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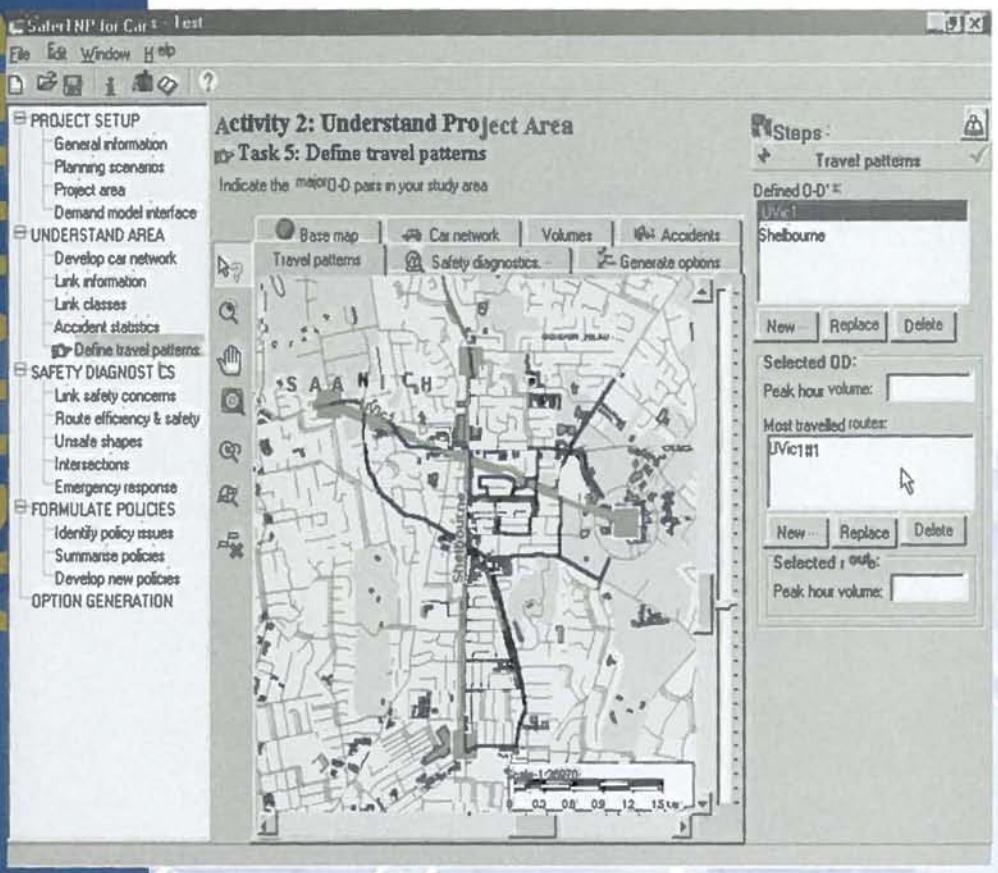
SWOV
INSTITUTE FOR ROAD SAFETY RESEARCH

RESEARCH ACTIVITIES



CONTENTS

Safer Transportation Network Planning

EVEN THOUGH ROAD SAFETY IS TO A LARGE EXTENT DETERMINED IN THE NETWORK PLANNING PHASE, IT IS NOT GENERALLY CONSIDERED TO BE AN IMPORTANT ISSUE IN THAT PLANNING PHASE. TRAFFIC ENGINEERS USUALLY REFER TO THE DETAILED LEVEL OF FACILITY DESIGN OF ROAD SECTIONS AND INTERSECTIONS FOR ACHIEVING ROAD SAFETY RATHER THAN TO THE NETWORK PLANNING STAGE. HOWEVER, AS THE FUNCTIONAL CATEGORIZATION AND THE STRUCTURE OF INFRASTRUCTURAL NETWORKS HAVE A TREMENDOUS AND LASTING INFLUENCE ON THE RESULTING ROAD SAFETY LEVEL, ROAD SAFETY SHOULD BE INTEGRATED INTO NETWORK PLANNING. SAFER TRANSPORTATION NETWORK PLANNING (SAFER TNP) IS BEING DEVELOPED AS A TOOL FOR INTEGRATING ROAD SAFETY INTO NETWORK PLANNING.

