to which a road network should integrate these core principles (SWOV, 2006):



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 recognize 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 now includes the Sustainable Safety 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.

A further measure which will contribute to reducing speeds throughout the EU is the proposed Directive on road infrastructure safety management. This proposal was adopted in October 2005 and is currently being discussed in the European Parliament and is due for final adoption in the course of 2008. The Directive aims to improve the road network by introducing an EU harmonised system of road safety inspection, management of high risk sites, road safety audits and safety impact assessment on the Trans-European Road Networks, accounting for 85,000 km of main roads. Member States will then also be able to apply these instruments to the rest of their road network. Currently too many EU countries do not yet implement these infrastructure safety measures which have the potential to save 600 lives in the EU. Moreover this legislation is timely for the new Member States who are currently upgrading and expanding their road network. The adoption and swift implementation of such a Directive would be an important step in reducing speed related road deaths.

IN SHORT:

- To reduce speeds clear action can be taken in all of the road safety pillars, allowing for an effective 'policy mix' approach. Speed management is probably the only road safety area of work that offers such scope.
- After setting clear and appropriate speed limits, additional measures should be taken in the light of the most pressing need: to make drivers comply with speed limits.
- Measures that are most likely to ensure compliance with speed limits include: efficient speed checks, including automated speed control and good enforcement plans; in car enforcement technologies (such as ISA); and self-explanatory infrastructure.
- Automated speed control methods (if possible with automatic number plate recognition) should be used to complement traditional methods and are necessary to deal with a large number of violations.
- A good enforcement plan should focus on increasing the subjective risk of being caught just as much as it focuses on the sanctioning itself.
- ISA is a mature technology that has great safety benefits and has a great potential to reduce the consequences of most severe crashes (fatal and serious injury). It is also an effective instrument in mitigating climate change.
- Road infrastructure improvements can make a significant contribution to reducing the frequency and seriousness of road traffic deaths caused by speed. An EC Directive must be adopted and implemented urgently in order to get maximum benefits in improving the road network in the EU.

4 Progress in Europe

MEASURES TAKEN IN EUROPE AND THEIR EFFECTS; BEST PRACTICES FROM EUROPEAN FRONTRUNNERS:

A number of countries, presented below, have achieved progress in making road users comply with speed limits. Much remains to be learned too, since total compliance with speed limits remains a distant attainment even for these well performing countries. Each front running country has its own approach to speed management, and each has something to teach others on how to curb speed.

Even well performing countries can achieve further progress and learn from their counterparts. Below is a condensed list of actions taken by frontrunners in terms of speed management:

France

Best Practice

The road safety achievement of France is mainly due to the introduction of fully **automatic speed control** (no human processing involved to issue fines) and information campaigns that augmented the **subjective risk** of sanctions among drivers (i.e.: the drivers' perception of the risk of being caught).

At the end of August 2007, there were 995 fix cameras and 557 mobile cameras in France; at the end of 2007 there will be 1950 radars (2/3 of which will be fixed).

Since automatic speed control has been introduced the number of speeding tickets has increased dramatically and the number of offences is easier to track. The money generated from this was reinvested in road safety work.

For traditional enforcement (operated manually by the police) the number of tickets remains unchanged.

France has been very active in carrying information campaigns on speed, thus augmenting the subjective risk of being caught.

Impact

- In France road deaths were reduced by 31% between 2002 and 2005; a government report indicates that 75% of this reduction results from reduced speeds (ONISR, 2006a).
- In 2004, a driver survey showed that a large majority of drivers declared that they drove more slowly, and that the main reason for that was the fear of enforcement (Arrouet, 2004).
- In addition to increasing the number of speeding tickets issued, the automatic system allows for better tracking of offences

Future Progress?

