SWOV
INSTITUTE FOR
ROAD SAFETY RESEARCH

RESEARCH
ACTIVITIES

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Contents:

Editorial

This issue of Research Activities opens with an article about the analysis of the annual Dutch road safety figures in 2006. You will also find articles about the SWOV contributions to the European projects RIPCORD and SafetyNet.

No further reduction in Dutch road fatalities in 2006

Fewer fatalities among car occupants, more among cyclists

Since the mid-1970s, the annual number of traffic fatalities in the Netherlands has shown a decreasing trend. In 2004 there was a sudden sharp decrease in the number of road deaths of 19%, from 1088 to 881, followed by a further decrease to 817 in 2005. The 811 fatalities in 2006 seem to indicate that the number of road deaths has levelled out and that the decrease was not a one time fluke. Both the number of fatalities and the number of in-patients in the period 2004-2006 are lower than would be expected from the decreasing trend in the period 1990-2003.

This is one of the conclusions of a recently published SWOV-report on the road safety situation in the Netherlands in 2006. The report discusses the numbers of casualties in 2006 and tries to find an explanation for the developments in terms of mobility, road user behaviour and road safety policies. The analyses have been made on the number of police registered fatalities. In the Netherlands, the underreporting of fatalities in the period 2004-2006 was around 10%.

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QUOTE

Managing speed is the most important measure to reduce death and injury on our roads. And ISA is a robust, simple and reliable technology to achieve this objective.

Jörg Beckmann,
(former) ETSC Executive director

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Developments car occupants and cyclists

The developments of the numbers of road deaths have been examined for different modes of transport and types of conflict, for different groups of individuals, for different types of road, for different regions and road authorities, for different time periods, and for several combinations of these types of characteristics. Although a variety of developments was found, the most remarkable developments for the year 2006, as compared to the average of 2004 and 2005, are a decrease of 12% in the number of fatalities among car occupants and an increase in the number of road deaths of 16% among cyclists. The reduction in fatalities for car-occupants can mainly be ascribed to car-car crashes. Most of the casualties are males in the age groups 18-24 and 40-59 who are the result of crashes on 100/120km/h roads, and crashes that happen at night-time.
The increased number of cyclist fatalities can for a large part be attributed to bicycle-car crashes involving older cyclists and occurring on 50km/h roads.

Transport mode of victim	Number of police registered fatalities in 2006	2006 vs. average 2004-2005
Pedestrian	66	-10 (-13%)
Bicycle	179	+25 (+16%)
Moped	44	+6 (+16%)
Light Moped	19	+1 (+3%)
Motorbike	57	-24 (-29%)
Car	323	-44 (-12%)
Delivery van	21	+4 (+24%)
HGV	9	-2 (-14%)
Total	**730**	**-47 (-6%)**

Number of police registered fatalities by transport mode of the victim

Year	Fatalities
1997	1235
1998	1149
1999	1186
2000	1166
2001	1083
2002	1069
2003	1088
2004	881
2005	817
2006	811

Road fatalities in the Netherlands 1997-2006, corrected for underreporting; Source: Ministry of Transport

Growth of bicycle mobility among older cyclists

In 2006 there was a stagnation in the mobility growth. Overall, the mobility was 0.3% lower than the average of 2004 and 2005. The mobility of cyclists increased with 0.3% as compared to the two previous years; the mobility of older cyclists (60+ years) increased with over 5%. This could partly explain the increase of fatalities among older cyclists who have a relatively high death rate in comparison with other cyclists.
Car mobility, on the other hand, was 1.8% lower than expected. With 14.5%, car mobility decreased most in the group of young drivers (18-24 years) who have a relatively high crash rate. This could be part of the explanation of the reduction of fatalities among car drivers.

Additional measures needed

The results of the analysis do not give a reason to adjust the recent SWOV road safety prognoses for 2010 and 2020. It remains uncertain whether the Dutch road safety targets can be achieved without taking new, additional measures. SWOV will develop proposals for additional measures in 2008 and present these to the designers of the new Road Safety Strategy 2008-2020.

