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## Contents:



## Editorial

**SUNflower, SUNflower+6, SUNflowerNext? The opening article introduces and discusses how cooperation and comparison between countries and sub-national jurisdictions can contribute to road safety improvements.**

# SUNflowerNext: towards a composite road safety index

**Including the quality of policy and measures in studies as well as traffic casualties and traffic behaviour will enable a better understanding of the road safety within a country and between countries. A composite road saftey index uses all levels of the SUNflower road safety pyramid, including that of quality of policy plans and implementation of these plans.**

This is one of the findings from the SUNflowerNext study that was concluded in October in the framework of the European SafetyNet project. The study was carried out by SWOV, the Technion University in Israel, the British research institute TRL and the Czech research institute CDV.

### SUNflower: comparing countries

Comparison of one's own situation with that in other countries can be useful and motivating in the process of improving road safety. In doing so, however, it is important to compare the right indicators in the right manner. Developing a method to achieve this was one of the aims of the SUNflower project. The SUNflower project started in 2002 with a comparison of the developments in the three countries with the best road safety record in the preceding period: Sweden, the United Kingdom and the Netherlands, the so-called SUN countries. In a later phase, six countries from South and Eastern Europe joined. This was the SUNflower+6 project. SUNflower is now well-known and appreciated in the road safety world.

### SUNflowerNext: a composite indicator

A recently published report describes the way in which SUNflower intends to study road safety

*Continued on page 2*

QUOTE

**Once one person puts their seatbelt on, everyone else in the car is more likely to do so.**

*http://www.direct.gov.uk*

*Continuing from page 1*

in Europe. This is the SUNflowerNext project that has the SUNflower road safety pyramid at its centre. This pyramid has five layers (see Figure). Countries are usually compared using road traffic casualty data or relevant traffic behaviour, the so-called safety performance indicators. The SUNflowerNext study has attempted to link all five levels of the pyramid and to define a composite road saftey index based on the result. This gives a much more complete picture of the road safety performance of different countries and gives more insight into the areas in which countries can learn from one another. However, it must be noted that the study concludes that it is better not to compare all countries among each other, but that it is better to group countries first, and to make comparisons within groups and compare each country with the 'best of class' in that group. This is a known approach in so-called benchmarking.

## Road safety, policy, and implementation

According to the SUNflowerNext study the composite index will consist of a road safety index which comprises the top three layers of the pyramid, a policy indicator which comprises the bottom two layers of the pyramid, and an implementation indicator which links the different layers. For the policy indicator SUNflowerNext distinguishes between the quality of the organizational conditions (e.g. policy strategies, available budgets, institutional frameworks) and the quality of plans of action and individual measures held up against the light of ambitions and targets that have been set. The implementation indicator aims at showing the causal relations between the different levels of the pyramid; for example the relations between the concrete measures ('safety measures and programmes') and changes in safety performance indicators and developments in the number of casualties. For a reliable quantification of these relations, however, much work needs to be done, especially in terms of data gathering.

## Five tests

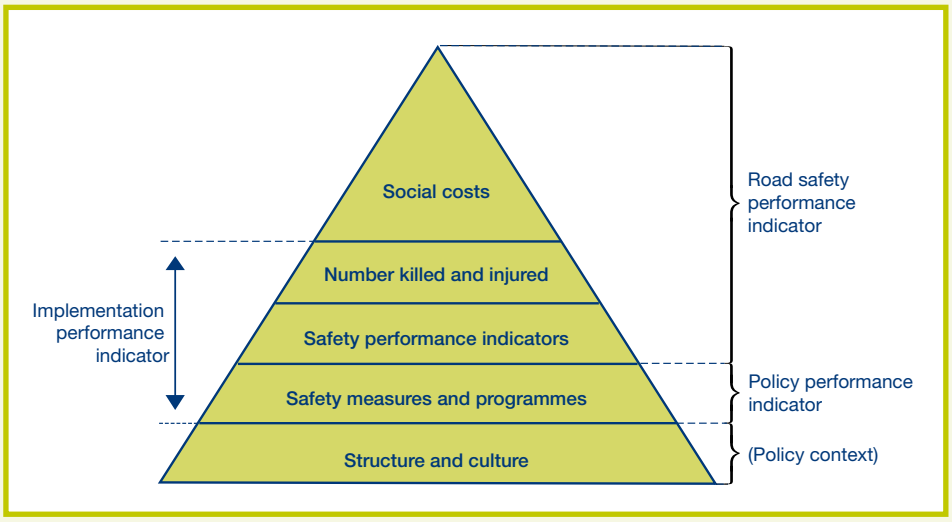
Using available data, several statistical tests were carried out in the SUNflowerNext project.

