Institute for Road Safety Research SWOV

Its objects, methods and its organisation

INSTITUTE FOR ROAD SAFETY RESEARCH SWOV
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Introduction

The Institute for Road Safety Research SWOV has the object of contributing to road safety by means of scientific research. It also promotes the use of scientific information for road safety purposes. SWOV therefore stimulates scientific *research* into road safety *and* dissemination of the *results* of this research as widely as possible.

SWOV's activities cover all aspects and areas of road safety. The authorities are the principal users of SWOV's services for research aimed at policy measures. Research not aiming directly at such action is undertaken by SWOV on its own initiative.
SWOV also contracts research to third parties. In this way it has a co-ordinating function in planning road safety research in The Netherlands.
In the Road Safety Policy Plan, the government described this as a 'kind of architectural function'. SWOV also represents The Netherlands in a number of international research groups working on road safety.

The research results and know-how are spread:
– among policy-making bodies which can put the research results into practice,
– among scientists, in order to exchange research results and methods, and
– among institutions and persons concerned with road safety.

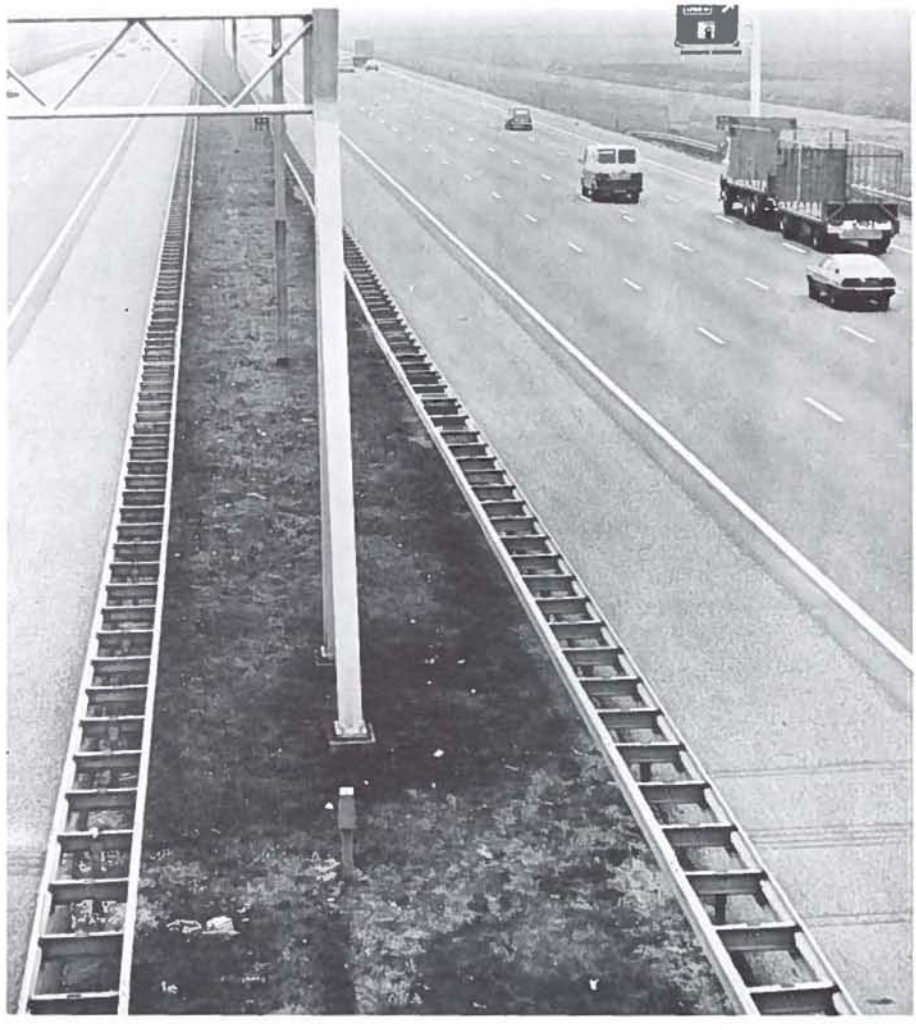
The Information Department will gladly supply a list of publications, reports and articles, and will also supply further information.

