

The road safety phenomenon

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F.C.M. Wegman
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SWOV Institute for Road Safety Research, The Netherlands

SWOV Institute for Road Safety Research
P.O. Box 170
2260 AD Leidschendam
The Netherlands
Telephone 31703209323
Telefax 31703201261

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Fred Wegman
SWOV Institute for Road Safety Research
The Netherlands

1. Introduction

Central and East European Countries (CEECs) are faced with the enormous task of implementing political, economic and social changes in converting their centrally controlled planned economy to a market economy. Transport and infrastructure are of vital importance in bringing about these changes and achieving economic growth. Economic growth will lead to increased prosperity and to a rise in the number of private cars owned. Once economic growth is established, this will also result in increased mobility: more transportation of goods, including by road, and higher mileage by private motorists. Unless the road system is expanded and the quality of the existing road system improved, major problems will arise: capacity problems that lead to less efficient use of the infrastructure and hence to economic losses and problems relating to nature and the environment, various difficulties (such as through traffic passing through small towns and villages, city centres congested with cars) and more accidents and casualties.

If it is assumed that the recent political and economic changes in CEECs result in (tremendous) economic growth and thereby in a further increase in mobility (a 'catching up' action), then extra effort will be needed to decrease the fatality rate. The extent to which this succeeds will determine the developments in road safety in CEECs. However, present indications give cause for concern. The number of casualties has risen in the last few years in the various countries and CEECs already score badly on various counts (number of casualties per inhabitant and per kilometre), as can be seen in Table 1.

In this contribution it is assumed that this is in fact the case. Without in-depth analysis of road safety and of the developments that affect it in the countries mentioned and without knowledge about their administrative system and administrative culture, one should not be tempted to formulate recommendations as to how road safety can best be improved in these countries. It is possible, however, to indicate the extent to which the policy pursued in highly motorised countries has helped the improvement of road safety. For the most part this will need to be a qualitative evaluation. It is also possible, using present knowledge, to indicate what could have happened in the past in western countries in order to achieve better results. Both of these aspects are examined: what policy has been pursued in highly motorised countries, especially in the field of infrastructure, and what is the result of this and also what could have happened that would have produced better results. CEECs could then judge for themselves what is applicable for them.

2. The road safety phenomenon

Let us look at an account of a road accident at random (Wegman, Mathijssen & Koornstra, 1991). An 18 year old youth has just passed his driving test. One Saturday night he is driving his friends home from a disco. The teenager has recently bought a second-hand car. The way home takes them over a winding dike beside a river. It is raining. The teenager misjudges a

	Fatalities per 100,000 population	Fatalities per 10,000 motor vehicles
Estonia	29.4	-
Hungary	20.5	8.8
Latvia	32.9	-
Lithuania	29.1	-
Poland	20.7	10.9
Russian Federation	30.4	18.4
Czech Republic	15.6	5.4
Austria	19.9	4.0
Belgium	18.7	3.9
Denmark	11.8	2.9
Finland	12.6	2.8
France	18.5	3.9
Germany	14.2	2.6
Italy	14.0	2.4
Netherlands	8.5	2.0
Norway	7.6	1.5
Spain	22.6	5.6
Sweden	8.7	1.7
Switzerland	12.4	2.1
United Kingdom	8.2	1.6
Australia	12.2	2.0
Japan	11.6	2.2
New Zealand	18.9	2.9
USA	16.4	2.2

Table 1. Fatalities (within 30 days) per 100,000 population (personal safety) and per 10,000 motor vehicles (road traffic safety) for highly motorized countries (source IRTAD) and Central and East European countries (1991)

bend. He is driving too fast so he cannot adequately correct for the bend. The car drives into the river. Because the youths are not wearing a seat belt, they are thrown out of the car and drown. The following morning a passer-by discovers the accident.

Cause? A young, inexperienced driver, not wearing a seat belt, driving at night in the rain along a road without a barrier, an unexpected sharp bend, bald tires? All of these factors could have contributed to the accident and to the outcome. Often a critical combination of circumstances is involved (OECD, 1984). Pointing to one single cause, finding one culprit for an accident, does not do justice to the complex reality and - unnecessarily - limits the real opportunities to prevent accidents. Research reports in the United States and the United Kingdom (cf. Rumar, 1985) have concluded that 95% of accidents are due to human error, 30% result from faults in road-design and 10% are the result of mechanical defects (Figure 1).

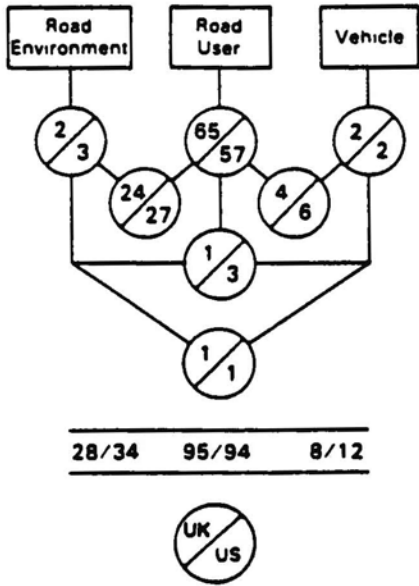


Figure 1. Percent contributions to traffic crashes as obtained in British and US in-depth studies (Rumar, 1985)

One conclusion that is sometimes drawn from this is that education (information, police enforcement, training) is the most important way of preventing accidents. This conclusion is erroneous and researchers have warned often enough about drawing such a conclusion. Is it not the case that road improvements, for instance, are intended to prevent human error? Information about the 'single' cause of accidents does not logically lead to a conclusion about the most effective way of preventing accidents, not counting the cost of measures. It is also possible to draw erroneous conclusions if one relies on police reports in which the question of guilt is settled. One of the people involved in the accident has always violated the law in some way: traffic regulations are so strict. However, this does not say anything about the most effective or efficient way of preventing an accident.

