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SWOV
INSTITUTE FOR
ROAD SAFETY RESEARCH

RESEARCH ACTIVITIES


CONTENTS



# PROMISING: planning mobility and safety

**The road safety of vulnerable road users would greatly benefit from measures that take both mobility and safety criteria into account. These measures are (sometimes highly) cost-beneficial. This conclusion is drawn in the European research project PROMISING, which was commissioned by the European Union. It was co-ordinated by the SWOV Institute for Road Safety Research.**

The PROMISING project aimed at developing measures that reduce the risk of injury to vulnerable and young road users as much as possible in a non-restrictive way. That is to say that safety and mobility must be improved together; the improvement of safety should not lead to reduced mobility. In the current situation in Europe, the mobility needs of vulnerable road users hardly receive any priority in traffic and transport planning.

As a consequence, safety policies often have a curative approach, which restricts the mobility of these vulnerable road users.

PROMISING focused on four groups of such vulnerable road users: pedestrians, cyclists, motorised two-wheelers (i.e. motorcyclists and mopedists) and young car drivers.

The differences between European countries in their transport modes were taken into account in this project.

## Pedestrians

The mobility needs of pedestrians in Europe have obviously been neglected in traffic and transport planning, as have those of cyclists. This should change, and only those safety measures that also enhance mobility should be promoted. PROMISING assessed about 100 measures for pedestrians on their safety and mobility effects and costs. Two of these are the most comprehensive and closest associated with urban planning and policy philosophies:

1) area-wide speed reduction or traffic calming schemes;
2) the provision of an integrated pedestrians-only network.

In addition to these complementary measures, other measures could also be taken to improve the safety of pedestrians. Vehicle users must be made to accept pedestrians as road users equal to themselves and to observe pedestrian rights. Road and traffic management can help to make drivers behave this way. Education, information and enforcement can contribute to achieving the right balance between pedestrians and other traffic. Additional incentives may be found in areas other than mobility and safety. One example of such an additional incentive is the environment.

## Cyclists

The same basic planning principles that apply for pedestrians, apply for cyclists. Because cycling is suitable for travel over greater distances, a bicycle network that distinguishes between a flow and an access function is needed, as is already the case for motorised traffic. However, provisions for cyclists should not simply be seen as additional features of the traffic structure for motor traffic. Rather, cyclists require a network of their own. PROMISING developed a hierarchy of roads according to function, design, and behaviour for all modes of transport. It was based on requirements of coherence of the network, directness, safety, comfort, and attractiveness on the one hand; and on the new concepts for road safety in the Dutch sustainably safe traffic system and the Swedish Zero Vision on the other hand.
Technical requirements for bicycles and other vehicles could also improve the safety of cycling.

## Motorised two-wheelers

The risk of a fatal accident per kilometre travelled is highest for riders of motorised two-wheelers. Some non-restrictive safety measures were identified for this group of road users. It is generally not recognised that different road design criteria should be applied for motorcycle/moped riding to those applied for driving in cars. The riders are much more vulnerable to imperfections of the road surface than car drivers, and special requirements have to be recognised for road markings, road surface repairs, longitudinal grooves, drainage, etc. A better consideration of the needs of motorised two-wheelers fits within a non-restrictive approach. Other non-restrictive measures are special traffic rules, such as those allowing motorbikes to overtake slow moving lines of cars and allowing them to ride on lanes with limited access. These special rules may give riders of motorcycles and mopedists some privileges compared to car drivers. Significant progress in safety requires that restrictive measures are also taken. Restrictive measures concern age limitations, vehicle requirements, and (correct) helmet wearing. Countries with a relatively low minimum age for riding a moped, or without compulsory training or licensing, should reconsider their regulations.

## Young drivers

Young car drivers have a higher risk of a fatal accident per kilometre travelled than pedestrians and cyclists of the same age do. It is crucial that measures are taken to increase their safety.
The majority of these measures are restrictive in nature.
Recommended behavioural measures for young drivers are, in general, restrictive. Lack of skill, inexperience, high exposure to difficult situations, and willingness to take risks expose young car drivers to different problems than other car drivers. Reduced car use is possible and has a positive result. Evaluation studies show that alternatives such as disco buses and cheaper public transport have a positive effect on road safety figures (see also "Why was there a temproary decrease in the accident involvement of young male drivers in the Netherlands?", (page 6). If alternatives for car use are brought into line with the specific mobility needs of young people, the restrictiveness of measures for reduced car use may be limited.
The minimum age for driving could also be raised. Other options for providing more safety for young car drivers could be alternative driver licence systems in which the learning phase is extended. Examples are a graduated licensing systems and an intermediate system, in which the full licence can only be obtained if the driver stays violation-free or observes restrictions such as accompanied driving, night curfews or a lower alcohol limit. A second test after probation could be added to this, to motivate drivers to gain experience and not to simply refrain from driving.

