# Best practices in road safety

## Handbook for measures at the country level

SUPREME

ON THE MOVE
for safer roads in Europe

EUROPEAN COMMISSION

# Best practices in road safety

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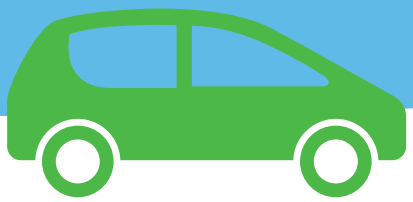


# Foreword

The goal of SUPREME was to collect, analyse, summarise and publish best practices in road safety in the Member States of the European Union, as well as in Switzerland and Norway. This document is a collection of best practices at national scale and aims to present the project's results to national/regional policy and decision makers across Europe, thereby encouraging the adoption of successful road safety strategies and measures. As such, the intention of this project is to contribute to reaching the EU target of a 50% reduction in road fatalities in 2010 (1).

The project was commissioned by DG TREN of the European Commission. It started in December 2005 and finished in June 2007. A total of 31 national and international road safety organisations were involved. More information about the project and its result can be found at: http://ec.europa.eu/transport/road_safety/pdf/projects/supreme.pdf



(1) White Paper European Transport Policy for 2010: Time to decide. COM(2001) 0370. http://ec.europa.eu/transport/white_paper/index_en.htm

# Best practice in road safety

## Why this handbook?

This handbook contains a large variety of road safety measures from throughout Europe. We hope that the handbook motivates those who are nationally or regionally involved in road safety to take up measures that have a high potential to improve road safety. By looking at successful experiences elsewhere in Europe, reinventing the wheel and trial and error approaches to road safety can be largely avoided.

## For whom?

Some road safety areas, e.g. vehicles safety, are largely the responsibility of the European Commission and other international bodies. Most areas, however, are the responsibility of national governments, increasingly delegated to regional or local authorities. This handbook is meant for national, regional and local policy makers and decision makers, for road safety practitioners, for interest groups, etc.; in short, for all those who are professionally involved in road safety at the national level.

## What type of measures?

The document describes measures in the following nine areas:

- institutional organisation of road safety;
- road infrastructure;
- vehicles and safety devices;
- road safety education and campaigns;
- driver training;
- traffic law enforcement;
- rehabilitation and diagnostics;
- post accident care;
- road safety data and data collection.

## How were measures selected?

An extensive procedure was followed to decide whether a measure could be qualified as a best, good or promising practice. It all started by formulating the criteria for best practice. These were very strict criteria, including, among other things, scientifically proven effects on road safety, a positive cost-benefit ratio, expected sustainability of effects, public acceptance for measures and good transferability to other countries. In an on-line questionnaire, for each of the areas of interest, experts in 27 European countries (1) proposed national best practice measures, with the substantiating evidence that these measures fulfilled all, or at least most criteria. This procedure resulted in 250 proposed best practice measures. Subsequently, area experts critically looked at the information provided by the national experts, requested additional information if necessary and evaluated the scores on the various criteria. They also weaved in existing knowledge from literature or other EU projects. This process resulted in a final list of examples to be included in this document, ranging between three and eight per area. More information about the submitted best practices and the selection procedure can be found in the *Final Report-Part A (Methodology)* (2).

## Best, good or promising practice?

A distinction was made between best practice, good practice and promising practice. That was done because for some measures quantitative information about the effects and, hence, the cost-benefit ratio was limited or lacking. In those cases it is difficult to say whether it is really best practice. Sometimes the information was missing, because a particular area does not have a tradition of evaluating measures in a quantitative way, often because a good scientific evaluation study is very difficult or even impossible to carry out. This is the case in, for example, the area of driver training and safety education. In these cases, an example could not qualify for best practice, but it could for 'good practice' if it was based on a sound theory. For other measures quantitative information was lacking, because it was very new or only available as a prototype, and not yet evaluated or only evaluated in laboratory conditions or small-scaled field studies. In these cases the measure was qualified as promising practice, if the theoretical foundation was good or if pilot studies yielded positive results.



(1) These countries were 25 EU Member States (excluding Bulgaria and Romania that joined the EU in January 2007) and Norway and Switzerland.
(2) The Final report is available at http://ec.europa.eu/transport/roadsafety_library/publications/supreme_a_methodology.pdf

## Where to find what information?

The next sections successively present the identified best, good and promising practices per area of interest. We start off with the institutional organisation of road safety, providing the framework for an efficient and effective road safety approach. This is followed by the road safety 'hardware', i.e. infrastructure and vehicles. We continue with the road safety 'software', successively, education and campaigns, driver training, traffic law enforcement, and rehabilitation and diagnostics. Post accident care is the last but one section, aiming to mitigate injury consequences by adequate and fast medical support. The final section focuses on best practices in data collection and data analysis. Good and reliable data is conditional for understanding road safety problems, for prioritizing road safety measures and for monitoring developments over time. Each section provides some general information about the aims and the general principles, illustrated by a number of examples in that area. The measures are presented in boxes of different colours:

- *Best practices in green boxes.*
- *Good practices in yellow boxes.*
- *Promising practices in orange boxes.*

## What types of measures are included?

European countries differ widely in the safety level they have reached. Some have a much longer history of road safety policies than other. Since the intention of the handbook is that all European countries could find measures that suit their needs, the measures presented in this handbook are very different in nature. Some are relatively simple and low-cost measures; other are less simple to implement and would need a larger budget. Some have been well-known for a long time in some countries, but less so in other.

The selection of measures was made with the utmost care and we believe that the handbook presents the most important measures. However, we do not pretend that the handbook is exhaustive. In particular measures that have been implemented at a very local level and have not been publicised widely, may have escaped the attention of national and area experts.

Finally, the selection was made based on current knowledge. It is likely that our knowledge will evolve when more evaluations are performed and when new measures are applied more widely. Different measures and different qualifications of best, good and promising measures may be the result. However, given the current state-of-the-art, we are convinced that the measures presented in this handbook belong to the best in its category.

## Take care: it's more than simply shopping!

Beware of the danger of reading an overview of separate measures. It might invite people to go out shopping, i.e. just to pick out one or two measures that seem interesting and easy to realise. That's not what road safety work is all about and certainly not what efficient road safety work entails. Road safety work needs to be based on a thorough analysis of existing safety problems, on a clear strategic view of what problems need to be tackled and by which types of measures, preferably on the basis of a vision about the long term aims and the role of the various components of the traffic system. Only then, it is time to examine this document to see what other countries did to tackle a similar problem. In all cases, consideration must be given to local conditions and, if appropriate, measures must be customised to those local conditions.

# Institutional organisation of road safety

**Institutional organisation of road safety refers to a variety or measures which, together, form the basis for the implementation of measures in all fields of road safety. The work in this area is supportive for all the rest of the road safety work. The measures presented in this section relate to the general organisational framework, to road safety visions, targets and strategies, to the provision and allocation of financial resources, and to tools and strategies for selection and implementation of (cost-effective) road safety measures.**

## Road safety visions

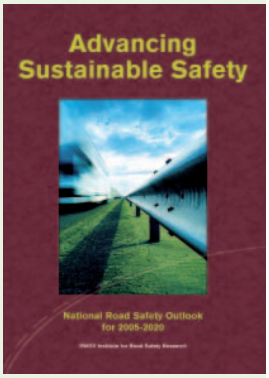
A road safety vision is a description of a desirable state in the future, based on a theory of how the different components of the traffic system interact or must interact. It is formulated as a long-term goal without a specified timeframe which may only be attained through large efforts over a long period of time. However, a vision gives directions to road safety work and generates reflexion on what improvements are necessary in order to approach the desirable state proclaimed by the vision. If there is commitment and funding, a road safety vision directs road safety actions and forms the basis of road safety plans and programmes.

Sustainable Safety in the Netherlands and the Swedish Vision Zero are the best known examples of road safety visions, which also have been adopted by other countries. In both visions, the core concept is to change the road traffic system into one which eliminates all known opportunities for human error and reduces the physical damage in crashes which are bound to occur. Because the vision is shared by all the stakeholders, responsibility for road safety is also shared between road users, system designers, road authorities, car manufacturers, etc., i.e. all those who are directly or indirectly involved in road traffic.



*Best practice*

### Sustainable Safety in the Netherlands




- ***What is it about?*** 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, predictability, forgivingness, and state awareness. The *Sustainable Safety* vision has a large influence on road safety work in practice, and has led and still leads to the implementation of effective and sustainable road safety measures. For example, one of the consequences of the principle 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.
- ***Who is involved?*** *Sustainable Safety* has been the leading vision in the road safety policy of the Netherlands since the early nineties. The road authorities at the different levels (national, regional and local) actually implement the *Sustainable Safety* measures.
- ***How effective and costly is it?*** It has been estimated that the infrastructure measures of the sustainable safety approach reduced the number of fatalities and in-patients by 6% nationwide. Costs, in particular those related to reconstruction of roads are high, but can largely be combined in the budget for regular maintenance work.
- ***More information?*** www.sustainablesafety.nl

*Best practice*

## Vision Zero in Sweden

➤ ***What is it about?*** In 1997, the Swedish Parliament adopted the Vision Zero, a bold new road safety policy based on four principles:
- Ethics: human life and health are paramount; they take priority over mobility and other objectives of the road transport system.
- Responsibility chain: the providers, professional organisations and professional users are responsible for the safety of the system. The users have the responsibility to follow rules and regulations. If the road users fail to follow rules and regulations, the responsibility falls back on the providers of the system.
- Safety philosophy: humans make errors; road transport systems should minimise the opportunity for error and the harm done when errors occur.
- Driving mechanisms for change: providers and enforcers of the road transport system must do their utmost to guarantee the safety of all citizens and each of the participants should be ready to change to achieve safety.

➤ ***Who is involved?*** The Swedish Road Administration (SRA) has the overall responsibility for road safety within the road transport system. According to the principles of Vision Zero, all other stakeholders in the field of road transport also have responsibilities for ensuring and improving road safety.

➤ ***How effective and costly is it?*** Vision Zero is estimated to achieve a possible reduction in the number of deaths by a quarter to one third over a ten-year period (1). The adoption of Vision Zero in Sweden helped in developing further research and implementing a new system design. It helped in the implementation of the upgrading of single carriageways to 2+1 lanes roads with central cable barriers to shield drivers from opposite traffic.

➤ ***More information?*** http://publikationswebbutik.vv.se/upload/1723/88325_safe_traffic_vision_zero_on_the_move.pdf
www.visionzeroinitiative.com



(1) Swedish National Road Administration, 2003.

## Road safety programmes and targets

A road safety programme is more specific and covers a shorter timeframe than a road safety vision. Preferably, it is based on a road safety vision. A road safety programme describes goals and principles for the organisation of road safety work and specifies the actions or spearheads for the next five to ten years. A road safety programme also defines the responsibilities and provides funding and incentives for the implementation of effective safety measures.

Road safety targets are an important part of a road safety programme. Targets give a precise, quantitative description of what is to be attained, and within what timeframe. Targets are usually formulated with a timeframe of up to 10 years. Targets should be challenging, but also attainable. Targets are usually set in terms of crash victims (e.g. the number of fatalities in a country or the number of serious injuries amongst children). But it is also possible to set additional targets in terms of intermediate variables related to road behaviour that has a proven relationship with crash risk (e.g. the number of speed limit violations on rural roads; or the percentage of the driving population driving under the influence of alcohol).

The success of road safety programmes and targets in improving road safety lies in the fact that they increase obligation and commitment to road safety goals, and that they provide the basic conditions for achieving these goals. Commitment and the political will to actually direct road safety work towards the safety goals can be further improved by linking these goals to goals in other areas of transport policy, such as environmental goals.

*Promising practice*

### Swiss 'Federal Action Programme for Greater Road Safety'

- ***What is it about?*** The Swiss *Federal Action Programme for Greater Road Safety* is implicitly based on Vision Zero. The safety target is a reduction of fatalities by 50 % from 2000 to 2010. The programme consists of 56 safety measures in all fields of road safety. The selection of the safety measures has been based on thorough analyses. The results were compared with a set of criteria related to, for example, the cost-effectiveness and the compatibility with goals in other fields of federal policies. The programme also includes a system for quality assurance (evaluation) and for implementation and financing of measures.

- ***Who is involved?*** The action programme has been developed by a large number of experts representing professional organisations, cantonal and local authorities, and political and business circles. Implementation will be the responsibility of the Federal Council, the road authorities and local governments.

- ***How effective and costly is it?*** Costs and benefits of the safety measures have been estimated in advance in terms of reduced crash costs, and costs for the society (that bears around two third of the costs) and for individual road users. The estimates yielded positive results. The programme will be implemented as of 2007.

- ***More information?*** www.astra.admin.ch/themen/verkehrssicherheit/00236/index.html?lang=en

## Efficiency Analysis

Efficiency analyses are conducted to evaluate the effects of road safety measures or programmes at different stages of their implementation. A distinction can be made between impact assessment and cost benefit analysis.

Impact assessment refers to the use of information about the expected effect of a measures, e.g. on the basis of evaluations of measures elsewhere. Impact assessments provide a scientific basis for deciding whether or not to implement a particular measure. Software tools are in use with which the effects of all types of measures on the numbers of crashes and on crash costs can be estimated.

Cost-benefit analyses are also conducted prior to the implementation of specific safety measures and used in decisions about which measures to implement. The costs of implementing a measure are compared to the expected (monetary) benefits of preventing crashes and saving casualties. Thus, by selecting the most cost-effective measures in a particular area, larger safety effects can be achieved with the same funds. It is also possible to include benefits other than safety ones in cost-benefits analyses (e.g. related to environment and mobility).

Systematic assessments and evaluations contribute significantly to road safety by supporting the implementation of the most effective safety measures. The greatest challenge is to assure the actual use of the results of the analyses in the decision process. The EU project ROSEBUD provides more details about efficiency analyses and an overview of the cost-benefits of a wide variety of measures ([1]).

As a complement to the assessment of the expected impacts and cost-efficiency analysis, an evaluation of the real-size effects of measures, obtained after implementation, makes it possible to adjust measures which are found not to be as effective as expected. This type of 'a posteriori' impact assessment would need to be an integral part of road safety programmes.

*Best practice*

### The Finnish TARVA programme

- ***What is it about?*** In Finland cost efficiency analyses are common in road safety decision making. A special software programme, called TARVA, is available as a tool. TARVA contains crash data for all roads in Finland. It is used to estimate changes in the numbers of injury crashes and fatalities of infrastructure measures on the Finnish road network. It can also calculate the monetary benefits and costs. TARVA has been in operation since 1994. The programme is flexible and easy to apply. Evaluations are regularly carried out.
- ***Who is involved?*** TARVA is used by the Finnish road authorities on both the national and regional level. It may be transferred to other countries if information is available on infrastructure, crashes, costs of measures, and if validated crash models are available.
- ***How effective and costly is it?*** TARVA improves the efficient use of resources by supporting the implementation of the most effective measures on those roads where they are most useful. Costs include the costs for data administration, research and development (e.g. estimation and validation of crash models), and administrative procedures.
- ***More information?*** www.tarva.net/tarvaintro.asp



(1) http://ec.europa.eu/transport/road_safety/pdf/projects/rosebud.pdf
For the ROSEBUD Handbook on Evaluated Road Safety Measures:
http://partnet.vtt.fi/rosebud/products/deliverable/Handbook_July2006.pdf

## Resource allocation processes

Resource allocation is crucial for the effectiveness of road safety programmes. Therefore, the resource allocation process always needs to be part of a road safety programme. Conversely, resource allocation processes should be linked to specific goals for road safety in order to achieve a maximum benefit of the funds which are allocated in the process. Preconditions for resource allocation processes are a long enough timeframe and sufficient budgets. It is also essential to conduct follow-ups in order to ensure the effectiveness of the measures which have been funded, and to avoid misuse of funds. Potential drawbacks of such schemes can arise if they lead to increased use of a specific type of safety measure at the cost of other (and maybe more effective) measures. Such side effects may be avoided by stipulating that the provision of resources be linked to the existence of adequate framework conditions and depend on the types of measures they are used for. Not reaching objectives should have consequences in order to assure the effective use of resources and to stimulate evaluation activities.

*Promising practice*

### The Belgian Road Safety Fund

- ***What is it about?*** The Belgian Road Safety Fund is a good example of how 'more safety for less money' can be put into effect. There are two features of this measures that are specifically promising for the transfer of this measure to other countries: the use of revenues of fines for road safety objectives, and the possibility to call back spent money that cannot be justified. The fund receives money from fines paid for traffic offences and gives financial support to police services for road safety actions (enforcement), that focus on speeding, drink driving, seatbelts, heavy goods transport, dangerous parking, aggressive behaviour in traffic, and weekend crashes. Expenses have to be justified, and money that has not been spent or accounted for can be returned. The Belgian Road Safety Fund was implemented in 2004.

