

Strategies for traffic safety throughout Europe

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STRATEGIES FOR TRAFFIC SAFETY THROUGHOUT EUROPE

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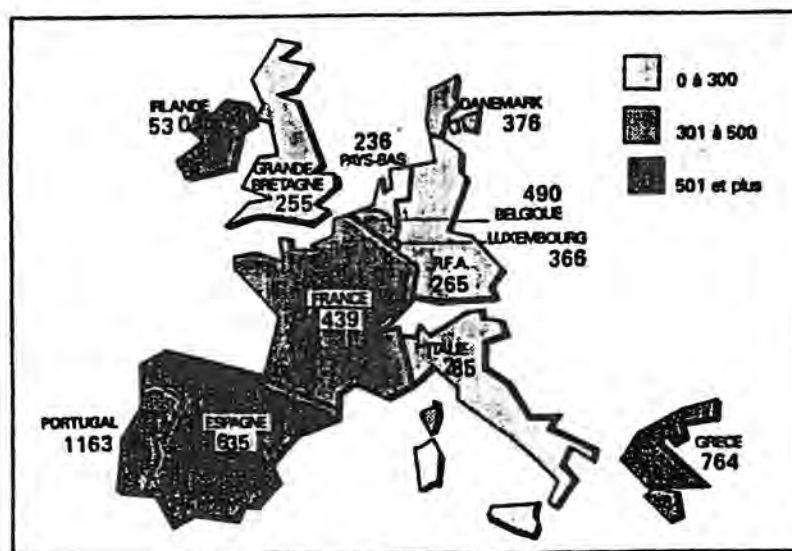
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1. The Responsibility for the Road Safety Phenomenon

Since the Treaty of Rome, the number of deaths in road traffic of the twelve EC-countries has reached two million; the number of injured is over 40 million. The economic loss due to road accidents is very substantial and endangers the welfare in the community. Now a days the macro-economic costs for the lack of road safety are about 70 billion Ecus per year in the EC-countries, depending on the calculation methods estimates ranges between 45 to 90 billion Ecus. The fact that this figure is larger than the Gross Domestic Product of, for example, Greece, Ireland or Portugal, demonstrates the extent of the losses involved.

If we compare passenger transport on the road with air or rail transport than the fatality rate per kilometers passenger travel reveals that the risk to be killed on the road is more than 200 times higher than for the other modes. The comparison of the fatality rate per kilometrage for road traffic between the EC-countries on the one hand and North-America and Japan on the other hand shows that road traffic is half less dangerous in North-America and nearly one-third less dangerous in Japan than in the EC-countries as a total. But there are also large differences in risk on the roads inside the European Community. Per million vehicles The Netherlands and Great Britain have a rate of road deaths which is less or about 250, while the rates in Spain, Greece or Portugal are 3 to 4 times higher.

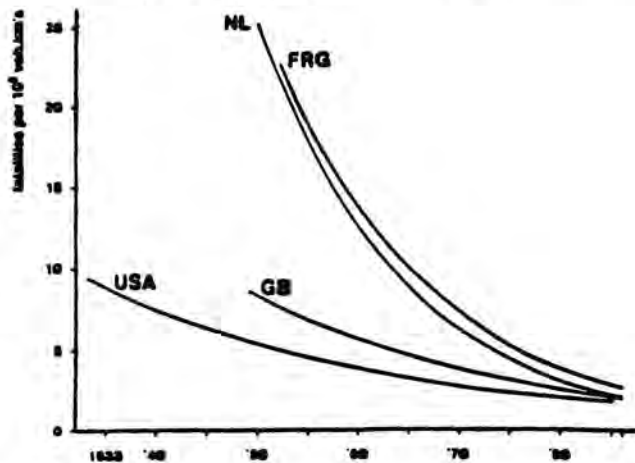
FATALITIES PER MILLION VEHICLES IN THE EEC



The fatality rate per motorized kilometrage differs even more with a factor up to 7 for these countries (UK and NL about 1.4; Portugal 10.5; per hundred million vehicle kilometers).