## Costs, benefits and effective measures

The costs of road safety measures are often tremendous, and there are many competing demands from society for improving the standard of living, for social activities, and for preservation of the environment and the cultural heritage. Cost-benefit analyses are therefore helpful and important for the introduction and promotion of new road safety measures.
The PROMISING project calculated the cost-benefit ratios of 20 measures (workpackage 5). The calculations were made of single measures only. Certain cost-benefit calculations were impossible to make, such as for

mandatory wearing of bicycle helmets, because the necessary assumptions cannot sensibly be made, yet.
However, the majority of the measures were highly cost-beneficial, the implementation of bicycle lanes being a very good example.
The analyses resulted in four main conclusions:

1. Measures that *reduce driving speed*, especially in urban areas, improve safety, and sometimes mobility, for pedestrians and cyclists. In order to further highlight the profitability of these measures, more kinds of benefits should be included in the analysis. These are social safety, mobility opportunities for children, elderly and handicapped people, as well as the quality of (residential) life.
2. The benefits of *facilities for pedestrians and cyclists* easily exceed their costs.
3. Measures that *improve conspicuity and visibility* of road users are cost-beneficial.
4. The implementation of measures regarding *injury protection* (underrun protection on trucks and helmet wearing for motorised two-wheelers) are cost-beneficial.

**A better balance between modes needs political support**

If the safety and mobility of all groups are to be enhanced in an integrated way, a better balance in mobility and safety for all modes of transport must be created.
Modes that will be promoted must be subject to higher quality requirements and to fewer restrictions. Political interventions are needed to achieve this, and road users ask for this change. Several studies (e.g. the SARTRE-survey, 1998) show that more people ask for a higher planning priority for walking and cycling than for car driving.

*The final report of the PROMISING project (D-2001-3) is available via SWOV, as are the six workpackages, the summary and an introductory leaflet. They will also be incorporated in the SWOV-website (**www.swov.nl**).*

*The PROMISING-project was carried out by SWOV, NTUA (Greece), VTT (Finland), BASt (Germany), TRL (U.K.), INRETS (France), KfV (Austria), VV (Netherlands), SNRA (Sweden), ENFB (Netherlands), I-ce (Netherlands / U.K.), CERTU (France), IfZ (Germany), UdB (Italy), UNIROMA (Italy), and TØI (Norway).*

INTERNATIONAL ACTIVITIES:

# Alcohol Ignition Interlocks, Seminars and Visitors

**A WORKSHOP ON ALCOHOL IGNITION INTERLOCKS, SEMINARS FOR VISITORS FROM THE CZECH REPUBLIC AND POLAND, AND A VISIT FROM THE MINISTER OF TRANSPORT FROM NORTHERN IRELAND. THESE WERE THE INTERNATIONAL ACTIVITIES THAT SWOV UNDERTOOK IN JUNE 2001.**

**Alcohol ignition interlocks**

On 11th June, an international workshop on Alcohol Ignition Interlocks was held at SWOV. The workshop was part of the EU project 'Alcohol Interlock Implementation in the European Union'. In this project, a large-scale practical experiment is being prepared in one or more EU countries. SWOV is the co-ordinator of this European project, of which a report will be published in September 2001. VTT (Finland), DTF (Denmark) and BASt (Germany) are partners in the project.
An alcohol interlock (alcolock) is a device in the car. The driver has to take a breath test before he/she can start the engine. If drivers have drunk alcohol, the car cannot be started. The alcolock is used in the USA, Canada, Australia, and Sweden as an alternative punishment for those who have repeatedly been caught driving under influence. The lock can also be used to replace a hard licence suspension by a probationary licence suspension.
The purpose of the workshop was mainly to exchange knowledge of the so-called alcolocks between the EU countries. Apart from this, the workshop discussed which countries were interested in carrying out a practical experiment with alcohol interlocks. During the workshop, Swedish and Canadian researchers held presentations about experiences with alcolocks in their countries. There was, furthermore, a great deal of discussion about the pros and cons of alcohol interlocks and about the possibilities and difficulties of a practical experiment in various EU countries. Several EU countries are positive about such a practical experiment.