- Introduce Section Control
- Address speeding of heavy vehicles
- Adopt infrastructure measures (checking signing / marking / speed limits)
- Develop ISA systems implementation

The Netherlands

Best Practice

The achievements of the Netherlands are in great part attributable to the ***'Start-up programme Sustainable Safety'*** between the national government and the local authorities launched in the early 90s. The programme underlines actions necessary to promote the integrated Sustainable Safety vision (spanning over infrastructure, enforcement, education). The approach borrows from the sustainable development concept by fostering the idea that it is no longer acceptable to hand over an unstable traffic system to future generations. In that light many **infrastructure measures** were promoted:

- 30 km/h and 60 km/h zones were created (down from 50 km/h and 80 km/h respectively) in access areas, accompanied by low-cost speed reducing measures (speed humps; plateau…)
- the construction of roundabouts was carried on a large scale (even if not envisaged by the start-up programme)
- more recently road markings are installed to increase 'recognisability': inform the road users about the type of road they are driving on (which is linked to a speed limit). However road users are not yet fully aware of what the markings means and there are some variations on how these markings have been installed

The Netherlands has also been active in other fields:

- Sanctions have been tightened since 1st of January 2006, on the basis of this simple principle: 'the more dangerous the behaviour, the higher the sanction' (eg: heavier sanction for speeding in work zones)
- Increased enforcement pressure (more inspections)
- Penalty point system for novice drivers
- The Netherlands has a very high number of automated speed check devices (1,700)
- The Netherlands has also been a frontrunner in developing Section Control radars which have been used there for over 10 years

To learn more about sustainable safety: www.sustainablesafety.nl

Impact

The implementation of 60km/h zones in particular has had a significant impact in terms of casualty reduction. It was estimated that in such zones road deaths were reduced by 67% in the period 1998-2003 and the number of hospitalised people by 32%.

Future Progress?

- Improve the link between road layout and speed limits
- Continue creating realistic speed limits
- Develop ISA systems implementation (a digital speed map of the Netherland has already been made)
- Consider the introduction of vehicle owner liability for sanctions

Belgium

Best practice

A **strengthening of sanctions** for speed infringements has been introduced in March 2006, also in this case with a stronger link between the 'dangerousness' of the infringement and the amount of the fine or the level of sanction. For serious speed infringements, the amount of the fine is growing for each additional kilometer over the limit, which was not the case before. The law has also recently been tightened for novice drivers.

New speed limits have also been introduced with a growing number of 70 km/h zones outside built-up areas instead of 90 km/h. Since September 2005, a 30 km/h limit must be applied in all school neighbourhoods, with permanent signs or with variable message signs operating at school starting and ending hours.

Efforts for communicating police interventions are also thought to contribute to increasing the subjective risk of being caught (approximately 35% of police operations are announced in advance).

The use of **safety cameras** in Flanders is widespread and their number has sensibly increased over the last years and reached a first objective of 350 cameras. There are much less cameras in Wallonia.

Impact

- We can observe a significant drop in mean speeds between 2003 and 2005
- Unsurprisingly mean speeds are lower in Flanders

Future Progress?

- More safety cameras in Wallonia
- Introduce digital cameras and consider the introduction of vehicle owner liability for speeding sanctions (Automatic Number Plate Recognition and new law needed)
- Prioritise police controls coupled with communication efforts

- More action against recidivists. This implies revising the law on the confiscation of driving licenses (at the moment licenses are confiscated only if three condemnations occur in one year, which is very unlikely)
- Improve the link between road design and speed limits and continue adapting the limits (the 90 km/h limit is still applied in many unsafe zones)
- Develop a digital speed map for ISA systems and develop ISA implementation

Switzerland

Best Practice

Speed limits and speed enforcement have been a topic in Switzerland for a long time. In the mid 1980s the speed limits in urban areas were lowered from 60 to 50 km/h. Also the national maximum speed limit on motorways was decreased from 130 to 120 km/h and on rural roads the maximum speed was lowered from 100 to 80 km/h. Since then, no further decreases in the national maximum speed limits were introduced. As in most other countries in many residential areas 30 km/h zones were introduced in the 1990s but the federal court has recently decided that the general urban speed limit is still 50 km/h and 30 km/h zones are only allowed under special conditions.