Problem identification

There are a number of possible causes for the current lack of attention for the safety implications of network planning. One plausible cause is that network planners do not (fully) realize that their decisions have structural effects on road safety. Networks are frequently implicitly determined by the design of city plans, without thorough consideration of road safety implications. But even when network planners are willing to address road safety as an important precondition for network design, another major problem presents itself, as there is no comprehensive knowledge available to

them on what makes a network safe or unsafe. Little is known about the safety effects of the different aspects of network design. What little knowledge is available is highly fragmented. Comprehensive guidance or insight is needed to achieve safety-driven network planning.

In short, the following problems need to be solved in order to allow road safety to become an explicit issue in network planning:

- Network planners must be made aware of the importance of considering road safety in the network planning phase;
- Sufficient information and guidelines on how to plan a safe network structure should be made available. This information should be presented in a comprehensive, structured manner so as to guide the designer through the process of "safety-driven network design";
- The consideration of road safety aspects of the network design should be made relatively easy, should not require too much extra time, and should not obstruct other city planning concerns.

A tool for Safer Transportation Network Planning (Safer TNP)

The abovementioned considerations are incorporated in a design tool called Safer TNP which SWOV is currently building in co-operation with the Insurance Corporation of British Columbia, Canada (ICBC). In Safer TNP, general information on safety planning principles is provided in several audio-visual presentations, and the need to incorporate explicit attention for road safety at a very early planning stage is explained. The Apply Module of the tool is based on an incorporated GIS, as is shown in the illustration on the front page. The Apply Module enables network planners to make the actual network design. They are guided through the "safety-driven planning process" step by step while being provided with the relevant, state-of-the-art information in every step. Planners indicate in which step of the planning process they are currently working, and they are then provided with the required drawing tools in the GIS, and with guidelines and recommendations relevant for that specific task (or, as shown, with the needed input screens). If planners require further information in addition to the guidelines and recommendations, they can refer to the Library Module of the tool. Users are then automatically linked to the specific items which are relevant for the task they are working at. This Library Module can also be approached separately for further reading or for searching particular information.
Safer TNP also evaluates alternative network designs with regard to the level of safety (the predicted number of accidents), which enables users to make a quantitative comparison of different network solutions.

As stated earlier, the amount of research on the relationship between road safety and network planning or land use planning is still limited. However, several road safety research institutes are currently performing research on these subjects. Therefore, new research information will probably become available in the (near) future. The information in Safer TNP will be updated regularly.

Planning

At present, two versions of Safer TNP are being developed, namely a Canadian and a Dutch version. A consumer release for both versions of the programme is planned for June, 2001. It is likely that more versions will be developed for other European countries. Since traffic and road characteristics and planning strategies can differ widely in various countries, those other European versions will have to be tailor-made for each country, in close co-operation with local experts.

ADVISORS: an introduction

Recently, the European Union (Directorate General Transport and Energy) granted a 3-year project called ADVISORS to a large international group of road safety research institutes and representatives of the automotive and transport industry. The project advisor is SWOV's Marion Wiethoff.

ADVISORS is an acronym for Advanced Driver assistance and Vehicle control systems Implementation, Standardisation, Optimum use of the Road network and Safety. ADVISORS aims to develop a methodology for assessing the impact of different types of Advanced Driver Assistance Systems (ADAS) that have been created to facilitate the tasks of drivers in the growing complexity of traffic conditions. This assessment is necessary as ADAS are being fitted to an ever-larger number of road vehicles while not much is known about their influence on safety, efficiency and environmental performance of the road transport system.