It is advisable to use a phase-model of the accident process when analysing road accidents

and formulating measures. Figure 2 shows an example of a simplified model.

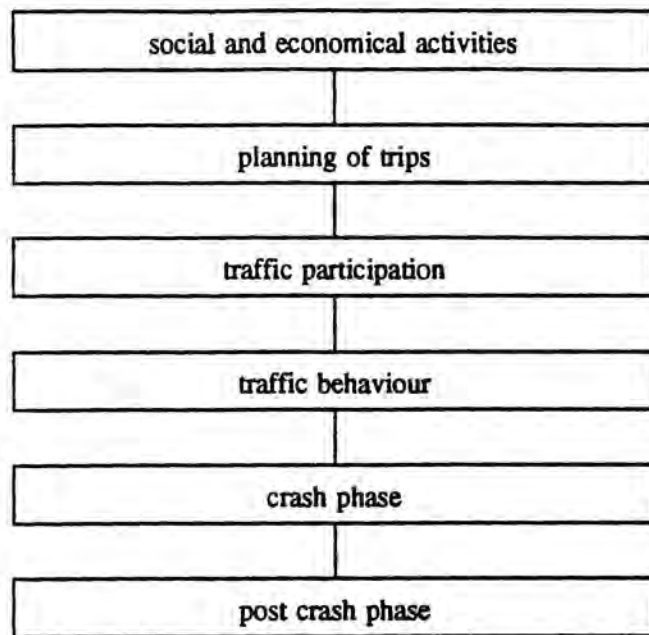


Figure 2. Phase model of the accident process.

There are many opportunities to intervene in this process. The earlier the intervention, the more structural and effective it will be. In the end road users themselves will have to prevent accidents and behaviour always plays a part in this. Others, though, (road authorities, road safety organisations etc.) can influence circumstances such that the risk of human error is reduced. Preventing accidents or lessening the seriousness of the outcome is not only the responsibility of the individual road user but also of collective decision makers (authorities, private organisations, industry etc.).

Furthermore, people should realise that when it comes to decisions about road infrastructure and about the vehicles that use it, there are more arguments involved than road safety considerations alone; these include physical planning and land-use policy, transport and traffic policy, environmental considerations, public health policy, etc (OECD, 1984 and 1994). This means that road safety is just one of the criteria used in decisions of this kind. It very often happens that road safety is not considered to be the main objective, though decisions are made that may have consequences for road safety. Road safety is one facet of these other areas of policy. This may mean that insufficient or no importance is attached to road safety, something that can happen consciously or unconsciously (Wegman & Oppe, 1988).

3. Developments in road safety in CEECs

Representatives from the countries themselves have made revealing statements: "In Russia, the problem of road safety is currently of vital importance. According to statistics, almost all absolute and relative indices of accident rates have been increasing" (Federov, et al., 1993). The Road Safety Plan of Hungary states: "Compared to earlier national data and to international data, the number of people who have died or been injured in road accidents has

increased, while discipline in traffic and observance of regulations are at their worst level ever".

A number of reports have been written recently that give an indication of the road safety problems in CEECs. For example, the World Bank and the European Community commissioned an initial survey in Hungary, Poland, Bulgaria, Rumania, the Czech Republic and Slovakia (e.g. Gerondeau, et al, 1992 and 1993). The Nordic Road Traffic Safety Council has also issued a report on the road safety situation in the Czech Republic, Slovakia, Hungary and Poland (NRTSC, 1992). The Technical Research Centre VTT from Finland has published a study on road safety in Estonia, Latvia and Lithuania (Segercrantz, 1992). In all of these reports an analysis is given of the developments in road safety, the conclusion is drawn that these countries compare unfavourably on an international scale and it is anticipated that there are many opportunities to improve the situation. At the end of 1992, the OECD organised a seminar on 'Technology transfer and diffusion for Central and East European Countries' in the area of roads and road transport (OECD, 1993). One of the themes of this seminar was road safety and the major conclusion drawn was that "Traffic safety is a major concern and targeted and integrated actions should be taken as soon as possible in order to reduce drastically the high economic costs incurred by road traffic accidents".

In order to give an indication of the economic scale of the problem, reference can be made to estimates prepared by the World Bank expert group. This group estimated that at present between 1 and 2% of the GNP is lost through costs incurred by road accidents.

The developments in the field of road hazard do not show a steady, continuous pattern. Figure 3 shows the developments for three countries, with no recognisable trend.

