

Speed policy in The Netherlands and Speed Management Research at the SWOV

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Contribution to IATSS Research on 'Traffic Accident Analysis and Traffic Safety Policies'

Summary

Government objective on speed is to reduce the level of speeders on main urban and secondary rural roads to maximally 10% in the year 2000. To enable monitoring the speed level a design for a traffic measuring network on secondary rural roads was made and installed in several provinces. The data from this network serves two purposes: use for national policy on speed and for provincial speed management.

Speed management through automatic warning and enforcement combined with information campaign and feed back signs has been applied and evaluated:

- An urban and rural intersection: speeders are warned automatically by a sign switchable sign. Mean speed dropped by minimally 5 km/h. The number of accidents was too small for a statistical evaluation. A theoretical calculation showed a considerable potential for accident reduction.
- Two lane rural road stretches: on four stretches of road, length between 10 and 20 km, speeders are warned automatically and when ignored a radar+camera registers the number plate of the car and a fine is sent later. The percentage of speeders dropped from 38 to 11%, the number of accidents was reduced with 35%. Vandalism of the radar and camera occurred several times.
- Provincial road network: the total road length enforced in three provinces was 700 km, the duration was 6 months. A radar and camera from an unmarked car parked on the road side registers speeders. A sign was posted downstream reading 'Your speed has been checked. Police'. Speed was reduced by 5 km/h. Surveys conducted among drivers showed the enforcement measures were accepted by the majority of the drivers.

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1. Introduction

In order to enable correct understanding and interpretation of research articles, relevant aspects should be included in these articles, often missing in practice. Therefore in this paper information regarding government policy, the speed limit system, law on speed and speeding, and daily practice regarding police enforcement are incorporated.

1.1. National and provincial government policy

In the Netherlands the first national 'Multi-year Road Safety Programme' was formulated for the period 1987-1991. This programme is adapted periodically (Ministry of Transport, 1991). The overall objective is to reduce the number of road victims with 25% in the year 2000 in comparison with 1985. One of the spear heads was lowering the average speed of motor vehicles on provincial and main urban roads with 5-10%, later a maximum of speeders of 10% was set for the year 2000 (Ministry of Transport, 1993). The provincial authorities are autonomous in setting their own goals, but most provinces follow these national objectives.

Several provinces are conducting demonstration projects to obtain a *sustainable safe road system*, by designing the road in such a way that the provoked driving speed does not exceed the speed limit and separating on-coming traffic to prevent head-on collisions (Catshoek & Janssen, 1995). The projects described in this paper were conducted on behalf of the Ministry of Transport.

1.2. Speed limits in The Netherlands

There are four general speed limits in the Netherlands: 120 km/h for motorways, 100 km/h for rural highways, 80 km/h for other rural roads and 50 km/h for urban roads, stipulated by law. For lorries and buses the general speed limit on all roads except urban roads is 80 km/h. Exceptions on these general limits are stipulated in guidelines (Ministry of Transport & Dutch Association of Road Markings and Signs, 1991). As a rule general speed limits are not shown along the road side. As a rule speed limits are coupled to function and road type, but in practice discrepancies exist, e.g. a double carriageway in a residential area.

1.3. Law on speeding

The owner of the car is held responsible for traffic law trespassing, unless he identifies the person who made the trespassing. Speeding with less than 30 km/h falls under administrative law, from 30 km/h and up the offence falls under criminal law, and the offender can be called to appear in court, where he is also accountable for old criminal traffic offences (Ministry of Justice, 1996).

2. Organisation and practice of speed enforcement management

The police has been reorganised since 1993, the police force has been regionalised and the policeman has to fulfill a broad scope of tasks. Special speed enforcement teams were abolished. As in many industrialised countries, priority is given to combatting criminality with the consequence that input of manpower to enforce traffic offences is relatively low. So often speed enforcement is conducted intensively on a few selected rural routes during a couple of weeks, and there after continued at a very low level. The speed level is lowered during the intensive campaign and will go up again to the level before the campaign.

Although not yet common practice, letters of intent for cooperation and division of tasks have been signed in several cases between the police, provincial and state road authority regarding speed management (Project Group of Regional Road Safety Organisation, 1995).

There are many organisations involved in road safety activities, such as national, provincial and city council road authority, public prosecutor, police, regional road safety organisation, national road safety campaign organisation, SWOV and other traffic institutes. In order to cope with the problem of speeding and accidents, more and more working groups are formed, where most or all of mentioned organisations, to supervise speed projects are participating. The benefit of such an approach is that problems could be tackled speedily as all parties concerned are present in a working session .