Background

SWOV carries out research to ensure maximum safety of roadside safety structures

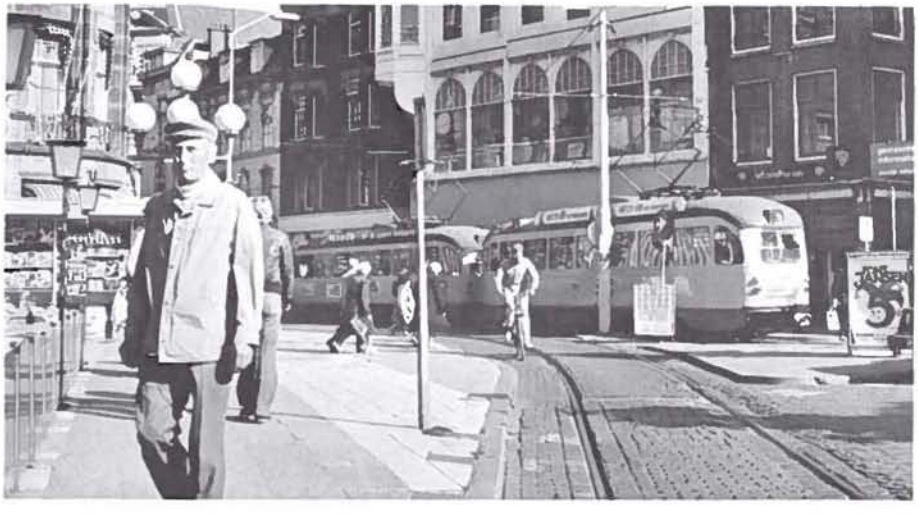
The Institute for Road Safety Research SWOV was founded in 1962 on the initiative of the Minister of Transport and Waterways, the Royal Dutch Touring Club ANWB and the Netherlands Association for Automobile Insurance NVVA. The reason was the constant increase in the number of road casualties and the realisation that scientific research was indispensable for an effective approach to road safety. The first subjects of research included road lighting, roadside safety structures and the accident proneness of moped riders. An important assignment in the early years was to provide contributions for the government Road Safety Memorandum, published in 1967. The terms of reference were:
– to provide a paper on the interrelationship of factors determining road safety;
– to indicate means of improving road safety.
The Contributions were based mainly on literature from other countries because so far there had been little scientific road safety research in The Netherlands. The number of research projects increased. After this, SWOV's organisation was also adapted for making recommendations and producing advisory reports at short notice.

In 1975 the government published its Road Safety Policy Plan. SWOV provided the 'Building bricks' for this,



Pedestrian areas enhance the quality of life and increase road safety

a stocktaking of existing knowledge. It was also indicated what new research would have to be carried out.
A number of suggestions were taken over in the Policy Plan, but the economic recession prevented some of the proposed research projects from being launched.
The Policy Plan indicates that society changed its attitudes to road safety in the 'seventies. Much more than in the past, the importance of mobility has to be weighed against that of living, working and residential environments. Other matters that demanded attention emerged. In the past the emphasis was on car traffic, especially on traffic regulation, while at present more attention is devoted to non-motorised traffic: pedestrians and cyclists, and especially the most vulnerable of them, the young and the old.
A distinction is made between 'residence areas' and 'traffic areas'. In residence areas, the emphasis is on walking, shopping and recreation, whereas in traffic areas the main objective is mobility. There are different evaluations of traffic in these areas. The consequences this will have on road safety policy are not yet fully settled. There are many conceivable possibilities; the discussion about them is still proceeding apace. The main objective in road safety policy continues to be, of course, to reduce the number of road casualties, starting from the road users' need for mobility.



The optimum relationship in a traffic system is being sought between meeting the need for mobility and reducing the hazards it entails. This is the framework within which SWOV carries out its research.

Methods

In a woonerf (residential precinct) walking and playing take preference over locomotion

Description of traffic safety

Accident statistics
Scientific research requires data that are as objective as possible. They must be accurate and *reliable*; they must give a complete picture of the problem or be a good cross-section of it, they must be *representative*, and they must be *obtainable quickly*.
Research into traffic safety firstly makes use of accident statistics, especially relating to accidents resulting in death or serious injury.
In order to improve accident records for scientific research purposes, SWOV initiated efforts to find a new system. On 1 January 1975 the Road Accident Recording Department (VOR) was set up under the Ministry of Transport and Waterways; it meets part of the requirements.

Conflicts observation
Accident statistics are not always available for indication of traffic safety. In residential areas, for instance, there are too few accidents for proper research by scientific standards. hence, supplementary or alternative data are sought by observation and analysis of near misses (or better: near hits) or other conflicts in which those involved get off with a fright. Such data are not as objective as in the accident records. Moreover, there is no international agreement on exact definition of a 'conflict'.