- ***Who is involved?*** The fund can be used by the federal police and local police forces and is managed by the Federal Ministries of Mobility and Internal Affairs.

- ***How effective and costly is it?*** The fund has lead to improved and increased enforcement activities for types of traffic behaviour that are known to contribute to severe crashes. Activities are based on action plans, and the quality and effectiveness of these plans must be evaluated. The measure is cheap as it finances itself. The way money is divided is still a point of discussion.

- ***More information?*** www.mobilit.fgov.be

# Road infrastructure

**Road infrastructure is the central element of a road transport system. It can be defined as the basic facilities, services and installations needed for the functioning of transport on highway, roads, and streets. Road infrastructure is a wide area and covers land use and network planning, (re)construction and design of road sections and intersections, signing and marking, maintenance, and, last but not least, quality assurance procedures like safety audits, safety impact assessments and safety inspections. In general, the road infrastructure would need to be designed and operated in such a way that road users understand what they can expect and what is expected from them, taking into account the limited human information processing capacity and resulting mistakes human beings are capable of.**

## Land use and network planning

Land use and network planning forms the basis of a safe road infrastructure. Elements that need consideration are the distance between work and housing and the location of daily services, such as schools, homes for the elderly, medical centres and shopping areas, in relation to living areas. Furthermore, it is important that for longer and frequent trips, the fastest route coincides with the safest route, i.e. that the required distance on the more dangerous lower order roads is limited in favour of the safer higher order roads. Generally, it is not easy to come up with an optimal road network, particularly not when dealing with an existing network that has evolved during many decades, and sometimes even centuries, in response to the ever increasing mobility needs. However, that does not mean that nothing can be done about existing networks. One important improvement can be achieved by reconsidering the current road classification, allowing for a limited number of road categories only and avoiding multi-functional roads, and subsequently ensuring that the design and lay-out of a road reflect its true function. The latter may require upgrading some roads and downgrading other.



*Good practice*

### The hierarchical mono-functional road network in the Netherlands

- ***What is it about?*** As a first practical result of the Sustainable Safety Vision, all Dutch road authorities re-categorised their roads into one of three road categories, each with its own and exclusive function: *through roads* for long distance travel, *access roads* for opening up residential areas and rural settlements, and *distributor roads* connecting the former two road types. On access roads motorised vehicles and vulnerable road users have to interact; therefore, vehicle speeds must be low: 30 km/h in built-up areas, 60 km/h in rural areas. On through roads, with grade separated intersections and physical separation of opposing traffic streams and no access for slow moving traffic, speed limits are 100 or 120 km/h. On the sections of distributor roads, separated pedestrian and bicycle facilities allow vehicle speeds of 50 km/h in urban areas and 80 km/h in rural areas. At intersections on distributor roads, slow and fast moving traffic have to merge again, so speeds must be reduced, e.g. by a roundabout. Each road category must be clearly recognisable by typical road design characteristics and road markings.

- ***Who is involved?*** Regional road authorities perform the categorisation in close co-operation with local road authorities and neighbouring regional road authorities, to ensure consistent transitions.

- ***How effective and costly is it?*** Categorising the road network is a prerequisite for (re)designing roads in such away that they reflect their function and elicit the desirable traffic behaviour. This increases the consistency and predictability of the road network and thereby reduces possibilities for human error and increases safety.

- ***More information?*** www.crow.nl

## (Re)construction and design

There are numerous handbooks on road design and road construction, some of them specifically focusing on designing for safety, e.g. the *Highway design and traffic safety engineering handbook* (1) and the *Road safety manual* (2) Two central requirements for a safe design are (3):

- the design characteristics need to be consistent with the function of a road and the behavioural requirements (e.g. speed);
- the design characteristics need to be consistent along a particular stretch of road.

A part of the road that should not be forgotten is the roadside. Obstacles alongside the road, such as trees, severely aggravate the consequences of a crash, once a vehicle runs off the road. Paved shoulders increase the opportunity for a driver to correct and return to their lane in time. Obstacle avoidance roadsides or roadsides protected by guard rails prevent secondary collisions once a driver cannot correct in time. Flexible or break-away roadside fixtures such as light poles and signs reduce the chance of serious injury in case of a collision.

When safety is considered from the beginning in the stages of the planning and design, the chance that remedial measures are required after implementation is small. Nevertheless, it is advisable to monitor the crash statistics in order to identify high risk locations. Further inspection of those sites often clarifies the problem and the ways to improve safety, if possible through low-cost engineering measures. Specific tools and procedures are needed to prioritise the remedial measures and implement the most cost-efficient ones at the appropriate hazardous locations (4).

*Best practice*

### Low speed zones in residential areas

- ***What is it about?*** For safety, low speeds are essential when motorised vehicles use the same space as pedestrians and cyclists. In many countries, low speed zones have been introduced in residential areas, near schools and in shopping areas. In Europe, 30 km/h zones are most common. In home zones (or 'woonerf') the maximum speed is even lower: 10-15 km/h. In both cases, it is insufficient to just put up a speed limit sign. Low speeds must be maintained by physical measures, such as road narrowings, speed humps and curves. Benches, flower beds, play areas, and trees improve the aesthetic experience. Low speed zones can be part of more general traffic calming activities. Traffic calming not only aims to establish low speeds, but also to reduce the amount of motorised traffic in specific areas or urbanwide, by discouraging through traffic and promoting walking, cycling and public transport.

- ***Who is involved?*** Traditionally, the initiative for implementing home zones or 30 km/h zones is taken by the urban (road) authorities. Involvement of residents in the planning process increases public support. Increasingly, initiatives for low speed zones are also taken by the residents themselves. Road safety organisations can provide guidelines about the required procedures.

- ***How effective and costly is it?*** The results of a UK study (5) showed that 30 km/h zones reduced accidents by 27 %, crashes causing injury by 61%, and serious crashes by 70 %. Other benefits are an increase in walking and cycling and improved accessibility for the mobility impaired. The implementation and maintenance costs depend on the size of the zone and the features installed. Environmental costs by carbon emissions may be reduced by avoiding the need for repeated acceleration and deceleration and by car use reduction induced by discouraging through traffic.

- ***More information?*** www.trafficcalming.org
  www.homezones.org



(1) Lamm, R., Psarianos, B. & Mailaender, Th. (1999) Highway design and traffic safety engineering handbook. New York, McGraw-Hill.
(2) PIARC (2004) Road safety manual. Paris, World Road Association PIARC (as printed book or CD-ROM).
(3) OECD (1999) Safety strategies for rural roads. Paris, Organisation for Economic Co-operation and Development.
(4) RoSPA Road Safety Engineering Manual, 3rd edition 2002, Birmingham UK.
(5) Webster, D. C.& Mackie, A. M. (1996) Review of Traffic Calming Schemes in 20 mph Zones. TRL Report Vol: 215. Crowthorne (UK), Transport Research Laboratory.

Junctions often have much higher accident frequencies than other road sections because of their numerous potential points of conflict. One way to mitigate crash risk at junctions is to grade-separate them. Where this is not feasible or justifiable, the implementation of roundabouts has proven to be a safe and efficient option which has gained popularity in many Member States over the last years.

*Best practice*

## Roundabouts

➤ ***What is it about?*** Most European countries apply roundabouts at junctions and their numbers are increasing rapidly. Since 1986, over 2 000 roundabouts have been built in the Netherlands, mostly in urban areas, and more are being planned. Sweden had 150 roundabouts in the beginning of 1980s and currently has 2 000. Roundabouts are aimed at lowering junction speeds and removing right angle and head-on collisions. Roundabouts also have a greater capacity than normal give-way or signalized junctions. A driver approaching a roundabout is forced to lower his entry speed, which reduces crash severity. The roundabouts in the Netherlands are characterized by a pure circular design, a narrow carriageway, radially oriented entry roads and right-of-way of the traffic on the roundabout.

➤ ***Who is involved?*** Replacing a junction with a roundabout is generally the initiative of the road authorities and has to be decided on by local or regional governments.

➤ ***How effective and costly is it?*** When converting an ordinary junction to a roundabout, injury crashes will decrease by 32 % for a three-leg junction and 41 % for a four-leg junction. Corresponding figures are 11 % and 17 % when converting a signalized junction to a roundabout. The benefit-cost ratio when converting a typical three or four leg junction to a roundabout is around ([1]).

➤ ***More information?*** www.tfhrc.gov/safety/00068.htm



(1) Elvik, R. & Vaa, T. (Eds.) (2004) The handbook of road safety measures. Pergamon, Amsterdam.

Collisions between motor vehicles and unforgiving roadside objects such as trees, poles, road signs and other street fixtures represent an important safety problem. Research and experience indicate that the positioning and design of off-road objects can play a major role in reducing such collisions and the severe consequences that are typically associated with them. Ideally, roads should be designed without dangerous off-road objects. However, this is clearly not possible in all situations and most of the interventions will have to be made on already existing roads. In such a case, man-made objects should be removed, made more forgiving or protected with crash barriers where none of the other options are possible. However, environmental, aesthetic, historical or even emotional value may be attached to roadside trees. In those cases, putting up crash barriers may be preferable to removing the trees, if the space available permits it.

*Promising practice*

## Measures against tree collisions in France

➤ ***What is it about?*** This pilot project aimed at avoiding tree collisions along a 26.5 km section of the national road RN 134 in the South West of France. The measure consisted of the implementation of 7 800 meters of guardrails, 13 junction and 8 lay-by treatments. Some stretches of the road in question had high risk levels in terms of crashes and severity due to the row of trees along the road side. The problem was to propose and negotiate measures to reduce the number and the severity of the crashes by ensuring the protection of the rows of trees by means of guardrails wherever possible – or otherwise by the felling the trees.

➤ ***Who is involved?*** The initiator of this activity was the local road administration, but the Ministry of Equipment and Transport and other national and regional authorities were also involved in the decision making and funding processes.

➤ ***How effective and costly is it?*** The total cost for implementing the measure against collisions with trees was around EUR 1 million, including management, studies, implementation, and site supervision. All costs were borne by the Ministry of Equipment and Transports through the financial management of the regional administration. The main benefit of implementing the measure consisted of a significant reduction of tree accidents, fatalities and crash severity. The benefits were found to exceed the costs by a factor of 8 to 9.

➤ ***More information?*** http://partnet.vtt.fi/rosebud/products/deliverable/Handbook_July2006.pdf

The search for accident clusters belongs to the basic safety tasks of road authorities. Across Europe, there are many practices for the identification and treatment of such high risk sites, but as yet there are no common classifications or methodologies defined. Given the lack of properly designed evaluation studies, no best practice could be identified. Hence, a list of good practice features of a sound high risk site management system was compiled.

*Good practice*

## High risk site management

➤ ***What is it about?*** The management of high risk sites, i.e. sites and sections with high accident frequencies, needs to meet several requirements:
- An accident database with exact (and validated) locations of crash sites, and – ideally – information on traffic density, local traffic regulations (e.g. speed limit) as well as road features such as design parameters and road(side) fixtures.
- Concise threshold definitions of high risk sites on stretches and junctions, taking account of number and severity of accidents, length of road section ('window size') and time frame to be included in analysis, and correcting for traffic flows.
- A periodical search for high risk sites (at least annually, based on crash data of a 3 to 5 year period to control for random fluctuations) and the establishment of a priority list.
- An integrated management system, allocating time for analysis and treatment and for resource allocation and efficiency control – in order to learn from successes and failures.

➤ ***Who is involved?*** Road authorities at national, regional and local levels with support from accident database experts. Site visits should involve relevant safety experts (engineers, psychologists) as well as the traffic police, emergency services and representatives of the road operator.

➤ ***How effective and costly is it?*** The measure generally has a good reputation for its potential of reducing accidents. Although it is undisputed practice in many Member States, hardly any evaluation studies of good quality exist. The safety benefits largely depend on the measures taken after a high risk site has been identified. The costs of the process of high risk site management itself are rather low. The cost-benefit ratio strongly depends on the measures taken.

➤ ***More information?*** www.fgsv.de/117.html

## Signing and marking

Signs and markings can provide important information to improve road safety. They regulate, warn and guide road users. By letting people know what to expect, chances are greater that they will react and behave appropriately. Signs and markings need to be applied in a consistent way, to be placed at logical locations, and be easy to understand and visible. This also means that underlying traffic regulations such as local speed limits need to be established on clear and consistent principles. The visibility of signs and markings needs to be checked regularly to avoid them being hidden by overgrown trees or blurred by sunlight. The use of retro-reflective material is needed to ensure night-time visibility.

Road side signs must be used sparsely. Road users are only able to process a limited amount of information at a time. Too many signs at a particular spot may confuse and distract road users rather than help them. Too many signs may also result in non-compliance and disrespect.

*Best practice*

### Rumble strips in Sweden

➤ ***What is it about?*** Rumble strips are milled into the asphalt surface of a road shoulder or between lanes in opposite directions in combination with ordinary road markings. Rumble strips vibrate and make a noise when a vehicle passes over them and alert drivers to the potential crash danger changing lanes poses. Crashes resulting from lane departure, head-on collisions and off-road crashes mostly have severe consequences and contribute to a large segment of severely injured or killed road users.

➤ ***Who is involved?*** The installation of rumble strips is usually the responsibility of national or regional roads administrations.

➤ ***How effective and costly is it?*** Research from different countries has shown that the number of injury crashes can be reduced by over 30% by shoulder rumble strips and by over 10% by centreline rumble strips. Estimations of costs vary largely. Cost-benefit analyses from Norway and USA have estimated that the benefits exceed the costs by factor between ca. 3 and 180.

➤ ***More information?*** http://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips

Permanent speed limits and warning signs have some shortcomings, since they do not reflect the actual circumstances related to, for example, weather and traffic conditions. In high traffic or in bad weather, lower speed limits may be more appropriate than under 'normal' conditions. Warning that a situation ahead may be congested or provide poor visibility due to fog is less effective than just warning of actual congestion or fog ahead. Variable Message Signs have the potential of giving adequate and situation- and time-dependent information to road users and increase compliance at the same time.

*Good practice*

## Variable message signs


➤ ***What is it about?*** Adaptation of speed limits and communication of warnings via 'Variable Message Signs' (VMS) – depending on traffic, weather and road conditions has been applied successfully by several Member States, mainly on congested or accident-prone motorway sections. Dynamic speed limits can help to harmonise traffic flow and increase throughput on congested sections. Many of these systems were implemented to solve a specific problem, e.g. 'fog warning systems' and 'congestion warning systems'. It has been observed that warning displays alone do not have much influence on speed behaviour, while speed limits justified by warnings or explanations have significant effects.

➤ ***Who is involved?*** It is mainly the road authorities at the national and regional level who are responsible for the implementation, operation and maintenance of VMS. Identification of relevant sections is normally carried out in co-operation with safety and database experts of safety boards or national statistics bureaus.

➤ ***How effective and costly is it?*** Despite methodological weaknesses in many of the evaluation studies for different kinds of VMS there are strong indications that VMS help to reduce injury accidents and harmonise traffic flow. According to evaluations carried out in the ROSEBUD project for systems in Norway, Sweden and Finland, cost-benefit ratios are between 0.65 and 1.45.

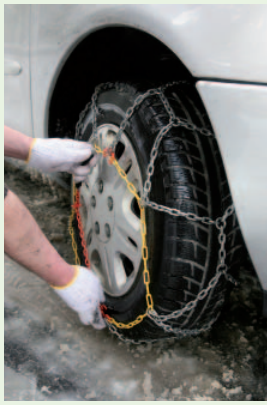
➤ ***More information?*** www.highways.gov.uk/knowledge/334.aspx

## Maintenance

Maintenance of existing roads is necessary to keep them up to standard. Maintenance relates to pavement, signs and markings as well as the road side. Maintenance plans based on observation and measurement procedures ensure that the key safety features are never out of order. In Nordic countries with regular snow and ice in winter time, winter maintenance also helps to keep roads operational in these adverse conditions. For efficiency reasons, more extensive maintenance work is often combined with reconstruction work. When maintenance and reconstruction takes place, normal traffic is disturbed. Unless sufficient precautions are taken, this can lead to a temporary increase in crashes at and around the work zones. Standard procedures are needed to define such precautions and to ensure they are applied systematically.