The road safety performance of countries was analyzed and weighted using principal component analysis and common factor analysis. Both methods appeared to be usable for the definition of a composite index. The results showed that the performance of a country using this composite index differs from the performance which is generated by a grouping based on a single indicator, such as mortality rate, as has been customary until now. It was illustrated clearly that information about policy and its implementation is essential for understanding why countries make more or less progress in casualty reduction.

## Developments over time

The SUNflowerNext study investigated the developments over time and the differences that are found between countries. These analyses seem to suggest that presently all countries are heading towards the same road safety position (mortality rate vs. fatality rate), but that they differ in the speed at which that happens. When we look at the developments in different crash types, large differences between countries are apparent. In some countries it is the pedestrian crashes that show a sharp decrease, in others it is the crashes involving passenger vehicles. Also when we look at the safety of, for example, different age groups or road types, many large differences are found between countries and between groups of countries. In other words: the road safety policy in each country appears to lead all these countries towards a similar position. But the sides of the road safety problem that need to be addressed are different for each country and therefore the policy required to reach the set road safety targets will also be different.

*The report 'SUNflowerNext: Towards a composite road safety performance index' can be consulted at www.swov.nl under Publications.*




*The SUNflower road safety pyramid: each layer has an effect on the layers above.*

# Dutch Road Safety Plan 2008-2020

**In September 2008, Dutch Parliament discussed and accepted the Ministry of Transport's Strategic Road Safety Plan 2008-2020. Cooperation, Integration and Sustainable Safety are the three cornerstones of the new policy plans. The new plans are aimed at making a more ambitious target for 2020 possible, as suggested by SWOV.**

### From, for and by everyone

The plan was developed in close cooperation and consultation with all actors in the field of road safety. As indicated by the subtitle of the document, the plan is from, for and by everyone, emphasizing the important role of regional and local authorities for road safety next to the central government. Several consultation rounds were organised to come to the final plan. Whereas SWOV was not formally involved in the process, the plan refers to many SWOV-publications and there have been many informal contacts to allow us to give our input.

### Cooperation, Integration and Sustainable Safety

The cornerstone 'Cooperation' refers to the need to work together on the issue of road safety; cooperation not only within the field of road safety, but also with relevant partners in adjacent policy areas such as police and education, and with relevant NGO's and the private sector. Integration, the second cornerstone, refers to the increasing need to fit in with other policy goals in the area of, for example, transport policy, the environment, and rural and urban planning. Finally, as the third cornerstone, the Sustainable Safety vision remains a basis for elaborating concrete solutions to reduce the number and severity of road crashes.

### Accompanied driving, ISA, alcolock

Whereas much of the current succesful policy will be continued, based on the motto *Never change a winning team*, a number of specific action areas have been determined. A distinction is made between groups who are the casualties and groups who cause the crashes. A list of 12 areas has been defined, including cyclists, elderly, young drivers, drivers under the influence of alcohol and drugs, excessive speeds, and main urban and rural roads. For each of the areas a number of specific measures are listed. For example, for young novice drivers, the introduction of accompanied driving will be considered; regarding excessive speeding the introduction of a closed ISA for repeat offenders is mentioned; and for drink driving the introduction of an alcolock for recidivists and heavy offenders is discussed. The necessary next steps will be to detail the proposed measures. These details will allow us to make final assessments of the implemented measures in terms of expected casualty reductions.