Switzerland has relied heavily on speed checks, in total the number of speed controls has doubled from 2002 until 2006. In 2006 about 203 million vehicles were checked for speed (Federal Office of Statistics, 2008a), 188 million with a fixed camera, and 14 million with a mobile safety camera. In total this means that every motor vehicle in Switzerland has been checked for speed 37 times. More than half of the controls took place in urban areas (about 108 million). Another 88 million were made on motorways. Rural road speed controls are only rarely conducted (about 3% of total controls).

Switzerland has introduced a detailed indicator system to monitor developments in the fields of speed and drink driving. Indicators include the levels of speed-related injury crashes, police checks, violation rates and sanctions as well as the opinions of the drivers about relevant safety regulations and their enforcement. The data are available on the internet through the Swiss statistical office:

www.bfs.admin.ch/bfs/portal/de/index/themen/19/04/01/ind11.html

Finally, in Switzerland there are national as well as regional information campaigns. These campaigns are either funded by national institutions like the Swiss Road Safety Fund or at regional (cantonal) level funded mostly by the police. In recent years - 2004 - the Touring Club of Switzerland (TCS), the largest drivers association, launched a campaign against speeding and speeders with two rather provocative slogans: "Help speeders – donate brain" and "Speeders reach the goal faster" with a skid mark leading directly into a grave. However the impact of such campaigns is not known.

Impact

- Within the last years the frequency of speeding has gone down on all types of roads, particularly on motorways and urban settings
- The rate of fatal crashes (per million vehicles) for which the policeman believed speed to be a major cause has decreased markedly. It has more than halved from the mid 90's to 2006

Future Progress?

- In view of the high toll of deaths on rural roads (about 50% of all road deaths) the number of controls on this type of road seems to be rather low.
- Develop a digital speed map for ISA systems and develop ISA implementation.
- Consider the introduction of vehicle owner liability for sanctions.

Norway

Best Practice

There are two types of speed enforcement in Norway: fixed safety cameras and traditional police enforcement.

Digital cameras have been introduced recently. In the past cameras were operated only about 5-10% of the time because films had to be changed manually and then brought to the police office for processing. Digital pictures are now automatically transferred to an office set-up for the processing of speed offences solely. There are at current 330 cameras in Norway, and plans to increase this number to 400.

There are 3 criteria to choose the location for fixed cameras in Norway:

- The mean speed of traffic should be above the speed limit;
- The accident rate per million vehicle kilometers should be higher than the mean accident rate for the type of road;
- There should be an expected annual accident density of at least 0.5 injury accidents per kilometer of road.

A field trial for the installation of section control was also recently completed near the town of Lillehammer. This was designed to test the reliability of the technology and had a positive outcome. The introduction of such devices throughout Norway now awaits political approval.

Traditional speed enforcement methods have also been deployed but at a rather low volume. On average, the police perform less than 1 hour of speed enforcement per kilometers of road per year.

In terms of sanctions, fines increased considerably from 1995 to 2005 but investigations reveal that this increase has had little impact on the rate of speeding (Elvik and Christensen, 2004, 2007).

Finally, speed limits have been reviewed and changed on a number of roads in 2001. They were lowered from 90 to 80 km/h on 393 kms of roads and from and 80 to 70 km/h on 741 kms of road with a high number of fatal or serious accidents.

A 'watch your speed' information campaign was also conducted every summer from 1999 through 2002 (large signs were displayed along the roads). An evaluation of the campaign found no effect on speed. The number of injury accidents did fall by 4% but this was judged not statistically significant.

Impact

Mean speed have diminished on motorways and urban roads in the past few years.

Lowering the limit from 80 to 70 km/h was associated to a reduction of the number of injury accidents of about 15% and of deaths of about 25%. The effect of lowering speeds from 90 to 80 km/h was less clear.