*Best practice*

### Winter speed limits and winter maintenance in Finland



- ***What is it about?*** In the Northern parts of Europe, traffic in wintertime is often disturbed by snow and ice. During winter conditions, crash risk is higher, although this mainly applies to damage-only crashes, since driving speeds are lower. Therefore, in Finland, general speed limits on rural roads and motorways are reduced by 20 km/h in the winter months. In addition, winter tyres are compulsory. The best way of maintaining roads in wintertime (salt, sand, in which proportion) is still being studied. However, the consistency and reliability of winter maintenance for a particular road is at least as important as keeping the roads in good condition, on the whole.
- ***Who is involved?*** The obligatory use of winter tyres is regulated by law. The Finnish Public Roads Administration has to follow the guidelines of the Ministry of Transport on the winter speed limits and is responsible for winter maintenance activities on national public roads (mainly outside built-up areas). Local authorities are responsible for winter maintenance in urban areas.
- ***How effective and costly is it?*** Reduced speed limits in winter time were found to reduce injury and fatal crashes significantly. Injury crashes were reduced by 28 % and fatal crashes by 49 %. Beside reduced crash risk, reduced winter speed limits also have positive environmental effects, as has been shown in Norwegian studies. The effect of the reduced winter speed limits cannot be separated from the effect of the winter maintenance activities.
- ***More information?*** http://alk.tiehallinto.fi/julkaisut/pdf/4000498-v_syks_ja_kev_nopeusraj_vaikutuk.pdf



## Quality assurance

It is important that road infrastructure be planned, designed and constructed with maximum consideration of the safety effects. This applies both to new infrastructure and to reconstruction schemes. An instrument for doing so is the road safety audit. In road safety audits, road safety experts look at the potential safety problems in different stages of planning and designing of an infrastructure project. It is a formalised, standard procedure of independent assessment of the *potential* safety problems of road schemes. The aim is to identify likely problems as early as possible to avoid more costly reconstruction work once the scheme has been implemented.

In addition to identifying potential safety problems in the planning and design stage, it is also important to identify potential problems with the existing road network. Road safety inspection is an instrument that consists of periodic checks of the existing network from a safety point of view, independent of the number of crashes.

Both road safety audits and road safety inspections are preventive measures in that they focus on implementing remedial measures before crashes occur.

*Best practice*

## Road safety audits

➤ ***What is it about?*** A road safety audit is a formal procedure for independent assessment of the crash potential and likely safety performance of a specific design for a road or traffic scheme in up to five stages – whether new construction or an alteration to an existing road. The idea of the road safety audit was first developed in Great Britain and is applied now in many other countries. Audits are based on detailed checklists listing the items to be examined. Road safety audits are often described as a first step leading to the implementation of a complete quality management system for roads.

➤ ***Who is involved?*** Road safety audits are performed by auditors. The auditor – who should be independent of the designer – indicates potential safety deficiencies of the design to the client in a report. The client should follow the recommendations of the auditor or – when insisting on the original design – state his reasons for it, in written form. Auditors should undergo a special education.

➤ ***How effective and costly is it?*** The benefits of road safety audits are that they reduce the future risk of crashes as a result of new transport infrastructure schemes and unintended effects of road design, and in also lower the long-term costs related to these potential future crashes. Audit costs range between EUR 600 and EUR 6 000 per stage. In general, the estimations in the different countries indicate that the cost of audits, related to the time spent completing them, is less than 1% of the construction cost of the whole project.

➤ ***More information?*** www.ripcord-iserest.com



*Good practice*

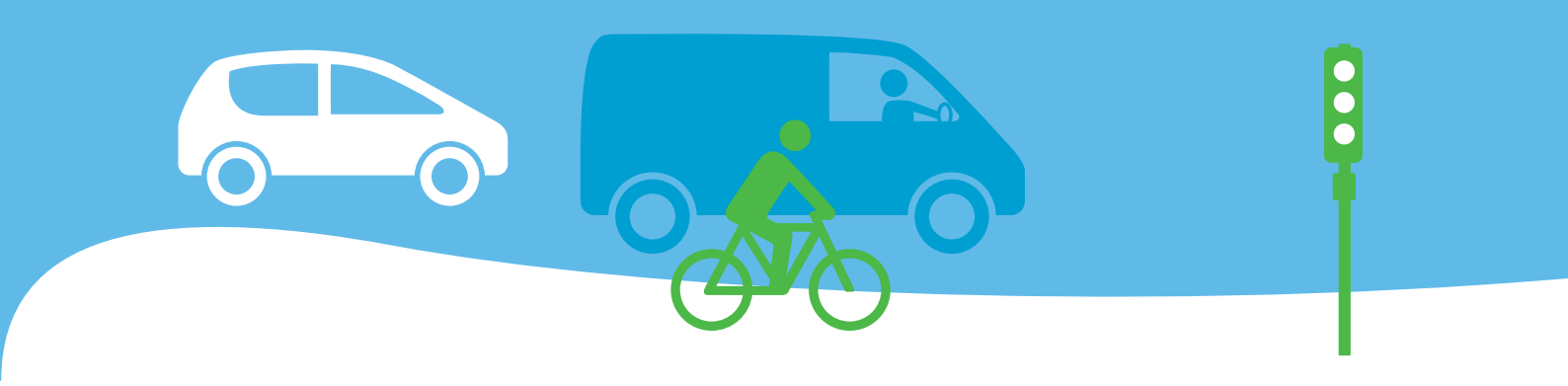
## Road safety inspections

➤ ***What is it about?*** Safety inspection designates a periodic review, by trained experts, of the safety aspect of a road network in operation. It involves visiting the road network. Routine safety inspections are regularly carried out of the road network to identify physical defects in the road infrastructure. As a result, improvements of the road environment can be planned and implemented, using low cost measures whenever possible.

➤ ***Who is involved?*** Road safety inspections are ideally carried out by a team of trained experts. Knowledge of responsible road operator and traffic police should be incorporated.

➤ ***How effective and costly is it?*** The benefits of road safety inspections are in:
– enhancing the awareness of road safety needs among policy-makers and road designers;
– providing a basis for the systematic upgrading of the safety performance of a road;
– pinpointing the most urgent needs for road upgrading by identifying exact locations and the type of defect identified.

➤ ***More information?*** www.ripcord-iserest.com



# Vehicles and safety devices

**Vehicles and vehicle safety devices play an important role in traffic safety, since they can generate an enduring, sustainable effect. The design of a vehicle affects the protection of occupants in case of a crash and the chance of serious injury to unprotected, vulnerable road users. Additional safety devices, such as seatbelts and airbags offer additional protection to car occupants. For two-wheelers, protective clothing and helmets help to mitigate the consequences of a crash. And last but not least, intelligent driver support systems, including in-vehicle, between-vehicle and road-vehicle technologies, help the driver to perform his task safely, preventing errors and violations which may otherwise have resulted in a crash.**

## Safe car design

The requirements regarding car design are set at an international (UN-ECE) and a European level (EC). However, there is a clear gap between the minimum requirements set by these international bodies and what is potentially possible from a safety perspective. Hence, there are also substantial differences in the safety performances for different cars. Informing the consumers on the safety performance of a car seems to have two consequences. It creates a consumer demand for safer cars and it stimulates car manufacturers to take safety into account as a marketing strategy.

*Best practice*

### Euro NCAP



➤ ***What is it about?*** The European New Car Assessment Programme (Euro NCAP) performs crash tests of the most popular cars sold in Europe to assess the protection they offer to its occupants and to pedestrians. Tests performed include a frontal impact test at 64 km/h into an offset deformable barrier, a side impact test at 50 km/h, a side impact pole test at 29 km/h and tests with pedestrian head and leg (partial) dummies at 40 km/h. Safety performance is evaluated for adults and children. Seat-belt reminders are also taken into account in the evaluation, and a general recommendation is given for vehicles with ESC. Based on the results, adult occupant protection, pedestrian protection, and child protection are evaluated on scales of 1 to 5 stars, the more stars – the better the protection. Test procedures evolve continuously to take account of new developments.

FOR SAFER CARS EURO NCAP
www.euroncap.com

➤ ***Who is involved?*** Euro NCAP was originally developed by the Transport Research Laboratory for the UK Department of Transport. Current members include several countries, and transport, road safety, consumer and insurer organisations. The European Commission is an observing member and provides additional support. Euro NCAP is independent of the automotive industry and political control. Individual countries can join and financially support Euro NCAP – and disseminate the results of the tests to consumers.

➤ ***How effective and costly is it?*** An evaluation study (1) showed that the risk of severe or fatal injuries is reduced by around 12 % for each extra Euro NCAP star rating. No difference was found in the case of lighter injuries. In a cost-benefit analysis (2), it has been estimated that each additional Euro NCAP star increases the costs for new cars by ca. EUR 600. Benefits associated with this measure are reduced crash severity. The analysis showed a benefit-cost ratio of 1.31.

➤ ***More information?*** www.euroncap.com

(1) Lie, A. & Tingvall, C. (2001). How do Euro NCAP results correlate to real life injury risks – a paired comparison study of car-to-car crashes. Traffic Injury Prevention, 3, 288-293.
(2) Erke, A. & Elvik, R. (2006). Effektkatalog for trafikksikkerhet (Road Safety Measures: A Catalogue of Estimates of Effect). Oslo: Institute of Transport Economics. Report 851/2006.

## Two-wheeler crash protection

Two-wheelers are particularly vulnerable, not only when colliding with a motor vehicle, but also in single crashes. Single two-wheeler crashes are fairly common, in particular amongst the young and the elderly. Helmets are very effective in preventing serious and often invalidating head injuries. Helmets are compulsory for motorised two wheelers in all Member States, apart from light mopeds (< 25 cc) in the Netherlands. For cyclists, helmet use is generally not compulsory.

*Promising practice*

### Mandatory bicycle helmet use

➤ ***What is it about?*** Bicycle helmets contain a thick layer of polystyrene which absorbs the force of an impact and can reduce the consequences of a crash, in particular those related to head injury. Although the safety potential of bicycle helmets is high and well documented, the helmet wearing rates are currently very low. In Austria, it appears that bicycle helmet wearing campaigns did not result in a desirable wearing rate, neither among children nor among adults. Mandatory helmet wearing for cyclists would be necessary to reach a desirable wearing rate.

➤ ***Who is involved?*** Mandatory helmet use would need to be regulated by law and supported by information campaigns and enforcement.

➤ ***How effective and costly is it?*** It has been calculated that the number of fatal or seriously injured cyclists would decline by 20 % if all cyclists wore helmets (1). Slight injuries would slightly increase (by around 1%), because some of the serious injuries would turn into slight injuries due to the helmet. An Austrian study calculated the costs and benefits (2). Assuming that a bicycle helmet costs EUR 20 or EUR 40, the benefit-cost ratio was 2.3 or 1.1 when looking at all road crashes, and 4.1 or 2.1 when looking at bicycle crashes only. A cost benefit analysis in New Zealand (3) showed that mandatory bicycle helmets would be cost-effective for children, but not for adults. Generally speaking, results concerning the effects of bicycle helmets are clearer for children than for adults. Mandatory bicycle helmet use may have a negative effect on bicycle use.

➤ ***More information?*** www.cyclehelmets.org

## Vehicle conspicuity

For road safety it is important that the presence of other road users can be detected in time. Better and earlier detection of other traffic will lead to earlier action to avoid a collision or to decrease the severity of a crash because of lower impact speed. For motorised vehicles lighting is the general way to increase conspicuousness. Lighting can also help to increase conspicuity during day time. Being visible is very important for bicycles as well, especially at night time. Their lights are generally much less blazing than the lights of cars and, in addition, only conspicuous from the front and behind. Bicycle side reflection can add to the visibility of bicycles. For all unprotected road users, pedestrians, moped riders and motor cyclists, reflective clothing will further enhance their conspicuity.



(1) Otte, D. (2001) Schutzwirkung von Radhelmen (The protection of bicycle helmets). Hannover, Verkehrsunfallforschung, Medizinische Hochschule.
(2) Winkelbauer, M. (2006) Rosebud WP4 case report: Compulsory bicycle helmet wearing. KfV, Vienna, Austria.
(3) Taylor, M. & Scuffham, P. (2002). New Zealand bicycle helmet law – do the costs outweigh the benefits? Injury Prevention, 8, 317-320.

*Best practice*

## Daytime Running Lights (DRL)

➤ ***What is it about?*** Daytime Running Lights (DRL) is a legal obligation for all motor vehicles to drive with low beam headlights or with special DRL lamps, regardless of the time of day or the light conditions. DRL aims at reducing daytime-crashes that involve more than one participant and at least one motor vehicle. DRL increases visibility and improves distance and speed perception of motor vehicles. It improves the possibilities for other road users to detect motor vehicles earlier and to adjust their own behaviour. 14 EU Member States have mandatory rules on DRL so far, with different requirements, and some Member States recommend the use of DRL.

➤ ***Who is involved?*** Implementation of DRL can take place at the national or the European level. Mandatory DRL requires a law change, supported by publicity campaigns and enforcement. Voluntary DRL would need intensive information campaigns to convince drivers of the safety advantages.

➤ ***How effective and costly is it?*** Meta-analyses (1) show that mandatory DRL will reduce the number of daytime multipart crashes with motor vehicles by 5 to 15 %. The effects are greater for fatalities than for injury crashes, and greater for injury crashes than for property-damage-only crashes. There is some opposition against DRL because of potential adverse effects on specific types of accidents (pedestrian, cyclists and motorcyclist, and rear end collisions), but there is no scientific evidence showing adverse effects. The costs associated with DRL are mainly costs for fuel use and the ecological costs related to that. The meta-analyses showed that for small vehicles the fuel use would increase by 1.6 %, for heavy vehicles by 0.7 %. Estimated benefit-cost ratios range between 1.2 and 7.7 (2).

➤ ***More information?*** http://ec.europa.eu/transport/road_safety/topics/vehicles/daytime_running_lights/index_en.htm



*Best practice*

## Bicycle side reflection

➤ ***What is it about?*** Bicycle side reflection implies that the front and rear wheel of a bicycle are equipped with reflective material to increase the visibility of cyclists during night and twilight time. The measure aims to prevent night and twilight crashes between bicycles and motorised vehicles (including mopeds) that approach each other from the right or left. Normally, the reflective material is integrated in the bicycle tyres by the tyre manufacturer.

➤ ***Who is involved?*** Side reflection can be regulated by law or introduced through market forces (bicycle manufacturer or tyre industry).

➤ ***How effective and costly is it?*** In the Netherlands, the introduction of bicycle side reflection resulted in 4 % less bicycle victims during night and twilight and an overall reduction of around 1% (3). Since the costs associated with the introduction of the measure are negligible, the benefit-cost ratio is high.

➤ ***More information?*** www.swov.nl/rapport/Factsheets/UK/FS_Cyclists.pdf

(1) Elvik, R., Christensen, P. & Olsen, S.F. (2003). Daytime running lights. A systematic review of effects on road safety. TØI-report 688/2003. Oslo: Institute of Transport Economics.
(2) http://partnet.vtt.fi/rosebud/products/deliverable/Handbook_July2006.pdf
(3) Blokpoel, A. (1990) Evaluatie van het effect op de verkeersveiligheid van de invoering van zijreflectie op fietsen [Evaluating the road safety effect of the introduction of bicycle side reflection]. SWOV Institute for Road Safety Research, Leidschendam, NL.

## Driver support systems

Driver support systems help drivers to drive their vehicle safely, e.g. by warning or intervening when a driver crosses the side line of his driving lane (Lane Departure Warning System), when he approaches too close to the car ahead of him (Adaptive Cruise Control or Collision Avoidance systems), when he exceeds the speed limit in force (Intelligent Speed Assistance), when he or his passengers forget to use a safety belt (Seatbelt Reminders) or when he is about to lose control of the vehicle (Electronic Stability Control). Most of these measures will be made available in new cars by car manufacturers, or as an after market (retrofit) product.

*Promising practice*

### Intelligent Speed Assistance (ISA)


- ***What is it about?*** It is estimated that excessive and inappropriate speeds are the cause of about a third of all fatal and serious crashes. ISA is a general term for a system that aims to increase speed limit compliance. In general, ISA systems establish the position of a vehicle, and compare the current speed of the vehicle with the posted speed limit or recommended safe speed at that particular location. In case of excess speed, the system gives feedback to the driver about the speed limit in force or even restricts vehicle speed according to the speed limit in force. There is a wide range of ISA systems that differ in the level of support and the kind of feedback they provide to the driver.
- ***Who is involved?*** Mandatory systems would need national or European legislation. Voluntary speed warning systems, e.g. Speed Alert, may be encouraged by publicity campaigns and/or financial by tax or insurance premium reductions.
- ***How effective and costly is it?*** The PROSPER project (1) calculated that ISA could lead to a fatality reduction between 19.5 and 28.4 % in a market-driven scenario and between 26.3 and 50.2 % in an authority-driven scenario. Benefits are larger on urban roads and for the more intervening forms of ISA. ISA systems can also reduce fuel consumption and noise, and improve air quality. The costs include the ISA equipment, and creating, updating and disseminating digital maps and speed limit databases. The benefit-cost ratios range from 2.0 to 3.5 (market-driven) and from 3.5 to 4.8 (authority-driven). The costs were calculated on the premise that by 2010, all new vehicles will have a satellite navigation system.
- ***More information?*** www.etsc.eu/documents/ISA Myths.pdf



(1) PROSPER (2006), PROSPER Final report, Project for Research On Speed adaptation Policies on European Roads, Project no. GRD2-2000-30217, May 2006.