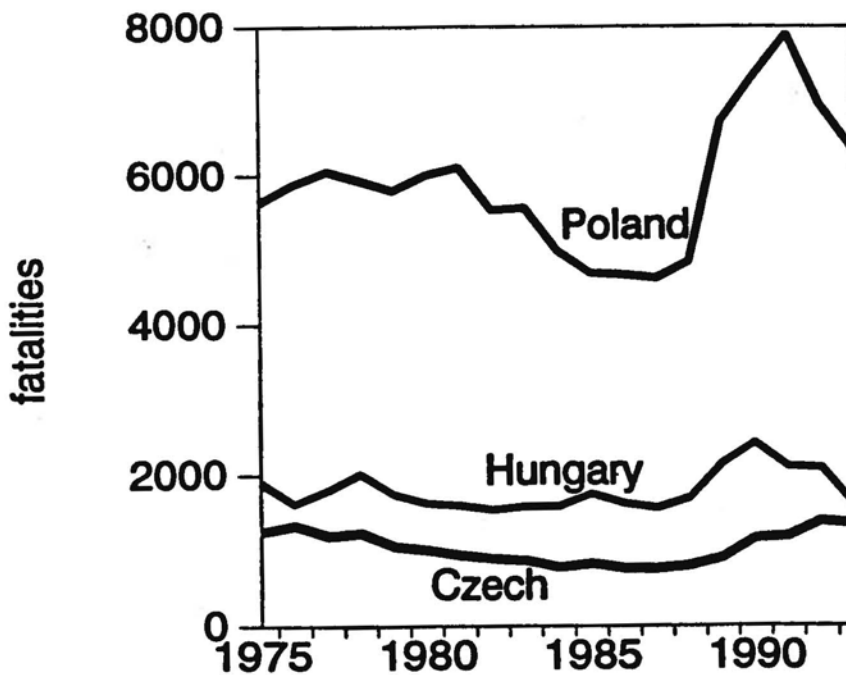


Figure 3. Fatalities in Hungary, Poland and the Czech Republic, 1975-1992.

The political and economic changes at the end of the 1980s seem to be expressed also in terms of a growth in the annual number of road accident fatalities. Of course, indications can be given to explain this phenomenon, which can also be found in the literature: a rapid growth in the number of vehicles, many new and inexperienced drivers on the road, many western new and second hand cars driving at relatively high speeds on inadequate and insufficiently maintained roads, much driving under the influence of alcohol in situations where there is little police enforcement and a poorly equipped police force, etc. These are possible explanations, but scientifically supported evidence is not available.

It is furthermore striking that, in a number of countries, the growth in road hazard has come to a halt. There are even countries where the 'war seems to be won'. Is the drop in road hazard in countries such as Hungary and Poland the herald of a favourable development, or is there question of a temporary favourable development which will soon revert? In order to be able to answer this question, it is useful to consider what developments have occurred in this field in highly motorised countries. If these developments can also be applied to Central and Eastern Europe, then predictions can be made for these countries on the same basis. However, it is risky to make statements about anticipated changes, particularly for the future. Reason enough to say something about the past in highly motorised countries, but not to be too eager to make statements about future road hazard developments for countries in Central and Eastern Europe. Nevertheless, lessons can be learnt!

4. More mobility, yet fewer traffic fatalities.

In various papers my colleagues Koornstra and Oppe have successfully modelled the developments of road fatalities based on long term developments in traffic growth (motorised kilometres) and in fatality rates (road deaths per distance of travel). The so-called logistic function, which is a S-shaped curve, fits the long term trend of traffic growth for many highly motorized countries. This could be illustrated for example by data from the USA, covering a period of almost 70 years (Figure 4).

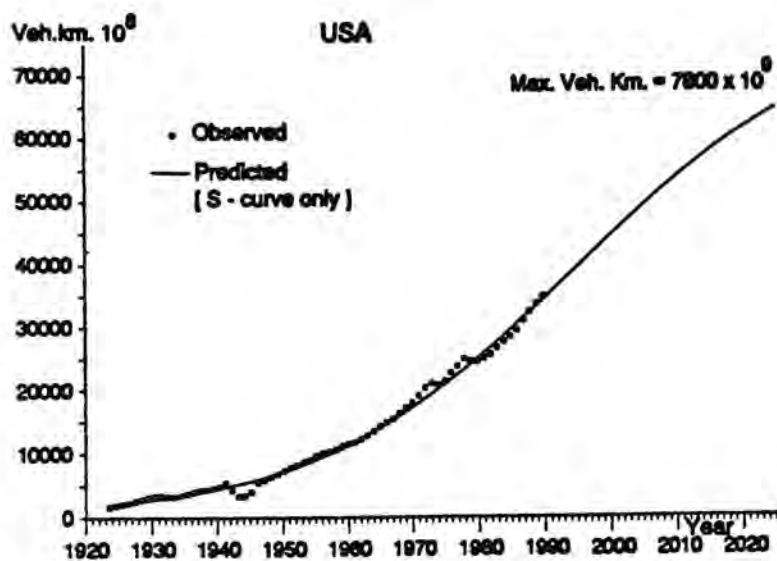


Figure 4. The S-shaped development of kilometrage in the USA.

Based on this curve a saturating level could be derived, assuming a growth of kilometrage could not be infinite. Of course, forecasts about car-ownership and growth of a population could be used as well to define a certain saturation level.

The growth of motorisation is accompanied by exponentially decreasing curve for fatality rates. This means a reduction in annual road fatalities per kilometre driven with a constant percentage (log-linear trend), although this percentage differs from one year to the next. The exponential curve is given for the USA, as an example (Figure 5).

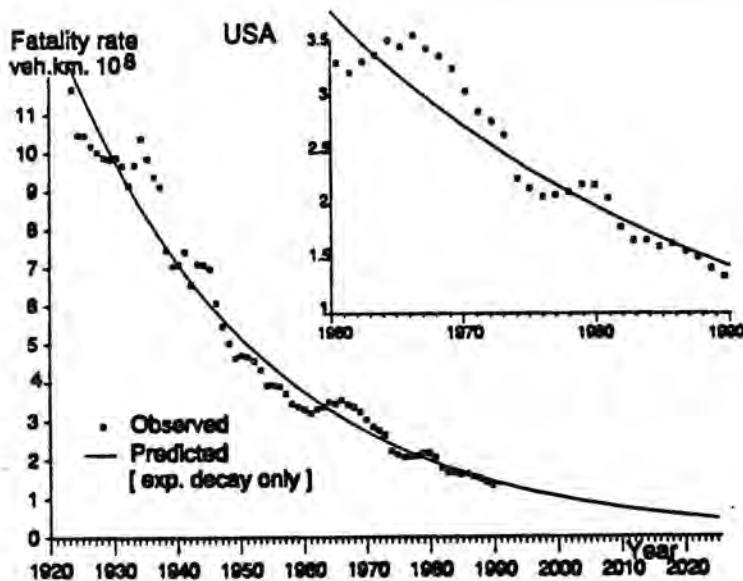


Figure 5. The exponential decay of the fatality rates in the USA.