Future Progress?

- Motorcyclists generally cannot be identified by fixed cameras because pictures are taken from the front (and they generally have a plate only on the rear). Pictures should therefore also be taken from the rear or motorcyclists should be required to have a number plate on the front
- In practice the 3 criteria for choosing the location of cameras are not always respected. In future they should be more strictly adhered to
- Consider the introduction of vehicle owner liability for sanctions
- Enforcement level through traditional methods should also be raised
- Introduce section control following the successful field trial near Lillehammer
- Develop ISA systems implementation

United Kingdom

Best Practice

The United Kingdom has also focused on safety cameras to a great extent, with 6000 automated speed check devices across its territory, including an increasing number of time over distance cameras (section control).

In terms of legislation, "Netting off" – allowing police forces 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 are major elements of the government's work to reduce road traffic collisions. New guidance to traffic authorities on setting local speed limits have been published in August 2006, 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.

Many 20mph zones have also been introduced in urban areas.

Impact

There has been a marked increase in compliance with the 30mph limits in recent years, and injury accidents in the areas covered by 20 mph zones have been reduced by an average of 60%.

Future Progress?

- Inappropriate speed remains a serious problem on rural roads, and the UK will probably have to focus on curbing speed on those roads in the coming years.
- Continue to introduce 20mph (32km/h) zones in urban areas
- Introduce more 30mph zones (47 kmh) in those rural villages that do not yet have them.
- Installation of ISA on all fleet vehicles
- Extend the use of time over distance cameras (section control), including enabling their use where the speed limit is 20mph

Below are the tables and line graphs indicating the speed reductions achieved in these front running countries per type of road

Urban roads					
	Highest level (km/h)	Lowest level (km/h)	Period	Change (%)	Yearly average change (%)
Belgium	53.9	50.4	2003-2005	-6.5	-3.2
France	51.8	47.0	2002-2006	-9.3	-2.2
Great Britain	53.1	48.3	1997-2005	-9.1	-1.1
Norway	50.3	47.9	2004-2006	-4.8	-2.4
Switzerland	43.0	41.0	2005-2006	-4.7	-4.7

Rural roads						
	Speed limit (km/h)	Highest/lowest level (km/h)	Lowest/highest level (km/h)	Period	Change (%)	Yearly average change (%)
Belgium	70	78.1	74.6	2004-2005	-4.5	-4.5
Belgium	90	94.3	88.3	2003-2004	-6.4	-6.4
France departemental	90	94.6	84.5	2000-2006	-10.7	-1.7
France national	90	90.1	80.3	2001-2006	-10.9	-2.1
France	110	112.4	99.1	2001-2005	-11.8	-2.8
Great Britain	96,6**	72.5mph	78.9mph	2001-2005	8.9	2.3
Great Britain	112,7*	112.7	109.5	2001-2006	-2.9	-0.6
Norway	70	70.3	69.8	2004-2006	-0.7	-0.4
Norway	80	79.3	78.7	2004-2006	-0.8	-0.4
Switzerland	80	78.0	72.0	2001-2006	-7.7	-1.5

*70 miles/h **60 miles/h

Motorways						
	Speed limit (km/h)	Highest level (km/h)	Lowest (km/h)	Period	Change (%)	Yearly average change (%)
France	130	126.0	119.0	2002-2005	-5.6	-1.8
France	110	112.1	109.0	2003-2005	-2.8	-1.4
Netherlands	100	97.8	95.5	2003-2006	-2.4	-0.8
Norway	90	86.6	83.0	2004-2006	-4.2	-2.1
Switzerland	120	114.0	110.0	2003-2006	-3.5	-1.2

Source: ETSC Pin annual report

POTENTIAL FOR SAVING LIVES IF SPEEDING WAS ELIMINATED ALTOGETHER

For two of those frontrunners, the potential for saving lives if speeding was eliminated altogether was also calculated on the basis of the Power Model (Elvik, Christensen and Amundsen 2004):

BELGIUM

The reference years for the 'initial' situation are 2003, 2004 and 2005. Lives saved in case of perfect compliance with speed limits were calculated using the power model.