# Prevention of unsafe traffic behaviour

People make unintentional errors, and commit intentional violations. Both result in unsafe traffic behaviour. Vehicle 'locks' could help to prevent errors and violations from happening. Locks make it impossible for drivers to use their car if and when they are not allowed to. This can be realised, for example, by a smart card. It is a type of individual driver licence that prevents a car from being driven if the driving licence has been suspended or when there are particular driving restrictions (e.g. related to a graduated driving licence). Another example, is the alcohol lock that prevents a car from being started if the driver is under the influence of alcohol.

*Best practice*

## Alcohol Ignition Interlock (Alcolock)

➤ ***What is it about?*** Alcohol is estimated to be a contributory factor in 20-25 % of the serious and fatal injury crashes. An 'Alcohol Ignition Interlock' or 'Alcolock' is an electronic device that prevents a vehicle from being started if the driver has drunk too much. To establish the BAC, the driver has to breathe into a breathalyser before starting the engine, and, subsequently, at random times when driving. Generally, the device is used to prevent people who have been convicted of drink driving from re-offending. In those cases, the Alcolock is often part of a wider prevention programme, including medical and psychological support. Alcolocks are also used in professional transport. Alcolocks originate from overseas (US, Australia, Canada). In Europe, Sweden introduced the Alcolock over 10 years ago. More recently, there have been pilots in a number of other European countries, including Belgium, Norway and Spain; other countries, e.g. the UK, are planning pilots.

➤ ***Who is involved?*** Alcolock programmes for offenders would need legislation, an organisation to install the equipment and 'read' the Alcolock data and an organisation to assess the results and accompany the Alcolock drivers medically and psychologically.

➤ ***How effective and costly is it?*** The risk of injury crashes in vehicles that are equipped with an Alcolock is reduced by around 50 %. Furthermore, it is estimated that Alcolocks lead to a 40-95 % reduction in the recidivism rate of convicted drink-drivers ([1]). The costs of an Alcolock programme for drink driving offenders consist of introduction costs (administration, medical examination and installation; around EUR 400), the annual running costs (rent of Alcolock equipment and four medical examinations; around EUR 2 000) and dismantling costs (around EUR 100) ([2]).

➤ ***More information?*** http://ec.europa.eu/transport/road_safety/pdf/projects/alcolock.pdf



(1) ICADTS (2001) Alcohol Ignition Interlock Devices 1: Position paper. Working group on Alcohol Ignition Interlocks, International Council on Alcohol, Drugs and Traffic Safety.

(2) Bax, C., Karki, O., Evers, C., Bernhoft, I., Mathijssen, R. (2001) Alcohol Interlock Implementation in the European Union: Feasibility Study. SWOV Institute for Road Safety Research, Leidschendam, NL.

*Best practice*

## Event Data Recorders (black boxes)

➤ ***What is it about?*** Event Data Recorders (EDR) or black boxes monitor a number of variables related to driving behaviour, such as speed, acceleration and deceleration forces, use of lights, gears, seatbelts, etc. There are two main EDR types. The crash data recorder collects data for a limited period just before and after a crash and the journey data recorder collects all data during driving. The *crash data* recorder is generally used to reconstruct the occurrence of a road crash. The *journey data* recorder is generally used to provide feedback to the drivers about driving style from an environmental viewpoint, a safety viewpoint or both, often in combination with a reward programme. EDR are most often used in trucks, vans and company cars, but increasingly also in private cars. Insurance premium reductions are the most common reward for private car drivers.

➤ ***Who is involved?*** EDRs for trucks, vans and company cars are generally introduced by the enterprises and firms or lease companies, for example as a part of a 'Safety Culture' programme. The use of EDR in private cars can be stimulated by insurance companies.

➤ ***How effective and costly is it?*** It appears that EDR have a preventive effect. It has been calculated that EDR in trucks and vans result in an average reduction of 20 % crashes and damages, 5.5 % fatalities and 3.5 % severe injuries ([1]). According to another study ([2]) the benefit-cost ratio for companies is 20 for the journey data recorder and 6 for the crash data recorder. A fleet owner can expect a return of investment within a year.

➤ ***More information?*** http://ec.europa.eu/transport/roadsafety_library/rsap_midterm/rsap_mtr_impact_assmt_en.pdf



(1) Bos, J.M.J. & Wouters, P.I.J. (2000) Traffic accident reduction by monitoring driver behaviour with in-car data recording. Accident Analysis Prevention, 32(5), 643-650.

(2) Langeveld, P.M.M. & Schoon, C.C. (2004) Kosten-batenanalyses van maatregelen voor vrachtauto's en bedrijven (Cost-benefit analyses of measures for HGVs and companies). SWOV Institute for Road Safety Research, Leidschendam, NL.

# Road safety education and campaigns

**Road safety education aims to promote knowledge and understanding of traffic rules and situations, to improve skills through training and experience, and to strengthen or change attitudes towards risk awareness, personal safety and safety of other road users. Education is generally directed at groups of pupils and normally in a school setting (as opposed to driver training). Whereas road safety campaigns eventually want to result in a behaviour change, they are often directed at either improving knowledge about a road safety problem or at changing attitudes towards particular road behaviour, e.g. drink driving or speeding.**

## Road safety education

Road safety education is generally performed in a school setting, focusing on the different transport modes and traffic roles that the pupils at different ages encounter actively or passively.

Whereas many countries advocate what is called permanent education, from the cradle to the grave, in practice the majority of road safety education programmes are directed at primary school children. Secondary school children, and certainly people beyond that age are less often involved in road safety education. For extensive good practice guidelines on road safety education for young people, we refer to the final report of the EU project ROSE 25 (1).

In general, educational measures that address the combination of knowledge, skills and attitudes are considered better than measures that focus exclusively on one of these three components. The relative weight of all three components needs to be adapted to the goal of the measure. Furthermore, it is important that road safety education is embedded in other road safety measures, e.g. enforcement and infrastructure and in a wider context in school (if it is an action within the school system).



*Promising practice*

### The Road Safety label in the Netherlands: Zebra Seef

- ***What is it about?*** Currently, the road safety label Zebra Seef is directed at primary schools, but a similar approach for secondary schools and special education is being developed. Schools can earn certificates and a label by working on one of the four main topics of the project: 1. Integrating road safety education in the school programme (e.g. road safety teachers, specific events like traffic safety weeks); 2. Stimulating a safe and healthy school environment (e.g. accessibility of the school, environmentally friendly transport modes, cycle stands, safe school routes); 3. Involving parents (e.g. development of an information system for parents; parents as crossing patrols); 4. Performing various practical training and projects. The project has a ´facilitating´ character in providing an organisational structure and professional support. For all topics, guidance, proposals and material exist in various forms (books, booklets, films, CD-ROMs).
- ***Who is involved?*** Apart from school staff, municipalities, local policy, police, road safety organisations, and last but not least, the pupil's parents are involved. There is an independent commission that visits the schools to give advice and support and to manage the certification and labelling process.
- ***How effective and costly is it?*** A limited evaluation study indicated a small positive effect on (self-reported) traffic behaviour. Participation of schools is for free. The regional authorities provide financial support for the overall project organisation and for educational materials for schools.
- ***More information?*** www.verkeersveiligheidslabel.nl

(1) KfV (2005). ROSE 25. Inventory and compiling of a European good practice guide on road safety education targeted at young people. http://ec.europa.eu/transport/rose25/documents/deliverables/final_report.pdf

*Good practice*

## Educative Continuum in France

➤ ***What is it about?*** The Educative Continuum extends from kindergarten to the post driving licence period and aims at the progressive acquisition of competences through successive programmes adapted to the biological age of the 'student'. It aims at developing skills for successive transport modes (walking, cycling, moped riding, driving), and ultimately at developing positive attitudes and behaviour with regard to road safety for all road users. Further steps are being considered, including continuing training for all drivers, special training to help elderly road users retain their competences as long as possible and psychological support for crash victims.

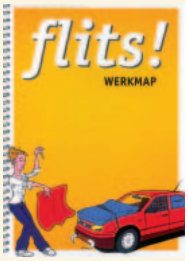
➤ ***Who is involved?*** The French Ministry of Transport co-ordinates the educative continuum and is responsible for its content. Furthermore, depending on the stage, other active establishments are involved: kindergarten, primary school and secondary schools, driving schools, insurance companies, the Ministry of Interior, and the Ministry of Defence (police).

➤ ***How effective and costly is it?*** Currently, there is little information about the effects and costs. Since this measure aims at a long term approach, the effects would need to be measured over a longer period of time as well.

➤ ***More information?*** www.securite-routiere.gouv.fr/article.php3?id_article=3296

*Good practice*

## Flits! A multi-media theatre monologue from Belgium




➤ ***What is it about?*** The focus of Flits! is on crashes involving young people and on crashes during weekend nights. Flits! is a multimedia monologue with live performances for young people and adults (16+). A professional actor tells the story of a group of friends, going out on a weekend night. But what begins as fun ends in a drama. Animated movies, videogames and pop music give this monologue the image of a trendy video clip. Flits! sensitizes young people, using images and a language they feel comfortable with. The communication is animated and in no way moralizing. During the discussions after the performance, it is possible to express personal experiences and emotions. This increases the level of realism. Flits! therefore works very well in schools. The monologue is also available on DVD.

➤ ***Who is involved?*** The initiative for the project was taken by a non-profit association of parents of children killed in road crashes. Flits! is performed on demand, in schools and cultural centres since 2002.

➤ ***How effective and costly is it?*** The effects have not been evaluated. The reactions of the young people are positive and the performances usually end in lively discussions. The DVD can be ordered for EUR 20.

➤ ***More information?*** www.wimgeysen.be/index.php?option=com_content&view=article&id=43:flits&catid=24:actueel&Itemid=20

# Road safety campaigns

Road safety campaigns as a stand-alone measure generally don't have a large effect on road safety. However, campaigns are crucial as a support for other measures such as legislation and enforcement. Campaigns generally aim to explain new legislation, to inform about a specific road safety problem and why particular measures are necessary. Some measures directly aim to change behaviour (e.g. not to speed, to use seatbelts, to have lights on your bicycle, etc.). It is important that the message be short, clear and unambiguous. Furthermore, it is important that a campaign make use of different media, e.g. bill boards, radio and television, leaflets, etc., and is repeated several times.

*Good practice*

## The BOB-Campaign, originating from Belgium

- ***What is it about?*** The Bob campaign has been present in Belgium since 1995. 15 EU Member States have copied it or have adapted it to their specific situation. The European Commission has supported these activities for several years. Bob is the name of a person who does not drink when (s)he has to drive and who brings his/her friends home safely. The aim of the campaign is to convince people not to drink and drive. It strives to make drink driving socially unacceptable. An important element of the campaign is the support by the alcohol industry. The Bob campaigns are always combined with more extensive enforcement during the campaign period. The campaign has both permanent elements (e.g. the Bob website, the Bob van, leaflets, key hangers, t-shirts) and periodic elements (e.g. road side billboards and TV and/or radio advertisements).

- ***Who is involved?*** The Belgian Bob campaign is a joint project of the Belgian Road Safety Institute (non-profit organisation) and the Arnoldus Group of the Federation of Belgian Brewers (industry SAO). In addition, the police support the campaign with extra road side breath tests.

- ***How effective and costly is it?*** After each Bob-campaign, post-test have been carried out to measure the impact of the campaign and its appreciation by the public. The Bob-campaign is highly appreciated. Around 35 % of the respondents say they have 'been' Bob and around two thirds of the people say they know someone who acts like Bob. During the campaign period (information + enforcement) the percentage of drunk drivers drops to around 4 %, whereas outside the campaign period, it is about 9 %.

- ***More information?*** www.bob.be/index.htm

*Good practice*

## Goochem, the Armadillo, originating from the Netherlands

➤ ***What is it about?*** Goochem, the Armadillo is the name of the awareness campaigns on the use of seatbelts and child restraint systems in the Netherlands. The campaigns in 2004 and 2005 intended to enhance compliance with seatbelt regulation, with emphasis on back seat occupants, mainly children between 4 and 12 years old. The 2006 campaign provided information about the new European regulation on child restraints and also stimulated the correct use of approved child restraints. The communication strategy is based on the Social Marketing theory, promoting the desired behaviour in a positive way, by emphasizing the advantages of the desired behaviour. The campaign uses television, radio, billboards, and websites to convey the message and an educational package was developed for use in primary schools. In 2006, around 16 EU Member States held their own Armadillo-campaign. The Armadillo-concept was also a key element in the communication strategy for the European EUCHIRES-campaign on seatbelts and child restraints, which was funded by the European Commission.

➤ ***Who is involved?*** The Armadillo campaign is organised by the Dutch Ministry of Transport with support of and in co-operation with the Dutch road safety organisation and regional governmental authorities.

➤ ***How effective and costly is it?*** Research shows that the share of children being transported with a protective device (child restraint or seatbelt only) increased from 75 % in 2004 to 82 % in 2005 and 90 % in 2006. The use of child restraints increased from 25 % in 2004 to 56 % in 2006.

➤ ***More information?*** www.gekopgoochem.nl



*Good practice*

## The *Sign of Light* from Latvia


➤ ***What is it about?*** *Sign of Light* is a national campaign in Latvia focusing on the safety of pedestrians in the dark. The campaigns were carried out in 2004 and 2005, in the last months of the year when daylight is shortest. The campaign aimed to inform pedestrians about the risks of walking during darkness and twilight without reflectors. The slogan of the campaign was *'A pedestrian without reflector is a dead body!'* A lot of different media were used in the campaigns. Big billboards were installed on main roads around the main Latvian cities. Following the campaign, a public fund, was established. The fund organised two actions. Waistcoats with reflectors were given to pupils of several schools in rural areas. And people were invited to donate warm jackets to Red Cross departments. There, reflectors were put onto the jackets and distributed among low-income families.

➤ ***Who is involved?*** The fund was set up with the support of third parties such as schools, the Red Cross departments and sponsors. The costs of the reflectors are borne by pedestrians and partly by sponsors of the campaign (mainly for children and for pedestrians with low-incomes).

➤ ***How effective and costly is it?*** After two *Sign of Light* campaigns, the average rate of pedestrians wearing reflectors in the dark, increased from 4 % to 20 %.

➤ ***More information?*** www.csdd.lv/?pageID=1131693376

*Best practice*

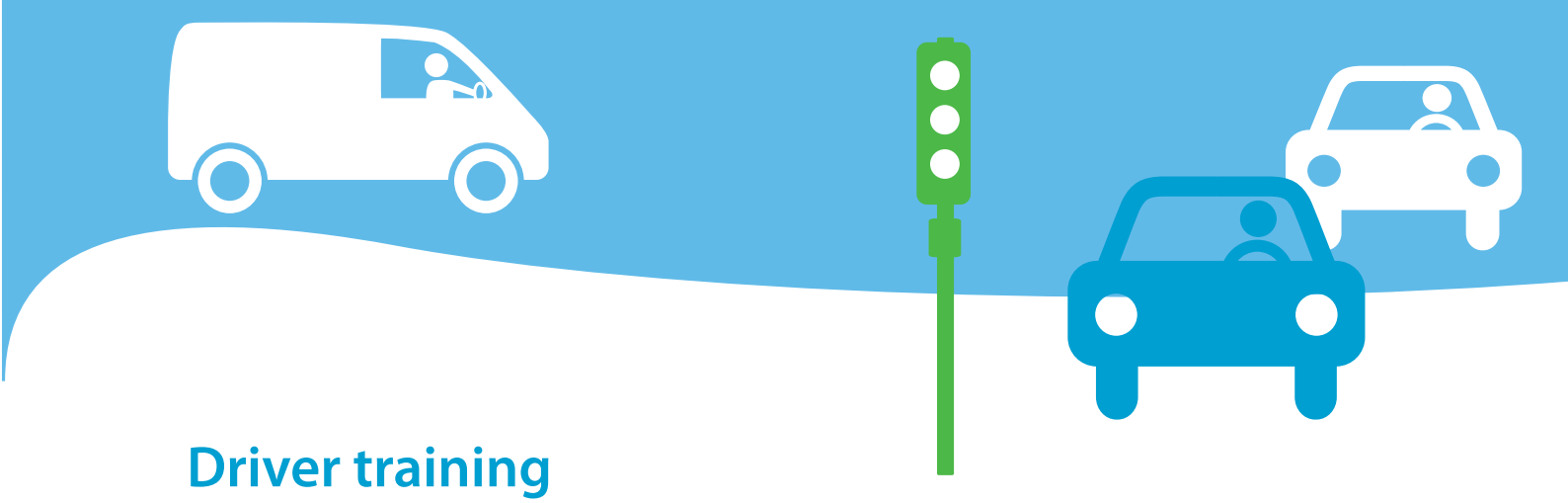
## Speak Out! from Norway

➤ ***What is it about?*** The target group of Speak out! are young people between 16-19 who are travelling a car as passengers in the evening, at night and during the weekend. Speak out! encourages those young people to speak out if the driver is not driving safely, for example when (s)he is driving too fast or under the influence of alcohol or drugs. Often, young people are afraid to speak out due to peer pressure. The information and messages are spread through school visits and information desks at control posts and by video films and T-shirts. Enforcement supplements the communication activities. The aim is both to support young people with an existing positive attitude to speak out, and to control and sanction those who are not likely to be influenced by the campaign. Controls are carried out at visible control posts by policemen in uniform.