Research in residential areas has led to closer consideration of the definition of traffic safety. As already stated, in these areas the importance of mobility is weighed against the need for walking, shopping and recreation. The residents do not want to be concerned with traffic all the time or feel their freedom restricted. Their feelings of unsafety are therefore very important, and are sounded by means of interviews.

Comparisons

The numbers killed and seriously injured give important indications of traffic safety. Traffic safety, as a *public health problem*, can thereby be compared with other threats to life and health. For instance, the priority that should be given to traffic safety can be indicated.
To determine where problems lie within traffic safety itselves, a closer definition is needed. A *specification of casualties* by ages, by form of road usage, by circumstances of accidents, and so on, is needed.
In order to make comparisons, accident statistics must moreover be related to the degree of *road usage*. To illustrate this, the number of road deaths in 1975 was 15% lower than in 1968, while the number of travellerkilometres increased during that period. Per kilometre, therefore, there was a greater

Increasing motorisation does not always cause more danger; minor differences in speeds in a dense traffic flow and greater driving experience have favourable effects

decrease in the number of road deaths. Approached in this way, the increase in traffic safety is greater than the absolute figures suggest, and is related to the increase in motorisation and traffic density. The gaps between driving speeds have been reduced, there are comparatively fewer inexperienced drivers, and road users have got more used to one another. Besides this, road facilities have been improved and measures have been introduced such as motorway guiderail structures (1969/70), a new legislation on drinking and driving (1974) and the compulsary use of helmets by moped riders and of seat belts by front-seat occupants of cars (1975).

Considerable information is needed in order to quantify these effects. Starting from specific activities, we call the probability of being involved in an accident with severe consequences the accident risk. All categories of road users have their own risk factors which can be used as the basis for allocating priorities in road safety policy. These risk factors are partly determined by the degree of road usage and exposure to dangerous situations. Although almost half the number of road deaths are among car occupants, the probability of a car occupant being killed is one-fouth of that for a pedestrian per kilometre travelled. Occupants of buses run practically no risk at all.

Analysis of the problem

Once the priorities are established, we can start looking for the possible causes of the hazards. Before any action can be taken with regard to a specific category of road users, the situations and circumstances of maximum vulnerability must be known. In the case of 'slow' traffic, for instance, these are streets in a residential neighbourhood; in the case of private cars a wet road may represent a special threat. Streets in a residential neighbourhood can be made safer, for instance by means of separate cycle paths or creating a woonerf (residential precinct). A wet surface can be improved by counteracting puddle forming or improving the skid resistance. There are nearly always several possibilities. Accidents are hardly ever caused by a single factor. Yet people often think they are and the road users are then blamed. Human limitations do always play a part in an accident. But characteristics of the vehicle, the roads and their facilities, climatic or geographical circumstances are also important.

Accidents can thus be described as an undesirable confluence of circumstances and events. Human influence on this can only be properly defined if other influences are taken into account. For example, if a motorist who only recently obtained his driving licence is involved in an accident, it is

too vague and inadequate to blame the accident on 'inexperience'. There may have been a downpour at the moment of the collision, the road surface may have been dangerously slippery and another driver may have forced him to make an emergency manoeuvre, whereupon the 'inexperienced' driver lost control of his vehicle.
In taking countermeasures, therefore, the authorities must proceed from traffic behaviour as the result of a variety of interacting circumstances and events. It usually proved more effective to do something to change roads or vehicles in order to improve behaviour in traffic than to impose norms on people which they are supposed to satisfy. Besides man's limited possibilities, we must take into account age, experience and physical and mental conditions such as fatigue and stress. The traffic situation ought really to be attuned to the 'least gifted' and 'vulnerable' category of road users. Road traffic training will also have the maximum effect if the traffic environment is adapted to 'human ability'.
As an accident nearly always involves a number of different factors any of which may moreover increase the influence of others, it is difficult to establish the effects of any countermeasure exactly. Besides this, road traffic is constantly undergoing all kinds of changes. SWOV has nevertheless been able to indicate approximately the effectiveness, for instance, of compulsory use of seat belts and moped riders' helmets, and of the drinking and driving Act.
The choice of countermeasure depends not only on its safety effect or its cost. A comparison will also have to be made between the safety effect and the extent to which the transportation system (meeting the need for mobility) is affected. This choice can be made easier by indicating possible countermeasures that affect the purpose of the transportation system to a greater or lesser extent. This makes it easier to compare the various interests, and a strategy can be planned for reducing road hazards. SWOV has worked out such a strategy.

