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SWOV
INSTITUTE FOR ROAD SAFETY RESEARCH

RESEARCH ACTIVITIES

CONTENTS

A new decision-support system for road safety policy

THE RECENTLY PROPOSED DUTCH NATIONAL TRAFFIC AND TRANSPORT PLAN (NVVP) ANNOUNCED A SERIES OF ROAD SAFETY PLANS AND PROGRAMMES INTENDED TO ACHIEVE THE NATIONAL GOVERNMENT'S ROAD SAFETY OBJECTIVE FOR THE YEAR 2010. A SIGNIFICANT NUMBER OF THESE MEASURES WILL HAVE TO BE WORKED OUT IN FURTHER DETAIL AND IMPLEMENTED BY REGIONAL GOVERNMENTS. SWOV HAS DEVELOPED A METHOD TO SUPPORT THESE REGIONAL GOVERNMENTS IN MAKING THEIR DECISIONS ABOUT REGIONAL ROAD SAFETY POLICY UNTIL 2010.

The Dutch government is preparing a new National Traffic and Transport Plan (NVVP) for the 2002-2010 period. After processing recommendations and public reactions, the preliminary plan was recently submitted to parliament for approval. The road safety section in the NVVP formulates an objective for the year 2010 as follows: no more than 750 road deaths and no more than 14.000 injuries requiring hospital care. In comparison with the reference year of

1998, this would mean 30% fewer road deaths and 25% fewer injuries requiring hospital care. A vision of a sustainably safe system of road traffic is providing a general indication of how this objective can be reached.

The NVVP announces measures for changing the road network, improving traffic behaviour, and equipping vehicles. The national government will be working out and implementing some of these measures, but a significant number will have to be engaged in by the provinces and municipalities. The total cost for the package of measures has been estimated by SWOV to be around € 5.9 billion (NLG 13.1 billion). While the national government should be contributing € 1.4 billion, the provinces and municipalities should be contributing € 2.9 billion and the private sector (transport companies, prospective drivers) € 1.6 billion. Because the provinces and municipalities work out their traffic and road safety policy largely on their own, the NVVP also indicates how all the levels of government will have to work together to achieve the national objective for 2010. Previous to the parliamentary approval of the NVVP, a start was recently made in preparing for regional planning. This article describes how this process of co-operation is designed, which decisions will have to be made during the first phase of regional planning, and what support SWOV will be offering in this regard.

Decentralise whenever possible, centralise only when necessary

This slogan summarises the national government's ideas in regard to the distribution of responsibilities for road safety policy among the various tiers of government. Traditionally, the Dutch provinces and municipalities have been responsible for managing the lower-order roads and have thus been responsible for the safety of these roads. In recent decades, this distribution of responsibility has become increasingly apparent. The national government has also gradually been decentralising tasks and authorities for other elements of road safety policy. At first, this was done by means of ad hoc agreements and temporary arrangements among the tiers of government. The Traffic and Transport Planning Act, introduced in 1998, systematically revised the tasks and authorities of all parties involved. Each is now required to draw up a cohesive traffic and transport plan for its own territory that also considers the plan of the tier of government one level above it. The national government can impose certain parts of the national plan that are labelled as 'essential' onto the provinces (and they can then impose these onto the municipalities). In the safety section of the current NVVP, this refers primarily to the targeted reduction in casualties for the year 2010.

The NVVP also mentions a number of matters about which the national government wants to make nationally applicable agreements with all the other parties. These include: facilitating in regard to information and financial resources, taking measures aimed at influencing traffic behaviour, making changes in infrastructure and essential criteria that the various kinds of roads have to meet, and monitoring and evaluating. Finally, the NVVP contains a list of certain measures that the national government will be engaging in itself. These include: improving driver training; new requirements for cyclists, lorries and delivery vans; extra police enforcement; reinforcing the 'safety culture' in transport companies; and making motorways safer.