3. Relevant conditions

3.1. Speed measuring network

To enable monitoring whether the goals are going to be met, a speed measuring network was designed by the SWOV on behalf of the Ministry of Transport for rural secondary provincial roads (Oei Hway-liem, 1994). This design is also conceived for provincial policy purposes, such as speed management, but also to monitor the use of roads related to road function and design. Misuse of roads, e.g. by-pass routes, can be detected. At present four of the twelve provinces have installed a speed measuring network, using double loop detectors, two provinces have started doing this, the rest are to follow in coming years.

3.2. Present speed levels in The Netherlands

Speed measurements on two lane rural roads using radar have been conducted in 1994 (Catshoek & Varkevisser, 1994a). The percentage of speeders was between 40-60%, so still well above the objective of 10%. On main urban roads this percentage can even go as far as 80% (Catshoek & Varkevisser, 1994b).

3.3. Accidents and speed

Empirical studies in Sweden (Nilsson, 1981), Finland (Salusjärvi, 1987) and the USA (Godwin, 1992) show that a reduction in speed gives a disproportionate large reduction in accident, injury and fatality rate. Using this formula a very large reduction in accidents, injuries and fatalities are to be expected from reaching the national objective on speed in the Netherlands.

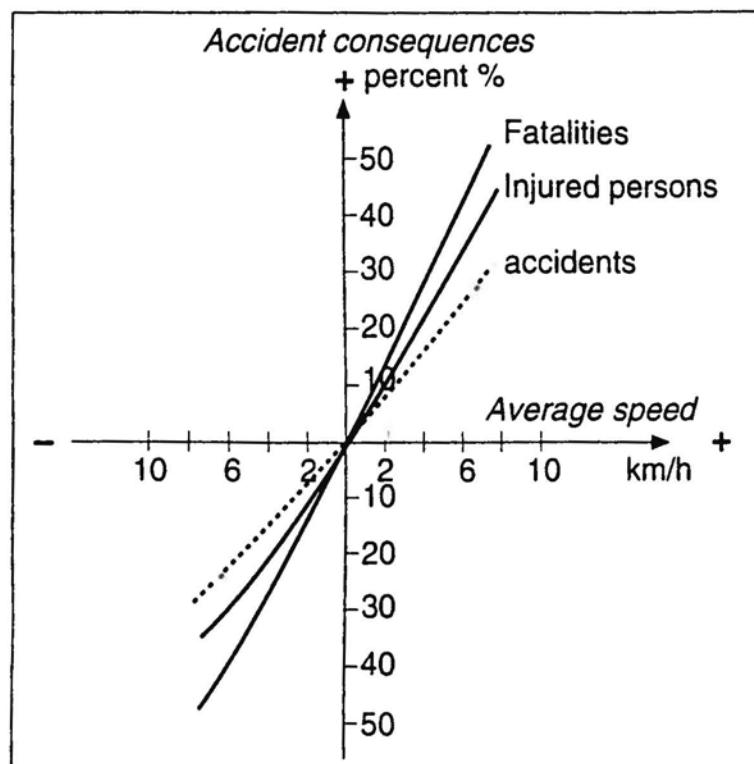


Figure 1. Changes in average speed versus changes in percentage in accidents (Nilsson, 1981).

This is expressed in the Swedish *Figure 1*: A speed reduction of a few kilometres per hour results in a reduction in the number of accidents of several tens percent.

4. Speed management

4.1. Enforcement level and level of compliance: hypothetical relation

Figure 2 gives a theoretical relation between level of enforcement and level of compliance to the speed limit. At zero enforcement level, a certain percentage of drivers will be complying to the speed limit. Increasing the enforcement has no effect in the beginning, as the probability of being caught e.g. once in 10 years or in 5 years makes no difference in effect. But from a certain enforcement level, an increase of the enforcement will result in an increase of the compliance level. The level of compliance will level off to 100% at a certain enforcement level. Then when the enforcement is decreased at first drivers do not notice this, so the compliance level is still high. The result is a hysteresis curve. The question is: what is the minimum enforcement level at which the compliance will be (almost) 100%?