*Photo: Dr. Beirness (Traffic Injury Research Foundation, Canada)*

**Seminars and visitors**

Other international guests visited SWOV to learn more about Dutch approaches towards road safety. The minister of Transport of Nothern-Ireland and his colleagues were especially interested in Dutch road safety policy and behavioural aspects in relation to road safety. Delegations of the national Police Force, the ministry of Transport and Communications, regional authorities, and the Transport Research Centre from the Czech Republic learned more about projects for speed reduction in traffic, alcohol and drugs, regional approaches to road safety and human behaviour (in traffic). The Polish National Road Safety Secretariat, the ministry of Transport, the national Police Force, local authorities, and the Motor Transport Institute were represented in a seminar that dealt with similar subjects.
Both seminars were organised in the framework of a Memorandum of Understanding between the Dutch ministry of Transport, Public Works and Water Management and its Czech and Polish counterparts.

# Telematics and Road Safety: where is it going?

**THERE ARE HIGH EXPECTATIONS OF TELEMATICS APPLICATIONS IN TRAFFIC. THE WHOLE WORLD IS RESEARCHING EXISTING AND NEW, TO BE DEVELOPED APPLICATIONS WHILE THE FIRST APPLICATIONS, SUCH AS NAVIGATION SYSTEMS AND ADVANCED CRUISE CONTROL, HAVE MADE THEIR ENTRY. THIS CAN GIVE THE IMPRESSION THAT TELEMATICS WILL ENSURE THAT, IN THE VERY SHORT-TERM, DRIVING WILL BECOME 'A PIECE OF CAKE'...BUT IS THIS SO? IS ROAD SAFETY SERVED WELL BY ITS IMPLEMENTATION IN TRAFFIC?**

In the SWOV report 'An inventory of ITS developments' (R-2001-17), these questions are asked. The report contains not only a general inventory of the existing Intelligent Transport Systems (ITS), but also reviews the national and international efforts in research as well as policy. It also reviews the expectations and wishes that exist regarding the implementation of ITS. Although the study showed that, in principle, ITS offer possibilities for improving road safety, there also seems to be a lack of clarity about the real (positive) contribution that ITS have to offer for road safety.

The most important reason for this is that it is by no means easy to design a system that can equal human possibilities. It perhaps sounds paradoxical, but in fact humans are extremely good at carrying out the complex task of driving a car. This is illustrated by the fact that the number of mistakes that eventually lead to an accident, is very small. This is certainly so if we take into account the amount of time we spend in traffic. If we want ITS to further diminish the chance of an accident, the machine must be better than the human being. And this is true only in a strictly limited number of areas.
For example, machines are especially good in quickly carrying out controlled tasks, but car driving requires much improvisation.

That is one of the reasons why systems are developed that only inform the driver, and do not take over any part of the driving task. Government policy also assumes that information and warning systems will be implemented before (parts of) the driving task have been automated.

### Types of ITS

ITS can be applied in-car or outside the car, as part of the infrastructure. The present systems aimed at road safety are mainly in-car systems. For ITS applications on and alongside the road, one can imagine dynamic route information, matrix road signs, or 'flash-poles'. In Japan, relatively much attention is also being paid to infrastructural ITS for preventing intersection accidents by, among other things, monitoring and regulating the traffic at intersections.

In the report, in-car ITS have been roughly divided into three categories: navigation systems and car-PC, so-called longitudinal control systems, and lateral control systems. The first category are purely informative systems that are not primarily aimed at safety. Navigation systems are aimed at helping drivers to reach their destination easily. This can work positively for road safety, because they prevent searching behaviour of drivers; this is one of the twelve requirements for a sustainably-safe road network. The presence of a navigation system can, however, also have a negative effect on road safety, because operating such a system can divert attention from the already very complex driving task. This diversion also applies to a much greater extent to the car-PC (also known as the office-on-wheels) because making a phone call, internetting, faxing, and word processing demand much attention.
Longitudinal control systems are designed to prevent frontal and rear-end collisions, mainly by adapting the driving speed. They can inform the driver about driving too fast, or a collision object getting closer, they can give warnings, or actually intervene. Examples of this are Advanced (Intelligent) Cruise Control (A(I)CC), Intelligent Speed Adaptation (ISA), and Collision Avoidance Systems (CAS). A(I)CC is a system that reduces speed if the distance to the vehicle in front becomes too small. ISA warns, or reduces speed, when the speed limit is exceeded (see box). CAS can be an ACC-type application in which the car is braked when a collision threatens.