Regional interpretation of the national objective

In discussions held among the national government, the provinces and the municipalities, the national safety objective for 2010 (30% fewer road deaths and 25% fewer injuries requiring hospital care) has been provisionally divided among the provinces. As soon as the NVVP is approved by the parliament, regional policy preparation will get under way. The first objective is that all the provinces formulate quantitative objectives for their road safety policy and that these objectives add up to achieve the national objective. Not only will this increase support within the region, but it will also give more credit to the national objective. In formulating their quantitative objectives, the regional governments will have to indicate the preliminary conditions (budget, manpower, organisation) necessary to meet the regional objectives. Each region will compile a general package of measures and will estimate the effects and costs for these measures. The result will indicate whether the region's own resources will be sufficient or if a supplementary amount from the national government will be necessary. This process will be concluded with binding agreements between the national government and the provinces about the definitive regional objectives in connection with the preliminary conditions that need to be met. The national contribution for road safety will be transferred without any earmarking to each province into a

general regional fund for traffic and transport policy. The national government has had instruments developed to facilitate this regional process, and SWOV is contributing its efforts to this.

Supporting decision-making in the region

Within the framework of the SWOV's feasibility study into the NVVP's national objective, a method was developed for estimating the effects and costs of all the measures including both national and regional costs. A report on this appeared in Research Activities, number 16 (April 2001). Based on these findings and existing knowledge, the national government and SWOV developed a manual for measures (the Measure Guide) that the regions can use when drawing up their Provincial Traffic and Transport Plans.

SWOV has improved the method developed from the national study and interpreted it for use at the regional level. The method is intended to help the provinces answer the following questions:

- Compared with 1998, what would safety levels be in 2010 if existing policy was not changed (i.e. without new safety policy)?
  In answering this question, the method also considers the increase in traffic, a new distribution of traffic over the road network as a result of a new sustainably safe categorisation of the roads, and an autonomous reduction in risks. To obtain an answer, the regions must submit certain basic data (e.g. traffic growth, the composition and length of their road network, and the current quantity of traffic);
- How many casualties will the new national policy save in each region for 2010?
- How many casualties will the new regional policy save for 2010?
  To answer this question, each region must compile a package of general measures. One resource for accomplishing this would be the manual for measures (the Measure Guide) but the regions could also opt to use the standard scenario that SWOV used in calculating the national effects of the NVVP, a method that calculates the effects while considering possible overlap between the measures and that focuses on the new classification of the road network into sustainably safe road categories.
- What will be the costs for the new measures for the national government and the region?
  Answering this question will involve calculations with unit prices that were previously used by SWOV in its national study, or prices that the region has submitted itself. Also indicated will be who will have to pay these costs: the national government, the provinces, the municipalities, or the private sector.
- What is the cost effectiveness of the new measures?
  This will be calculated as based on the findings of the previous calculations. The cost/benefit analysis will also be made in which the value of the spared casualties will be expressed in financial terms.

Finally, the provinces themselves must assess how well their regional package of measures can be carried out by considering the time it takes to complete the measures, the availability of manpower, etc.

Initially, SWOV will be conducting its calculations by means of the calculation modules it developed, but efforts will also be devoted to giving the regions themselves the opportunity to make use of these. This would make it easier for them to draw up and test alternative scenarios.

In conclusion

Preparing the regional road safety policy is now under way. All the provinces have chosen to make use of the SWOV method. A major advantage to this is that the findings from all the regions can be compared. It is expected that this will facilitate the discussion in the regions about the composition of the general package of measures and that better insight into the feasibility of the regional objectives will be obtained. At the same time, a shared basis will be laid for agreements with the national government about these objectives and the resources needed to achieve them. These agreements will have to be made during the spring of 2002.

Once this process is completed, SWOV will continue to work on improvements and making the decision-support system suitable for more applications.

NEW NUMBER

New SWOV telephone number

SWOV has recently got a new telephone number; it is + 31-703173333. SWOV's old telephone number (+ 31-703209323) can, however, still be used for the time being.

Apart from this, the individual SWOV employees have each got their own direct-dial number. These numbers can be found on the SWOV-website: www.swov.nl.