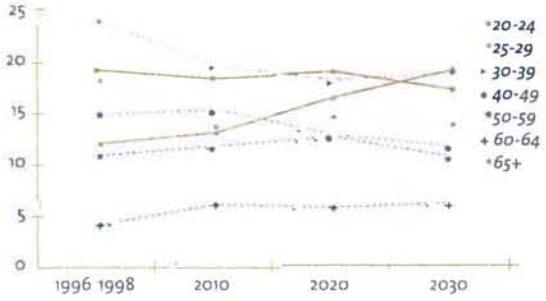
ADVISORS adopts a multidisciplinary, problem-focussed angle rather than a technology-driven approach. That is to say that the project will focus on instruments that are needed for safety, efficient use and the environment on the European road network rather than on what is technically possible. Since the final aim of ADVISORS is to make the implementation of ADAS feasible and functional, due attention will also be paid to the aspects that determine a successfull introduction of ADAS. For this reason, the various relevant stages for a potential breakthrough of ADAS will be investigated. The market conditions for ADAS, their impact on driving behaviour, road safety and environment, the role of the EU and of member states in the implementation of ADAS, public acceptance of ADAS, and implementation strategies of ADAS will be studied. On the basis of empirical studies of relevant aspects for an ADAS introduction and questionnaire surveys, a decision scheme will be developed to enable policy makers to introduce suitable ADAS successfully.

Elderly drivers: A preliminary study

IT IS A WELL-KNOWN FACT THAT MOBILITY IS INCREASINGLY IMPORTANT IN MODERN LIVES. IT IS EQUALLY WELL-KNOWN THAT THE NUMBER OF ELDERLY PEOPLE WILL INCREASE DRASTICALLY OVER THE COMING YEARS. SWOV PERFORMED A PRELIMINARY STUDY IN ORDER TO UNDERSTAND WHETHER ELDERLY DRIVERS CONSTITUTE A GROUP OF ROAD USERS THAT NEEDS FURTHER ATTENTION IN ROAD SAFETY POLICY AND RESEARCH. THIS RESEARCH SHOULD INDICATE WHETHER SPECIAL MEASURES COULD BE TAKEN TO ACHIEVE PROLONGED SAFE MOBILITY FOR ELDERLY DRIVERS.

The project showed that elderly drivers will become an important group of road users in the future, that there are measures which can be taken to enhance their road safety, and that further research is necessary before all measures can be implemented. The research consisted of three parts: an accident analysis, prognoses of the share of elderly drivers (65 years and older) in the total number of seriously injured drivers, and an inventory of potential measures for reducing the future travelled death rate of elderly drivers. The conclusions of each part are yielded below.

Seriously injured drivers by age group



Bron: SWOV AVV (verkeersongevallen)

Accident analysis

In this first part of the project, the number of casualties, the accident risk and the involvement in accidents of the elderly was compared with the situation in other age groups. The results of these analyses yielded the following conclusions:

- The travelled fatality rate is highest for drivers over the age of 75.
- The travelled casualty rate is highest for 18 to 24 year old drivers. Drivers over the age of 75 take second place.
- The high travelled fatality rate of drivers over 75 is determined by a high degree of vulnerability to a greater extent than in other age groups. The high travelled death rate of 18 to 24 year old drivers, on the other hand, is to a greater extent determined by a higher accident involvement rate. Therefore, elderly drivers, as compared to other drivers, will benefit most from an improvement of secondary safety: reducing the injury once an accident has taken place.
- A reduction in the number of accidents of elderly drivers (primary safety) can be achieved by designing measures which are aimed at avoiding the accident types caused by elderly drivers, such as right-of-way accidents, accidents as a result of not allowing another road user to pass, and accidents caused by left turns at intersections.

Prognosis

A prognosis was made to estimate the share of elderly drivers in the total number of seriously injured (hospitalized and killed) drivers. This prognosis, based on data on the trends of risks, mobility and the percentage of driving licenses, indicated that the share of elderly drivers will increase from 11.8 % (2000) to 14.3% in 2010. Another estimation procedure that is merely based on the increase of the elderly population, predicts that the share of the elderly will be 12.9% in 2010. Since this last estimation does not take into account the expected increase in mobility and driving license rate, it was taken as a lower limit. When applying this estimation procedure to the years 2020 and 2030, the share of elderly drivers in the total number of seriously injured drivers can be expected to increase to 15.7% in 2020 and 18.4% in 2030. This makes elderly drivers an important group of road users that should be taken into consideration in research and in policy making. This is especially true since they will have outnumbered the share of 20 to 24 year old drivers in 2030.