Lateral control systems are meant to prevent vehicles leaving the road or overtaking incorrectly. This is often done with a camera scanning the verge line and, thereby, determining the lateral position of the vehicle. If the vehicle is a long way off its correct position, the driver is stimulated to correct his steering. This is done by visual, auditive, or haptic (steering wheel vibrations) warnings.
A new trend is to combine various of the above-mentioned systems, for example, a navigation system with ACC and lateral control.

It is, furthermore, striking that most of the developments are aimed at use on motorways, whereas the risks on such roads are relatively low. Most of the accidents occur on streets and roads with a speed limit of 50 km/h and 80 km/h respectively.

**Future expectations**

The expectations of the road safety effects of ITS are very high, especially in the United States and Japan. In Japan, the expectation is even that 80% of fatal road accidents can be prevented by implementing the various ITS. It is striking that governments and industry do not indicate their expectations per individual Intelligent Transport System. The fact that ACC is sold as a comfort system is revealing about this situation. Apart from this, research among experts shows that they are agreed about implementing ITS (navigation systems and ACC) in the short-term, but that there are rather varying thoughts about the expected (middle) long-term developments.

There are, simultaneously, both great expectations and obscurities about the safety effects of ITS. It is in any case clear that the implementation of ITS should only take place if the consequences of the use of ITS are well known. Before ITS are used on a large scale, there must be thorough research into how it can help drivers to carry out their task, without negative side-effects. SWOV will continue to study the strengths and weaknesses of humans and ITS, their interaction and the possible effects of the introduction of new ITS.

This research is being conducted, among other places, within the EU project ADVISORS (Advanced Driver assistance and Vehicle control systems Implementation, Standardisation, Optimum use of the Road network and Safety). This project is being directed by SWOV.

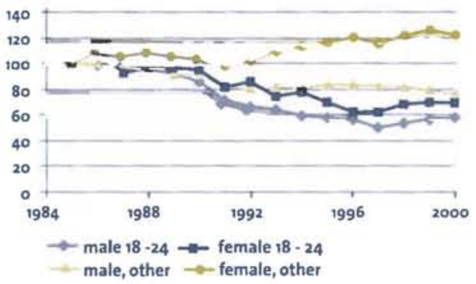
Public reports from this project can be found on **www.advisors.iao.fhg.de.**

## Road Safety consequences of ISA (Intelligent Speed Adaptation)

Intelligent Speed Adaption (ISA) is a system designed to prevent drivers from exceeding speed limits. The system uses a Global Positioning System (GPS), and in the car there is a CD-rom on which the road network and corresponding speed limits are stored. First of all, the GPS determines where the vehicle is, then the CD-rom determines what the existing speed limit is. When the speed driven is faster than the speed limit, the system, depending on the installed version, warns the driver or intervenes. Recently, a practical study was completed in the city of Tilburg. In this, especially the social support for ISA was studied, and the experiences of the users were evaluated. Research into ISA has also been carried out in Sweden and Great Britain. In the SWOV report 'Safety Consequences of ISA' (R-2001-11), these and other experiments with ISA are described. This report also makes estimates of the expected safety effects of a general introduction of ISA. Because the extent of the effects of speed reduction on road safety is relatively well known, it is possible to make such estimations for ISA. The conclusion is that ISA can result in a reduction of 25-30% in the number of (serious) injuries if a) it is generally introduced and working, and b) the system ensures that nobody drives faster than the present speed limits in the Netherlands. More experiments and large scale practical evaluations will increase the insight into the actual extent of the effects of this very promising system.