➤ ***Who is involved?*** The campaign was initiated by the Norwegian Road Directorate.

➤ ***How effective and costly is it?*** An evaluation of the first three years indicated that the number of the number of killed or injured car passengers in the 16-19 age group was reduced by 27 % in the first year, by 31% in the second year and by 36 % in the third year. There was no effect on the number of killed and injured young car drivers. The benefit-cost ratio ranged from 1.9 (when including the development costs and taking the lower limit of the confidence interval for the safety effect) to 16.8 (when excluding the development costs and taking the best estimate of the effect).

➤ ***More information?*** www.toi.no/getfile.php/Publikasjoner/T%D8I%20rapporter/1999/425-1999/425-1999-elektronisk.pdf



# Driver training

**Young, inexperienced drivers have a much higher risk of getting involved in a crash than older, more experienced drivers. Driver training is an important tool for preparing people to drive safely and for raising awareness of the risks of driving motorised vehicles. Whereas minimum requirements for the driving test are already laid down in EU Directives, driver training itself has not yet been addressed by European-level regulations and hence remains the full responsibility of individual countries.**

## Essential elements of driver training

There is considerable variation in national legislation and regulations in the area of driver training. The most common approach is professional training by certified instructors, followed by a (practical and theoretical) test and, if passed, a driving licence. In an increasing number of countries, professional training has been supplemented with accompanied practice with parents or other licensed adults. Some countries apply a multiphase approach in driver training, involving mandatory training both before and after the driving test.

For driver education it is important for learner drivers not only to learn to master their vehicle, and to be familiar with traffic regulations, but also that to learn to assess risks and risk-increasing factors in road traffic as well as to be a good judge of their own skills and limitations. This is reflected in the GDE matrix (Goals for Driver Education) that was applied in the EU-project GADGET ([1]):



| | GDE matrix: essential elements of driver training | | |
|---|---|---|---|
| | Knowledge & Skills | Risk-increasing factors | Self-evaluation |
| IV. Goals for life and skills for living | Lifestyle, age, group, culture, social position, etc. vs. driving behaviour | – Sensation-seeking<br>– Risk-acceptance<br>– Group norms<br>– Peer pressure | – Introspective competence<br>– Own preconditions<br>– Impulse control |
| III. Goals and context of driving | – Modal choice<br>– Choice of time<br>– Role of motives<br>– Route planning | – Alcohol, fatigue<br>– Low friction<br>– Rush hours<br>– Young passengers | – Own motives influencing choices<br>– Self-critical thinking |
| II. Mastery of traffic situations | – Traffic rules<br>– Co-operation<br>– Hazard perception<br>– Automatization | – Disobeying rules<br>– Following too closely<br>– Low friction<br>– Vulnerable road users | – Calibration of driving skills<br>– Own driving style |
| I. Vehicle manoeuvring | – Car functioning<br>– Protection systems<br>– Vehicle control<br>– Physical laws | – No seatbelts<br>– Breakdown of vehicle systems<br>– Worn-out tyres | Calibration of car-control skills |

(1) Hatakka, Keskinen, Glad, Gregersen & Hernetkoski, 2002.
See also http://ec.europa.eu/transport/road_safety/pdf/projects/gadget.pdf

## Driving schools

With regard to driver training in driving schools, a recent report of the Joint OECD/ECMT Transport Research Centre (1) on young drivers recommends:

- Expanding the traditional method of skills-based instruction, whereby the instructor tells the candidate about right and wrong, with methods that engage the candidate personally and emotionally to a larger extent. This is particularly relevant in relation to increasing the 'self awareness' of the candidate about his/her difficulties, reactions, etc., with regard to the driving task.
- Ensuring that professional driving instructors have the knowledge and pedagogical skills necessary to guide and assist the candidate towards becoming a safe driver – driver trainers should be able to coach and not simply instruct.

*Good practice*

### Initial driver training in Denmark

- ***What is it about?*** Driver education in Denmark was changed radically in 1986. The new system prescribes a highly-structured series of steps in the training process which has to be respected by the driving instructor. The training is structured in a way that leads the learner from easier to more difficult tasks, alternating between theory and practice. The driver training programme is based on a very detailed curriculum which lists all theoretical and practical requirements for training. Instructors are expected to follow this curriculum strictly. An important part of the content of the initial driver training is the subject of defensive driving and hazard perception. The learner must attend at least 26 theory lessons and 20 practical sessions. Practical driving begins in an area closed off to traffic, and progresses to public roads. The training also includes risk awareness exercises on a driving ground.

- ***Who is involved?*** The driving instructors are responsible for carrying out the training programme.

- ***How effective and costly is it?*** After the introduction of the new training programme a crash risk reduction of 7 % was measured during the first year of driving. This effect seems to largely disappear after the first year of driving. However, the first year effect appears to have been sustained over successive generations of novice drivers (2).

- ***More information?*** www.politi.dk/NR/rdonlyres/B0BA6AD6-71EA-4D54-8801-D6375C20B97F/0/Laerervejl_katB_06.pdf
  www.politi.dk/NR/rdonlyres/EFBBB8E3-1956-439C-8EEB-B142EE7C61E4/0/Undervispl_katB_9_06.pdf



(1) OECD/ECMT (2006) Young drivers: the road to safety. Paris, Organisation for Economic Cooperation and Development. www.cemt.org/JTRC/WorkingGroups/SpeedManagement/SpeedSummary.pdf

(2) Carstensen, G. (2002) The effect on accident risk of a change in driver education in Denmark. Accident Analysis and Prevention, Vol. 34 (1), 111-121.

## Accompanied driving

The aim of accompanied driving is to offer young, novice drivers a higher level of experience before they receive their driving licence than with just formal driver trainers in driving schools. Lack of experience is considered to be one of the three main factors explaining the high crash risk amongst novice drivers (the other two being age and gender). The Joint OECD/ECMT Transport Research Centre report recommendations on this issue are:

- Augment formal training by requiring young drivers to attain as much experience as possible before solo driving. While at least 50 hours of pre-licensing practice are recommendable, experience in one country showed that increasing this to about 120 hours reduced crashes in the two years following licensing by approximately 40 %.
- Provide accompanying drivers, including parents, with information and advice about how to fulfil their role effectively, and encourage them to provide extensive opportunities for practice. While setting minimum standards for accompanying drivers may be desirable, it should not exclude or discourage people from taking on this role.

Accompanied driving should be performed in co-operation with the driving school and both the driving school instructor and the accompanying persons (parents) must be aware of the important coaching role they play.

An increasing number of European countries apply the principles of accompanied driving (17 countries in late 2006, including Austria, Belgium, France, Sweden), although the legal and organisational details may differ. Whereas accompanied driving increases the exposure of young drivers, the experiences so far show that the number of crashes during the accompanied driving phase are small and that the net effect is positive due to the reduced crash risk after licensing.

*Good practice*

### More experience for learner drivers in Sweden

- ***What is it about?*** Through a reform implemented in September 1993, the minimum age for learning how to drive was reduced from 17 to 16 years while the licensing age remained 18. The purpose of lowering the age limit was to give learner drivers an opportunity to acquire more experience, through accompanied practice, before the driving test. Starting to learn to drive at 16 is a voluntary process, but many learner drivers in Sweden have taken this opportunity.
- ***Who is involved?*** Lowering the age for accompanied driving would require a change in the law in most countries. Furthermore, parents or other licensed adults must be ready and able to get involved in accompanied practice.
- ***How effective and costly is it?*** In the first year after obtaining a licence, the crash risk per million kilometres for novice drivers under the old system was 0.975 compared to a risk of 0.527 for drivers following the new system. This represents a decrease in risk of 46 % ([1]). A concern was that crashes during practice would increase, thereby nullifying the beneficial effects after licensing. However, when comparing the costs of the measure in terms of driving practice crashes and the benefits in terms of reduced crashes after obtaining a licence, the benefits appeared to outweigh the costs by a factor of 30 ([2]). Low crash risk during accompanied driving has also been determined in the UK and Finland. The effectiveness of the Swedish accompanied driving system seems to have decreased in the last few years. Currently, learner drivers have been taking less hours of accompanied practice.
- ***More information?*** www.cieca.be



(1) Gregersen, N.P. e.a. (2000), Sixteen Years Age Limit for Learner Drivers in Sweden, an Evaluation of Safety Effects. Accidents Analysis and Prevention, 32. Gregersen, N-P & Sagberg, F (2005), Effects of lowering the age limit for driver training. Traffic and Transport Psychology, Elsevier.

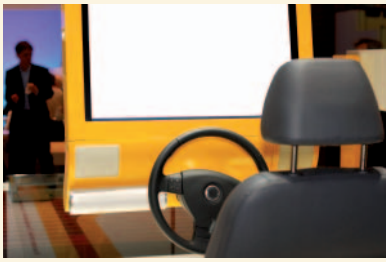
(2) Gregersen, N.P., Nyberg, A. & Berg, H.Y. (2003). Accident involvement among learner drivers – an analysis of the consequences of supervised practice. Accident Analysis and Prevention, 35, 725-730.

# Insight-based driver training

Traditionally, driver training has focused on manoeuvring skills and formal traffic regulations. In addition, it is important to provide insight into the reasons behind the need for risk awareness, skills, rules and regulations, for example by demonstrating the physical and mental limitations of the human being in general and a novice driver in particular. This aims to work towards the ultimate goal of driver training, i.e. to create drivers who are safe and safety-oriented, and not just technically competent.

*Good practice*

## Safety Halls in Sweden



- ***What is it about?*** The 'Safety Halls' contain educational aids designed to encourage an active and accurate use of in-car safety equipment among novice drivers. The Safety Hall concept is part of the Swedish insight-based driver education which is moving away from skills-based and instruction-based training, to personal experience and risk-insight training. Both practical exercises (e.g. experiences of physical forces and driving style demonstrations) and theoretical drills (e.g. group discussions) can be used to accomplish this objective. In Sweden, learner drivers are required to attend a half-day session at a skid-pan and the Safety Hall is located at these skid-pans. Currently, eight of the 35 skid-pans in Sweden are equipped with 'Safety Halls' and they are gradually being introduced at more skid-pan centres. Safety Halls are increasingly used in driver training across the Nordic countries.

- ***Who is involved?*** For the Safety Halls concept to work in other countries, an appropriate opportunity and location in the licensing process needs to be found to feature the Safety Hall concept. In Sweden, it is deliberately featured towards the end of the (pre-test) educational process when learner drivers have accumulated a fair amount of driving experience already. Driver trainers need to be trained on how to maximise the learning potential of these educational aids.

- ***How effective and costly is it?*** The estimated cost of the educational aids (presuming that all aids can be bought 'ready made') is EUR 25 000. The roll-over simulator accounts for two third of this cost. The benefits, in terms of saved casualties, have not been estimated. However, an evaluation of the effects in Sweden showed that there was a significant improvement in knowledge and attitudes, some 18 weeks after training.

- ***More information?*** www.vti.se/EPiBrowser/Publikationer/R502.pdf

# Traffic law enforcement

**It is widely recognised that enhanced enforcement – especially when it is targeted to speeding, drink driving and non-use of seatbelts – is a very important (and cost-effective) way to achieve substantial improvement in road safety within a relatively short period. It has been estimated that full compliance with traffic law could reduce road crashes by 50 %. Empirical evidence on the potential effects of intensified enforcement suggests smaller but still substantial crash reductions between 10 % and 25 %.**

## General principles of traffic law enforcement

Traffic law enforcement aims to prevent traffic offences by increasing the objective and subjective chance of getting caught. The number and frequency of actual police controls along the road determine the objective chance of being caught. Based on the objective chance and what they read in newspapers or hear from friends or colleagues, drivers estimate their own chance of being stopped for a traffic offence. This is the subjective chance of being caught. When drivers see this chance as being sufficiently high, they will avoid traffic offences. To increase the subjective chance and hence, the effectiveness of enforcement, it is important that police controls:

- are accompanied by sufficient publicity;
- take place regularly over a long period;
- are unpredictable;
- are clearly visible, and;
- are difficult to avoid.

For a maximum safety effect, it is important that police enforcement focus on traffic offences that have a direct, proven relationship with road safety (e.g. speeding, drink driving, seatbelt usage, close following), and at locations and at times where violations are expected to have the most effect on safety. To increase the acceptance and credibility of enforcement it is important to avoid the impression that enforcement is performed to generate income for general local, regional or national purposes. Ideally, the generated income from fines should flow back to road safety activities and regular feedback should show the positive effects of enforcement on safe traffic behaviour to the general public.

## Speeding

There is a clear relationship between the speed on a particular road and the number and severity of crashes. Reducing speed limit violations will directly affect the safety level. There are various methods to enforce speed limit compliance. Automatic speed enforcement is by far the most effective, since the enforcement density, and hence the objective chance of being detected, can be very high. Efficiency of automatic enforcement is higher if the vehicle owner and not the vehicle driver is held liable, since it is easier and faster to identify the owner than the driver. Efficiency is further enhanced if the handling of fines for detected violations is largely automated. Fixed and mobile speed cameras are a well known method of automatic speed enforcement that is applied in many European (and non-European) countries.

*Best practice*

## The safety camera programme in the United Kingdom

➤ ***What is it about?*** In the UK, the safety camera programme is run by local partnerships. There are strict guidelines as to where to put the cameras based on crash numbers and the prevalence of speeding. The cameras are clearly marked so road users see them well in advance. The revenues from fines are used to invest in the cameras as well as in other road safety measures. A pilot scheme with eight partnerships started in 2000, followed by the implementation at national level. By the end of 2004, 38 partnerships participated and managed over 4 000 camera sites. Since then, the implementation has increased further. In the UK, the driver is held responsible for speeding offences, but the owner is required to identify the driver.

➤ ***Who is involved?*** Local partnerships of police, highway authorities and other authorities are responsible for the scheme in their region. They have to present the case for investment in cameras based on the anticipated benefits and revenue from fines.

➤ ***How effective and costly is it?*** Evaluations showed a reduction of 70 % in speed limit violations at camera sites. On average, speeds dropped by 6 % and the crash numbers near the sites dropped by between 10 and 40 %. The estimated enforcement costs, including supporting education and information, are estimated to be £96 million (around EUR 140 million). The estimated value of crash saving is £258 million (around EUR 380 million). Consequently, the estimated cost-benefit ratio is 1:2.7.

➤ ***More information?*** www.dft.gov.uk/pgr/roadsafety/speedmanagement/nscp



*Best practice*

## Automatic speed enforcement in France

➤ ***What is it about?*** In France, the automatic speed enforcement programme started in 2003. Since then, 1 000 fixed and 500 mobile speed cameras have been put into use nationwide. The cameras are directly linked to a central processing office where photographs of the licence plate are used to identify the vehicle owner who is liable for the violation. The law was adapted to enable this form of automatic detection of offenders. A fine is sent automatically to the vehicle owner who must pay it within 45 days. Only after paying this fine it is possible to designate another driver as the offender. This new practice has reduced the appeal rate below 1%. The location of fixed and mobile cameras is decided by the police forces on the basis of traffic and crash information. Wide publicity campaigns have taken place on the deployment and location of speed cameras and on the safety effects of speed reduction. The sites of fixed speed cameras are displayed on the Internet.

➤ ***Who is involved?*** Speed cameras are implemented under the authority of the police (Ministry of Interior and Ministry of Defence), but the devices are subcontracted to the private sector. The scheme is part of intersectoral road safety policies co-ordinated by the French Road Safety Directorate.

➤ ***How effective and costly is it?*** Average speeds on French roads decreased by 5 km/h over three years from 2002 to 2005. In the same period, the number of fatalities decreased by over 30 %. Roughly 75 % of this reduction was attributed to the new speed camera system. The annual costs of maintaining the 1 500 cameras are around EUR 100 million. The annual revenues from speeding fines are around EUR 375 million. These are used for financing and maintaining the system; remaining revenues go to other road safety activities. The benefits from crash savings have not been evaluated yet.

➤ ***More information?*** www.securiteroutiere.equipement.gouv.fr/cnsr/2_documents_page_travaux/306_rapport_csa.pdf

Another more recent method is section control, currently used in the Netherlands, Austria and the Czech Republic. With section control the average speed over a particular distance (typically several kilometres) is calculated automatically by identifying a vehicle when it enters the control section and when it leaves it, and recording the travel time between those two points. Whereas most section controls are fixed locations, there are also mobile units in use (e.g. in the UK and Austria) particularly at road works zones.