The report "Road safety in 2006; Analysis of crashes, mobility, behaviour and policy" Report number R-2007-14 can be consulted and downloaded from www.swov.nl. The report is in Dutch, and has an English summary.

Road safety impact assessments

On 26 February 2008, the Transport Committee of the European Parliament discussed a report of the European Commission on a Directive for road infrastructure management. The Directive will focus on various instruments, including road safety impact assessments, road safety audits and safety inspections. According to the Transport Committee, the Directive should contain non-binding guidelines and best practices for infrastructure improvements and should be restricted to the Trans-European Network (TEN).

Developing guidelines and identifying best practices for road safety impact assessment was one of the areas of interest of the EU project RIPCORD-ISEREST. This project set out to develop 'best practice tools' and guidelines for infrastructural road safety measures (see Box). Considering that most casualties occur on single carriageway rural roads, RIPCORD-ISEREST focused on road infrastructure measures for this type of roads, rather than just for motorways. The project started in 2005 and was finalised in December 2007. The final report and the various deliverables will soon be available on www.ripcord-iserest.com.

Road safety Impact Assessments

One of the topics of Workpackage 2 of RIPCORD-ISEREST, led by SWOV, was Road safety Impact Assessments (RIA). RIA is a methodology to assess, in advance, the likely impact of road infrastructure investments on safety. These can be major infrastructural schemes, such as constructing a new motorway or a new bridge, that may or may not be intended to raise the safety level. Here it is important not only to look at the expected safety impact on the constructed roads, but also to look at the potential effect on the adjacent road network. A RIA can also be applied

for wider schemes, such as national or regional transport and mobility plans that are likely to affect the safety level of the total network. An example of this application was piloted in Norway, where a formal RIA was conducted on a selected number of measures of the Norwegian National Transport Plan 2010-2019. The road safety effects are usually estimated on the basis of scientific knowledge as published in handbooks. Cost-benefit analyses are a useful addition, in particular if several alternatives are available and need to be compared.

Accident Prediction Models

For road safety policy making, including for conducting RIAs, good insight is required in the safety level of various roads as well as in the variables that explain these levels. Accident prediction models (APM) provide this insight. An APM is a mathematical formula which describes the relationship between the safety level of an existing road and the variables explaining this level. APMs were also dealt with as part of the work conducted in WP2 of RIPCORD. It was concluded that the most important explanatory variables for the number of accidents are traffic volume and road length. Other explanatory variables investigated included road width, curvature, number of connecting roads and the proportion of heavy goods vehicles. To determine and quantify explanatory factors, much good quality data is required. These are usually not available, hence there are few good examples of APMs that include explanatory variables other than traffic volume and road length.

A pilot study in Austria, Portugal and the Netherlands for different road types confirmed that in each case traffic volumes and road length were important predictors of the number of accidents. The extent of their contribution, however, differed in each of these countries and for different road types. Therefore, it is not advisable to use an APM that was developed in another country or for another type of road.

The results of RIPCORD-ISEREST, including the final report of workpackage 2 and the overall final report can soon be found on the website www.ripcord-iserest.com.

The objective of the EU project RIPCORD-ISEREST was to develop best practice guidelines for:
- Road Safety Impact Assessment tools and Accident Prediction Models
- Road Design and Road Environment
- Road Safety Audit
- Road Safety Inspection
- Black Spot Management and Safety Analysis of Road Network

The project consortium consisted of 17 partners from 14 countries covering scientific organisations, road safety institutes, universities, road authorities and private companies. The consortium coordination was in the hands of the German Federal Highway Research Institute BASt.

New impulses to SWOV's international cooperation

SWOV considers international cooperation to be a very important aspect for a national research institute. SWOV has a long term history of international activities, including participation in international expert groups and European research projects, and the exchange of researchers. Recently there have been a number of new impulses to expand our international cooperation to formal agreements with overseas universities and research institutes for mutual exchange.

Exchange of knowledge and expertise

For SWOV international cooperation is important, since it allows us to learn about other views and approaches, and to keep abreast of the policy and scientific developments elsewhere. It also allows us to test one's own research to the expertise of international colleagues. As such it is a valuable input for our work in the SWOV research programmes. Moreover, as part of a well-performing road safety country, SWOV considers it as her task to inform countries with a shorter history of road safety interest, about the Dutch approaches, such as Sustainable Safety, and the knowledge that is developed by SWOV and other Dutch research institutes.