# Why was there a **temporary** decrease in the accident involvement of young male drivers in the Netherlands?

**In the late eighties and early nineties, the number of young male drivers (18-24 years old) involved in serious accidents decreased considerably in the Netherlands. The decrease was larger in this period than the decrease for young female car drivers and car drivers of other age categories (see Figure 1). Since 1998, the picture has slightly changed. The number of young male car drivers involved in serious accidents is increasing again, whereas the number of male car drivers in the other age categories continues to decrease, be it relatively slowly.**

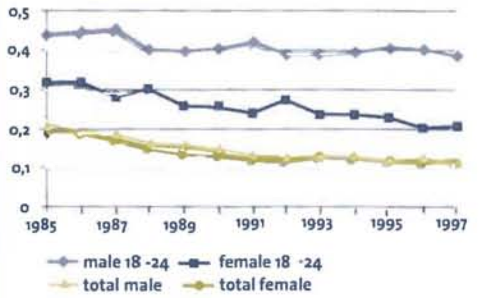



*(figure 1)* **Number of drivers involved in serious accidents by gender and age, indexed (1985=100)**

An earlier study assessed the factors which may have contributed to the positive development of the late eighties and early nineties. Various data sources were combined for this purpose.

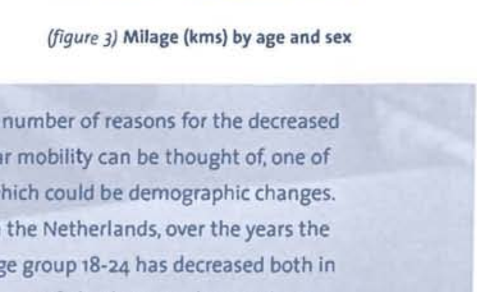
The study covered the years 1985 to 1997, with 1997 being the last year for which relevant information was available. The first question in the study was whether the decrease in accidents among young (male) drivers was due to safer driving behaviour or whether they were driving less. Figure 2 shows that, while young drivers have become somewhat safer drivers, this cannot be the full explanation of the large decrease in absolute number of accidents in this group.

Compared to the total group of car drivers, the reduction in accident risk (number of accidents per 10 ⁶km) is markedly smaller for young drivers. In the period 1985 to 1997, the accident risk of young male drivers decreased with approximately 10 per cent; that of young female drivers with around 30 per cent; and that of the total group of car drivers with almost 50 per cent.




*(figure 2)* **Involvement in serious accidents of young car drivers versus total car driver group (per 1.000.000 km)**

Since the accident risk decreased only slightly, a substantial decrease in exposure can be the only explanation for the large decrease in the number of crashes involved young drivers. Figure 3 shows that this is indeed the case, at least for male drivers between 20 and 24 years old. In this group, the annual number of kilometres driven decreased with approximately 30 per cent. For female drivers and 18-20 year old male drivers, the exposure hardly changed.

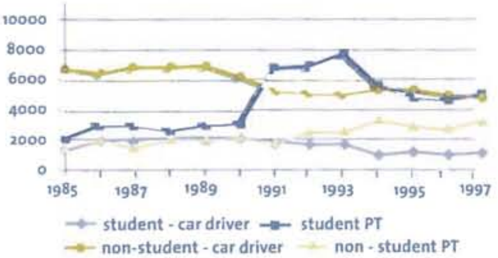



*(figure 3)* **Milage (kms) by age and sex**

A number of reasons for the decreased car mobility can be thought of, one of which could be demographic changes. In the Netherlands, over the years the age group 18-24 has decreased both in terms of absolute numbers and as a proportion of the total population. However, since the decrease in car milage is mainly apparent for the young men and the demographic development affect both men and women rather

equally, it is unlikely that this factor is a major explanation.
This observation is confirmed by the development of the milage per person which still shows a decrease for 20-24 year olds, and an increase for most other age groups.

One relevant event took place in the late 80's and early 90's which may have contributed to the decreased car mobility of young men. In January 1991, the Free Public Transport Pass (FPTP) was introduced, allowing 16 to 24 year old pupils and students to use public transport free. If the introduction of the FPTP had an effect on car milage, it can be expected that this only affected




*(figure 4)* **Car use and public transport use (PT) by students and non-students by kilometres travelled**

students. Figure 4 shows the car milage and public transport milage for students and non-students. The figure shows that the FPTP affects the travel pattern of students considerably. However, the main effect seems to be that students used public transport more often. At the same time car milage decreased, but an even larger decrease is visible for the non-students, starting a few years earlier. Hence, whereas the introduction of the FPTP may have had some impact on the car use of students, it certainly is not the main explanation.