### Research

Research and the development of knowledge are considered crucial for the current plan and for further elaborations. SWOV has provided and will provide the building blocks for an 'evidence-based' road safety policy. Not only the Sustainable Safety vision, but also many of our studies have been mentioned in the plan and many of the currently intended measures were identified by SWOV as promising in previous years. For example, the intention to set a more ambitious target for 2020 is largely based on recent calculations on the estimated effects of the current safety plan. For the future, SWOV hopes that its research will further contribute to reducing the number of be road traffic casualties on Dutch roads.

*For more information on the Dutch transport policy, please consult the website http://www.verkeerenwaterstaat.nl/english/. The strategic road safety plan is available in Dutch only through the electronic SWOV library at www.swov.nl.*

# Considerably fewer **blind spot crashes possible** with set of measures

**A SWOV study has indicated that a considerable drop in the number of blind spot crashes in the Netherlands is indeed possible. This can be achieved by the introduction of a set of short and long term measures. The study was carried out in reaction to a discussion in Dutch Parliament about the blind spot issue.**

During the past four years, the number of fatalities among cyclists in blind spot crashes in the Netherlands was approximately 15 per year. Blind spot crashes usually happen when a lorry turns right while a cyclist is situated on the right, right front, or entirely in front of the vehicle, and is therefore outside the driver's immediate visual range. Lorry drivers have to give way to cyclists in these circumstances.
The study analyzed the serious blind spot crashes in the Netherlands and the corresponding police reports for the years 2006 and 2007. This data was supplemented with the results of a survey among cyclists who were injured in blind spot crashes and the lorry drivers involved. The researchers also gathered observational data at locations where blind spot crashes had occurred. To gain insight in the way cyclists and lorry drivers deal with the blind spot issue in actual practise, both road user groups were interviewed. In addition, the actual everyday traffic situation at the crash location and lorry drivers' behaviour in the cabin were studied.

### Main causes

Research shows three main causes of blind spot crashes for which measures should offer a solution:

- (high) lorries manufactured before 2007 do not offer their drivers a view of cyclists who are positioned in front or at the right front of their cabin; front view mirror or camera remedy this situation, but as yet they are insufficiently applied and used;
- lorry drivers fail to notice cyclists who are positioned at the right of their cabin due to inadequate use or poor adjustment of the right mirror;
- cyclists do not always make sensible use of their right of priority. Although lorries turning right should yield right of way to cyclists, cyclists sometimes claim their right of way in an inappropriate manner.

### Short term measures

The study resulted in a number of concrete recommendations. For the short term a coherent set of measures can reduce the number of blind spot crashes between lorries and vulnerable road users considerably. These measures are:

- A separation of cyclists and lorries at locations where lorries can turn right. This can be achieved by traffic measures like (the distance from) halt lines or give-way road-markings.
- A behavioural code for cyclists about where to position themselves in relation to a lorry and where not. This requires a media campaign.
- Build in an extra check by the lorry driver in which the front view mirror or camera must be used. This extra check must be included in the driver training and refresher courses for lorry drivers.
- All lorries should be fitted with a new front view system, including the vehicles that were constructed before 2007. In that year a front view system was made compulsory for new lorries.

### Long term solutions

For the long term SWOV proposes investigating a solution that makes it impossible for lorries and vulnerable road users to physically meet. The realisation of this separation requires only admitting heavy freight traffic to the main road network where distribution centres are situated. The secondary road network will then only be used by light distribution traffic. This solution fits better in a Sustainable Safety approach.

*SWOV report "The circumstances of blind spot crashes and short- and long-term measures" (R-2008-11A) is to be found at www.swov.nl under Publications. The report is written in Dutch, but has an English summary.*


## Daytime Running Lights

The European Commission has decided to introduce mandatory Daytime Running Lights (DRL) on all new types of motor vehicles from the year 2011 onwards. This will substantially increase the visibility of motor vehicles to other road users. The special daytime running lights switch on automatically when the engine is started and switch off as soon as the regular lighting is switched on. They have low energy consumption and differ from the present regular head lights.