The systems approach

The 'systems approach' is proving more and more indispensable to the research. Road hazards are a complex social problem. They are an – unwanted – side-effect of the transportation system which is, in fact, a 'production system' with the object of locomotion. This object of the transportation system should never be lost sight of in controlling road safety. The endeavour to achieve greater safety is a matter primarily of optimising a complex entity of relationships between road users, vehicles, roads and surroundings, in which disturbances occur. Research into this requires expertise from many scientific disciplines, such as physics, technology, the social sciences, medicine, economics and law. With the systems approach, expertise from the individual disciplines can be integrated.

Controlling road safety

The control and study of road safety problems requires the entire problem field to be traversed. In recent years, this has been done many times for research purposes and with the aim of solving the road safety problem, with varying degrees of success. On the basis of 'Energy Transfer Analysis', Haddon (1976)* introduced a number of control strategies which SWOV is now elaborating specifically for road safety purposes. The assumption is that the built-up energy is the 'agent' (the necessary but not sufficient condition) of risk in traffic. Energy-transfer analysis can thus be described as follows. In order to make locomotion possible there must be an energy build-up. But the release of this energy is not always controllable, for example when a vehicle skids. In this case we speak of

*) W. Haddon jr (1976). On the escape of tigers; An ecological note. In: Ferry, T.S. & Weaver, D.A. (eds.). Directions in safety, pp. 87-94. Charles C.Thomas, Springfield, Illinois, 1976.

an incident. if the released energy then comes into contact with dead of living structure, we speak of an accident, which may cause damage or injury.
If help is not provided quickly enough, the injury may spread.
On the basis of this analysis, road-safety control strategies may intervene in six different phases of this process. Countermeasures may be focussed upon:
Phase 1: Limitation of traffic – but this seriously affects the purpose of the transportation system, the mobility.
Phase 2: Limitation of energy build-up, for instance by promoting public transport and cycling, by speed limits for motor vehicles and by reducing the distances travelled.
Phase 3: Prevention of the undesired energy release (incident prevention) – traffic facilities must be designed and constructed in such a way that the road user does not have to function beyond his capabilities and is moreover not 'tempted' to act in an 'undesirable' way.
Phase 4: Prevention of contact of released energy with living or dead structure (accident prevention) – this can be achieved by segregating the various categories of road users physically or in time (for instance by providing traffic lights and separate lanes for cars, moped/cycles and pedestrians), or by creating space for emergency actions.
Phase 5: Prevention or limitation of injury or damage if energy clashes with

Introduction of compulsory wearing of moped protective helmets has made a major contribution to the recent decrease in the number of moped riders killed on the roads

Separate cycle paths: more space to manoeuvre and less risk of collisions with fast traffic

ıvıng or dead structu ıes (injury and/or damage prevention or limitatıon) – ınjury ıs generally regarded as so much more serıous than materıal damage that ın practıce materıal ıs often sacrıfied to save human lıves (crash zones ın cars, roadsıde safety structures, moped rıders' protectıve helmets, seatbelts).
Phase 6: Prevention or limitation of ınjury or damage once it has occurred from spreadıng further – this necessitates speedy, adequate aıd.

ın a systems approch to road safety, prıorıty ıs gıven to measures having the greatest ınfluence on safety which affect the objective of the transportatıon system as lıttle as possıble. The effect upon thıs objective ıs greatest in phase 1; it becomes gradually smaller ın the subsequent phases. In the present state of the art, the prıncipal premise for countermeasures will be adaptatıon of traffic facılıtıes to man's possıbılıtıes and lımıtatıons. Thıs relates both to human tolerance (ınjury limitatıon) and man's capacity for observatıon, decısıon makıng and actıon in road traffic (accident and incident prevention).
This approach can prevent any sideeffects of a countermeasure beıng overlooked, for instance the effect on traffic circulatıon.
The system approach can, of course, also be used for comparıng the objectıves of the transportatıon system with the objectıves of other systems such as the residence system, the physical planning system, the energy system, the environment system, the well-beıng system and so on. Road safety will thus be related, for ınstance, to fuel restrictions, the quality of life in residential areas, the movement of jobs to areas with many commuters, and so on. These relationships are becoming increasingly important in the social debate.