Inventory of Measures

A number of measures that might reduce the future travelled death rate of elderly drivers was discussed in the third part of the project. These measures included assessment procedures for identifying the most important risk groups, and ways of supporting drivers, such as sustainable safe adjustments of the traffic environment, telematics, education and training. The project report included research proposals for measures that require further research. SWOV will focus on two of these proposals, namely:

- To investigate the effects of the traffic environment on the behaviour of road users, and the extent to which a sustainable safe traffic environment connects with the strengths and weaknesses of elderly road users.
- To investigate the extent to which telematics can contribute positively to the harmony between the traffic environment and elderly road users.

Road safety policy: also within a European context

In past years, much has been accomplished by the European Commission (EC) with respect to improvements to road safety. The EC has concerned itself with vehicle requirements, with the requirements made of professional drivers, with ways to influence road user behaviour and raise public awareness of road safety, and with gathering and disseminating information. The progress report published by the EC in March 2000 describes the past developments in road safety that the EC has made. The EC communication describes both the progress of the proposed European road safety policy and measures which should receive priority in the upcoming period. The most important points in this policy are listed in the boxes, while a successful crashworthiness-testing programme is used as an example in the text to explain the current state of affairs.

The developments described in the progress report are in line with the plans the EC made several years ago in regard to improving road safety in Europe. These policy lines, as delineated in the Action Programme of 1997-2001, are also noted in the progress report. A crucial part of this Action Programme was the 'one million euro test': each measure that prevented a fatality and that cost less than 1 million euros would have to be adopted. In this Action Programme, the EC emphasized the enormous costs of road safety and propagated decision-making based on cost effectiveness studies by all responsible parties, from the European to the local level. The estimate of 1 million euros for each fatality (this figure also including other injuries and material damage) is an underestimate of the actual costs and thus indicates a lower limit. The EC also proposed to develop mechanisms that allow decision-makers and those who pay for road safety measures to become more aware of the impact of those measures. When the effects of road safety investments are clearly visible to the investors, they will be more willing to make new future investments. Finally, the EC advocated that all decisions concerning infrastructure are considered with regard to their consequences for road safety.

The progress report discusses several measures that are proposed to be implemented within a European context. An example of this is the EuroNCAP project: the European New Car Assessment Programme. As part of this project, crashworthiness tests using new cars are made in which the consequences of frontal and side impacts are examined not only for the occupants but also for crash opponents, and especially for participants in slow traffic. By thoroughly informing consumers about the safety of cars, the market could be influenced. In the Netherlands, the Ministry of Transport, Public Works and Water Management, the Royal Dutch Touring Organization ANWB, the Consumentenbond (the Dutch consumer union) and TNO (the Netherlands Organization for Applied Scientific Research) are co-operating to make the results of the tests available. Based on sales figures for certain cars that performed exceptionally well in the tests, the progress report asserts that it is possible to ascertain that EuroNCAP's methods are working. The project is partially funded by the European Union (EU).

The progress report also indicates which measures should receive priority within European road safety policy in coming years. In setting these priorities, the concerned representatives from all members states, as well as certain non-governmental experts, addressed

Current state of affairs

The progress report of March 2000 describes what the EC has done in the area of road safety since the appearance of the Action Programme 1997-2001. The following are examples of priorities in regard to European policy:

- EuroNCAP: European New Car Assessment Programme (see text).
- Stricter requirements for vehicles. The speed-limiting device for heavy goods vehicles has been introduced within the European context. Also undergoing preparation are regulations that address side protection and a more 'collision-friendly' front end for heavy goods vehicles.
- Regulations relating to road transfer and haulage. The tachograph should make it possible to insure compliance with driving and rest periods. EC regulations for second-generation tachographs will simplify this monitoring. Based on the introduction of these newer tachographs, digital equipment will be introduced by the year 2002.
- Co-ordination of training requirements. Agreements have been made about the examination requirements for consultants in regard to the transport of hazardous substances. Such consultants will have to be appointed within all companies dealing with such substances.
- Technical provisions on vehicles. Research is being conducted into the effect of black boxes in cars driven by unexperienced drivers and into the effect of Adaptive Cruise Control (ACC) on buses. ACC involves an automatic adjustment in the vehicle's speed when the distance to the vehicle in front of it is reduced to a certain value, and picking up the speed again when that is allowed.
- Providing road users with up-to-date information about road conditions. Tests are being conducted in which road users receive information about the weather, the condition of the road surface, the intensity of traffic and other circumstances so as to be able to adjust their speed accordingly.
- Alcohol, drugs and medicines. An efficient determination of the degree of intoxication is being encouraged as well as research into this topic.

the question of which topics would offer the best opportunities for improving road safety within the European context in the coming years. Three priority categories were defined : 'top priority' and 'high priority', both of which would be implemented best at the European level, and 'high priority' that would be supported by the EU but which would have to be implemented by the member states. As part of its involvement, the EC also wants to support national policy by means such as organizing the exchange of information.

Continuing the EuroNCAP project is one of the top priorities in which more attention is being devoted to pedestrians and cyclists involved in collisions with passenger cars. Another top priority is establishing a European road safety information system, the idea behind this being that there is a great deal of useful information within Europe that is not yet easily accessible.
A computerized system could make key data and knowledge gleaned from research available to everyone at their own work location. Research into the feasibility of such a system was previously conducted under the leadership of the SWOV Institute for Road Safety Research (R-99-22). The research report was discussed in Research Activities 12, October 1999. This study could become the basis for further planning. Other examples of realized European policy and important measures discussed in the communication are described briefly in separate boxes of text.

The communication from the EC thus shows that road safety is increasingly becoming a common European goal. Road safety can only be achieved if authorities on all levels (national, local, regional and European) commit themselves to it.

Priorities within a European context

The memorandum issued in March 2000 defined three priority categories in road safety measures that should be implemented within the EU.

Measures labelled as 'top priority'
These measures should be implemented at the European level and should therefore receive the most attention. Topics included here are:

- Continuing the EuroNCAP project in which more attention is being devoted to pedestrians and cyclists involved in collisions with passenger cars.
- Means of protection. This topic intended to include information campaigns and legislation.
- A European road traffic safety information system (see text)

Measures labelled as 'high priority'
The memorandum recommended that these important measures also be implemented at the European level:

- Speed management, including having this accomplished by such means as speed-limiting devices on vehicles between 3.5 and 12 tons.
- A European radio channel for traffic information that should encourage a better detection of incidents and a better management of lending assistance in emergencies.
- Control of the use of alcohol, drugs and medicines.
- Drawing up additional requirements in regard to the driving aptitude of drivers of motor vehicles.
- Introducing daytime running lights (DRL). As based on studies one of which was made by the SWOV Institute for Road Safety Research, most of the member states believe that DRL should be introduced, but certain member states have requested additional research into its cost effectiveness.

European measures at the national level
The communication also discusses measures with a high priority that the EC wishes to encourage but which will have to be implemented by the member states themselves. The EC wishes to support national policy in regard to these points by such means as organizing the exchange of information. These measures include:

- Attempting to have advertising take into more consideration possible effects in regard to road safety and to promote road safety in particular.
- Ensuring that the best possible assistance be provided to seriously injured casualties. The trauma helicopter being used in the Netherlands is a good example of this.
- Designing road layout in such a way as to minimize the occurrence of accidents and their consequences.

Special vehicles on public roads?

In recent years, increasing numbers of special vehicles have been appearing on European roads. Examples are open, lightweight three- or four-wheeled vehicles such as the quad, trike and Fun Tech. If a new vehicle type is granted type approval in one of the EU member states, the other member states are obliged to allow this type on public roads. The individual member states may, however, establish their own rules of behaviour for the users.