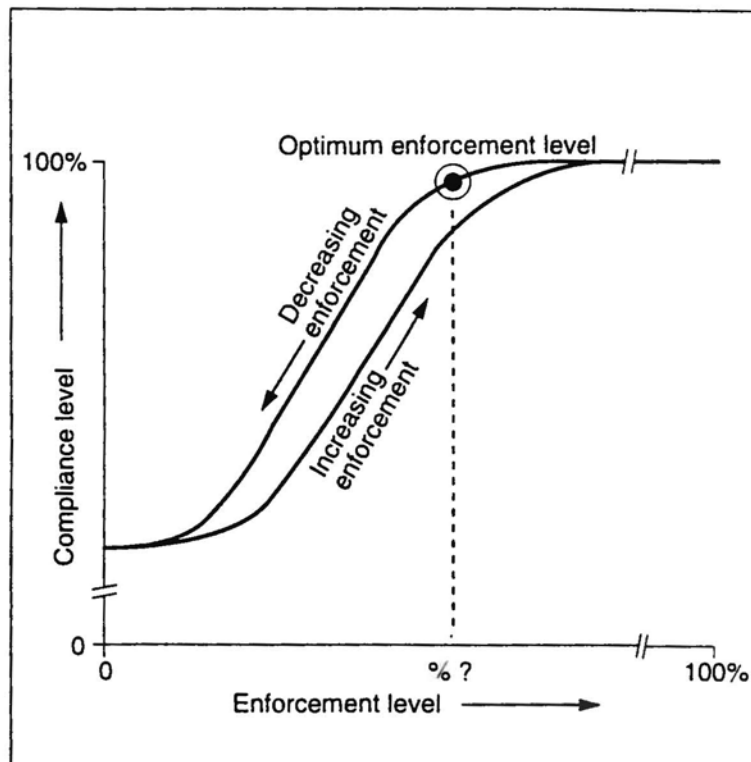


Figure 2. Hypothetical relation between enforcement level and compliance to the speed limit (Oei, 1994b).

4.2. A strategy for speed management

The ultimate aim is to lower the speed level on accordance with the national objective as mentioned before. As the capacity of the police is by far not sufficient to reach this goal by conventional enforcement, other complementary means and methods have to be applied.

Firstly, the speed management should be directed to those locations and roads where the problem of accidents and speed is highest, i.e. the potential

reduction in accidents when the national objective has been reached. The objective is *specific* prevention at these dangerous locations and routes, so drivers should get a warning regarding the strict speed enforcement before approaching the dangerous area.

Secondly, new methods should be put into operation that increases the efficiency of the enforcement, such as using automatic warning and enforcement, abolishing stopping speeding drivers on the road. Police enforcement can be conducted by stopping speeders or by sending the fine by post, for which a speed camera is needed, installed in a fixed road side box or in a police vehicle. Stopping speeding vehicles needs a disproportionate large input of manpower, and as this is limited, use of a camera will result in a very much larger output of enforced vehicles. The policy until shortly was to have about half of all traffic offenders enforced by stopping them on the road, the other half can be enforced without halting, e.g. using a camera (Ministry of Justice, 1993). The motive was to prevent overloading of the judicial system with traffic offences.

Thirdly, new available technologies should be used, such as automatic registering, reading, identification and processing of number plates of speeding vehicles.

Fourthly, Improving the communication and feed back to drivers to increase the subjective probability of being caught and so increasing the compliance level.

Fifth, as the problem of speeding is also manifest outside those selected locations and routes another approach is needed for these roads and road networks. Several techniques could be applied, such as enforcement of a long stretch of road through averaging the speed between two points on that road using two radar posts. Another method is by enforcement using radar+camera from an unmarked car with feed back downstream of the speed check.

The aim of speed management on a road network is *general* prevention: drivers are expected to drive carefully everywhere on the whole network. So only general warning is given through the media or posters, but no specific warning is given about the actual locations where speed is enforced.

The SWOV has conducted experiments on speed management, firstly on a small scale, i.e. at urban and rural intersections. Later this was expanded to road stretches, routes having a length between 10-20 km. And the last experiments were on whole provincial road networks.

4.3. Local speed management

Experiments were conducted at an *urban* intersection, where a school complex is situated, with periodically many crossing children (Oei & Papendrecht, 1989). On the main artery the percentage of speeders 150m upstream of the intersection before the experiment was 80%.