Another explanation for the reduced car mobility of young male drivers may be found in the economic situation. The economic situation can affect car ownership and driver licence possession, and therefore indirectly, car mobility. The late eighties and early nineties were characterised by a stagnation in economic growth, international instability (the Gulf War) and high oil prices. It appeared that in the period between 1985 and 1997, the absolute number of young men with a driving licence declined with 22 percent points; the number of young women with a driving licence decreased with 11 percent points. A similar pattern was observed in car ownership. In 1985, approximately 40 per cent of the young men owned a car; in 1997 this had almost halved to 24 per cent. For young women the decrease was smaller: from approximately 19% in 1985 to circa 15% in 1997.

Table 1 provides an overview of the developments of various factors affecting the accident involvement of, in particular, young male drivers. The table shows the relative (indexed) increase or decrease in percentage of the average of the years 1995-1997, with the average of the years 1985-1987 set at 100 per cent for young men and women separately. It can be concluded that a combination of factors may explain the reduction in accident involvement of young car drivers in the period between 1985 and 1997. The number of 18-24 year old people in the Dutch population decreased for men and women by the same amount. The accident risk decreased as well, for young women more so than for young men. It would therefore be logical to expect that the number of young female car drivers involved in accidents had declined more than that of young male car drivers. However, accident statistics show the contrary (see Figure 1). This striking situation can be explained by a substantial reduction in exposure of young men in particular. The exposure of young men declined mainly because fewer of them hold a driving licence and own a car. The decrease is also visible for young women, but to a much smaller extent. In addition, female driver licence holders and car owners increased their car mobility, whereas this was not the case for the male licence holders and car owners.
It is likely, as indicated in table 1, that the decrease in the number of licence holders and the decrease in car ownership is a combined effect of the introduction of the Free Public Transport Pass for pupils and students between 16 and 24 year old, the economic situation and the instability of the early nineties, with the latter factor being more important. Since, in absolute terms, car ownership is higher among young men than among young women, the economic recession affected men relatively more. The latest accident statistics show an increase in the accident involvement of young male car drivers, coinciding with a revival of the economic situation in the Netherlands. This supports the conclusion, but would need validation on the basis of further analyses. These further analyses await the availability of milage data for the last three years.

*(table 1)* **The indexed characteristics in the period 1995 - 1997 (index period 1985 - 1987) for 18 - 24 year olds.**

| Characteristics | Index 1995-1997 (1985 - 1987 = 100) | |
|---|---|---|
| | young men (18 - 24 years) | young women (18 - 24 years) |
| Absolute number in the population | 82 | 83 |
| Accident risk | 89 | 70 |
| Car milage of 18 - 24 year olds | 62 | 92 |
| Number of license holders | 78 | 89 |
| Car ownership | 53 | 74 |
| Car milage per license holder | 79 | 104 |
| Car milage per car owner | 96 | 110 |

# 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 to you by the Department of Information and Communication (swov@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 will charge an extra Dfl. 15,- per transfer. After SWOV has received your payment, the reports will be sent to you by mail. Records of all SWOV reports that were published from 1995 onward can be found on our website **(www.swov.nl).**

**Method for the monitoring of helmet use by mopedists**
Pretest of observations and interviews within the framework of an evaluation of intensified police traffic surveillance. J.K. Batstra & C.C. Schoon. R-2000-23. 24+22 pp. Dfl. 22,50 (in Dutch).

**The numbers of road accident in-patients**
Data linking of the road accident registration and that of the hospitals. R-2000-26. P.H. Polak. 44+48 pp. Dfl. 30,- (in Dutch).

**Considerations about governmental and public support in road safety decision-making**
Ch. Goldenbeld & A.A. Vis. R-2001-13. 126 + 21 pp. Dfl. 45,- (in Dutch).

**Emotions of lorry drivers**
Questionnaire study of emotions and moods in various traffic circumstances and the relations with unsafe behaviour. P.B.M. Levelt. R-2001-14. 73 pp. Dfl. 25,- (in Dutch).

**The driving skills and possibilities of training young mopedists**
Ch. Goldenbeld & S. Houwing. R-2001-16. 86 + 76 pp. Dfl. 50,- (in Dutch).

**Promotion of mobility and safety of vulnerable road users**
Final report of the European research project PROMISING. Roelof Wittink (ed.). D-2001-3. 97 pp. Dfl.30,-.

**Road safety prognoses for the year 2010**
Mobility and casualty risk based on the 1948-1998 developments. J.J.F. Commandeur & M.J. Koornstra. R-2001-9. 48 + 1 pp. Dfl 22,50 (in Dutch).

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**Colophon**

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