EU projects, international expert groups and exchange of staff

Participation in EU projects is one way to realise international cooperation. Another way is to participate in international expert groups such as those of the OECD/ITF, IRTAD, ETSC, WHO and World Bank. Clearly, SWOV is also a member of the Federation of European Road Safety Institutes FERSI. SWOV has received various researchers from other countries to visit SWOV for some time, as part of a sabbatical or in connection to international research work, e.g. the current Network of Excellence HUMANIST. The last decennia, SWOV has been involved in numerous of this type of international activities (see *Box* for some examples).

Overseas Memorandums of Understanding

Recently, SWOV more explicitly looked for possibilities to cooperate with overseas research institutes. In March 2007, SWOV and the Highway Safety Research Centre (HSRC) of the University of North Carolina signed a Memorandum of Understanding to formalise their cooperation in the area of road safety. Part of the memorandum was the mutual exchange of researchers. SWOV researcher Martine Reurings went to Chapel Hill last year to study the Highway Safety Information System that is operated by HSRC. In April this year HSRC researcher Laura Sandt will come to SWOV to contribute to the follow up of the SUNflower projects. Last year, a visit was payed to the United States to discuss the Strategic Highway Research Program and SWOV was appointed as a liaison member of the SHRP2 Technical Coordinating Committee on Safety Research. Currently, we are also in contact with the Monash University Accident Research Centre in Melbourne, Australia to discuss the possibilities of mutual exchanges of staff and closer collaboration.

Examples of current or recent EU projects with SWOV involvement:
- CAST
- DRUID
- HUMANIST
- In-Safety
- PEPPER
- RIPCoRD-Iserest
- SafetyNet
- SUNflower
- SUPREME

Examples of recent expert groups with SWOV involvement:
- OECD-ITF JTRC working group on Young drivers
- OECD- ITF JTRC working group on Speed management
- OECD- ITF JTRC working group on Ambitious Road Safety Targets
- ETSC expert group on IRTAD Road Safety Performance Index (PIN)

The elderly and road safety can go hand in hand

Specific electronic in-vehicle assistance and adjustments to intersections are beneficial for the road safety of drivers in the age group 75 and over. SWOV researcher Ragnhild Davidse was awarded her PhD at the University of Groningen on 13 December 2007 for her research of the behaviour of older drivers.

"The elderly are slow drivers and pay insufficient attention". "The elderly are a danger on the roads". In her thesis, Ragnhild Davidse negates these preconceived notions. "Older drivers have to deal with age-related limitations, but they generally know well how to compensate for them." With the prospect of a substantial increase in the number of drivers aged 75 and above in the coming years, this conclusion sets the mind to rest.
However, the elderly *do* have a higher fatality rate. This is not so much due to a larger risk of being involved in a crash, but more so to their physical vulnerability. If they are involved in a crash, they have a relatively high risk of being killed.

Intersections: a problem for older drivers

Intersections are more of a problem for the elderly than for younger drivers. Older drivers are particularly often involved in crashes when turning left at an intersection. This manoeuvre is actually one of the most complex tasks when driving a car: drivers have to process a lot of information and carry out multiple tasks simultaneously under pressure of time. This generally is more of a problem for the elderly.
Davidse suggests two types of countermeasures that can be of support to older drivers in that particular situation. In the first place, adjustments can be made to the intersection design to clarify the traffic situation. Examples are providing clearly visible road markings, and removing obstacles which obstruct the view of the intersection. In the second place she mentions electronic in-vehicle support systems. "On approaching an intersection, future navigation systems could for instance give information about the priority regulation at a location and about the limited view of intersecting traffic. They could even give a signal when it is safe to merge or cross. These types of messages are also useful for other drivers. They facilitate the driving task for everyone."
However, the safety gain is expected to be larger for the elderly, because they function closer to the limits of their abilities. All the same, some of the elderly are more alert than some of the younger drivers.