Organisation

Cleaning the road surface to prevent further accidents

Much of SWOV's research is focused on obtaining information for policy measures. Most assignments for this come from the Ministries of Transport and Waterways, and of Public Health and Environmental Hygiene This therefore determines a large part of the research programme.
In recent years, however, more and more assignments have been received from provincial and municipal authorities.
When SWOV receives an assignment, known solutions of the problem are first examined: the existing scientific knowledge is catalogued.
Sometimes, a study of Dutch and other literature may render new research superfluous. But if research is needed, then it often takes several years to complete the project.
SWOV makes its own decisions regarding research not aimed specifically at countermeasures. For example aimed at defining the road safety problem, theory formulation for future research, improvement of research methods, and forecasting.
Programming, planning and administration of SWOV research is aimed at meeting as fully as possible the growing and changing need for research results, given the available manpower and finance.
Research programme priorities are established by assessment of social importance and importance to policy, existing knowledge, time and resources available, and expected results.
A major criterion of social importance is the assessment and evaluation of the risk road users run themselves and that they represent to other road users. Pedestrians, for instance, cause little risk, if any, to others, but the risk to themselves per kilometre travelled is four times that of car occupants Thus, pedestrians must be protected, for example by making other modes of transport less aggressive.

Information

SWOV's objects reveal its *policy supporting function*. Collection of scientific knowledge alone will not suffice. This knowledge must be applied in the policy. SWOV keeps in touch with policy decisions and policy changes in order to be ready for future questions. On the other hand, SWOV endeavours to bring developments in traffic safety to the notice of the policy makers.
This link-up between policy and the gathering of knowledge is so far taking place almost only at national government level.
Besides its policy-supporting function, SWOV has a *social responsibility*. The government provides ninety per cent of the necessary income and decides a large part of the research programme. But SWOV nevertheless has a large

measure of independence; it must make a critical assessment of road safety trends, and be able to disseminate knowledge. There is a clear division of responsibilities in research policy relationships. SWOV catalogues, analyses, interprets and accounts for these activities by scientific principles. The policy maker reaches his decisions by reference to (or in spite of) results of scientific research and from other considerations.
SWOV gives shape to its social responsibility by *making its knowledge public*. For years, its rule has been that every research project must be published. No principal can prevent publication for more than one year. SWOV's aim has always been to reach the widest possible range of people and organisations (politicians, governing bodies or interest groups). Research project results are presented in different forms, linking up with needs and levels of knowledge.

In the first instance, a report is made on a research project on a completely scientific basis. This is intended for the sponsors. Next, the report is distributed among a group selected by SWOV (active publication) or it is stated that the report is available on request (passive publication). Reports are obtainable upon payment of the cost of printing and postage. The principal customers are the policy-making bodies.

The scientific contributors also write articles for periodicals, read papers and give lectures, attent symposiums, and provide educational programmes at higher professional and university levels.
Members of the Information Department edit, present and distribute scientific reports, articles and the essential details of papers and lectures. They also write brochures, either together or in consultation with the scientific members. These brochures are distributed free of charge. They relate to details of research of wide social importance. It is decided beforehand – differently from the reports – what groupings should be informed of the results of a research project.
The Information Department produces an information bulletin, 'SWOV-schrift', which has a mailing list of about 5,000 addresses. They include organisations and individuals directly or indirectly concerned with road safety or related subjects, and the mass media. SWOV-schrift is up till now only available in Dutch.
Much attention is paid to service to the press. The news media are regularly informed about research results. Lastly, organisations' and individuals' questions are answered. The information issued by SWOV is aimed primarily at the interests of the 'consumer', i.e. the road user.

Co-operation

SWOV is represented on many official advisory organisations and co-operates with policy-making bodies. The most important scientific research establishments with which SWOV co-operates or to which projects are contracted out are the Central Organisation for Applied Scientific Research in The Netherlands TNO and a number of universities.
Internationally, the principal fields of co-operation and exchange of expertise is within the Road Research Programme of the Organisation for Economic Co-operation and Development.

Members of SWOV represent The Netherlands in a number of research teams formed by the OECD. Other international organisations with which SWOV is in contact include the European Communities, the Council of Europe and the World Health Organisation.

Departments

SWOV has expanded into an Institute with about a hundred working members.
SWOV's Board of Governors consists of representatives of various Ministries, of industry and of leading social institutions.

The Bureau is managed by E.Asmussen, Director.
Its departments include a.o.:

Pre-crash research
Crash and Post-crash research,
Methods and techniques
Research services
Policy-support and consulting,
and Information.

This brochure has been compiled by the Information Department SWOV.

Photographs by: Studio Verkoren, The Hague (pp. 3, 8, 9, 11), Pam Sok & Jaap Ruurs, Voorburg (pp. 4); Jos van Leeuwen, The Hague (pp 6, 10).

If not on our mailing list please let us know.
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