The percent decline per year differs for different countries. Higher rates do not correspond with higher decline rates, although some indication could be found in different highly-motorized countries that nowadays the fatality rate decline is lower than in the past. Koornstra and Oppe concluded on empirical data that cyclic modifications should be added to the long term macroscopic trend of mobility growth and of fatality rate decrease as well, although some space for discussion remains. **Just by combining both developments as a product [fatalities = fatalities/kilometrage * kilometrage] the development of fatalities could be described (Figure 6).** This lead to the conclusion that a reduction in number of fatalities ought to be the result of a higher decrease in fatality rate than increase in mobility growth. Should the growth in mobility accelerate, for example due to high economic growth, then extra attention should be devoted to (road safety) measures with the aim of further decreasing risk in road traffic.

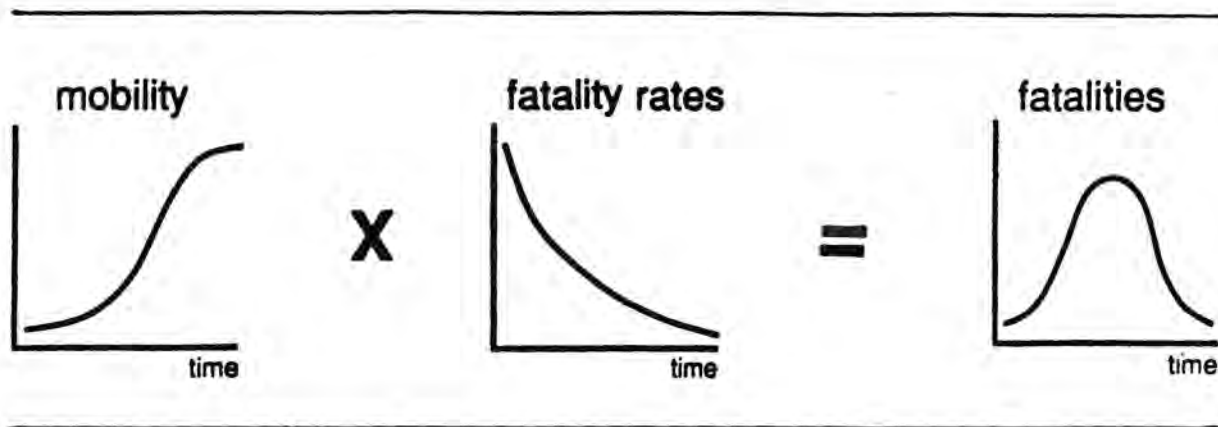


Figure 6. Relation between mobility, fatality rates and fatalities.

The following interesting results of these modelling activities are of great importance for policy making in Central and Eastern European Countries. First of all, remarkable differences are to be notified between different countries: high reduction rates in Japan and Finland (ca. 10% per year) and lower rates in the UK and USA with ca. 4%. It seems to be that the more recent the motorization and the more explosive, the larger the annual decrease in fatality rate. **This indicates that reduction rates of 8-10% in fatality rates must be considered as realistic targets for Central and Eastern European countries.**

Secondly, a correlation has been established in highly-motorized countries between traffic growth and fatality rate reduction: the slower the growth of mobility the less the reduction in fatality rate. High traffic growth percentages correspond with high fatality rate reductions in highly-motorized countries. However, in no sense this correlation is a result of a natural law or a spontaneous development. We might consider this correlation as a collective influence to adapt a society to growing traffic. Growing traffic requires an enlarged, renewed, improved and well-maintained road traffic system. This traffic growth and its corresponding adaptation results in better and newer roads, increasing mean driver experience, newer and safer vehicles and appropriate traffic regulations and enforcement. All highly-motorized countries went through this adaptation to mass-motorization. And a lot of information is available nowadays about effective measures to improve road safety. **So, if (accelerated) traffic growth is not accompanied by appropriate risk reducing countermeasures and activities, a (disastrous) increase of road fatalities might be an outcome.**

But, thirdly, a lagged correlation between traffic growth and fatality rate reduction were observed. So, after some years high traffic growth lead to higher fatality rate reductions. This could be understood as time-lag which is needed to implement effective countermeasures for risk reduction. But this mean more fatalities due to traffic growth and some years later, hopefully, reduction. **The lesson to be learnt here is, when accelerated traffic growth is anticipated, no time has to be lost to invest in safety!**

The developments of road traffic and casualties in Poland might serve as an example to illustrate the developments in Central and Eastern European countries. Figure 7 clearly shows that the average decrease in fatality rate over the last ten years (1982-1992) has changed in an increase, which could be considered of a temporary nature.



Figure 7. Rate change percentages in Poland.

The question is what to expect from the future? Two different scenarios could be made. In the first one we assume that the steep increase in fatality rates and fatalities form a part of the long term development in Poland (Figure 8A). Based on the assumption that the situation during the end of the eighties was from an extraordinary nature and says nothing about future developments Figure 8B could be composed.