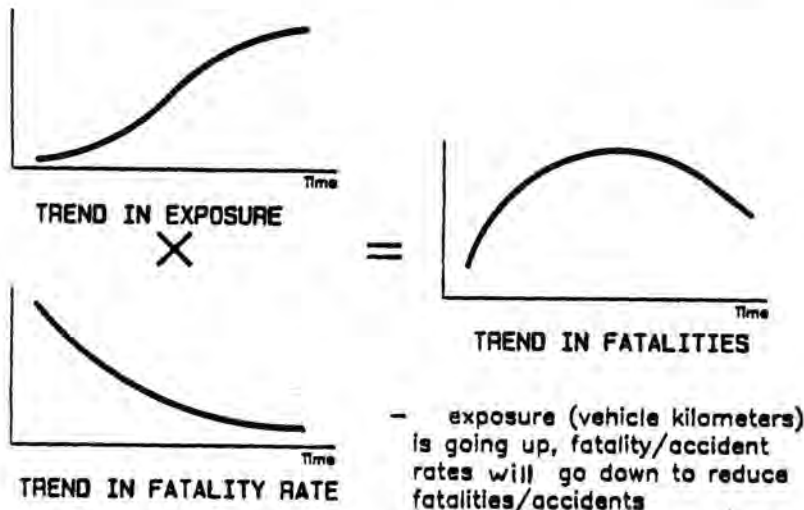
There are also differences in the changes over time (Koornstra, 1987; Oppe, 1991). Nearly every industrialized country shows a decrease of fatality rate per kilometrage in the long run. It seems that the longer the unbroken history of mass-motorization is, like in the USA or the UK, the lower the historical level as well as yearly decrease of that rate is.

COMPARISON OF FATALITY RATES IN 4 COUNTRIES



As long as the percentages of growth in motorized kilometers is larger than the percentage of decrease in fatality rate, the number of fatalities is increasing. In western Europe, North America and Japan this has been the case up to the beginning of the seventies and also after the mid eighties in Japan and some Western countries. If the percentage of growth in motorized kilometers levels off and attains a level below the percentage of decrease in fatality rate, the number of fatalities reduces. This results simply from the tautological expression of:

$$\text{Fatalities} = \text{Fatality Rate} \times \text{Vehicle Kilometers}$$



In Greece, Spain and Portugal the motorized kilometers grew greatly in the last ten years and there we also saw a large increase in the number of fatalities. One may expect that the same will hold for the East European countries in the next decade. In this respect the safety differences between countries may be regarded as a matter of advances and backlashes in macro-development of mass-motorization. National policies are a main factor in the determination of the course of this development and, moreover, the policy in the EC can influence that macro-development.

In view of the above figures (which mainly can also be found in the EC-report of the high level expert group for an European Policy for Road Safety (Gerondeau, 1991) of which group I was a member) and their developmental and policy dependent nature, it must be concluded that road accidents are not an unavoidable corollary to the increasing motor traffic. On the contrary, authorities and their policies can, if not to abolish, at least reduce the number and seriousness of road accidents. In this matter, so also states our EC-report (Gerondeau, 1991 p. 15):

" the authorities have a fundamental part to play, through the action which they do (or do not) take:

- . they are responsible for the road network and its equipment;
- . they are responsible for the standards applying in building and controlling vehicles
- . they are responsible for organizing assistance;
- . lastly, they are to a very large degree responsible for the opinions and the behaviour of road users, whom they can influence through education and training, information, traffic regulation, enforcement and penalties."

The Gerondeau-report acknowledges that individual mistakes or bad conduct can be demonstrated in 90% or more of road accidents, but warns not to draw the wrong conclusion from that point. It states that:

" the behaviour of every road user is in fact largely dependent on circumstances of his journey outside his control (road network characteristics, other users' behaviour, the regulations, the degree of enforcement, etc.)."