*Best practice*

## Section controls in the Netherlands

➤ ***What is it about?*** In the Netherlands, there are currently 14 road sections where section control is applied, both on motorways and non-motorway rural roads. The system works 24 hours a day, 7 days a week, which means the chances of getting caught are practically 100 percent. In the Netherlands, the vehicle owner is held responsible for speed violations and the administrative handling of violations is highly automated. The first section control was operational in May 2002 and supported the introduction of a reduced speed limit of 80 km/h (where it was 100 km/h) to improve air quality in a nearby, densely populated suburb. Some of the other section control sites also support a lower speed limit set to improve air quality. Other sites are selected for safety reasons.

➤ ***Who is involved?*** The Dutch Bureau for Traffic Enforcement of the Public Prosecution Service oversees the operational section control systems.

➤ ***How effective and costly is it?*** Speed limit compliance on section control sections is 98 %. Evaluation of the first scheme showed that the average speed of cars was reduced from 100 to 80 km/h and the average speed of heavy vehicles from 90 to 80 km/h. The variance of speeds was also reduced. The number of crashes decreased by 47 %. On road sections further away stream upward or downward the number of crashes decreased by 10 %. The annual costs are between 2 and EUR 4 million. The revenues from fines in the first year of operation were EUR 7 million. This results in a cost-benefit ratio between 1:1.7 and 1:3.5, excluding the savings in crash costs which were not estimated.

➤ ***More information?*** www.verkeershandhaving.nl/?s=99

# Drink driving

Drink driving is another major road safety problem in many countries. The legal limit differs between countries. The majority of the European countries have a blood-alcohol limit of 50 millilitres (a blood-level content of 0.5) or lower. This is also recommended by the European Commission. Whereas drink driving violations are much less common than speeding offences, the effect on road safety is substantial. Estimates that 20-25 % of the road fatalities are alcohol related are no exception. Random breath testing is the most commonly used method of drink driving enforcement.

*Best practice*

## Random breath testing

➤ ***What is it about?*** Random breath testing (RBT) aims to identify drivers who exceed the legal alcohol limit. With RBT drivers are stopped and tested for alcohol by the police, whether they are suspected of drink driving or not. RBT is common in many European countries. Finland has the highest level of RBT in Europe with a number of tests per population of 34 %; Sweden is second with 17 %.

➤ ***Who is involved?*** Random breath testing is generally the responsibility of the police.

➤ ***How effective and costly is it?***

- Swedish law allows the police to test drivers involved in crashes, drivers apprehended for a traffic violation, or random in planned road checks. The proportion of car injury crashes involving drunk drivers, reduced from 14 % to 9 % after introduction of RBT in the 1970's.
- In Finland, since the introduction of RBT in the late 1970's, alcohol consumption and vehicle kilometres have doubled. In this period, the proportion of drunk drivers first halved and remained close to 0.2 % since early 1980's. The number of fatalities involving drunk drivers remained close to 80 during the last ten years, the same as in 1970.
- In the Netherlands, each doubling of the number of RBT tests since 1986 was accompanied by a 25 % decrease in drink driving offenders, and between 1985 and 2005 the proportion of drink driving offenders decreased by two thirds.
- Since 2003, in Denmark, all drivers submitted to an ordinary police control (e.g. speed control or seatbelt control) are also tested for alcohol. The number of alcohol related crashes was reduced by over one quarter in the two years following the introduction of this measure.
- Estonia introduced RBT in 2005. In 2005, 180 000 drivers were tested. The share of drunk drivers decreased from 1.86 % to 1.19 % between 2004 and 2005.
- The expenses consist of costs of enforcement and of administration. Benefits consist of reductions in crash costs. According to a Norwegian estimate, the tripling of the number of RBT would lead to a 3 % reduction in fatal crashes, and the benefits would exceed the costs by a factor of 1.2 ([1]).

➤ ***More information?*** www.immortal.or.at



(1) Elvik, R. & Vaa, T. (Eds.) (2004) The handbook of road safety measures. Pergamon, Amsterdam.

## Seatbelts and child restraints

Seatbelts considerably reduce the chance of severe and fatal injury. They work better in preventing fatal injury than severe injury. This is because a fatal crash is closely associated with head injury and internal torso injury and it is mainly these types of injuries that seatbelts prevent. The effect of seatbelts is partly dependent on the collision speed. Effects are greater at lower speeds. This is why it is also important to wear seatbelts on urban roads. The effect of child restraint devices is even greater than that of seatbelts. Based on several studies, the injury reduction effects are estimated to be (1):

| | Seatbelt in front seat | Seatbelt in rear seat | Child restraint devices |
|---|---|---|---|
| Severe injury | 25 % | 20 % | 30 % |
| Fatal injury | 40 % | 30 % | 50 % |

Whereas in many countries the usage of seatbelts and child restraints has been on the rise, there is still considerable room for improvement, in particular for back seat car passengers and drivers and passengers of vans. Police enforcement, in combination with information campaigns can help.

*Good practice*

### Targeted seatbelt enforcement in Denmark

➤ ***What is it about?*** In Denmark, there are police controls that are specifically targeted at drivers who do not wear their seatbelts. Strategically planned controls increase the detection risk for driving without seatbelts. During such a control, all persons in the car are checked, and the police make sure child restraints are correctly used according to new rules in the Danish Road Traffic Act. The enforcement activities are accompanied by information campaigns. Even though 87 % (2005) of the drivers in Denmark actually do use seatbelt, some groups of road users still don't: 30 % of van drivers and 35 % of back seat passengers fail to use the seatbelt.

➤ ***Who is involved?*** National police, local police districts, legislators, and media.

➤ ***How effective and costly is it?*** From 2000 to 2005 the compliance rate for using seatbelts increased from 80.1% of car drivers to 87 %. This may have been a result of the police control combined with information campaigns. This may also have been due to the fact that fines were raised in September 2000 from 200 DKK to 500 DKK (from EUR 27 to EUR 67).

➤ ***More information?*** www.politi.dk/en/servicemenu/forside
www.sikkertrafik.dk



(1) SWOV (2005) Seatbelts and child restraints; factsheet. Available at www.swov.nl

# Penalty point systems

Penalty point systems aim at prosecuting repeat offenders. When a traffic violation is detected, the violator receives one or more penalty points (or looses one or more bonus points). When a certain point limit is exceeded, this results in a temporary licence suspension. Often there is also the possibility of participating in a rehabilitation programme so as to get rid of (some of) the penalty points. Many European countries already have a penalty point system in force. The measure is popular amongst the population, probably because people see it as fair to tackle recidivist violators more strictly.

Measuring the effects of penalty point systems is complex and the positive effect is assumed to be obvious. The indications are that their contribution is only modest, and mainly limited to the first months after the introduction. This is because drivers find out quickly that the chance of a violation being detected is actually rather small. In order to increase the effect, the system must be strict and the chance of being detected must be great.

*Good practice*

## Penalty points in Latvia

- ***What is it about?*** Latvia implemented a penalty point system on the 1st of July, 2004. The aim of this penalty point system is to separate the regular violators from those who generally comply with the rules. 1 to 8 penalty points are assigned depending on the severity of the violation. Points are valid for 2 years (5 years for drink driving offences). Drivers who exceed 16 points (10 points for novice drivers) twice in ten years are disqualified for 5 years. Drivers who exceed 8 points have to attend a driver improvement course. The penalty point system covers all offences which can generate a crash. The measure applies to all vehicles except mopeds and bicycles.

- ***Who is involved?*** The penalty point system is regulated by law. The traffic police is responsible for enforcement. The driver improvement courses are organised by the Road Traffic Safety Directorate.

- ***How effective and costly is it?*** The comparison of data before and after the implementation of the penalty point system shows that the number of violation of drivers has decreased by around 20 %. This may have contributed to the road safety improvement in Latvia. In the year after the introduction of the penalty point system implementation, the number of injury crashes decreased by 7.2 %, the number of fatalities decreased by 11.4 % and the number of injuries decreased by 4.3 %. The costs of implementation and maintenance of a penalty point system are estimated at EUR 0.43 million per year. Other measures in that period may have contributed to this decrease in crashes. According to a meta-analysis ([1]) the effect of a penalty point system on all crashes is a 5 % reduction.

- ***More information?*** www.csizpete.lv/files/Legislation_regulations.html



(1) Elvik, R. & Vaa, T. (Eds.) (2004) The handbook of road safety measures. Pergamon, Amsterdam.

# Rehabilitation and diagnostics

**Rehabilitation measures refer to *measures to restore fitness to drive* after offences (e.g. warning letters, single- and several-day courses, group discussions, sometimes in combination with a technical measure such as the Alcohol Ignition Interlock). Rehabilitation programmes must be seen as complementary to other behavioural measures like campaigns, police controls and education. Diagnostic measures refer to *measures to identify* people at risk of committing traffic offences or behaving in an unsafe way (e.g. self-declaration sheet when applying for a driving licence, compulsory diagnostic clarifications).**

## Rehabilitation

Most rehabilitation activities focus on drivers who have been driving under the influence of alcohol or drugs. Relatively few activities focus on drivers who committed other serious traffic violations, e.g. exceeding the speed limit, aggressive and dangerous driving. The effects of rehabilitation on the total number of crashes in a country can never be great, since it only reaches those drivers who have been convicted of a serious traffic violation. A Swiss study estimated that the introduction of a nationwide, compulsory driver improvement scheme for offenders would lead to a reduction in fatalities and severely injured people of around 0.5 % in each group of offenders. On the other hand, the benefits may extend beyond traffic safety. For example, drink driving rehabilitation courses could also lead to a decline in the number of alcohol-related diseases and an improvement of the quality of life of those affected.

Based on European experiences with rehabilitation measures and on the literature, the following best practice guidelines have been developed by the SUPREME experts:

- Completion of a rehabilitation programme should be conditional for re-licensing. Rehabilitation programmes should never replace licence suspension but always only supplement it.
- Based on standardised diagnostic clarifications, offenders should be allocated to an intervention tailored to their needs. For drink driving offenders, a differentiation should be made between two levels with regard to current alcohol or drug consumption habits.
- Rehabilitation programmes should contain both educational and therapeutic elements. Follow-ups to rehabilitation programmes should be compulsory. The focus should be on critical self-reflection of participants.
- Group size should not exceed 10 participants. Consideration should be given to participants' ethnic and cultural backgrounds.
- Rehabilitation measure should be conducted as soon as possible after the first serious offence and repeated for recidivists.
- Rehabilitation programmes should not be organised and conducted by the authorities. The exchange of information between the authorities and rehabilitation programme organisers should be clearly defined (protection of participants).
- Price for rehabilitation programmes should be monitored and be at a uniform level. Financially weaker participants should be granted financial support.
- Rehabilitation programmes should always be evaluated, with the cost of the evaluation being included in the programme budget. Cost-effectiveness should increasingly be a component of the evaluation.
- In terms of training and social skills, course leaders should be highly qualified. Health aspects should similarly be included for rehabilitation programmes involving drink driving offenders.
- Course meetings must be held over a longer period or several weeks. However, at an earlier stage, particularly for people with drink driving problems, short interventions are also recommended outside the legal system.

*Good practice*

## Mandatory Driver Improvement in Austria

➤ ***What is it about?*** The target group consists of drivers with severe violations, such as drink driving and speeding. Courses for drink driving offences are separated from those of other offences. Some institutes also distinguish between novice drivers and experienced drivers. The course is mandatory for driver licence reinstatement. Drivers on probation, whose licence dates back less than 2 years, may participate while still in the possession of a licence. The course makes participants aware of the relationship between violations and personal attitudes, aiming to elaborate ways to correct both. Knowledge gaps, e.g. about the effects of speed and speeding, are filled and adjusted. Behaviour patterns are developed, tested and rudimentarily stabilised. Courses are held with between 6 and 11 participants and consist of 15 units of 50 minutes each, divided into five sessions. Sessions are separated by an interval of at least two days. The intervention lasts at least 22 days.

➤ ***Who is involved?*** Courses are performed by traffic psychological institutes, appointed by the Federal Ministry of Transport. They have to meet special standards defined in the licensing law. Course leaders have to fulfil certain prerequisites as well (psychologist, professional experience as traffic psychologist, training in therapeutic intervention techniques, class B licence holder, annual further training, …).

➤ ***How effective and costly is it?*** Within a timeframe of 2.5 years, 30.6 % of drink driving offenders who had not participated in a driver improvement course had a relapse, compared to 15.8 % of those who had. The participation fee is EUR 525 for first offenders and EUR 630 for repeat offenders.

➤ ***More information?*** www.kfv.at/index.php?id=388



*Good practice*

## Training course for recidivist drunk drivers in Switzerland

➤ ***What is it about?*** The target group consists of drivers with two drink driving convictions. Drivers addicted to alcohol are excluded. Participation in the programme is optional, but combined with earlier driver licence reinstatement. A preliminary personal interview provides insight in the individual participant. The programme provides information on the topic of alcohol and driving (legal and statistical aspects, as well as physical effects of alcohol). Participants are supported in tackling their own drinking habits and encouraged to define their personal solutions. Homework is an important means for achieving a change in behaviour. The programme lasts 8 to 12 weeks, consists of 6 group sessions of 2 hours (maximum of 10 participants) and a 1 hour individual discussion. On average, it takes 6 months between the offence and course participation. Whereas different in various details, similar rehabilitation programmes exist in Austria, Belgium and the Netherlands.

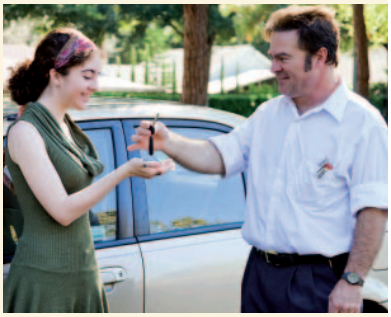
➤ ***Who is involved?*** The courses are conducted by psychologists who generally have had additional therapeutic training. They are appointed by the cantonal authorities and trained by the Swiss Council for Accident Prevention (bfu).

➤ ***How effective and costly is it?*** Many studies report recidivism rates to be reduced by about 50 % for drunk drivers who participated in a rehabilitation programme compared to drunk drivers without such participation over a two to five year observation period. The cost of participation is EUR 350.

➤ ***More information?*** www.bfu.ch/PDFLib/786_68.pdf

*Good practice*

### Rehabilitation seminar for novice drivers in Germany



- ***What is it about?*** This is a measure for novice drivers in their probation period who have committed a traffic law violation. The course is mandatory. The aim of the measure is to avoid repeat offences by influencing participants in their risk awareness on the roads and by motivating them to behave more safely and with more regard to others. The intervention comprises the following elements: self reflection (self evaluation), change of behaviour and attitudes and building up new strategies. The intervention also comprises a drive with other participants, which results in peer-to-peer feedback. The course comprises four sessions of 135 minutes each and includes a practical driving observation session between the first and the second session. The training sessions should be taken in a period of minimum 14 days and maximum 4 weeks.
- ***Who is involved?*** The seminar is implemented by special qualified driving school trainers. The 'train-the-trainer'- courses are co-ordinated by the German Council for Road Safety (DVR) and the Association for Driving School Trainers. The programme was developed by DVR and road safety education experts.
- ***How effective and costly is it?*** The effects have not yet been evaluated. The costs of participation are between 200 and EUR 350 per participant. The costs of training a seminar leader is between EUR 600 and EUR 800, the administration costs are between EUR 30 and EUR 40 per participant.
- ***More information?*** www.dvr.de/site.aspx?url=html/sonst/148_20.htm



## Diagnostic assessment

The potential benefits of diagnostics primarily depend on the reliability with which serious risk-increasing behaviour can be predicted. Consideration must be given to the fact that the costs for the diagnostic clarification of all drivers or learner drivers will be very high. Furthermore, even if good test procedures are applied, the false positive rate (persons diagnosed wrongly as having a particular incapacity) is often very high. If diagnostics are limited to driving offenders, the costs will be lower, but the benefits will also be smaller, since the intervention takes place after the violation has been committed (secondary prevention). Therefore, countries need to develop licensing models that can target those drivers who pose evident risks to others. The diagnostic tests need to be based on a judgement of the functional impairments relevant for safe driving.

Based on European experiences with rehabilitation measures and on the literature, the following best practice guidelines have been developed by the SUPREME experts:

- A system of assessment only targeting drivers with functional impairment relevant to safe driving should be preferred to a system with mandatory assessment for all (older or impaired) drivers.
- A network of community notification sources such as doctors, health professionals, social workers, police, friends and family and older drivers themselves should be established. Only drivers suspected of having a high crash risk should be reported to the licensing authority for formal assessment.
- The notion of 'high crash risk' should be defined and agreed upon at international level.
- A multi-tiered assessment should be established. The more elaborate and expensive tests would be reserved for the most serious cases.
- More effective instruments for assessing fitness to drive should be developed.
- More research is needed in order to evaluate the different road safety jurisdictions in the Member States.
- Older drivers should be informed at an early stage on procedures and mobility alternatives.
- The role of the licensing authorities should not be limited to licensing procedures, but they should also give advice on different matters such as car adaptations or mobility alternatives.