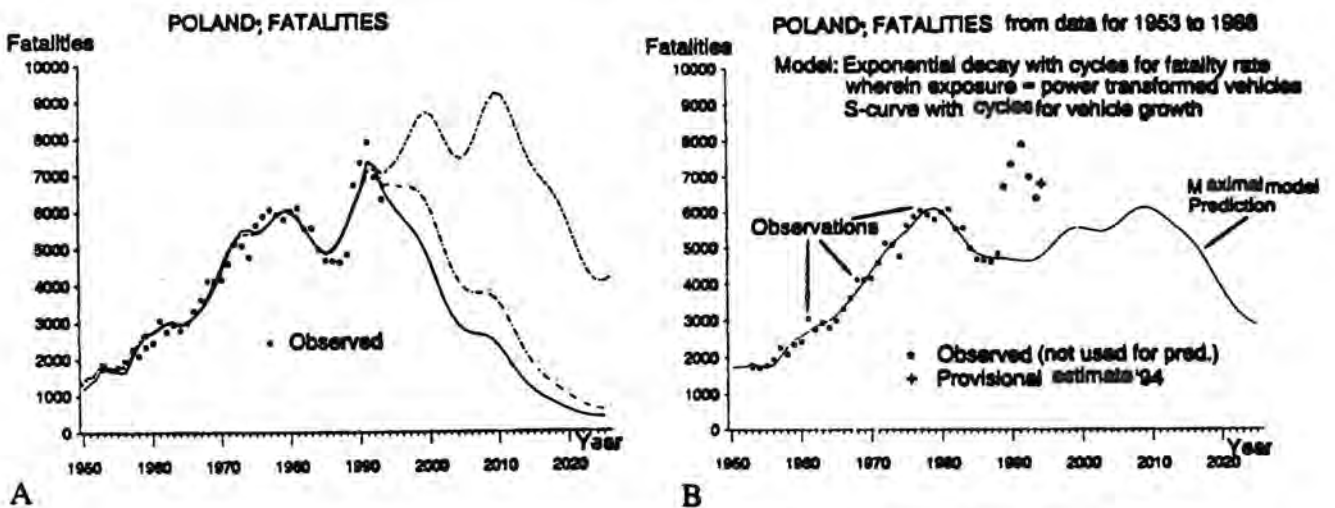


Figure 8. Predicted fatalities in Poland; A: data from 1953 to 1993 and B: data from 1953 to 1988.

From this the conclusion could be drawn that still a change exist of unfavourable developments in this field. But by investing in the quality of the transport system more favourable developments could be reached as well. Traffic growth, quality of the road

transport system and road safety are strongly related. This asks for integration of road safety policy in traffic and infrastructure policy. **When traffic growth will be accompanied by appropriate risk reducing measures, also in the field of infrastructure, casualty rates could decrease and, accordingly, the number of casualties.** Without appropriate measures to reduce casualty rates the number of casualties will increase!

5. Road safety: a social and political problem

Road use fairly seldom results in an accident for a road user. On average a road user in the Netherlands gets involved in a fatal accident every 10 000 years. It is understandable that the risk of an accident occurring is virtually of no importance in the daily driving experience of a road user. Looked at in this way, road safety is not a problem.

However, because a great many people live in a country and use the roads and because there are a great many streets and junctions, a completely different picture emerges. Viewed collectively, there is indeed a problem. Every year tens of thousands of people die in road accidents in CEECs (compared to 50,000 per year in the EU), including many children and young people. In addition, hundreds of thousands of people are injured in road accidents, which makes heavy demands on the health service as many accident victims are permanently disabled. All this results in substantial economic losses (1 - 2% of the GNP).

In addition to the factual, objective consequences of accidents, road safety has another, more intangible and subjective dimension. Responsible citizens complain to the government about hazardous situations: people drive too fast or a crossing is dangerous. There are parents who are bothered by the feeling that something could happen to their children in traffic. These are objective and subjective aspects of the same problem, a problem that, individually, results in tragedies, a problem that incurs enormous social costs for society as a whole.

Yet road safety does not seem to be perceived as a major social problem; nor is it perceived as a major political problem. If a society does not appear to take road safety seriously, it is extremely difficult to gain public support for road safety measures, either from institutions or from individual citizens and road users. A form of social mobilisation is involved here, the first phases of which are problem identification and problem recognition. Public support based on public awareness is no static concept, but rather a dynamic one. Public support can be created and if it exists one day, it can diminish the next. The result is that 'maintenance' is needed. In addition to establishing an effective organisational structure, achieving public support is one of the first activities that could be carried out within the framework of an (intensified) road safety policy.

Influencing social norms of behaviour in traffic follows naturally from this (Evans, 1991). Hence in some countries, drunk-driving has been reduced not only as a result of more intensive police enforcement, but also because a successful policy has been pursued to reduce the social acceptability of drunk-driving. Such a campaign is even more effective when it fits in with a more general campaign to discourage people from drinking alcohol ('alcohol ruins more than you think' and 'enjoy, but drink in moderation'). It appears that these forms of behavioural influence are also effective in other areas (smoking, healthy diet, physical exercise) and can be in the field of road safety.

An approach known as social marketing has recently begun to play a part in road safety policy. It includes phases of analysing the 'market', determining the needs and requirements

of the target group, formulating clear objectives, strategies and implementation programmes (OECD, 1993). There is an impression that if this approach had been adopted earlier, certain policy objectives would have been achieved earlier and at lower cost. This conclusion is partly due to the fact that the belief in legislation and subsequently in the enforcement of legislation has diminished. This option does not appear to lead to the objectives set or else would involve prohibitive costs.