# Fewer casualties among children

**During the last decades, the number of casualties among children has been decreasing considerably. In 2005, there were approximately 30 fatalities among 0-14 year-olds in the Netherlands as opposed to 120 fatalities in the late 1980s. This reduction of 75% is higher than that for any other age group.**

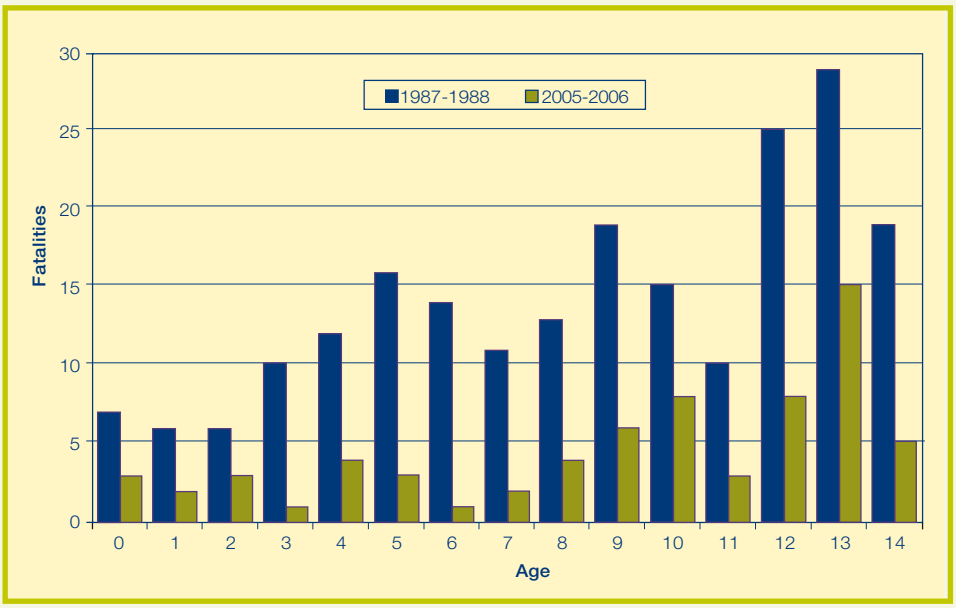
With an extensive analysis of the crashes and by studying the literature SWOV has surveyed the safety of children in traffic, identified the remaining problems and investigated possible measures. The study was aimed at children under the age of 14 who participate in traffic as pedestrians, cyclists, or car passengers. These transport modes are responsible for more than 90% of the traffic casualties among children in the ages 0-14. Most of children's casualties are cyclists. Although their number of hospital admissions, unlike that of adults, is not on the increase, it is a very substantial group with 63% of all hospital admissions.

The main crash opponent for cyclist fatalities are motor vehicles; relatively often these are delivery vans and lorries. Hospital admissions are especially the result of bicycle accidents in which no motor vehicle is involved. The majority of these accidents is one-sided, for example falling of the bicycle, cycling against a bollard, et cetera. Boys are overrepresented among both fatalities and hospital admissions.

## Largest gain among 6-12 year-olds

During the past 20 years, the number of registered traffic fatalities among children under the age of 14 has been decreasing with an average annual percentage of more than 6%. For other age groups this decrease was less than 3% per year. In the group 0-14 year-olds, the largest decrease was found for those aged 6-11 with an average annual decrease of 7.7%. With an annual average of approximately 2% the decrease of the number of in-patients among children was considerably lower.

The decrease of the number of casualties cannot be attributed to demographical developments, as the size of this age group has remained practically stable during the past 10 years. Also the measured traffic participation remained almost unchanged during the past 10 years and therefore does not offer an explanation for the decrease that occurred. Children younger than 6 are accompanied by adults during approximately 80% of their journeys; for children between 6 and 11 years old this is approximately 40%. Somewhat older data (1995-2002) also shows little development on this point. It is also important to be aware of the fact that the official mobility data (kilometres travelled, in this case) are not really a good indicator for children's exposure. This data, for example, does not consider playing outside as mobility, although children may indeed do this (less) in a traffic environment.
Therefore, the conclusion is that traffic has become safer for children during the last decades and that this increase in safety cannot be explained by a decrease in children's traffic participation.