An information campaign just before the start of the experiment gave information regarding the experiment and the danger of speeding. Speeders are warned automatically by a flashing sign showing the speed limit '50'. The percentage of speeders was lowered to 47%, the mean speed went down with 5 km/h. A theoretical calculation showed that this results in a potential reduction in * accidents of 25% * injury accidents of 50% and * lethal accidents of 80%.

At a *rural* intersection, the main two lane road had a speed limit of 100 km/h, mean speed was 80 km/h. At the approach of the intersection the

speed limit was lowered to 70 km/h and a fixed sign upstream shows 'Lower your speed' and speeding drivers are warned automatically with a sign showing 'You are speeding'. At the start of the experiment a parked police car was surveying periodically at the intersection, this was reduced and stopped after a while. The mean speed was reduced to 60 km/h and this remained 2 years after the installation of the system. The number of accidents was statistically too small for analysis, though it was reduced by more than 60% (Province of Friesland, 1994).

4.4. Speed management on routes

Experiments were conducted on four provincial routes, each having a length varying between 10 and 20 km, the speed limit was 80 km/h (Ministry of Justice, 1993). The selection criteria were accident history and speed level. The experiments were conducted on two types of roads, each having their specific objectives and type of signs (*Figures 3a & 3b*):

Road type A

On two roads slow moving agricultural vehicles were also allowed on the road. The objective of the experiment on these roads is to lower the number of vehicles speeding.

At the beginning of these routes on both ends, firstly a fixed sign warns all passing drivers of the speed limit: 'Max 80 km/h'. About 300m further downstream drivers still speeding are warned by an automatic switchable sign: 'You are speeding' (translated in English). And further on the road three to four radar boxes were installed along the road side, in which one radar and camera system can be circulated. So a photo is made of the number plates of speeding cars.

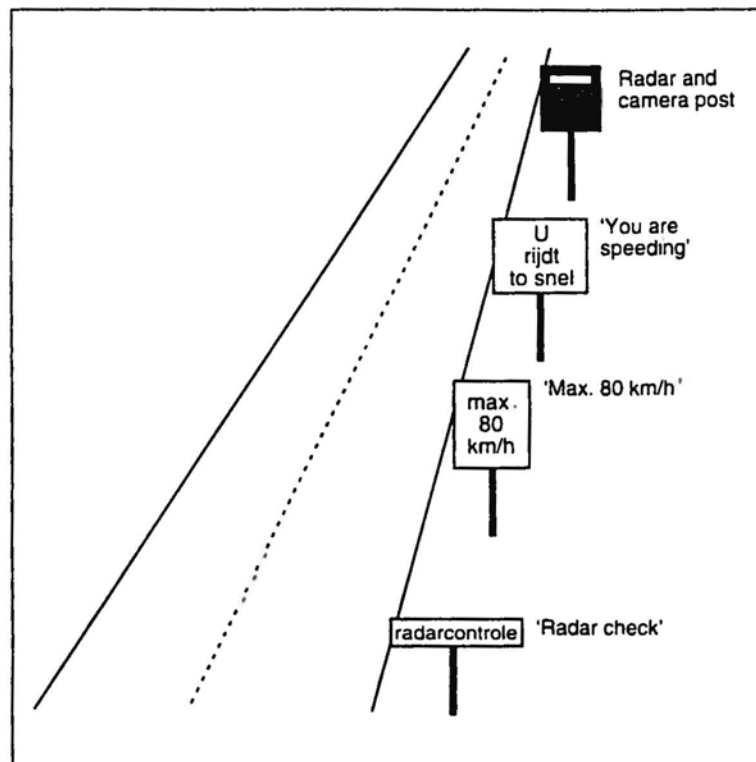


Figure 3a. Design of the automatic speed management system on two-lane rural roads open for all cars, motorcycles and tractors only.

Road type B

On the two other roads only cars and motorcycles were allowed on the road. The objective is to lower the number of cars speeding *and* also the number of slow driving vehicles. At the beginning of these roads the fixed signs shows: 'Safe speed 60-80 km/h'. About 300m further downstream drivers still speeding are warned by an automatic switchable sign showing '60-80'. And further on the road again in radar boxes along the road side a radar and camera system can be circulated.