Like a fish in water

Ragnhild Davidse has always held a fascination for traffic behaviour. "Already when I was studying I participated in a SWOV study of the effects of rewarding safe road user behaviour. A year after completing university, I started work at SWOV. They were very supportive when I told them I wanted to start PhD research. I found Professor Wiebo Brouwer of Groningen University prepared to be my supervisor. My colleague Marjan Hagenzieker was found willing to be co-supervisor. A substantial part of my PhD research was part of the regular SWOV research programme."
Davidse feels like a fish in water at SWOV. "The wide variety of research topics keeps the work exciting."
As a follow-up to her PhD research, Davidse will study existing examinations and training courses for elderly drivers. This new project is a collaboration between the Dutch Driving Test Organisation, Groningen University and SWOV, and will focus on questions like: "Are current examinations sufficiently accurate?" and "Is there a risk that an older person wrongfully loses his driving license?" Because the latter is what we wish to prevent.

Ragnhild Davidse's PhD thesis, entitled 'Assisting the older driver; Intersection design and in-car devices to improve the safety of the older drive', can be consulted and downloaded on http://www.swov.nl/rapport/Proefschriften/Ragnhild_Davidse.pdf.

Compensating for unexpected behaviour

During each car journey you are likely to encounter risky situations, but fortunately, they generally end well. This is the result of our ability to react quite well to unexpected traffic situations. SWOV researcher Maura Houtenbos investigated this talent and presented her findings in the thesis *Expecting the unexpected*, for which she was awarded a PhD at Delft University of Technology on January 8th 2008. Her findings are essential for the development of Advanced Driver Assistance Systems (ADAS) as ADAS will also influence interaction behaviour.

In traffic, road users nearly always encounter other road users and it is important that they handle this safely. In her PhD research cognitive psychologist Maura Houtenbos studied the interaction process between car drivers and the role of their expectations within this process. In a first study, she investigated aspects of drivers' expectations in interaction situations. Subjects were presented with photos and video clips of interaction situations and were asked for their expectations. Next, driving simulator experiments were used to investigate how drivers react to other road users' expected and unexpected behaviour. Using two linked driving simulators, these were quite innovative experiments. These linked simulators made it possible to investigate interactive behaviour between two human drivers, rather than focusing on the interaction between a human driver and pre-programmed other road users.

Unexpected behaviour not necessarily unsafe

The results indicated that expectations do indeed play an important role in the interaction process between drivers. Perhaps surprisingly, another driver's unexpected behaviour does not result in an unsafe situation most of the time. The encounters usually end well due to compensatory behaviour of other drivers involved in the interaction. If, for example, another driver does not seem to yield, you will simply decide to brake yourself.
Maura Houtenbos: "When I talk about this at a party, I often get comments like: sure, isn't that obvious? But the research also showed that people are barely aware of the fact that they are so strongly inclined to compensate for other people's unexpected behaviour."

Fewer 'near-misses'

Two factors appeared to be of specific importance for interaction between drivers: uncertainty about the other's intentions and the time and space available to react to each other's behaviour: the interaction space. The study also looked at the effects of increasing the interaction space, for

example by improving the view of the intersecting road or by providing extra in-vehicle information. The latter was done by using beeps and flashing lights to inform drivers about the direction and speed at which traffic on a side-road approached the intersection. Increasing the interaction space did not seem to affect the decision whether or not to yield. However, hard braking occurred less and there was a decrease in the number of near-misses. Interaction also took place more efficiently.

Social forgivingness

Maura Houtenbos completed her Psychology study with an internship at the Netherlands Organization for Applied Scientific Research TNO. "That's where my interest for applied psychological research in traffic comes from. Towards the end of my studies, my professor drew my attention to a vacancy in the BAMADAS project (Behavioural Analysis and Modelling for the Design and Implementation of Advanced Driver Assistance Systems). This research programme was financed by the Netherlands Organisation for Scientific Research and the Dutch mobility cooperative Connekt, and carried out by researchers from different Dutch universities. One of the universities was Delft University of Technology (TU Delft) and Professors Andrew Hale and Peter Wieringa at this university became my supervisors. The BAMADAS position provided me with the opportunity to carry out my PhD research partly at TU Delft and partly at SWOV." At present Houtenbos works at SWOV full-time. "At this moment I am working out the social aspect of the Sustainable Safety principle 'forgivingness'. We are investigating how people can compensate for each other's behaviour and consequently prevent errors that may result in a crash. As expectations about and anticipation of the behaviour of other road users seem to be important factors here, there is a nice link with my PhD research."