This does not mean to say though that no legislation would be required for some issues. There is sufficient evidence (Wegman, 1992) that legislation and the associated enforcement of legislation has positive effects on behaviour (speed limits, wearing a seat belt etc.). What is in fact meant here is that legislation should not be the start of a journey that leads to a change in behaviour, but rather it should be the end of the journey. Legislation would only be introduced when (a considerable proportion of) road users have seen the sense of changing their behaviour and have demonstrated the desired behaviour to a certain extent. This approach will probably result in less discussion about the content of legislation and in better legislation!

Now that there are signs of regained freedom in CEECs, manifested by an unwillingness to obey traffic regulations etc., it might be interesting not just to react by introducing new and stricter legislation in this area, but to follow this social marketing approach.

6. Road safety: a policy problem

For years countries have had the task of improving road safety and many, if not all countries in the world will make an effort in some way. Politicians and policy-makers in positions of responsibility call road safety a serious social problem yet it does not seem to be taken seriously as a policy problem. The following statements have all been made at some point:

- The yardstick used is inadequate. Accident records are incomplete and those accidents that are recorded occur throughout the entire road system, seemingly unsystematically; there is nothing that can be done about it.
- Road safety measures encounter opposition, especially those that restrict individual freedom.
- The effects of measures are debatable and unknown in advance. With regard to the cause of and remedy for accidents, different opinions are fairly often expressed and it cannot be proved whether these are right or wrong.
- The effects of measures are not subsequently 'measurable'. It often proves difficult to make statistically sound judgements because the effect of measures is often difficult to 'isolate' from other influences and because chance fluctuations can play a major part.
- Central government cannot do everything alone. Tackling the issue of road safety requires effort from many bodies. This means that good collaboration is essential. It is difficult to achieve good collaboration and a lack of it can be demotivating.
- There are doubts about what authorities can do. It is difficult to determine the effects of measures taken by authorities in terms of a reduction in accidents and at first sight the effects are not apparent. As a result of this the view can - mistakenly - take root that a local government policy makes no difference.
- Understanding of road safety problems is not enough, whereby common sense and personal experience as a road user sometimes determine the view of individual

policy-makers and politicians. This situation in itself leads to disputes as regards content and policy.

- There is a lack of administrative precedent and experience in implementing measures. Tackling the issue of road safety - particularly where road safety is a facet of other areas of policy - has virtually no administrative precedent.

More than enough reasons for coming to the conclusion that formulating and implementing a road safety policy is no easy task. Quite apart from the 'usual' problems such as inadequate funds and a lack of sufficiently qualified personnel, whose numbers are, moreover, dropping, due to government cuts. In policy and administrative terms the improvement of road safety is a persistent and tricky problem requiring a great deal of inventiveness and decisiveness and involving a real risk of failure. To put it briefly, the improvement of road safety is not a subject for timid administrators who like to play it safe. To cope with these problems a recent OECD-study 'Targeted road safety programmes' (OECD, 1994) could be helpful.

7. A National Road Safety Plan

A National Road Safety Plan is an important means of getting and keeping this subject on the political agenda. What is more, a plan of this kind can also act as a reference for implementing policy. First and foremost, the plan should include a philosophy about how road safety is to be improved, in the short term and in the longer term. The plan should therefore open up possibilities and indicate frameworks.

A plan is not enough in itself. Conditions must be established that the plan will also be implemented. In the OECD-study 'Targeted road safety programmes' the conclusion is drawn that, based on findings available, "targeted road safety programmes do not guarantee better results than routine-type safety activities or automatically improve either programme planning or the likelihood of the desired accident reduction. However, a number of the features of targeted road safety programmes encourage good practice in programme planning. Clearly formulated road safety targets can guide policy making in a better way than less elaborate or less detailed road safety targets and, thus, improve safety performance."

In the Netherlands, a great many policy plans have emerged in the past in the area of road safety. Based on this experience, it is advisable to devote some attention to the following 'ten commandments' in a road safety plan:

- raise awareness and support in society and create public acceptance of safety measures;
- integrate with other areas of policy;
- create network of well-educated professionals and interested citizens;
- use know-how when implementing policy;
- check quality of implementation;
- combine long-term strategy with short-term successes;
- start with well-known and simple cost-effective measures;
- reduce chance of human error by increasing predictability in traffic, making traffic more homogeneous, reducing speed and separating road user categories;
- improve vehicle safety;
- improve emergency services and hospital care.

An international team of experts developed a methodology to assess the effectiveness of a

'National Road Safety System' (Worldbank/European Community, 1992). Two functions are defined in this methodology:

I. In the framework of the general design of road safety policy

- 1.1. Set up a road safety policy
- 1.2. Identify the problems
- 1.3. Identify and maintain specific skills
- 1.4. Obtain the necessary financial resources

II. In the framework of the implementation of the road safety policy

- 2.1. Set up general regulations relating to behaviour and protection of drivers (and passengers).
- 2.2. Improve safety level of infrastructure
- 2.3. Train and educate
- 2.4. Control and penalize
- 2.5. Ensure good conditions of new vehicles and those in use
- 2.6. Inform and make aware
- 2.7. Set up an effective emergency service for accident victims
- 2.8. Evaluate before and after the efficiency of measures and programs

8. Organisation of a road safety policy

A former Dutch Minister, who was responsible for coordinating the road safety policy, once wrote: "As Minister of Transport, Public Works and Water Management, I am responsible for the national road safety policy. I do not shirk this responsibility. However, I would stress once more that a Minister alone can accomplish very little. Road safety is a matter that directly concerns half of the Cabinet, but also, and particularly, administrators of provinces and local authorities, not to mention over 14 million other Dutch people" (Ministry of Transport, Public Works and Water Management, 1991). The following conclusions were drawn from this:

- attach more importance to coordination within the Cabinet;
- more targeted collaboration by all of the organisations within a province that have a role to play within the context of road safety;
- persuade citizens to obey traffic regulations that are vitally important.