A SWOV research report for the Ministry of Transport, Public Works and Water Management (R-2000-9) contains recommendations for further national (Dutch) regulation of special vehicles. The report considers, inter alia, the above-mentioned quad, trike and Fun-tech, for which type approvals have already been awarded. The Netherlands are thus obliged to allow these types of vehicles on public roads. The question presents itself, however, as to where they should be allowed to ride and what safety devices could be made compulsory. Overall, the question presents itself as to whether "Europe" should indeed allow such vehicles.

The quad, trike and Fun-tech are recreational vehicles which allow a sporty driving style. The quad and trike can be categorized as three-wheeled motor vehicles, the Fun-tech 50 cc version as a moped. In the report it is concluded that the trike, which has a track similar to that of a car, is the only one of the three vehicle types that gives the impression of being relatively safe. The quad is considerably less stable in curves and when driven at high speed. It would seem obvious to prohibit these types of vehicles on motorways and trunk roads. Rules of behaviour such as those for mopeds should apply for the Fun-tech 50cc version.

Although it seems logical to make wearing of helmets compulsory for all of these vehicles, such a measure would offer only a limited degree of safety. When such a vehicle turns over, there is a large chance that the driver will end up underneath it. A helmet then affords insufficient protection. In addition, a helmet will offer very little protection in the event of a collision with a car or a heavy goods vehicle. Reasonable protection is provided only if a secure roll bar is fitted and a seat belt is worn. Compulsory wearing of helmets is, however, one of few measures that can be taken with these vehicles to provide some form of injury prevention. After all, new requirements cannot be specified for vehicles that are already on the market. Compulsory wearing of helmets could possibly deter people from buying and using these types of three- and four wheelers.

The fundamental question that should be asked is how to prevent such open vehicles from arriving on the road in the future. Of course, some of them look attractive, and driving them can be pleasurable in good weather. But for the SWOV, the question remains whether the (European) authorities should pay attention to such aspects when there are clear disadvantages in terms of road safety. Preferably, granting of type approvals should be made more difficult. One possibility for realizing this is by including extra safety requirements in the European framework directives for vehicles of this kind. Such requirements should relate to, inter alia, vehicle stability and specific requirements for prevention of injury to the drivers.

SWOV: Target figures essential in national traffic plan

Much to the satisfaction of the SWOV, road safety is to be one of the major elements of the National Traffic and Transport Plan (NVVP), which is to be published this autumn. This integrated policy document, which is the successor to the Second Transport Structure Plan, seeks an answer to the question as to how to achieve increased mobility in an acceptable manner in the coming years, that is without losing sight of quality-of-life considerations and safety.

As can now be seen, the NVVP comprises quantitative targets in the area of road safety. One such target is a reduction, by 2010, of 50% in the number of fatalities and of 40% in the number of casualties. As one of the advising parties in the creation of the policy document, the SWOV applauds such targets. Concrete target figures have after all been seen to help in creating and implementing policy. Clear objectives result in realistic plans for improvement of road safety and more efficient use of public resources. They also allow for regular examinations of whether the policy is having the desired effect and whether it should perhaps be made stricter.

Further growth of mobility must, after all, not be allowed to result in the roads becoming less safe. The Netherlands is still one the countries in Europe with the highest level of road safety, but it might lose its leading position. SWOV has ascertained this on the basis of developments at home and abroad. Solid plans for road safety, along with quantitative targets, are thus certainly not an unnecessary luxury.

Tineke Netelenbos, the Minister of Transport, Public Works and Water Management, recently mentioned a number of road safety measures that are to be found in the NVVP draft. For a large part, these measures fit within the vision of sustainably safe traffic, the first phase of which has virtually been completed (1997-2001). Work is now being done on the concepts and agreements for the second part. Examples of measures the minister mentioned are the provisional driving licence for inexperienced drivers, lowering of the maximum permitted blood alcohol content for such drivers, a reduction of the incidence of driving under drugs and medicines, and increased use of seatbelts. With regard to vehicle technology, the minister is considering measures that have a direct effect, such as blind-spot mirrors and side protection on lorries, and longer-term policy measures such as the black box and Intelligent Speed Adaptation. For the infrastructure there is the execution of further categorization of road sto make a clear distinction between roads for residents and those for through traffic.