Emotions of Lorry Drivers

THE RELATIONSHIP BETWEEN ROAD SAFETY AND EMOTIONS AND MOODS OF LORRY DRIVERS HAS BEEN BROUGHT INTO PICTURE BY A RECENT SWOV STUDY. THE STUDY EXAMINED ESPECIALLY THE FEELINGS BROUGHT ON BY TWO MEASURES SPECIFICALLY AIMED AT LORRY TRANSPORT: THE SPEED LIMITER AND AN OVERTAKING PROHIBITION ON SPECIFIC PARTS OF DUTCH MOTORWAYS. 291 LORRY DRIVERS FILLED IN QUESTIONNAIRES. THE STUDY IS PART OF SWOV'S LONG-TERM RESEARCH PROGRAMME.

The study consisted of three parts (SWOV report R-2001-14, in Dutch). In the first part, the main subject of this article, a study was made of how freedom-limiting traffic measures are related to irritation. The second part linked elements from existing theories of emotions to road safety. The third part examined the road safety consequences of lorry drivers' moods and emotions.

The first part was an inventory of 32 traffic situations that are the result of the overtaking prohibition or speed limiter, or both. It was studied how often these situations occur, and how annoying they are considered. When situations are very annoying or frequent, irritation occurs. The frequency multiplied by the annoyance is, therefore, a good measurement of irritation. Certain situations are, maybe, not so frequent but are extremely annoying. This can bring on as much irritation as a situation that is slightly less annoying but frequent.

Relevant to the overtaking prohibition	Relevant to the speed limiter
You are driving your lorry on a motorway behind a car that is driving slower than you would like. There is an overtaking prohibition, so you cannot overtake.	You are driving your lorry on a motorway and you are overtaking another lorry. This takes a long time because of your speed limiter.
You are driving your lorry on a motorway. A lorry behind you is driving close to you to hurry you up. There is an overtaking prohibition which means that he cannot overtake you.	Because of your speed limiter, you have more difficulty driving up a hill or bridge.
You are driving your lorry on a motorway in a column of lorries. This is because of the overtaking prohibition.	You are driving your lorry on a motorway and you are overtaking a car. While doing this, the car accelerates. Because of your speed limiter, overtaking takes a long time.

Table: Traffic situations studied

A number of situations with a relatively high score for irritation were studied further. Three of these six situations are relevant to the overtaking prohibition and three to the speed limiter (see table).

The study showed that situations relevant to the overtaking prohibition are more irritating, and give rise to more anger, than situations that are relevant to the speed limiter. It is therefore important to keep paying attention to the goal of the measure, for example by emphasizing the traffic flow advantage of the overtaking prohibition. Moreover, car drivers' behaviour is experienced as being more annoying than the same behaviour of lorry drivers. Information aimed at both groups of drivers can increase the mutual understanding, and maybe thus diminish negative feelings.

Apart from the relationship between traffic measures and irritation, the moods and emotions of lorry drivers were also studied using theories of emotions. In the theory of emotions, experiencing the damage to one's own interests is of great importance. In the case of lorry drivers, one can also take into account the 'not being able to drive on', or 'adverse effects on the feeling of safety'. The study showed that when lorry drivers experience such damage to their own interests, they more often break traffic laws and are fined. Breaking laws and fines also appear to relate to certain moods and emotions such as irritability and being hurried. If you wish to know more about theories of emotions, traffic measures, and lorry drivers, we refer you to the summary of SWOV report R-2001-14, which is available via our website.

Single lane roads with edge strips for bicycles

Since access roads are a category within the Sustainably Safe Programme, they should also be made recognisable as a category. Outside urban areas, this can be done by introducing edge strips on both sides for cyclists and reserving the single traffic lane between them for motor vehicles. But is this the best way, in terms of road safety, to standardise this type of road? Furthermore, can or should carriageways with edge strips start applying as a guideline for access roads?