Death reduction for 120 km/h roads was not calculated because of the lack of speed data for these roads. On 30 km/h roads, the calculation does not really make sense due to the small amount of deaths on these roads.

	Speed limit	30 km/h	50 km/h	70 km/h	90 km/h
Deaths	Initially	7	309	234	439
	Saved if compliance	5 (72%)	141 (46%)	122 (52%)	153 (35%)
	remaining	2	168	112	286

Data sources: IBSR

NORWAY

There is, in principle, a large potential for improving road safety in Norway too if speeding is eliminated. Based on the Power Model, this potential across the entire road network has been estimated to:

- Deaths: - 21 %
- Seriously injured road users: - 15 %
- Slightly injured road users: - 8 %

Source: TØI 2007

These are only two illustrations of the additional safety benefits that can be obtained if total compliance with speed limits was achieved.

5 Political recommendations

5.1 TO EUROPEAN INSTITUTIONS

Enforcement

- Adapt and Adopt a Directive to include minimum requirements covered by the EC Recommendation on enforcement (2004/345), alongside the cross border enforcement of traffic law.

In-car enforcement technologies

- Extend the obligation to fit speed limiters to N1 vehicles (vans).
- Adopt European legislation for mandatory fitting of European cars with informative or supportive Intelligent Speed Assistance systems in the type approval procedure for cars. This Directive should include technical requirements and an implementation timetable.

Infrastructure safety

- Work towards the swift final adoption of the Directive introducing an EU system of road safety inspections, the treatment of high risk sites, road safety audits and safety impact assessment on the TEN-T.

Beyond 2010: 4th Road Safety Action Programme

- Make clear reference to speed and speed management measures as a priority to achieve better safety across European roads in the 4th Road Safety Action Programme.

5.2 TO MEMBER STATES

- Monitor speed compliance.

Enforcement

- Member States should prepare enforcement plans with yearly targets for compliance with speed limits.
- Member States should ensure an appropriate level of traditional police enforcement and fully automatic speed control (including automatic number plate recognition if possible), which targets all road users.
- Member States should in the case of automatic enforcement, provide a system that makes the vehicle owner legally responsible for the violation when the driver cannot be identified.
- Member States should ensure proper follow-up of offences:
  - Introduce a set of fixed penalties for minor speeding.
  - Work towards a low level of appeals for fixed penalties for speeding violations.
  - Include speeding offences in penalty point systems, where they exist.
  - Introduce rehabilitation programmes to address recidivism in case of speeding.
- Member States should support the swift adoption of a Directive on cross border enforcement and in the mean-time work towards setting up Enforcement Co-ordination Points to ensure that serious or repeated offences committed by non-resident drivers are reported and followed up accordingly.

In-car enforcement technologies

- As a first step, promote the industry's efforts by supporting additional research and standardisation, by introducing tax cuts as incentives to install ISA and becoming first customers of ISA technology. As a second step, require informative or supportive Intelligent Speed Assistance systems by law.
- Authorities in charge of the road network management should, possibly in co-operation with the private sector, develop a digital database of all the speed limits on the network and make this database available for GPS application as a prerequisite to the implementation ISA systems.

Infrastructure

- Set safe speed limits that are credible in the light of the road and the road environment.
- Adapt infrastructure to indicate safe driving speeds.
- Integrate speed management into the requirements of treating high risk sites, road safety audits and safety impact assessment of all roads.
- Support the implementation of an EC Directive on Infrastructure Safety, once adopted work towards its swift transposition and implementation, also on national and local roads.

Education and information

- Accompany enforcement programmes with wide public communication and social marketing.
- Set up a transparent system for the allocation of revenues generated by fines and channel revenues from camera enforcement back into road safety work.

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Notes

Notes

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