A convincing illustration can be found in the fatality rate on motorways which is many times lower than on other main rural roads; it is hardly acceptable to assume that the responsibility of drivers on these roads is suddenly changed. The frequency of road user mistakes and the consequences vary considerably with the characteristics of the elements of the road traffic system he uses.

The Gerondeau-report concludes: ' Whilst the part played in accidents by individual faulty actions of large numbers of users is often used as an excuse for inaction, there is a need for the awareness that, in spite of the appearances, the responsibility for taking action against traffic accidents is primarily collective and that it falls firstly on the various public authorities which might take such action. ... Progress is only possible through this approach, as is shown by the experience of those Community countries which have achieved the best results. ... Of course, other groups besides the authorities should and can take action on road safety: the car makers, the insurance companies, the media (etc.). And voluntary bodies also can play an important part in attaining public awareness and in changing attitudes in any coherent action, their potential support must be sought. Nonetheless, there is a fundamental need for a commitment of preventing accidents, from all the public authorities involved. That includes a commitment from the Community.

2. A European Safety Strategy

The Experts Committee recommend in the Gerondeau-report three general objectives for a European strategy for road safety.

- Firstly, set a quantified multi-year target for the whole of the Community, such as a reduction of between 20% and 30% in the number of victims in road accidents by the year 2000.
- Secondly, establish gradually a European Road-Safety and Road-Traffic Zone by harmonization of the safety levels in the Member States, encouraging the countries with the worst problems of low safety to catch up without delaying progress in the countries more advanced in the field.
- Thirdly, set the target of promoting a behaviour model for road users mindful of others, a model of driving calmly and not aggressively, both in town and on rural roads.

These three objectives can be reached, according to the Expert Committee, by adopting measures throughout the Community which have shown to be effective in reducing the number and seriousness of road accidents, but which are not applied in all the EC-Member States. In the Expert Committee we were very pragmatic and realistic. We did not concentrate on modern electronics and telematics, despite the potential value which such measures may have in the future; nor did we make innovations or propagate until now unapplied measures. Nearly all our concrete proposals are already at least applied in one of the Member States with positive results on road safety which are judged to be also effective in the other Member

Countries. The only innovations were some combinations of varieties of similar measures which were judged to yield a more optimal effect. The Expert Committee listed 64 proposals for such concrete measures. These proposed measures can be taken on different levels, either by the Community institutions or by authorities on the national, regional or local level.

Not all proposed measures belong to the European level, but on the level of the European Community action also should be taken toward the lower organization levels by dissemination of knowledge and the pooling of experience in Member States. The EC should actively facilitate the adoption of proposed measures and issue recommendations for actions, and if necessary, urge the adoption of some measures by Member States. For this active role of the European Community, the Expert Committee listed 14 proposals of a more process and organization oriented nature.

Here it is not the place to elaborate on the latter 14 proposals directed to the level of the European Community. Nor can I discuss all the 64 concrete measures that has been proposed, but I shall try to highlight and illustrate some general ideas beyond the scope of these measures. First of all and beyond these proposed measures, we have realized that human behaviour is not infallible and also that no one really wants to become involved in an accident by his own behaviour, but that the frequency of the seldom failures of millions of road users, which nonetheless results in the enormous amounts of losses in road safety, is largely dependent on the human made traffic system. Since one can not create an infallible human being by measures, the reduction of that failure frequency must be sought in an improved traffic system which elicits less opportunity for failure. Such failure opportunities, however, are also elicited by the road user behaviours of others. Of the concrete proposals 24 measures concern that improvement of road user behaviour with respect to the others directly. The idea beyond them lies in the fundamental principal that human behaviour is conditional to circumstances and individual backgrounds as well as to the expected utility of the outcome of that behaviour. The individual background is mainly shaped by public information, education and training as well as by the experience in traffic which are conditioned by stimuli from the physical traffic structure as well as by traffic laws or regulations and their enforcement and penalties. The 24 behavioural proposals are directed to these domains which condition the road user behaviour. Such a proposal like the compulsory use of day time running lights illustrates in a simple way what I mean by improvement of the