In elaborating a system of sustainably safe road traffic, the uniformity in road design and traffic engineering measures is an important point requiring attention. Uniformity is a way of procuring the recognisability and predictability of critical traffic situations. The set of revised guidelines for the design of rural roads, motorways excluded (RONA) also assumes the importance of the uniformity of roads.

The uniformity of access roads outside urban areas (60 km/hour) could be increased by introducing a single lane for car traffic in the middle of the carriageway. This lane would be indicated by means of broken lines. The remaining space consists of two edge strips on either side of the road, intended for cyclists. These edge strips would sometimes be made of red asphalt. Various professional and research organisations are recommending the application of this carriageway design.

The SWOV Institute for Road Safety Research has conducted various studies into the effect of 'single lane access roads' on road safety. In its publication entitled R-99-19, SWOV reported on a comparison between access roads with and without such a single lane. The conclusion was that roads with a single lane and edge strips displayed a somewhat lower average driving speed than roads without this layout. Also concluded was the fact that the space between cyclists and passing cars is somewhat smaller on roads with edge strips than on roads without edge strips. SWOV then conducted a study into traffic situations on roads before and after a single lane was introduced (before and after studies). A report on each of these roads is being published, followed by a summary report.

A tentative conclusion from these before and after studies is that the average driving speed is sometimes reduced by a few kilometres per hour on roads with a single lane and edge strips. It also appears that cyclists use "their" lane and usually start cycling farther from the edge of the road than in the previous situation in which there was no edge strip. When motorists are the only road users on the road, they often occupy space on the road that is not just "their" lane. This means that unlike what was intended, they are not driving farther from the edge of the road than before the introduction of a single lane.

When passing cyclists, motorists are swerving somewhat less to the left since the introduction of the edge strips. This means that the space chosen for use by both motorists and cyclists is less than what should be possible as based on the available space in the cross sectional profile. In other words, they can occupy more space but are not doing so.

It is still too early to conduct an accident analysis of single lane roads but such an analysis will be conducted within a broader framework during a later phase.

Whether or not the carriageway with a single lane on access roads outside urban areas should be introduced into the revised guidelines for the design of non motorways as a method for marking this type of road is a good question. Previous research findings show that road safety cannot yet be considered as the primary reason for doing so. Apart from this, however, the standardising of what road users perceive on roads of various types is an important reason for emphasising road categorisation. On access roads outside urban areas, cars and bicycles use the same carriageway while travelling at great differences in speed as they pass and meet one another. The recognisability of this situation increases by a marking system that clearly indicates the location for the car (single lane) and the bicycle (edge strip). For this reason, SWOV is currently recommending this kind of marking on all access roads outside of urban areas. The accident study can provide new perspectives later.

Road Safety Audits in the Netherlands

THE DUTCH GUIDELINES FOR ROAD SAFETY AUDITS (RSAS) WERE PUBLISHED LATE IN THE SUMMER OF 2001. THIS WAS FOLLOWED IN THE AUTUMN BY THE FIRST TWO-DAY TRAINING COURSE IN CONDUCTING RSAS. THESE EVENTS MARK THE END OF A LONG-TERM DEVELOPMENT PROCESS THAT INVOLVED THE EFFORTS OF SWOV, THE DUTCH MINISTRY OF TRANSPORT AND VARIOUS ROAD AUTHORITIES. ALTHOUGH THE WIDE-SCALED USE OF THIS RSA INSTRUMENT IS BY NO MEANS GUARANTEED, IT IS HOPED THAT MARKET FORCES WILL CONTRIBUTE TO ITS APPLICATION.

A Road Safety Audit (RSA) is an official procedure in which the accident potential and the safety performance of road schemes are assessed by independent auditors. An RSA is supposed to be conducted during the planning and design stages of both new road schemes and schemes for improving and rehabilitating existing roads. This means that an RSA is conducted *before* a scheme is actually implemented and *before* a safety problem is disclosed in the form of accidents.

The decision to introduce RSAs in the Netherlands was made in 1997 by the Ministry of Transport and various road authorities within the framework of the Dutch policy known as Sustainable Safety. The main objective of the sustainable safety policy is to create a traffic environment in which serious accidents are virtually eliminated. Obviously, the use of RSAs is very much in keeping with the preventive character of sustainable safety.