*The total number of fatalities in the Netherlands among children of 0-14 years old in 1987/1988 and 2005/2006 (BRON 1987-2006).*

## Combination of measures

It is difficult to indicate precisely which factors contributed to the decrease in the number of casualties. It is likely to be a combination of measures relating to spatial and urban planning, infrastructure, vehicles, safety devices, public information, and education. Particularly the effects of the Sustainable Safety vision and the layout of 30 km/h zones deserve to be mentioned here. The safety improvements of passenger vehicles and the increased use of child restraint seats and seat-

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belts by children have most probably made a contribution.

### Bicycle helmets especially effective for children

Cyclists in the age group 6-14 are relatively frequently involved in serious crashes that often result in head injury, including severe brain injury. Therefore, wearing a bicycle helmet is an effective measure, especially for children. However, around their 6th birthday, children seem to be no longer willing to wear a helmet voluntarily. That is why parents should be made more aware of the benefits of wearing a helmet. Public information is a good way to encourage wearing bicycle helmets.

### Lorries and delivery vans

The share of lorries and delivery vans as opponents in fatal crashes with 0-14 year-olds is remarkably high. On average during the last few years, a lorry or delivery van has been involved in 30 to 35% of the fatal crashes involving a child. This percentage has only decreased slightly in the past 20 years. Recently SWOV has made a further analysis of the causes of crashes involving lorries turning right, the so-called blind spot crashes.
Furthermore, SWOV recommends to study the involvement of delivery vans in crashes in general and in those with children more in particular. The opening article of this issue of Research Activities discusses the SWOV analysis of blind spot crashes in more detail.

*SWOV report 'The road safety of children; A crash analysis and literature study' (R-2008-6) can be found at www.swov.nl under Publications. The report is in Dutch, but has an English summary.*

# Kick-off meeting of EU-project INTERACTION

**The EU-project *Differences and similarities in driver INTERACTION with in-vehicle technologies* organised its kick-off meeting on 27 and 28 November in Lyon. The project focuses on when, how and why drivers interact with in-vehicle technologies and on the effects of longer term use on driver behaviour, performance and safety.**

The project is coordinated by the French institute Europe Recherche Transport, a subsidiary of the better known INRETS research institute. The consortium consists of 12 partners from 8 EU countries and Australia. SWOV is one of the partners and responsible for a work package that aims to assess the behavioural effects of in-vehicle technologies using a naturalistic approach. INTERACTION is intended to continue for 3.5 years.

### Potential benefits, potential risks

It is generally assumed that in-vehicle technologies have a large potential to improve safety, and an increasing number of empirical studies confirm this. Many of these studies, however, were performed under experimental conditions or in relatively small-scaled field trials. Less is known about the longer term effects as well as about the potential compromising effect of inappropriate use or poor design. Potential risks associated with in-vehicle technology relate to, for example, distraction, over-reliance, mental overload and behavioural adaptation. INTERACTION will use various methods and approaches to assess these potential risks and the ways to prevent them.

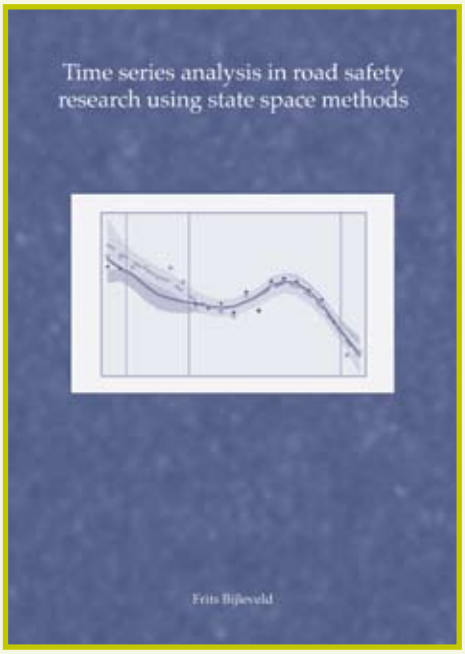
### Naturalistic driving

One of the methods used in INTERACTION is naturalistic driving. The naturalistic driving approach means that during the test period participants drive their own car in their own environment and for their own purposes. There is no experimenter present. Information about road behaviour and the traffic situation is collected using in-vehicle data recorders and video equipment. This approach results in realistic, unbiased information about day-to-day driving behaviour in various circumstances. SWOV will be in charge of this activity which will consist of field trials in six European countries and in Australia. Assessments will also be carried out using experimental and in-depth approaches.