Maura Houtenbos' PhD thesis entitled 'Expecting the unexpected: a study of interactive driving behaviour at intersections', may be consulted and downloaded on http://www.swov.nl/rapport/Proefschriften/Maura_Houtenbos.pdf

In-patients not the same as severely injured

A hospital admission is not always the result of severe injury. Therefore, using the concepts of in-patients and severely injured as synonyms is not correct. This is SWOV's conclusion after analysis of the data of road crash casualties who were admitted to hospital over the 1984-2005 period. SWOV advocates using the number of severely injured in-patients as a road safety indicator instead of the total number of in-patients.

During the 1984-2005 period, the number of (registered) road deaths decreased by 54%. According to the Dutch National Medical Registration, the number of in-patients as a result of a road crash went down by 'only' 16% over the same period. In order to find an explanation for this difference in development between road deaths and severely injured, SWOV analysed the data about injuries and other characteristics of the hospital admissions during this period.

No severe injury for one-fifth of the hospital admissions

One of the findings of the SWOV analysis was that in-patients are not always severely injured. Road crash casualties are often taken into hospital overnight for observation, after which it may be apparent they have not sustained any serious injury. These in-patients may also include those with symptoms which are the result of e.g. alcohol poisoning, mental complaints or symptoms of drowning. In these cases unambiguous diagnosis in relation to the crash is impossible.
Over the years, the proportion of these types of hospital admissions has grown to an average of 8%; it has even reached 18% for car occupants. According to medical criteria, another 14% of the hospital admissions involve patients with slight injury.

MAIS2+ injury: a better indicator

SWOV is of the opinion that the number of in-patients is not a correct indicator of road safety and proposes to use in-patients with at least moderate injury (injury severity with a minimum of MAIS2; see *Box*) instead. The injuries of these hospital admissions are marked out sufficiently objectively and are clearly defined. MAIS2+ injury includes road crash casualties who have sustained injuries like serious fractures, dislocations, concussions and internal injuries with lasting effects or injuries which require a long period of recovery.
SWOV recommends using road deaths and severely injured as indicators for the road safety criteria rather than road deaths and in-patients. Restricting ourselves to just using the number of road deaths as an indicator is too limiting. Moreover, this number is influenced by incidental, sometimes large fluctuations. The number of in-patients with MAIS2 injury is a good addition, but it must be certain that these are indeed only the in-patients with MAIS2+ injury severity.

More information can be found in SWOV report R-2007-2 'Hospitalized road crash injured; Developments in numbers, injury severity, and length of stay since 1984'. This report is in Dutch, but has an English summary. It may be consulted and downloaded on www.swov.nl under Publications.

Injury severity: AIS and MAIS

Several international systems are available to determine injury severity. The so-called AIS, Abbreviated Injury Scale, is often used in research of road crashes. The AIS distinguishes six severity categories, ranging from light to fatal injury. The AIS system assigns a severity category to each of the casualty's injuries. Next, there are several possibilities to determine the casualty's overall injury severity. The simplest way is to use the severity rating of the most severe injury; this is called the Maximum AIS or MAIS. The MAIS therefore has the same categories as the AIS. MAIS2+ then means that the severest injury a casualty has incurred must at least be classified as AIS2.