The Dutch RSA procedures are largely based on procedures previously developed by other countries, specifically the UK, Australia and Denmark. The suitability of the provisional RSA procedures for Dutch conditions was assessed during a trial period (SWOV report D-2000-7). It was during this period that around 15 RSAs were conducted as pilot studies by different road authorities in which road schemes for different lengths of road sections were conducted during various stages of their planning and design.

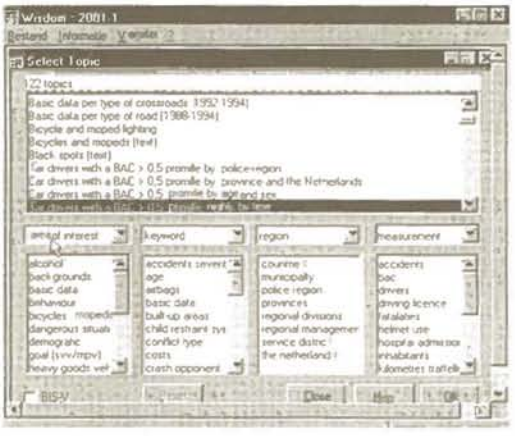
Discussions held within the RSA development group as well as knowledge obtained during the trial period showed that an RSA was not automatically accepted as a useful instrument. Firstly, there were rather practical arguments against the use of the RSA such as its cost, the time delay involved and the administrative burden of yet another procedure. And then there were arguments referring to more fundamental questions. Was there evidence to prove the effectiveness of conducting RSAs? Was it correct to consider road safety separately from aspects such as the environment and land use? What added advantages would there be to conducting an RSA when complicated or large-scaled planning and design projects had already been outsourced to other professional agencies? All in all, it proved somewhat complicated to provide arguments intended to convince people of the value of conducting RSAs. Nevertheless, the scepticism of those who had been directly involved in a pilot study were largely convinced of its value after having gone through the RSA procedures and having seen the results.

Considering these issues, the current Dutch RSA procedure is defined as flexibly as possible and is applied on a voluntary basis. It is up to the road authority in question to decide whether or not to conduct an RSA, and if so, whether or not to incorporate the results into the various planning and design stages. In order to conduct an RSA, the following conditions will have to be met: a) the request for an RSA must be submitted in writing, b) the audit will have to be conducted by an experienced traffic engineer who has successfully completed a two-day RSA training course, c) the findings of the audit must be submitted in the form of a written report and, last but not least, d) the organisation requesting the RSA will have to respond to the audit report, this written response stating which findings will be incorporated when adapting initial design and giving grounds for not incorporating other findings.
In conducting the audits, it would be advisable to have two independent auditors carrying out an RSA during each of the five following stages: feasibility phase, preliminary phase, detailed design phase, before opening or reopening, and after opening or reopening. Checklists are available for each of these stages, but it is also possible to perform an RSA during only one or two stages and/or to have only one auditor involved. Hopefully, the flexibility offered in conducting an RSA will make the instrument more attractive. It is also hoped that supply and demand will now be effective in promoting its use. Whether or not the RSA has a chance of becoming an integrated part of the planning and design process in the Netherlands should become evident over the next few years.

A Road Safety Information System: from concept to implementation

IMPROVING THE ROAD SAFETY OF A COUNTRY CAN BE GREATLY SUPPORTED BY A NATION-WIDE ROAD SAFETY INFORMATION SYSTEM. A WELL-DEVELOPED SYSTEM CAN HELP ROAD SAFETY PROFESSIONALS IN DEALING WITH INFORMATION ON THE MOST IMPORTANT ROAD SAFETY PROBLEMS AND ON THE MOST EFFECTIVE AND EFFICIENT POLICY INTERVENTIONS. IT CAN ALSO CREATE A SOUND BASIS FOR CO-OPERATION BETWEEN ALL KEY ACTORS IN THE FIELD OF ROAD SAFETY.