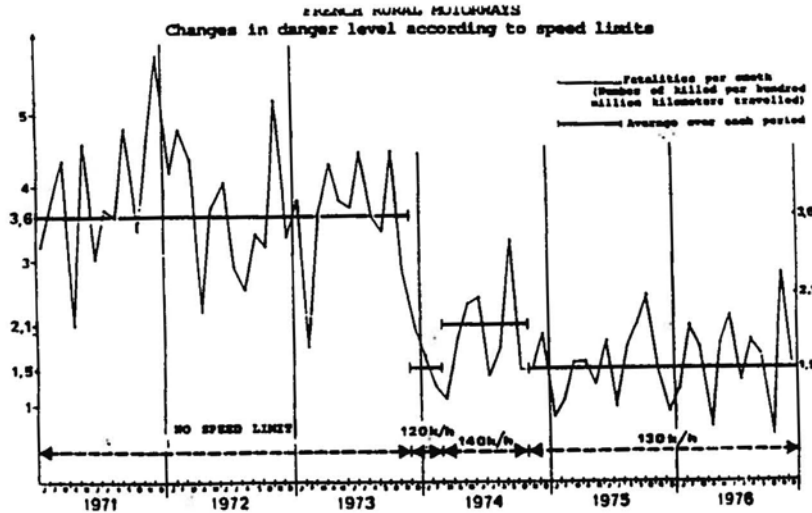
behaviour of other road users; it simply reduces the failure rate of not timely reactions of others with respect to your own behaviour, as the recent results from the new obligation in Denmark has reaffirmed. However, such "stand-a-lone-proposals" are not the most important ones. I regard, apart from the European harmonization in the proposals, the integrated scope of the proposals for

- a) graded licensing and the practice of accompanied learner driving,
 - b) speed regulations and
 - c) specific and general enforcement practices
- as the most important behavioural proposals for an effective road safety strategy on this topic in the Gerondeau-report.

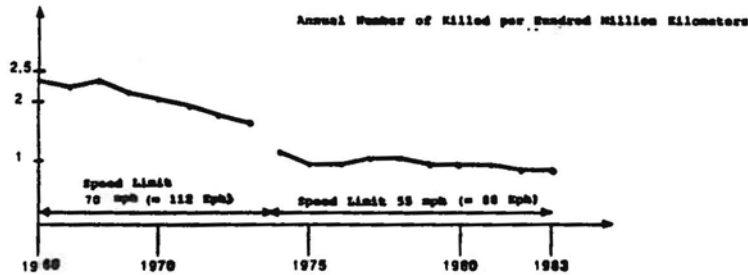
If the proposals on the training and licensing of drivers of the report (Gerondeau, 1991 p. 20) would be applied throughout the Community, then the risks of young drivers could be reduced considerably. The French experience with such a procedure shows that skills and knowledge alone are insufficient for safe driving by youngsters, but that danger perception and responsible driving can be learned in a very practical way. If the French results apply in general then the risks reduction of young drivers reduces even by a factor of seven times, which in the EC-States would mean more than 10% less serious accidents, that is more than 150.000 injured and about 5.000 fatalities per year less and a gain of 7 billion Ecus for the whole of the Community. A very cost effective and important life saving measure indeed, which only depends on the political willingness of their adoption.