# Time series analyses in road safety research

**On 4 November, SWOV researcher Frits Bijleveld successfully defended his thesis *Time series analysis in road safety research using State Space Methods*. With his mathematical background Frits Bijleveld has been one of SWOV's data analysis specialists for more than 20 years. During this period he carried out a search for reliable analysis methods that account for the imperfections that are characteristic of empirical data series.**

Under supervision of Siem-Jan Koopman, professor at the VU University Amsterdam and co-promotor Kees van Montfort, professor at the same university and at Nyenrode Business Universiteit, Frits Bijleveld's work has now resulted in a PhD.




In his thesis he discusses the elements of a new method for time series analyses of inaccurate or incomplete road safety data. He describes the practical applicability of this new method using empirical road safety data.

### Quantitative relations

The thesis, the fourth in the SWOV dissertation series, has the statistical approach of road safety issues as a basis. For example: to what extent do specific developments or measures contribute to the decrease of the number of casualties and what does that tell us for the future? For a quantitative answer to this type of question, numeric relations are required between observed changes in the number of crashes or casualties on the one hand, and the possible explanations on the other hand: changes in policy, changes in traffic behaviour, changes in exposure, the introduction of specific measures, et cetera.

### Incomplete and inaccurate data

Both road safety data and the possibly explanatory data show many imperfections and inaccuracies. If the analyses do not allow for this, they may result in incorrect or unjustified conclusions. Inaccuracies are caused, for example, when the actual data is estimated on the basis of random samples. This results in observational errors that may even vary over time. Sometimes data for a particular year even lack altogether. Another complicating factor arises when road safety is examined for a longer time period. It must then be taken into account that the developments during that period may have influenced the safety in different ways during that period. For example, there are developments that mainly have an effect on the development of crashes, and developments that mainly influence the severity of crashes. Underregistration of crashes must also be taken into account. If both types of development occur more or less simultaneously, a model must also analyse the numbers of crashes and the numbers of casualties simultaneously.

### A new approach

In his thesis, Bijleveld introduces a new approach to the accepted time series analyses applied to road safety research as a contribution to solving this type of problem. This new approach is based on so-called structural time series models and combines three fundamental aspects simultaneously. This new approach for instance makes it possible to include multiple explanatory variables as well as multiple dependent variables, such as the number of crashes and the number of casualties. In addition, the model accounts for observational errors or even for missing data. Finally, the approach enables the researcher to decompose the road safety process and its uncertainties in interpretable components. Using empirical road safety data Bijleveld illustrates the effectiveness and applicability of this new methodology. Topics that are discussed in his thesis are, for example, the registration level of crashes, the ways of determining urban and rural mobility, and the effects of weather conditions on road safety.

*The summary of Frits Bijleveld's thesis entitled 'Time series analysis in road safety research using state space methods' can be found on www.swov.nl under Publicaties.*


## Colophon

Research Activities is published three times a year by SWOV, Institute for Road Safety Research in the Netherlands. Research Activities contains articles about road safety research and scientific projects carried out by SWOV and by others.

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

# ITMA 21st World Congress

**The International Traffic Medicine Association (ITMA) aims to increase and disseminate scientific knowledge about reducing road traffic crashes, injuries and fatalities, and about enhancing safe outside-mobility for impaired persons.**

ITMA organizes world congresses covering all areas of Traffic Medicine and its associated disciplines. Its 21st international congress will be held in the Museum voor Communicatie in The Hague on 26-29 April 2009. The motto of the congress is safe mobility for young and old. A wide variety of subjects will be covered and some of the topics that will be highlighted are 'Drivers with neurological disorders', 'Drivers with aging related disorders', 'Young drivers and brain development, and impairments', and 'Data sources and registration systems for crashes and injuries'. SWOV researcher Divera Twisk participates in the organisation of the congress.