Attaching more importance to coordination within the Cabinet means first and foremost making a statement of political will. A statement of this kind, supported by the Cabinet, legitimises activities relating to harmonising policy in various areas in the context of the improvement of road safety. The 'competitive position' of road safety is reinforced by the quantitative terms of reference which have been in existence for some years now: 25% fewer casualties by the year 2000 and before 2010 50% fewer deaths and 40% fewer injuries than in 1985 (Ministry of Transport, Public Works and Water Management, 1991).

Over the years it has proved necessary to have a separate unit within central government where road safety policy is coordinated and specific aspects of the policy can be implemented. Due to the complexity of road safety problems, some countries have opted to house this 'Road Safety Agency' within the offices of the Prime Minister (Japan, France). Other countries have brought an unit of this kind within a specialised department, usually the department that is responsible for transport and/or infrastructure. This agency organises

(formal) discussions with other ministries. In addition, discussions with other organisations and institutions, that are of relevance to road safety, are very important.

If, in addition to coordination, an unit of this kind is also allocated executive tasks, two risks should be combatted. First of all that other departments within central government (in the field of physical planning for instance, the health care system or the police supervisory organisation etc.) think that, because a road safety unit exists, they can be less involved. It might also happen that the dynamism of the road safety unit takes the initiative away from other bodies.

To summarise, an attractive type of organisation is a separate unit or agency which combines implementation of policy (particularly within the road safety sector, such as driving lessons, road safety campaigns) and coordination of policy (road safety seen as a facet of other areas of policy). This unit should have sufficient direct access to a Minister in order to be able to aim at an effective policy. The unit has a relatively modest budget to enable policy to be implemented by others based on the idea of 'setting a sprat to catch a mackerel'. In addition to carrying out its own tasks efficiently, the service will lay great emphasis on coordination by facilitating the activities of others, by providing encouragement and by making it attractive for others to contribute to promoting road safety.

Neither one Minister alone nor central government alone will be capable of pursuing an effective road safety policy. In 1993, there are doubts about a 'makable society', but the view that central government could make a society finds little support any more. Other sections of government and private organisations are vital links. Local and provincial government in every country in the world has a crucial role to play in physical planning and in the construction and maintenance of road infrastructure, where they enjoy a relatively large degree of policy freedom. The more active these administrative layers are, the more knowledge that is available, the higher the budget allocated to improve road safety, the more effective the efforts made in terms of a reduction in the number of road accident casualties. Perhaps this is one of the most important organisational provisos for a successful road safety policy.

Another effective means appears to be to allow private organisations to participate in formulating policy and to involve them in implementing aspects of the policy. What is more, private organisations need to work together and reinforce one another rather than hinder one another. The road safety unit has an important part to play in this process. Private organisations and organised interest groups that are working together must be considered capable of exerting social pressure and creating public support within society. A road safety parliament or a road safety council might be seen as a formal expression of these views.

9. Infrastructure policy and road safety

Since the beginning of the fifties a great many measures have been taken that have resulted in a substantial reduction in the risk of having an accident and have also led to a decline in the annual number of casualties. It seems that it is not possible to give a satisfactory explanation for the actual development; it is, however, possible to give an expert opinion on the basis of research findings.

The sixties and seventies saw a great deal of investment to expand and improve road

infrastructure in highly motorized countries. This resulted in a considerable expansion of the motorway network and in through traffic being diverted away from built-up areas. Comparison of the fatality rates for various types of roads reveals that the traditional roads (main roads within built-up areas and dual carriageways outside built-up areas, to which all traffic is admitted) are among the most hazardous (Figure 9). The fact that the proportion of safe types of road (calming areas and especially motorways) in the total length of infrastructure has increased, and that the proportion of mobility on these roads and streets has increased even more sharply, has certainly contributed to the drop in the fatality rate.