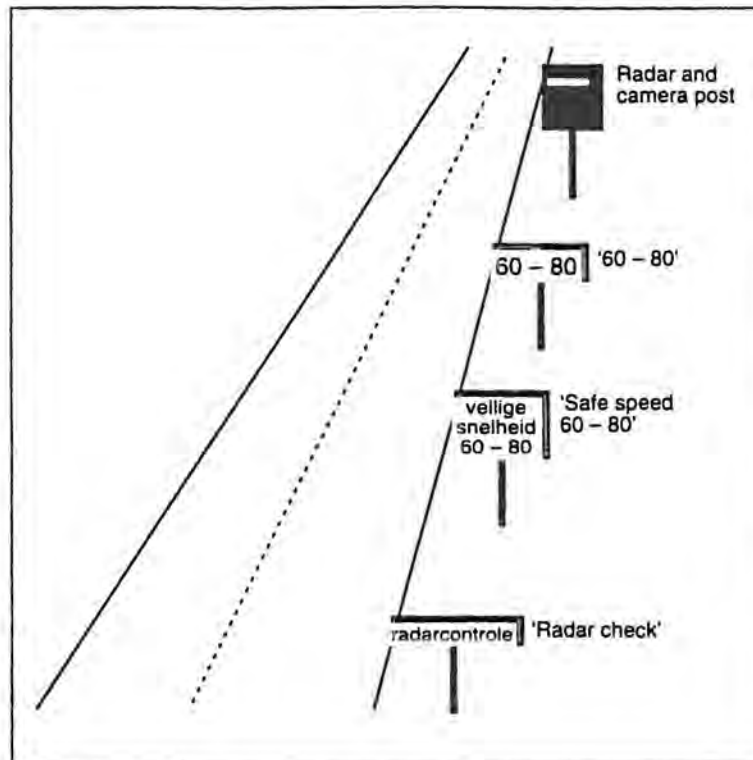


Figure 3b. Design of the automatic speed management system on two-lane rural roads open for all cars and motorcycles only.

Before the start and also during the experiment through a *publicity campaign* information regarding the project was given through the media to warn potential users of these roads of the danger of speeding and of the high probability of being caught when speeding on these routes. One camera was circulated between three to four boxes along the route. The camera was operated continuously from early morning till midnight during three months.

The results were a reduction of speeders from 38% to 11%, the percentage of drivers driving slower than 60 km/h was small, though this was increased somewhat. A 35% reduction of accidents was found on all four roads together.

A long term evaluation of speed and accidents was conducted three years after conclusion of the experiment on one of the roads (Oei, Van Minnen & Goldenbeld, 1995). In this period the camera was out of operation during one year because of vandalism and after reinstatement this system was operated only one day per month. The results though were still positive: the percentage of speeders went up from 11% to 16% and the number of

accidents did not increase compared with the situation at the end of the experiment in 1991 and with two control roads of the same type in the same province with no speed measures.

A special Symposium was organised by the Ministry of Transport and SWOV where viewpoints from different angles were presented by the Ministry of Transport, SWOV, Road Authority, Ministry of Justice and the Police (Oei, 1993). The aim of this symposium was to inform other provincial road authorities and police districts about this type of speed management.

4.5. Speed management on a provincial road network

In three provinces a speed enforcement campaign was conducted on around 100 selected secondary rural roads, total length 700 km (Oei & Goldenbeld, 1995; Oei, 1996). The enforcement was conducted during a period of 5-6 months. Criterion for the selection was the potential reduction in accidents when speed is reduced to a maximum of 15% speeders. Information regarding the speed campaign was given through regional TV, radio and the press, so drivers are forewarned. During the campaign the results of the enforcement is given in the papers periodically. The enforcement was conducted only during working days from 7-19 hours from an unmarked police car, parked along side the road, using radar + camera. The planned frequency of speed checks for every road was once every five days during two hours. This was not reached because of capacity problems of the police, partly due to the reorganisation. On average each road was enforced during 1,5 hours every 7-10 days.

Down stream from this car a portable sign was placed, showing 'Your speed has been checked. Police'. The aim of this sign is to increase the subjective enforcement level. Posters are spread along the network, showing a speedometer and the text 'It must be lowered!'.

A speed sign using a radar gun was applied periodically on the network - without enforcement - to attract the attention of drivers on their driving speed.

The project was conducted under supervision of a working group, with participation of the road authority, public prosecutor, police, regional road safety organisation, organisation for road safety campaigns and SWOV.

A survey among drivers showed that this type of enforcement method was condoned by the majority of the drivers. 50% of them contend that they will comply to the speed limit also without enforcement, 85% say they do this when they are checked once a month, and almost all drivers say they won't speed when checked every week. To attain 15% speeders only, so a monthly speed check during 7-19 hours is needed, meaning the input of manpower should be increased substantially. At present the capacity of the police is insufficient to do this.