*Good practice*

## Traffic-Psychological assessment of drunk drivers in Austria

➤ ***What is it about?*** If a driver is detected driving with an alcohol level of 0.16 % BAC or more or if he refuses the breath test (or investigation by a health officer or blood sample), he is required by law to undergo a traffic psychological assessment. The goal is to make a prognosis of the probability of future drink driving. The traffic psychological assessment consists of a performance test and a personality test, preceded by a medical investigation. The traffic psychological investigation takes about 3 to 4 hours for the client. If the overall assessment is negative, the licence remains revoked until sufficient driving capability and/or sufficient willingness to adapt to traffic is restored. By law, the assessment is combined with a licence revocation of at least four months, a fine, and participation in a driver improvement course.

➤ ***Who is involved?*** The assessments are performed by specially trained psychologists in qualified assessment institutes in co-operation with the driving licence registration office.

➤ ***How effective and costly is it?*** Since 1990, the number of drink driving crashes in Austria has dropped somewhat (2 860 crashes in 1991 to 2 746 in 2005). The decrease of drink driving crashes can be attributed to multiple measures. The driver has to pay for the psychological assessment. The cost of police detection, administration, etc. is covered by the government.

➤ ***More information?*** www.kfv.at

# Post accident care

Post accident care takes place after a crash has occurred and deals with optimising the chances of medical and psychological recovery of the victims. The care after a crash usually consists of several, integrated steps: first aid, emergency call, efficient response of emergency systems, security and safeguarding of the crash site, transportation and medical treatment to enable the transport of the victims, further treatment at medical centres and psychological support of victims and their relatives.

## First aid

Of all victims killed in a road crash, 57 % die in the first minutes after the crash, before the arrival of the emergency services. Immediate first aid action provided on the spot in these vital first minutes saves lives and provides psychological support for the victim and other people involved. The 'ideal' first aid education system in a country would consist of:

- First aid education in schools, repeated e.g. once a year, to maintain knowledge.
- Mandatory 'first aid' education during driver training.
- Re-certification of 'first aid' for drivers at regular intervals.
- Optional: first aid campaigns to motivate non-driving adults.

*Good practice*

### First aid courses integrated with driver training

- ***What is it about?*** In a number of European countries (Austria, Bosnia and Herzegovina, Estonia, Germany, Hungary, Latvia, Lithuania, Slovakia, and Switzerland) first aid courses are an obligatory part of formal driver education. The measure is especially important in rural areas where emergency services frequently cannot arrive at the crash location within 5-15 minutes.
- ***Who is involved?*** The courses are usually organised by organisations such as the Red Cross.
- ***How effective and costly is it?*** A common way to valuate the outcome of measures in the public health sector is the valuation in QALYs (Quality Adjusted Life Years). A QALY is a life year at the best possible state of health, so if a road crash results in physical and psychological disorder, the number of QALY will be reduced. As first aid can help to save lives and prevent neurological damage, the effect on QALYs can be high. The costs for first aid courses will be paid by the drivers, no additional costs for governments are to be expected. Besides the advantages for traffic crash victims, there are other likely social benefits.
- ***More information?*** www.erstehilfe.at
  www.firstaidinaction.net

# Emergency calls

Fast and reliable information about the crash location and the type of crash and preferably also about the number of victims and the type of injury, helps emergency services to respond adequately. One single EU emergency number (112) is one step. The next step is automatic emergency calls in case of a crash (eCall).

*Promising practice*

## Promoting the implementation of eCall systems in Finland

➤ ***What is it about?*** eCall is an automatic in-vehicle emergency call service developed in the European Union. An eCall-equipped vehicle has a terminal with satellite connection, wireless communication and sensors for detecting a crash, rollover and fire. When a crash has occurred, the terminal sends information on vehicle position and crash type to the emergency response centre. It also opens a voice connection between the vehicle occupants and the operator of the emergency response centre. Thus, the eCall system enables faster and more adequate responses to road crashes. The objective is to equip all new cars with eCall terminals starting in the year 2010. Tests with eCall have been under way since spring 2004. Other Member States can join the initiative at any time.


➤ ***Who is involved?*** The parties involved are car customers, car manufacturers, medical centres and national governments.

➤ ***How effective and costly is it?*** A Finnish study based on an analysis of actual crash data in 2001-2003, estimated that an eCall system will reduce 5-10 % of motor vehicle fatalities and 4-8 % of all road fatalities in Finland (1). The costs for an automated emergency call system would be borne mainly by car customers and by medical emergency services. It is not yet clear whether the benefits will exceed the costs.

➤ ***More information?*** http://ec.europa.eu/information_society/activities/esafety/index_en.htm



(1) Virtanen, N. (2005). Impacts of an automatic emergency call system on accident consequences. AINO publications 14/2005. Helsinki, Ministry of Transport and Communications Finland.

# Efficient emergency responses

The response to emergency calls must be efficient, ensuring a fast arrival of the right emergency services at the crash scene. The time gap between crash and arrival of rescue services (response time) can be shortened by technical measures, by infrastructural measures, by clear instructions to road users about what to do when emergency vehicles have to pass and by good organisation and co-ordination at the crash scene.

*Good practice*

## Tow trucks on the motorway network in the Netherlands

➤ ***What is it about?*** The core of the measure is the agreement between insurance companies and the Ministry of Transport that a tow truck be sent to the incident location immediately after the incident has been reported. In case of false alarms, the bill is paid by the Ministry of Transport. In all other cases the bill is paid by the insurance company. Due to this measure, response time has been reduced by approximately 15 minutes on average. The measure has been fully implemented on the Dutch motorway network, and partially implemented on the regional network.

➤ ***Who is involved?*** The measure is based on a legal agreement (covenant) between the Ministry of Transport and insurance companies.

➤ ***How effective and costly is it?*** There are benefits in terms of reduced costs by helping victims faster, by preventing secondary crashes, and by avoiding congestion. For the Dutch national road network, the reduction of time spent in congestion due to an accident has been estimated 5 to 15 minutes per incident and vehicle, adding up to 2 to 4 million hours per year. The annual costs of this measure for the Dutch Government are estimated at EUR 650 000 (6 500 false alarms). The benefit-cost ratio varies from 27.8 (based on 5 minutes reduction vehicle delay) to 76.3 (15 minutes vehicle delay) ([1]).

➤ ***More information?*** www.incidentmanagement.nl

*Best practice*

## Emergency lanes in congestion in Germany and Switzerland

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➤ ***What is it about?*** The German term *Rettungsgasse* (emergency lane) is defined by law in Germany and Switzerland. It means that, if there is traffic congestion and an emergency vehicle needs to get through, traffic has to form a free lane in the middle of two lanes. If there are more than two lanes, all cars on the outer left lane must move to the left, all others must move right. This free lane enables all emergency vehicles to provide fast and efficient help in congested traffic conditions.

➤ ***Who is involved?*** The government has to draw up a law concerning driver behaviour in case of an incident and has to inform the drivers about that law.

➤ ***How effective and costly is it?*** The benefits are that, in case of traffic congestion, emergency vehicles can reach the crash location faster. The costs are mainly limited to publicity costs when introducing the new law. Although no precise estimates are available, the cost-benefit ratio is likely to be favourable.

➤ ***More information?*** www.oeamtc.at/netautor/pages/resshp/anwendg/1124101.html
www.admin.ch/ch/d/sr/741_11/a16.html

(1) Schrijver et al. (2006) Calculation of the impact of a nationwide introduction of various incident management measures on vehicle delay. TNO Mobility and Logistics, Delft.

# First treatment and transportation of victims

The professional handling of injuries during the first critical hour after an injury event (the *Golden Hour*) is crucial. If the critical trauma patient does not receive appropriate medical care within the first 60 minutes, the odds of his successful recovery diminish dramatically. Professional treatment at the crash site, stabilising patients for transportation, and fast and safe transport to a trauma centre increases the chances of survival and decreases the chances of permanent injury.

*Best practice*

## The use of a mobile intensive care unit in Denmark

- ***What is it about?*** In the Copenhagen area in Denmark, a Mobile Intensive Care Unit (MICU) provides pre-hospital treatment for road crash victims. A MICU secures and stabilises trauma patients at the crash site, thereby increasing the chances of the patient's survival during transport to the hospital. The MICU ambulances are manned with an experienced anaesthesiologist and a specially trained fireman, and carry a wide range of medical equipment. MICU is available 24 hours a day and works in a two-tier system together with ordinary ambulances. The central Emergency Call Service decides whether the MICU or an ordinary ambulance is to turn up. The ordinary ambulance can call in the MICU at any time. Other countries, e.g. Austria, Sweden, Switzerland, apply similar two-tier systems in emergency responses.

- ***Who is involved?*** In different countries, different personnel provide pre-hospital medical treatment. In Switzerland paramedics or emergency medical technicians are deployed in less serious cases, accompanied by a trained emergency physician in serious cases. In Sweden, highly trained nurses are part of the MICU-team. Austria uses emergency physicians together with specially trained paramedics. In a sparsely populated country with long transportation distances it might be necessary to use MICU helicopters as well as ambulances.

- ***How effective and costly is it?*** The additional personnel costs for doctors are high but these costs are partly compensated by reduced hospital costs.

- ***More information?*** www.akut.dk
  www.prehospital.dk

*Best practice*

## Transport of road crash victims by helicopter in the Netherlands

➤ ***What is it about?*** In the Netherlands severe road crash victim can be transported to a hospital by a trauma helicopter in order to decrease the duration of transport. Trauma helicopters are in operation in four areas, covering the main part of the Netherlands. Areas near the border of the Netherlands are served by trauma helicopters from Belgium and Germany. In 1995, the use of a helicopter-trauma team for crashes was tested in Amsterdam and Rotterdam. In 1998, the measure was implemented. Helicopter ambulance services also exist in several other European countries, for instance in Belgium, Germany, and Austria.

➤ ***Who is involved?*** The medical team on the helicopter consists of a specialist, a nurse and a pilot. This team has to be certified with special diplomas for trauma help and flying tasks.

➤ ***How effective and costly is it?*** A Dutch study (1) calculated that mortality would have been 11-17 % higher if the group of victims transported by the trauma helicopter had been transported by ambulance. Based on the costs of operating a trauma helicopter and costs of medical help, the costs of saved years of a life were calculated. These costs are between EUR 18 000 and EUR 37 000 for each saved year, which is acceptable in the medical world.

➤ ***More information?*** www.swov.nl/uk/research/swovschrift/inhoud/10/victim_assistance_by_helicopter_results_in_less_deaths.htm



(1) Charro, F.T. de & Oppe, S. (1998) The effect of introducing a helicopter trauma team to assist accident victims. SWOV, Leidschendam/Erasmus University, Rotterdam.

## Psychosocial support

A road crash can have far-reaching and long-term consequences, not only physically, but also psychologically and socially, and not only for the victim, but also for his/her relatives and friends. The deployment of psycho-social support has to start immediately after the event, which means already during the rescue operation itself. Sometimes, longer-lasting support may be needed, either by professionals or by volunteers. In medical terms, the psycho-social support has to be understood as a preventive measure, since traumatic events like road crashes can create post-traumatic stress disorder which result in further health risks and damage.

*Promising practice*

### Psychological support for road crash victims in Spain

- ***What is it about?*** In Spain, the project 'Road Violence Victims Care' aims at a two-stage intervention for both 'direct' victims and for 'indirect' victims (relatives or close friends). The first intervention stage takes place immediately after the crash, while the second concerns a longer term treatment of psychological consequences of the crash. A three-component programme is recommended to ensure that victims have access to appropriate psychological support: 1. A traffic victim support network; 2. Victim support training for hospital workers and others; 3. A protocol of road crash victim support. Also in other countries there are semi-professional volunteer organisations that represent the interests of road crash victims and provide psychological support.

- ***Who is involved?*** In different countries, different persons are involved in providing psychological support to road crash victims: the victims themselves, the parents or other relatives, volunteers, or professionals, such as policemen, hospital workers, social workers and psychologists.

- ***How effective and costly is it?*** The Spanish initiative is not yet implemented. In Austria, the annual cost of maintaining a regional (Red Cross) crisis intervention team is about EUR 300 000. The Austrian intervention teams consist partly of volunteers. The cost will be higher if professional organisations are involved. Psychological trauma arising from road crashes can lead to negative consequences such as loss of work, depression and even suicide. In view of this, the benefit-cost ratio is likely to be positive, but precise estimates are not available. The European Federation of Road Traffic Victims provides an overview of national initiatives.

- ***More information?*** www.fevr.org/inglese/helplines.htm

# Road safety data and data collection

Road safety data are essential for the development of well founded road safety strategies. What exactly is the problem? What are the causes? The more we know about road safety developments and about the underlying causes of those developments, the better we will be able to design and implement the appropriate solutions. Efficiency analyses for assuring that the limited resources are used optimally also require sufficient data. This means that we need reliable data in a number of areas: crash statistics, exposure data, safety performance indicators and data from in-depth crash analysis. Whether the data are reliable largely depends on the data collection method that would need to ensure that the data are correct and representative. Furthermore, good documentation of the data collection method is important as is the accessibility of the data ([1]).

## Road crash statistics

Not all road crashes are registered and stored in a database. Generally, fatal crashes are best registered, but even here the data are not complete. The registration rate of fatalities probably ranges between 85 % and 95 %. As injury severity decreases, the registration rate decreases further. The registration rates of severe injuries generally do not exceed 60 %; of slight injuries, it generally does not exceed 30 %. Another general phenomenon is that the registration of crashes that do not involve a motorised vehicle is far less complete than that of crashes that do involve a motorised vehicle. Underreporting of crashes leads to an underestimation of the size of the road safety problem. Underreporting of particular types of crashes can also lead to unjustified decisions about road safety measures.



*Best practice*

### Correcting for underreporting of road traffic fatalities in the Netherlands

➤ ***What is it about?*** In order to calculate the real number of traffic fatalities, the Dutch Central Bureau for Statistics (CBS) compares three data sources:
– crash registration by the police;
– court files on unnatural deaths;
– files on causes of death from municipal population records.
These three data sources are compared by linking date of birth, date of death, type of unnatural death (suicide, traffic crash, etc.), municipality of death, and gender. The data are stored and can be obtained at CBS. Data can be disaggregated to age group, gender, region, modality, day of the week and month. The aggregated data are also available via the SWOV website ([2]).

➤ ***Who is involved?*** CBS is responsible for overall data management and for collecting and linking the court and municipality data. The Transport Research Centre of the Ministry of Transport (AVV) is responsible for collecting the police records. CBS and AVV work together to arrive at the final database.

➤ ***How effective and costly is it?*** The reporting rate of the real number of traffic fatalities, based on the combined three data sources, is very high: 99.4 % for 2004. The individual reporting rates were 90 % (police records), 88 % (court data) and 95 % (municipality records). The costs are not exactly known, but assumed to be rather low (a few person months a year), because existing databases can be used.

➤ ***More information?*** www.swov.nl/uk/research/kennisbank/inhoud/00_trend/01_monitor/registration_rate.htm

(1) This chapter includes information collected in the framework of the European project SAFETYNET: http://erso.swov.nl/safetynet/content/safetynet_results.htm
(2) www.swov.nl/cognos/cgi-bin/ppdscgi.exe?toc=%2FEnglish%2FAccidents%2FReal%20numbers%2FVictims

*Best practice*

### The Rhône road trauma register in France

➤ ***What is it about?*** In 1995, the Rhône road trauma register was created in the French region of Rhône. Its goal was to estimate the real number of non-fatal casualties and obtain more information about injury severity and long-term impact. The register is based on data from all health care facilities in the Rhône region. For each victim a standard form has to be completed. The register has been 'qualified' by the French National Committee of Registers and is periodically evaluated. An extension of the register is planned for the region Rhône-Alpes to include a wider variety of road traffic conditions. Later, registers should be set up in other parts of France as well. The database is protected by privacy laws, but is made available for research purposes when confidentiality rules are observed.

➤ ***Who is involved?*** In the Rhône region, 96 first-line hospital services, 160 follow-up services and 11 rehabilitation centres are involved, represented by a central network. Data management is performed by the UMRESTTE Research Department of INRETS.

➤ ***How effective and costly is it?*** By the end of 2005, over 10 000 cases had been recorded. Regular data analysis and research is performed, focussing on specific themes. The themes studied over the last two years include the safety of elderly road users, gender differences in road risk, characteristics of injuries sustained by young road users, pedestrian injuries and the long-term consequences of injuries. The operating costs are approximately EUR 310 000 per year, funded by the Ministry of Transport, the Institute for Health Surveillance and the Institute for Epidemiology and Medical Research.