The ITMA congress is of interest to a wide range of professionals involved in medical, behavioural and technical aspects of Road Safety and Driver Rehabilitation. This includes medical doctors, psychologists, occupational therapists, car-adaptation experts, engineers, policy makers and many others.

*More information is available on the ITMA website www.trafficmedicine.org. Here you can also find the procedure with regard to registration.*

# CAST Final Conference

The European project CAST, Campaigns and Awareness-raising Strategies in Traffic Safety developed a handbook for the design of road safety campaigns and an evaluation tool. Both products aim to facilitate the implementation of effective campaigns throughout Europe. SWOV researcher Divera Twisk held the position of quality officer in the project. At the final conference in Brussels on 26 and 27 January 2009 the results of the CAST project will be presented. The conference marks the end of the three-year project which started in February 2006.

*More information about the project and the conference is available on the CAST website www.cast-eu.org.*

# Publications

Below is a selection of reports that have recently been published by SWOV. Most SWOV reports are written in Dutch, but they all include an English summary. 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. Fact sheets are also placed on our website under Research.

**Recognizability of category transitions in infrastructural design; Literature study of the guidelines and knowledge concerning category transitions, particularly those on intersections**
R.F.T. Brouwer, L.T. Aarts & W.J.R. Louwerse. R-2008-9. 36+ 3 pp. € 10.- (Dutch) .
An important Sustainable Safety principle is the recognizability of roads, and the predictability of the road's course and road user behaviour. This not only applies to road sections, but also to intersections. Intersections have the important characteristic that they often are the location of a transition between two road categories. This literature study makes an inventory of what is known about the layout of transitions at intersections and about the layout in relation with the recognizability of transitions.

**Safety effects of route choice in a road network: Simulation of changing route choice; Research in the framework of the European research programme In-Safety**
A. Dijkstra & H. Drolenga. R-2008-10. 64 + 5 pp. € 16.50 (English).
In the Netherlands, the concept 'Sustainably safe traffic' is the leading vision in road safety policy and research. Important requirements following from this vision are that journeys should follow safe roads as much as possible, should be as short as possible, and the quickest and the safest route should coincide. This report focuses on the development of a method which enables the planner to find out the safety effects of existing route choices, and also of changes in route choice. Safety indicators are formulated and used in a micro-simulation model. Safety indicators are required when evaluating the safety effects of the route choice of (all) vehicles in a network, and when evaluating the effects of changes in these route choices.

**The circumstances of blind spot crashes and short- and long-term measures; A crash analysis over the years 1997-2007, traffic observations, and surveys among cyclists and lorry drivers**
C.C. Schoon, M.J.A. Doumen & D. de Bruin. R-2008-11A. 105 pp. € 15.- (Dutch).
The Netherlands has been struggling with the blind spot problem for many years now: serious crashes involving lorries turning right and cyclists going straight ahead. Every single one of these crashes causes social unrest because of the severity of the crash and the idea that it must be possible to prevent this type of crash. This report gives an account of a study investigating the circumstances of blind spot crashes and measures that can be taken to reduce their occurrence. Report R-2008-11B contains the appendices to this report and does not have an English summary.

**Time series analysis in road safety research using state space methods**
F. Bijleveld. 2008. SWOV-Dissertatiereeks, ISBN 978-90-73946-04-0 € 20.- (Dutch).
This thesis, published in SWOV's dissertation series, takes the statistical approach to road safety issues as a starting point, for example: to what extent do specific developments or measures contribute to the decrease in the number of traffic casualties and what does that tell us for the future? A new approach toward the customary time series analyses is presented, specifically from the road safety research angle. The approach is based on so-called structural time series models and combines three fundamental aspects simultaneously.

**Factsheets:**
- Public information about road safety
- Negative emotions and agression

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