The speed evaluation was conducted using radar measurements from an unmarked car, parked along side the road. Some of the drivers brake their car seeing the parked car, supposing speed checks being conducted by the police. This effect may be greater during the campaign because of the information given through the press, etc. The result was a reduction of the 85 percentile speed with about 5 km/h, the percentage of speeders was only lowered from 40% to 30%.

Literature

- Catshoek, J.W.D. & Janssen, S.T.M.C. (1995). *Monitoring of the demonstration project 'Sustainably Safe Western Zeeland Flanders': A definition study*. [In Dutch].
- Catshoek, J.W.D. & Varkevisser, G.A. (1994a). *Motor vehicle speeds on 80 and 100 km/h roads (II)*. R-94-70. SWOV, Leidschendam. [In Dutch].
- Catshoek, J.W.D., Varkevisser, G.A. & Braimaister, L. (1994b.) *Pilot speed measurements in built-up areas*. R-94-71. SWOV, Leidschendam. [In Dutch].
- Godwin, S.R. (1992). *Effect of the 65 m.p.h. speed limit on highway safety in the U.S.A.* Transport Reviews, Vol. 12, No. 1, 1992, pp 1-14. [In English].
- Ministry of Justice (1993). *Criminal law with prudence; Guidelines for Traffic Enforcement*. Policy program of the Prosecution Office 1993. [In Dutch].
- Ministry of Justice (1996). *A volume of Texts and Tariffs on crime, trespassing and administrative infringements*. The Hague, January 1996. [In Dutch].
- Ministry of Transport (1991). *Multi-Year Road Safety Program*. The Hague. [In Dutch].
- Ministry of Transport (1993). *Evaluation report on speed policy 1993*. The Hague, 1993. [In Dutch].
- Ministry of Transport & Dutch Association of Road Markings and Signs (1991). *Road Signs; Guidelines for the Road Authority*. [In Dutch].
- Nilsson, G. (1981). *The effects of speed limits on traffic accidents*. OECD Proceedings of Symposium on the Effects of Speed Limits on Traffic Accidents & Transport Energy Use, Dublin. [In English].
- Oei Hway-liem (1993). *Background, design, and results of experiments on automatic speed warning and enforcement*. In: Proceedings of Symposium on Electronic Speed Management 'You are driving too fast', Organised by Ministry of Transport and SWOV, Utrecht, November 30th 1993. [In Dutch].
- Oei Hway-liem. (1994a). *Towards a traffic measuring network for national and regional purposes*. R-94-53. SWOV, Leidschendam. [In Dutch].
- Oei Hway-liem (1994b). *Effective speed management through automatic enforcement*. Proceedings of Seminar J on Traffic Management and Road Safety (pp 277-288) of 22nd PTRC European Transport Forum, University of Warwick. Warwick, September 12-16, 1994. [In English].
- Oei Hway-liem (1996). *Automatic Speed Management in The Netherlands*. Presentation at the Transportation Research Board Conference, Washington D.C., 7-11 January 1996. Session no. 154, Tuesday 9th January, 7 30 pm, Sheraton Hotel, Washington D.C. Preprint No. 960943. [In English].

Oei Hway-liem & Goldenbeld, Ch. (1995). *Evaluation of the enforcement on speed on 80 km/h and 100 km/h roads in the province of Friesland*. R-95-24. SWOV, Leidschendam. [In Dutch].

Oei Hway-liem, Minnen, J. van & Goldenbeld, Ch. (1995). *Automatic speed enforcement on N266 in the province of Noord-Brabant; A long term evaluation*. R-95-9. SWOV, Leidschendam. [In Dutch].

Oei Hway-liem & Papendrecht, J.H. (1989). *Speed signs, speed reduction and road safety. Evaluation of a local speed warning system*. Proceedings of the 6th International ATEC Congress. Paris, 3-7 July 1989. [In English].

Project group of Regional Road Safety Organisation (1995). *Agreement regarding speed enforcement on 80 km/h roads in SE Friesland*. [In Dutch].

Province of Friesland (1994). *Speed management policy on provincial roads*. Leeuwarden. [In Dutch].

Salusjärvi, M. (1987). *The speed limit experiments on public roads in Finland*. Gothenburg. [In English].