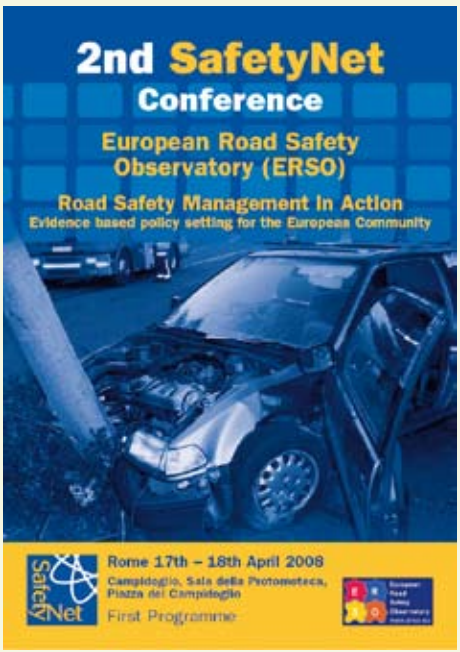
SafetyNet manual on Safety Performance Indicators

The SafetyNet manual on Safety Performance Indicators (SPIs) is available now on www.erso.eu/data. The manual aims to assist EU countries in collecting relevant data for producing national SPIs and to make them comparable at the European level. The manual will be formally presented at the second SafetyNet conference on 17 and 18 April in Rome.

Safety performance indicators (SPIs) are an intermediate measure of road safety. The final measure would be the number of crashes in several severity categories. SPIs can, for example, be used to assess the current safety level, to monitor developments, to evaluate safety interventions and to make comparisons between countries or regions. The manual discusses SPIs in seven relevant road safety areas (see *Box*). One of the advantages of using SPIs in addition to the number and severity of crashes, is that SPIs give an indication in which safety area a country or region lacks behind and, hence, in which area there is room for improvement. Another advantage is that SPIs can help to find explanations for the road safety developments in a country. Furthermore, SPIs allow for assessing the effect of safety interventions, where the number of crashes would be too small for reliable analyses.

A proven relationship with crashes

As an intermediate measure of road safety, the most important requirement for an SPI is that it has a proven causal relationship with number and severity of crashes. For example, the number of parking violations would not be a good SPI, since there is hardly evidence that this number is related to the safety level of a particular area. On the other hand, there is plenty of scientific proof that e.g. average speed, the use of safety belts, driving under the influence of alcohol, and road design do have an impact on the safety level. Detailed information on these issues can be considered as good SPIs. A further important requirement is that the SPIs provide quantitative rather than qualitative information. This and other theoretical issues concerning the use of SPIs in the seven identified safety areas are presented in a separate SafetyNet report, entitled *Safety Performance Indicators: theory.*



The need for harmonized SPIs

Many countries already collect data on SPIs. A problem, however, is that countries or even regions often collect different types of information or they collect similar information but in a different way. This makes comparisons of the safety developments, one of the important purposes of SPIs, impossible. The use of harmonized, comparable SPIs across the EU enables benchmarking as a proven tool in road safety policy. The recently published SPI manual provides details about which data needs to be collected in what way, so that finally each country would have a uniform set of data on each of the relevant SPIs.

The SPI manual

For each of the seven identified safety areas, the manual defines quantitative SPIs, demonstrates existing practices for their measurements, provides best practice examples, and details the procedures which are necessary to collect and process the required data for the estimation of the SPIs on a national level. The procedures and methods presented in the manual must be considered as the minimum quality requirements for producing national SPIs. In addition, the manual provides a more general theoretical background concerning the sampling issues in estimating SPIs, including sampling size, sampling error, stratified sampling, representativeness of the results, and estimating confidence intervals of the SPI values.

For example: SPIs in the area of speed

As an example, in the area of speed, the manual sets out the planning and implementation of representative vehicle speed surveys. Eventually, the analysis of the survey data would need to result in the following minimum set of speed indicators, separately for each road type and separately for day and night time:

- Average speed for light vehicles;
- Standard deviation of speed for light vehicles;
- 85th percentile of speed for light vehicles;
- Percentage of light vehicles over the speed limit;
- Percentage of light vehicles 10 km/h over the speed limit.

The manual also describes which locations are suitable for speed measurements; which road types should be distinguished; which time periods are valid for speed measurements, and so on. It also provides detailed recommendations on the random selection of measurement sites, the sample size, the measuring devices, as well as data analysis, documentation and reporting.