➤ ***More information?*** www.inrets.fr/ur/umrestte/themes/Registre.htm



## Exposure data

For a good understanding of road safety developments and road safety problems, exposure data are indispensable. Exposure data provide information about how, where and how far people travel and who these people are. Together with crash information, this information allows for calculating the relative risk of travelling in general, or for particular transport modes, particular types of road or particular groups of people. All over Europe, the number of road crashes has decreased in the last couple of decades, despite the huge increase in mobility. This means that the risk of getting involved in a road crash, e.g. per kilometre travelled, has declined substantially. But this decline is neither equally distributed over transport modes, nor over road types or road user types. If the risk of some types of travel stays behind, it might be needed to take specific measures to catch up or to prevent that the number of crashes will increase if a risky type of travel is likely to increase in the future. To assess differences in risk and risk developments, it is necessary to monitor exposure on a regular basis.

*Best practice*

## The National Travel Survey in Great Britain

➤ ***What is it about?*** The National Travel Survey (NTS) provides information about personal travel within Great Britain and monitors trends in travel behaviour. The first NTS took place in 1965/1966. In 1988, the NTS became a continuous survey, conducted on a monthly basis. The NTS gathers information about several different aspects of travel including purpose of travel, travel mode (walk, car, bus etc.), origin and destination of trips, time travelling and distance, as well as information about individuals, vehicles and households. This is done by 'computer assisted personal interviewing'. The survey contains a representative sample of households in Great Britain. Since 2002, the annual sample size is 15 048 addresses. This sample size provides the degree of precision required for reliable annual analyses. Previously, with sample sizes of around 5 000 addresses, it had been necessary to combine three years' data for most analyses.

➤ ***Who is involved?*** The NTS is commissioned by the British Ministry of Transport. The survey results are published by the Department for Transport.

➤ ***How effective and costly is it?*** A national response rate of 60 % was achieved in 2003 and in 2004. Information about data quality, e.g. related to sampling errors, is checked and reported regularly ([1]). The costs include interviewing, programming, coding and operations staff. The costs for annual travel surveys are rather high. However, they are shared with research organisations and industry, since the data are interesting for a wide range of purposes.

➤ ***More information?*** www.dft.gov.uk/stellent/groups/dft_transstats/documents/page/dft_transstats_612468.hcsp



*Promising practice*

## The Road Safety Information System in Latvia

➤ ***What is it about?*** The Latvian Road Safety Information System consists of four linked databases with background information, relevant for decisions about road safety: vehicle database, driver database, crash database, traffic law violator database. The databases are mutually linked. For example, the vehicle database can be linked to the crash database by the car licence number; and the driver database can be linked to the violator database or the crash database by the personal identification number. The implementation was realised stepwise between 1993 and 2004. There is a consistency check within the database every 10 years, using the renewal of people's driving licence. The database itself is not accessible for third parties.

➤ ***Who is involved?*** The Road Traffic Safety Directorate in Latvia is responsible for management and maintenance of the four databases. Data are provided by the Road Traffic Safety Directorate, and by the police and insurance companies.

➤ ***How effective and costly is it?*** Data are used for various analyses which are published annually or biannually. The management and maintenance costs are borne by the Road Traffic Safety Department, which is a self-financing organisation generating its income from services, e.g. vehicle registration, vehicle technical inspection, and driver registration. Data collection does not require extra staff, since these belong to the regular tasks of the involved parties.

➤ ***More information?*** www.csdd.lv/?pageID=1074852248
www.csizpete.lv (in English: under construction)

(1) The National Travel Survey: Technical Report 2003/04 is available at:
www.dft.gov.uk/stellent/groups/dft_transstats/documents/page/dft_transstats_610054.hcsp

## Safety Performance Indicators

The number of road traffic victims and the severity of the injuries are the most direct measure of road safety. However, it is also useful to monitor road user behaviour or characteristics of the road that have been proven to relate to the road safety level, e.g. driving speeds, the prevalence of drink driving, seatbelt wearing rates, or the presence of forgiving road sides. These types of measures are called safety performance indicators. They provide an indication of the road safety level of a country, and can be used to assess the effects of particular road safety measures. It is important to define safety performance indicators that can be measured reliably and have a causal relationship to the number of crashes or to the injury consequences of a crash.

*Best practice*

### Monitoring speed and drink driving offences in Switzerland

➤ ***What is it about?*** The Swiss indicator system monitors developments in the areas of speeding and drink driving. Indicators include levels of police checks, violation rates, sanctions, fatal crashes as well as the opinions of drivers about relevant safety regulations and their enforcement. The opinion survey is performed once every three years by telephone interviews of around 6 000 drivers. Data on the other indicators are collected on a continuous basis. There is a central location where the data are stored. Data are not electronically accessible, but part of the data can be found on the Internet.

➤ ***Who is involved?*** The Swiss Federal Statistical Office is responsible for implementing the indicator system. Data are made available through police, courts and administrative bodies. The survey is carried out by a survey company.

➤ ***How effective and costly is it?*** The indicator system provides an indication of relevant driving behaviour, their enforcement, and their trends, and can also be used for research purposes. In Switzerland, the investment costs were EUR 50 000; maintenance and administration costs are EUR 200 000 per year and require 1.5 person years. A survey costs EUR 70 000.

➤ ***More information?*** www.bfs.admin.ch/bfs/portal/de/index/themen/19/04/01/ind11.html
www.etsc.be/documents/perfindic.pdf

*Good practice*

### Monitoring mobile phone offences in Great Britain

➤ ***What is it about?*** The use of mobile phones while driving increases crash risk. It is therefore of interest to monitor the proportion of drivers who use a mobile phone. In Great Britain, road side surveys of mobile phone use were carried out in 2002, 2003 and 2004 at 38 sites in South East England. Phone use was recorded using a combination of visual observation and an electronic mobile phone detector to maximise the reliability of the observations. In the 2004 survey, over 110 000 cars and 27 000 other vehicles were observed.

➤ ***Who is involved?*** The survey is carried out on behalf of the British Department for Transport.

➤ ***How effective and costly is it?*** The surveys give information about the actual use of mobile phones while driving and the trends over time. The costs are relatively low. About 2 to 3 people per site collect the data. In total, it takes about 40 site-days per survey. The amount of time necessary to manage the data collection is negligible, since observation data are entered directly in a laptop. An investment has to be made to purchase the electronic detectors.

➤ ***More information?*** www.trl.co.uk

## In-depth crash data

In-depth crash studies aim to get more detailed information about the causes and the outcome of crashes than available from police records. In in-depth studies, crashes are reconstructed retrospectively by investigations on-the-spot, by interviewing participants and witnesses, by inspecting the damage to the vehicles involved, and by information about the sustained injury. Normally, in-depth studies focus on specific crash types. The extra information is used to detect shortcomings and potential improvements in, for example, vehicle design, road design, road user training, and medical care. In-depth studies are rather common in other transport modes, but less common for road traffic. One of the reasons may be that it is a rather costly type of study. Nevertheless, there is an increasing amount of experience with this type of crash analysis, for example in France, Germany and the United Kingdom and in the framework of the European projects PENDANT ([1]) and SafetyNET ([2]).

*Promising practice*

### In-depth analysis of heavy truck crashes in the Netherlands

➤ ***What is it about?*** It concerns a pilot research project, aiming to explore the possibilities for primary and secondary safety improvements of heavy trucks. In-depth data are collected from inspections at the crash sites, from police and hospital information, and from the road users that were involved. This way the crash can be reconstructed and analysed. During the pilot, data of 30 crashes were collected. In addition, 30 control group locations were investigated to control for the effect of exposure. The police notified the researchers when a relevant crash had happened. Within 24 hours, the crash location was inspected and questionnaires were sent out to involved parties and witnesses. Vehicles were inspected later. The police collected the data according to their own procedures and submitted this information for the in-depth analysis.

➤ ***Who is involved?*** The data were collected by the TNO Research Organisation and Dutch Crash Investigation Police departments. TNO is responsible for data coding, data analysis and maintenance of the database.

➤ ***How effective and costly is it?*** The small number of crashes (30 in all) does not lend itself to reliable analyses, even though interesting indications about the problem of heavy truck crashes have already become visible. It is estimated that a sample of 1 000 crashes is needed to find statistically significant results. The costs are EUR 3 000 per crash and EUR 1 000 per control group location.

➤ ***More information?*** www.dft.gov.uk



(1) http://ec.europa.eu/transport/road_safety/pdf/projects/pendant.pdf
(2) http://ec.europa.eu/transport/road_safety/pdf/projects/safetynet.pdf

# Concluding remarks

You have just reached the end of this comprehensive road safety handbook, after having encountered a wide variety of measures that have been proven to be (cost-)effective or are very promising in that respect. We realise that not all measures will be equally suitable for all Member States. It largely depends on, among other things, the current safety level, the measures taken so far, and the particular safety problems in a country. For countries with a shorter history of road safety measures other measures may be more relevant than for countries with a longer tradition of road safety work. Furthermore, it is of eminent importance that road safety measures are embedded in a (national) road safety plan that is based on thorough analyses of the road safety problems each respective country is facing now, or might face in future.

You may wonder why a particular measure did not make it into the document. The main reason is that we wanted to be concise. Our aim was to describe a number of measures in each of the categories of road safety measures, but it was impossible to present an exhaustive list of best, good and promising measures. Final selection was based on Member States' proposals and subsequent judgments based on strict criteria. As a consequence, some measures may not have reached us as potential good practices, other may have reached us, but the 'proof' of their effectiveness was less convincing than that of other measures in that category. In the *Final report* of the SUPREME project you can find an overview of all submitted measures ([1]).


And last, but not least, the measure descriptions had to be kept short. Should you seriously consider applying one of these measures, you will most likely need additional information. The links in the example boxes provide a first step in getting that extra help and information. Additional information may be found on the website of the European Road Safety Observatory (ERSO), which is currently being created within the EU project SafetyNet. This site is still under construction, but provides a lot of information about road safety issues and road safety measures and, in addition, it contains an extensive list of national and European institutes, organisations and governments, involved in road safety. ERSO is accessible at www.erso.eu

All in all, we hope that this handbook will further motivate and inspire you to continue to prevent the very significant number of road casualties, and fight for safer traffic measures in an efficient and effective way.



(1) The *Final report* is available at http://ec.europa.eu/transport/road_safety/pdf/projects/supreme.pdf

# Annex: overview of best (B), good (G) and promising (P) measures

| Institutional organisation of road safety | | |
|---|---|---|
| Road safety visions | Sustainable safety (B) | NL |
| Road safety visions | Vision Zero (B) | SE |
| Road safety programmes and targets | Federal action programme for greater road safety (P) | CH |
| Efficiency Analysis | TARVA (B) | FI |
| Resource allocation | Road safety fund (P) | BE |
| **Infrastructure** | | |
| Land use and network planning | Hierarchical, mono-functional road network (G) | NL |
| (Re)construction and design | Low speed zones in residential areas (B) | various |
| (Re)construction and design | Roundabouts (B) | various |
| (Re)construction and design | Measures against tree collisions (P) | FR |
| (Re)construction and design | High risk site management (G) | various |
| Signing and marking | Rumble strips (B) | SE |
| Signing and marking | Variable message signs (G) | various |
| Maintenance | Winter maintenance (B) | FI |
| Quality assurance | Road safety audits (B) | various |
| Quality assurance | Road safety inspections (G) | various |
| **Vehicles and safety devices** | | |
| Safe car design | Euro NCAP (B) | various |
| Two wheeler crash protection | Mandatory bicycle helmet use (P) | various |
| Vehicle conspicuity | Daytime Running Lights (B) | various |
| Vehicle conspicuity | Bicycle side reflection (B) | various |
| Driver support system | Intelligent Speed Assistance (P) | various |
| Prevention of unsafe traffic behaviour | Alcohol Ignition Interlock (B) | various |
| Prevention of unsafe behaviour | Event Data Recorders (black boxes) (B) | various |
| **Road safety education and campaigns** | | |
| Road safety education | The road safety label in the Netherlands: Zebra Seef (P) | NL |
| Road safety education | Educative continuum (G) | FR |
| Road safety education | Flits! A multi media theatre monologue (G) | BE |
| Drink driving campaign | The BOB-Campaign (G) | BE |
| Seatbelt campaign | Goochem, the Armadillo (G) | NL |
| Campaign on pedestrian visibility | The sign of light (G) | LV |
| Campaign for young car passengers | Speak Out! (B) | NO |

| | | |
|---|---|---|
| **Driver training** | | |
| Training in driving schools | The initial driver training (G) | DK |
| Accompanied driving | More experience for learner drivers (G) | SE |
| Insight-based driver training | Safety Halls (G) | SE |
| **Traffic law enforcement** | | |
| Speeding | The safety camera programme (B) | UK |
| Speeding | Automatic speed enforcement (B) | FR |
| Speeding | Section control (B) | NL |
| Drink Driving | Random Breath Testing (B) | various |
| Seatbelt and child restraints | Targeted seatbelt enforcement (G) | DK |
| Penalty point system | Penalty points (G) | LV |
| **Rehabilitation and diagnostics** | | |
| Rehabilitation of severe violators | Mandatory driver improvement (G) | AT |
| Rehabilitation drink-driving offenders | Training course for recidivist drunk drivers (G) | CH |
| Rehabilitation of young offenders | Rehabilitation seminar for novice drivers (G) | DE |
| Diagnostic assessment | Traffic- psychological assessment of drunk drivers (G) | AT |
| **Post accident care** | | |
| First Aid | First aid courses integrated in driver training (G) | various |
| Emergency calls | Promoting the implementation of eCall systems (P) | FI |
| Efficient emergency responses | Towtrucks on the motorway (G) | NL |
| Efficient emergency responses | Emergency lanes in congestion (B) | DE, CH |
| First treatment and transportation | The use of a mobile intensive care unit (B) | DK |
| First treatment and transportation | Transport of road crash victims by helicopter (B) | NL |
| Psychosocial support | Psychological support for road crash victims (P) | ES |
| **Statistics and In depth-analysis** | | |
| Road crash statistics | Correcting for underreporting of road traffic fatalities (B) | NL |
| Road crash statistics | The Rhône road trauma register (B) | FR |
| Exposure data | The National Travel Survey (B) | UK |
| Exposure data | The road safety information system (P) | LV |
| Safety Performance Indicators | Monitoring speed and drink-driving offences (B) | CH |
| Safety Performance indicators | Monitoring mobile phone offences (G) | UK |
| In-depth crash data | In-depth analysis of heavy truck crashes (P) | NL |

# Project Members

| | | |
|---|---|---|
| KfV | KfV<br>Kuratorium für Verkehrssicherheit (Co-ordinator) | AT |
| ÖRK | ÖRK<br>Austrian Red Cross | AT |
| IBSR | IBSR-BIVV<br>Institut belge pour la sécurité routière/ Belgisch Instituut voor de Verkeersveiligheid | BE |
| CDV | CDV<br>Transport Research Centre | CZ |
| DTU Transport | DTF<br>Danish Transport Research Institute | DK |
| DVR | DVR<br>Deutscher Verkehrssicherheitsrat e.V. | DE |
| CERTH/HIT | CERTH/HIT<br>Hellenic Institute of Transport | EL |
| FITSA | FITSA<br>Foundation Technological Institute for Automobile Safety | ES |
| INRETS | INRETS<br>Institut National de Recherche sur les Transports et leur Sécurité | FR |
| NRA | NRA<br>National Roads Authority | IE |
| SIPSiVi | SIPSiVi<br>Italian Society of Road Safety Psychology | IT |
| ETHK | ETEK<br>Cyprus Scientific and Technical Chamber | CY |
| CELU | CELU<br>satiksmes izpete, SIA (Road Traffic Research Ltd) | LV |
| TRRI | TRRI<br>Transport and Road Research Institute | LT |
| KTI | KTI<br>Institute for Transport Sciences | HU |
| WHO | WHO<br>Europe World Health Organization – Regional Office for Europe | |

| | | |
|---|---|---|
| ADT | ADT<br>Malta Transport Authority | MT |
| SWOV | SWOV<br>Institute for Road Safety Research | NL |
| TNO | TNO<br>Business Unit Mobility & Logistics | NL |
| DHV | DHV Group | NL |
| TØI | TØI<br>Institute of Transport Economics | NO |
| IBDIM | IBDIM<br>Road and Bridge Research Institute | PL |
| PRP | PRP<br>Prevenção Rodoviária Portuguesa | PT |
| Vozimo pametno! | SPV<br>Slovene Road Safety Council | SI |
| VÚD Výskumný ústav dopravný | VÚD<br>Transport Research Institute Inc. | SK |
| bfu | bfu<br>Schweizerische Beratungsstelle für Unfallverhütung | CH |
| VTT | VTT<br>Technical Research Centre of Finland | FI |
| vti | VTI<br>Swedish National Road and Transport Research Institute | SE |
| TRL | TRL Limited | UK |
| CIECA | CIECA<br>Commission Internationale des Examens de Conduite Automobile | INT |
| ETSC European Transport Safety Council | ETSC<br>European Transport Safety Council | INT |

European Commission

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