A country must answer three central questions in trying to improve its road safety: 1) how to raise the political and social priority of road safety, 2) how to organize road safety policy, including the special role of the government, and 3) how to deal with information on the most important road safety problems and on the most effective and efficient policy interventions. For this last purpose, a nation-wide road safety information system can be very helpful. If well used, it ensures that all road safety professionals involved have easy access to the same information; information which is up-to-date, relevant, qualified, and which meets as much as possible international standards and conventions. Besides supporting decision making, a road safety information system will also improve communication, because people use the same references. SWOV contributed to a road safety training course organized by the World Bank on the topic of how such an information system can be developed (SWOV report D-2001-14).



Traditionally, the main emphasis of a road safety information system has been laid on road accident data. However, accident data is as such not enough to interpret and explain road safety developments. The Land Transport Safety Authority in New Zealand developed a philosophy for a safety information system, which can be visualized as a pyramid construction with four different levels, representing four different types of information (see figure). The idea behind this construction is that data at all levels of the pyramid is necessary to describe and understand the process leading to accidents.

The bottom level of the pyramid model represents road safety policy. Implementation of policy leads to certain changes in road traffic (the next level), such as drink driving, speeding, and road network quality. Such parameters are known as safety performance indicators and have a causal relationship with accidents and casualties (discussed in a recent ETSC report entitled Transport Safety Performance Indicators). Improving 'safety performance' will thus influence the next level, containing the accident data. The top level of the pyramid contains data that express all negative consequences of accidents, quantified as socio-economic costs.

At the level of road accident registration, the police traditionally plays a central role, and will continue to do so. However, the processing of these data and making them available to traffic and transport professionals is preferably done by a designated government body or agency. It is recommended that this registering body has no pursuit of profit and that access to the accident data is free of charge.

The adoption of a multi-level approach as described above, implies other registrations than accident registration alone. It is recommended to link and combine these data sources, and to compare and relate the data in order to maximize data quality and usability.

Another key factor to the success of a road safety information system is a group of sufficiently educated staff who can communicate with (potential) users about the valid use of the database, and who can analyse the data and publish them, including the interpretation. It is recommended to organize a system of feedback between suppliers of the data, its processors and its users (or their representatives).

The Netherlands has a national information system operational since 1993, aimed at road safety professionals at the national, regional, and local level. Especially the exchange of ideas between all parties involved contributed to the large-scale dissemination of the system and to the contents of the system fitting to the users' occupations. Other countries could profit from experiences here.

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**).

Traffic Safety Information in South Africa
How to improve the National Accident Register. Jan van der Sluis (ed.). R-2001-18. 34+66 pp. Dfl. 30,-.

Integration of needs of moped and motorcycle riders into safety measures
Review and statistical analysis in the framework of the European research project PROMISING, Workpackage 3. P.C. Noordzij et al. D-2001-5. 212 pp. Dfl. 65,-.

A road safety information system: from concept to implementation
Contribution to the Road Safety Training Course of the World Bank, 1 May 2001, Washington D.C. Fred Wegman. D-2001-14. 26 pp. Dfl. 17,50.

Demonstration of the metabolism of alcohol in the human body
M.P.M. Mathijssen & D.A.M. Twisk. R-2001-19. 50+10 pp. Dfl. 22,50 (in Dutch).

Sharing responsibility - central and local government partnership
Contribution to the Road Safety Conference of the European Transport Safety Council, 12 September 2000, Brussels. Fred Wegman. D-2001-7. 21 pp. Dfl. 17,50.

A method to assess road safety of planned infrastructure
Case study of Maastricht in the framework of the European research project DUMAS, Workpackage 9. Jan van der Sluis & Theo Janssen. D-2000-14. 42+13 pp. Dfl. 32,50.

In all kinds of weather
Road safety effects of periods of extreme weather. J M.J. Bos. R-2001-23. 34+15 pp. Dfl. 22,50 (in Dutch).

SWOV
INSTITUTE FOR
ROAD SAFETY RESEARCH

Colophon

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