SafetyNet Conference in Rome

On 17 and 18 April, the second SafetyNet conference will take place in Rome. One of the sessions will specifically deal with various aspects of SPIs, including the formal hand-over of the manual. Other issues at the conferences are road safety management, road safety trends in Europe, comparison between countries, in-depth crash analyses, and, last but not least, the European Road Safety Observatory ERSO as a source for knowledge for decision makers and road safety practitioners in EU Member States.

The SPI manual and various other documents on SPIs can be downloaded from http://www.erso.eu/data/content/performance_indicator_statistics.htm.
The programme of the second SafetyNet Conference in Rome as well as a registration form is available at the homepage www.erso.nl.

The SafetyNet manual discusses the required Safety Performance Indicators in seven relevant road safety areas:

- Alcohol and drugs use;
- Speed behaviour;
- Usage of protective systems;
- Daytime running lights;
- Vehicle characteristics (passive safety);
- Road quality (infrastructure); and
- Quality of trauma management.

Speed support and the intelligent vehicle: system assistance for safer speeds

For speed management, the largest road safety effects are to be expected from Intelligent Speed Assistance (ISA) and to a lesser extent from Advanced Cruise Control (ACC). This is one of the conclusions of a SWOV study into the effects of promising intelligent vehicle systems for speed support. The study was carried out together with the Delft University of Technology in the framework of the Dutch Transumo project.

Speed management is a central theme in traffic management, aiming to optimize traffic in terms of safety, travel times and the environment, by reducing speeding and speed differences in traffic. It has been estimated that in about 30% of fatal road crashes excessive speed is involved, making speed one of the crucial factors in road safety.

Speed limits

According to Sustainable Safety, speed limits are the core of the speed management system, and they must be safe and credible (matching infrastructural design and road network layout). Speed limits are preferably dynamic, instead of static, so that they are adjusted to changing traffic circumstances, such as weather, traffic density, pollution levels, and incidents. And last but not least, road users have to be well-informed about the limits.

The most promising systems to assist the road user in chosing and/or maintaining the correct speed are various forms of Intelligent Speed Assistance (ISA) and Advanced Cruise Control (ACC) .

ISA

There are several types of ISA that vary in type of feedback and intervention level (informing, warning, intervening or automatic control) and speed limit type (static or dynamic). All types of ISA are expected to have positive effects, but effect estimates for the types that strongly intervene with the driving task show the best results.
ISA enables drivers to always have direct access to speed limit information in their car. The informing and warning types (also called SpeedAlert) can actually be seen as an additional feature of route navigation systems, and they recently started to be introduced on the market. Static informing ISA could result in a substantial reduction of fatal crashes on the entire road network. Speeding offences due to driver's mistake or misjudgment are expected to drop considerably with these systems. For enforcement they can add to the credibility and effectiveness of speed checks. According to a British study, the best results are to be expected from mandatory installation of automatic controlling ISA based on dynamic speed

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Colophon

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The SWOV website contains a wealth of information about a variety of road safety topics. The Knowledge Base and the SWOV fact sheets are all available in English. The library has extensive possibilities to search for international road safety literature and publications.

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limits, in all cars, with no possibility to overrule. According to this study, this type of ISA can halve the number of fatal crashes. The predicted effects of other ISA types are lower, but still positive.

ACC

Most ACC studies show a significant decrease of speed variations due to ACC which can result in considerable accident reductions. The best effects are expected on motorways, in non-congested traffic, and in good weather. ACC effects on other road types needs to be further assessed, as well as the effects of different time headway settings. More positive effects are predicted for the next generation ACC, which will be more designed to detect hazards, e.g. by car-to-car communication, and to operate in congestion prone traffic.
A combination of ISA and ACC may also be a good option. Where ISA reduces the mean speed and speeding, ACC may add to the system by reducing tailgaiting and speed variations. If individual cars supply their speed data to a traffic manager (e.g. through floating car data), it could give more reliable traffic information to drivers and an optimum speed advice for the given traffic situation.