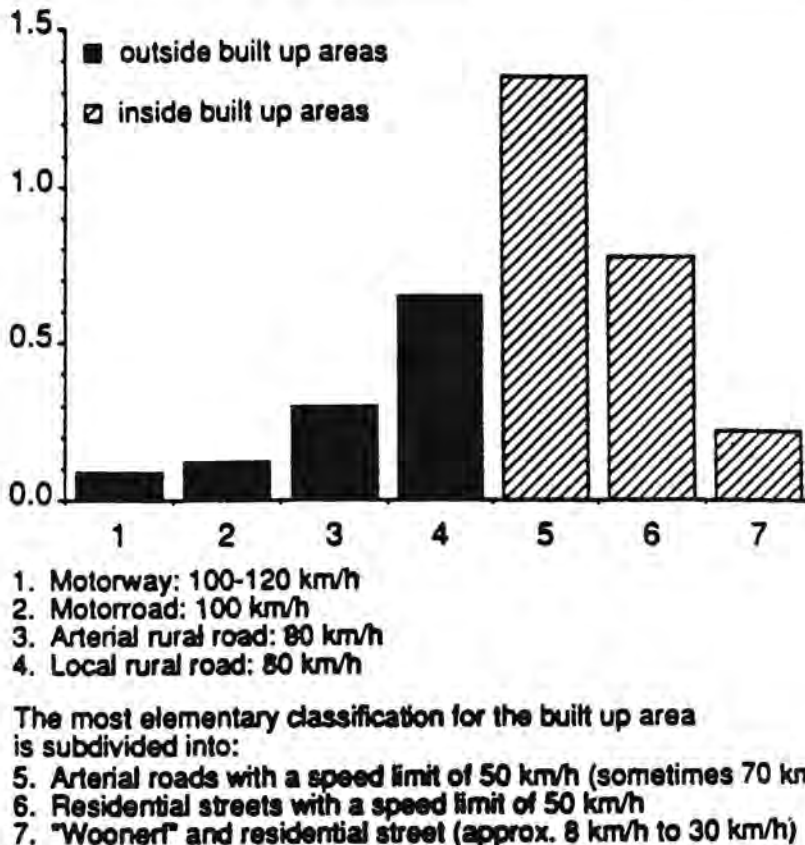


Figure 9. Injury accidents in the Netherlands (1986) per million vehicle kilometres.

A large part of the present road system, however, is still that roads and streets are expected to fulfil several incompatible functions at the same time, where the road user has generally to guess what to expect from the road traffic situation and is presumed to guess what others expect from him, where road users can and do drive at relatively high speeds, where large differences in speed are possible and do in fact occur, and where encounters with other road users coming from different directions are possible (SWOV, 1993). These factors explain the relatively high risks on these roads. There is some talk of a road system that has all the characteristics of gradual adaptations (not geared to one another) of the increase in mobility. There are three principles which, if they were adopted systematically and consistently, would result in a substantial decrease in the number of casualties. These three safety principles are functional use (preventing unintended use of the infrastructure, related to the function of the road), homogeneous use (preventing large discrepancies in speed, direction and mass at moderate and high speeds) and predictable use (preventing road users from experiencing

uncertainty).

If these principles were to be adopted, three functions of the road system would be clearly discernible for the road user: the flow function (rapidly processing with through traffic), the access function (making residential areas and districts easy and rapid accessible) and the property and residential function (making homes and shops accessible and at the same time making the street a safe meeting place). The design of the roads should be adapted to the allotted function; combinations of functions should be excluded as far as possible. It would have been advisable when constructing and expanding the road system to adopt the principles mentioned as far as possible, which would have meant that such large investments were not necessary (in retrospect). For that, a reference plan for the whole infrastructure would have been needed in which a hierarchically designed road system should have been the starting point. Furthermore, there would have to have been design guidelines in which road safety formed an important starting point and where (legal?) steps were taken to prevent deviation from the required design quality.

Now that CEECs can expect an increase in mobility and expansion of the infrastructure, it would be advisable to speak out in favour of such an approach instead of acquiring a higher degree of road safety at a later date at a much higher cost, as is the case in highly motorised countries at present.

This does not mean though that no further gain in road safety could be achieved in the short term with infrastructure measures. On the contrary, it is advisable to take low-cost measures in places where many accidents occur. Furthermore, highly motorised countries have amassed a great deal of knowledge, which at present is termed basic but which has been built up over many years, about the effect of road design, road construction and materials on road safety. Examples include the use of marking and signposting, road surfaces (unevenness) and winter maintenance. From the point of view of harmonisation it is also advisable for CEECs to adopt the general course of action of becoming a party to international treaties and conventions in this field.

10. Conclusions and recommendations

1. If it is assumed that the recent political and economic changes in Central and East European Countries (CEECs) result in economic growth, there will be an extra increase in mobility which, unless road safety measures are taken quickly, will lead to a decrease in road safety in CEECs. The increase in the number of road accident casualties in recent years proves that this expectation is correct. The number of casualties per 100,000 inhabitants and per 10,000 vehicles is (substantially) higher in CEECs than in highly motorised countries.
2. It is realistic to expect that an effective road safety policy in CEECs will result in a smaller decrease in road safety, as was the case in highly motorised countries until the beginning of the seventies.
3. With the knowledge that is presently available about the developments in road safety and the effectiveness of measures in highly motorised countries, the approach adopted in these countries could perhaps have been different than was the case in the past. CEECs might consider learning from this.

4. Road accidents usually occur as a result of a critical combination of circumstances and seldom have just one cause. There appear to be many opportunities for preventing human error that brings about road accidents (cf. the so-called phase model of the accident process). This could be used as a starting point when formulating a road safety policy. This means that thoughts and arguments with regard to road safety have to play a role in decisions concerning physical planning and urban development, in traffic planning, in policy concerning education, the police and justice system, the health service etc. This calls for integrated road safety programmes and requires the government to be organised in such a way as to reflect these. A unit with the important task of coordinating policy is a vital aspect of this organisation.

5. A politically sanctioned National Road Safety Plan, that is based on the starting points formulated above, is regarded by the entire road safety community as being its 'ownership', can count on the support of (large sections of) the public, is based on a clear analysis of road safety and contains concrete (quantitative) targets, can make a significant contribution to improving road safety. The implementation of this Plan should be monitored and the evaluation results of the monitoring should, if necessary, and in view of the targets to be achieved, lead to additional efforts being made.

6. The improvement of road safety should be situated in the long-term perspective of development towards 'sustainable' safe road traffic. Such a long-term perspective (20 years or more) should include concrete short-term goals. Steps should be taken to prevent measures being taken that jeopardise long-term targets: making compromises hinders the achievement of long-term targets and leads to extra costs being incurred.

7. Based on political will, on a proper organisation and making use of existing knowledge on the most effective and efficient measures, road safety can be improved. The chain is as strong as the weakest link. Improvement of road safety is an organisational and management problem in which the role of the government is crucial. Financial resources - or rather the lack of them - should not so much determine targets, but rather should only affect the speed at which the objectives can be achieved.

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