The SWOV works on estimations of the effects of the intended measures. These estimations relate to the possible reduction in the number of fatalities and casualties and to costs/effectiveness. The estimates should show whether the measures are achievable and sufficient for achievement of the quantitative targets for road safety by 2010.

Publications

Most SWOV reports are written in Dutch but include an English summary. Below is a selection of reports that have recently been published by SWOV. Reports can be obtained by completing the SWOV order form that can either be found on the website, or that can be sent at request by Patrick Rugebregt of the Department of Information and Communication (Patrick.Rugebregt@swov.nl). The price of each report (in Dutch guilders) is mentioned in the following list, as well as the language in which the report is written. Reports can be paid by credit card. For bank transfers, we charge an extra Dfl 15,- per transfer. After SWOV has received your payment, the reports will be sent to you by mail.

Road safety consequences of new, special vehicle types.
C.C. Schoon & H. Hendriksen. R-2000-9. 70pp. Dfl 25,- (in Dutch).

Road Safety Audit, tools, procedures and experiences:
A literature review and recommendations
Research in the framework of the European research project SAFESTAR, Workpackage 8. R. van der Kooi (ed). D-99-5. 55 pp. Dfl 22,50 (in English).

Road safety: from research to realisation
An overview of recommendations from recent SWOV reports that have not yet been prepared or researched, but that are still relevant. D-2000-2. 17 pp. Dfl 15,- (in Dutch).

Transforming 'traditional' urban main roads into sustainably safe roads
Contribution to the Second International Symposium on Highway Geometric Design, 14-16 June 2000, Mainz, Germany. A. Dijkstra. D-2000-4. 23 pp. Dfl 17,50 (in English).

Vehicle compatibility in car-to-car collisions
Literature review in the framework of the EUropean research project "Improvement of crash compatibility between cars", Workpackage 1. J. van der Sluis. D-2000-1. 39 pp. Dfl. 20,- (in English).

Advice on practical testing of long and heavy vehicles
A further study of the road safety consequences of long lorry combinations up to 25,25 meters. C.C. Schoon. R-99-6. 35 pp. Dfl. 20,- (in Dutch).

The effect model of 'Sustainably Safe'
Results of consulting prospective users, and a proposition for the development of a model. L.G. Braimaister & J.A.G. Mulder. R-99-37. 24+19 pp. Dfl. 22,50 (in Dutch).

The TRIANGLE safety barrier at the H4-level
Development of a new safety barrier at the H4-level using the VEDYAC simulation program. J. van der Sluis. R-2000-11. 78 pp. Dfl. 58,- (in Dutch).

Loading tests on anchor bolts in asphalt
Tensile and shearing tests on three types of anchor bolts for H4-level barriers. W.H.M. Pol. R-2000-7. 72 pages. Dfl. 34,- (in Dutch).

The effect of vehicle mass, vehicle type and collision type on the seriousness of injury
Analysis of accident and vehicle data during the period 1996-1997. L.T.B. van Kampen. R-2000-10. 48 pp. Dfl. 22,50,- (in Dutch).

Safety aspects of traffic facilities in urban areas
A. Dijkstra. R-2000-5. 31 pp. Dfl. 20,-.

The effect model of 'Sustainably Safe'
Results of consulting prospective users, and a proposition for the development of a model. L.G. Braimaister & J.A.G. Mulder. R-99-37. 43 pp. Dfl. 20,- (in Dutch).

The availability of traffic education in the first 2 or 3 years of secondary school.
P.B.M. Levelt. R-99-35. 133 pp. Dfl. 40,- (in Dutch).

SWOV
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ROAD SAFETY RESEARCH

Colophon

RESEARCH ACTIVITIES is a magazine on road safety research, published three times a year by the SWOV Institute for Road Safety Research in the Netherlands. Research Activities contains summaries of research projects carried out by SWOV and by others.

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