Feasibility

An important aspect in creating a serious user demand for ISA will be to create an awareness of the benefits for the individual driver, combined with the collective interests for society as a whole. Upgrading current vehicles to intelligent vehicles may help achieve this. Combined functionalities may result in an integrated driver assistance system which is based on existing technology and can be improved with new technological developments. It can help to drive safely, avoid speeding tickets, optimize travel times and route planning, and drive in a comfortable and economic way. These benefits may make it easier to address the individual driver since he will get a more straightforward return on investment. Upgrading of the vehicle may also add to the product image and commercial attraction of the vehicle, while at the same time contributing to public goals.

Deployment

Public authorities, the industry and consumers/drivers are the main stakeholders for ISA deployment. Good cooperation between them is necessary for successful implementation of ISA, but so far there has only been little market activity. Effective deployment of ISA requires good coordination, both at the national and at the international level. Central governments are in a good position to lead the coordination process. In most countries, they have an important responsibility for the quality of the overall traffic and transport system, although other stakeholders can also play a crucial role. Furthermore, they have the overview of what is available in the market, how various applications can interact, and how ISA can be tuned to other speed management measures.

The scientific evidence of the predicted effects of promising intelligent vehicle systems for speed support is presented in SWOV report R-2006-25 'Speed support through the intelligent vehicle; Perspective, estimated effects and implementation aspects'. The report can be consulted and downloaded from the SWOV-website under Publications.

Publications

Most SWOV reports are written in Dutch but they all include an English summary. Below is a selection of reports that have recently been published by SWOV. Reports that were published in or after the year 2000 can be found on our website (www.swov.nl) and may be downloaded free of charge.

Assisting the older driver; Intersection design and in-car devices to improve the safety of the older driver

R. Davidse. 2007. SWOV-Dissertatiereeks. ISBN 978-90-73946-02-6. € 20.- (In English)
Drivers aged 75 years or older have a higher fatality rate. The main cause is their physical vulnerability; if they are involved in a crash they have a relatively high risk of being killed. On average, older drivers need more time to process information and make decisions; they experience more difficulty in dividing their attention and performing tasks under time pressure. However, they generally are very capable of to compensate for these age-related disorders. In her PhD thesis, SWOV's Ragnhild Davidse studies the possible effects of two types of measures: adaptations to intersections and electronic in-vehicle support devices.

Cyclist hospital admissions; An analysis of crashes and injuries

L.T.B. van Kampen. R-2007-9. 55 pp. € 11.25 (In Dutch)
Early 2007, two alarming developments were recorded for cyclists who are admitted to hospital after a crash: their number is increasing steadily, and their injury severity is hardly decreasing. This report describes the analyses that were made to find an explanation for these developments. The analyses look at the most important injury of each cyclist who was admitted to hospital, and distinguish between injured cyclists in crashes with a motorized vehicle as a crash opponent, the motor vehicle crashes, and those in crashes in which no motor vehicle was involved, the non-motor vehicle crashes.

Better safe than sorry; SWOV's contribution to the Strategic Road Safety Plan 2007-2020

F.C.M. Wegman. R-2007-10. 51 pp. € 10.- (In Dutch)
During the last few decades, the number of traffic casualties in the Netherlands has decreased considerably, but we still have the ambition to further reduce the number of casualties. necessary. It is SWOV's opinion that the Sustainable Safety vision provides ways and means to achieve this, and international support strengthens us in this idea. This report is SWOV's contribution to the drawing up of the Strategic Road Safety Plan 2007-2020, in which we expect a new target for 2020 to be presented. The Minister of Transport will offer the Plan to Parliament, and will indicate how the target is to be realized.

Expecting the unexpected; A study of interactive driving behaviour at intersections

M. Houtenbos. 2008. SWOV-Dissertatiereeks. ISBN 978-90-73946-03-3. € 20.- (In English)
During each car journey you are likely to encounter risky situations, but they generally end well. This is caused by the expectations (motorized) road users have about each other in traffic situations. SWOV's Maura Houtenbos studied this issue in her PhD thesis. The findings are important for the development of Advanced Driver Assistance Systems (ADAS) that can provide support for the communication between road users.

Fact sheets:

– Sustainable Safety; principles, misconceptions, and relations with other visions
– Background of the Sustainable Safety principles

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