The level of mean speed given the road type and the variation in speeds are important factors in traffic safety. The variation in speeds on the road (also between categories of road users) determines to a large extent the number of accidents. If the standard deviation of speeds is reduced, then theory says that the number of accidents approximately changes nearly by a quadratic effect of that reduction. The absolute level of speeds determines also quadratically the seriousness of the outcomes of a given accident with the particular masses of vehicles involved. Since generally variation of speeds reduces with a reduction of absolute mean speed, it follows that mean speed reduction easily can have a fourth power effect on safety, which for example means that a reduction or increase of 10% in mean speed (factor .90 or 1.10) can change the number of fatalities by 34% reduction (factor $.90^4 = .656$) or increase of 46% (factor $1.10^4 = 1.464$). These theoretical considerations are confirmed by

several empirical Swedish studies (Nilsson, 1982) and are also confirmed for motorways in the USA and France, as shown in the two pictures taken from the Gerondeau report here.



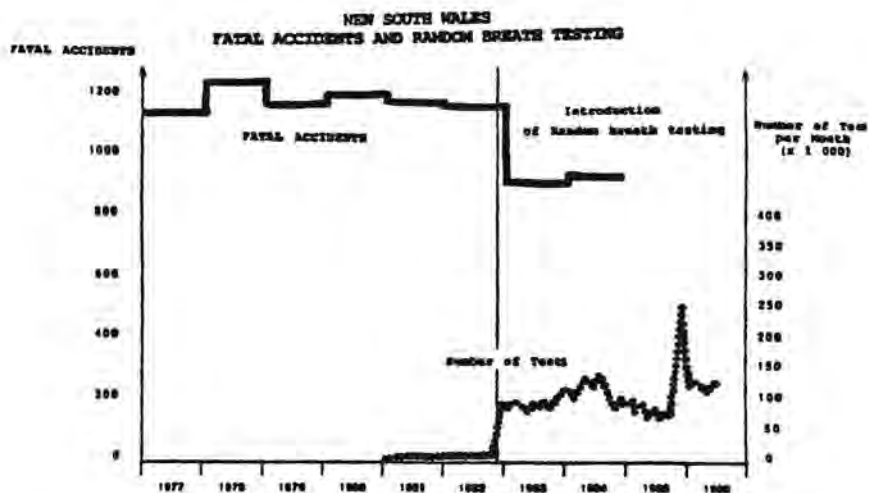
RURAL INTERSTATE FREIGHTWAYS: CHANGE IN DANGER LEVEL
ACCORDING TO SPEED LIMITS



But not only on motorways this relations between speeds (and speed variations) and accidents holds, also the Danish actual speed reduction from the urban speed limit change of 60 km/h. to 50 km/h. and the Dutch results on so called "woonerf" by traffic calming measures inside living areas which reduces speeds from 50 km/h limit to speeds below 30 km/h. affirmed these relations between speeds and accidents. The network related proposals of the Expert Committee on speed limits, speed enforcement and automatic control as well as the proposals for car-manufacturing and their advertisement, therefore, are of utmost importance. Their application in a harmonized way to all types of roads in the Member States could save many thousands of lives and also reduces billions of Ecus in the Community.

This includes their application to the German motorways and rural roads; speed limits on these roads could stop the increase of fatalities which is observed in the last 5 years on the German motorways and also can reduce the increasing share of traffic fatalities from rural roads in Germany.

The importance the proposals for a renewed enforcement practices of specific and general police control in the Gerondeau-report are illustrated by the results of the intensified random breath testing in New South Wales in Australia.



Not only show these results that such a high density of testing leads to lasting reduction of 20% of the number of fatalities, such a high density also is still cost effective since it yields a return rate of 2 for 1 Cost unit as Dutch research has shown.

The proposals of the Expert Committee in the Gerondeau-report which are directed to action for the infrastructure of the road network are 12 in number. The ideas beyond these infrastructure proposals are the based on a hierarchical categorization of the roads in the network with homogeneous characteristics along the routes within each category and their uniform layout of connection sections within and between types of roads.

Our road system evolved gradually from the network that was originally fitted for carriage and pedestrian travel. The road transport system has never been designed in such a way that the opportunity for accidents is prevented a priori, like it has been in the rail- and air-transport systems. Rail and air passenger transport are more than a factor of 200 times safer than passenger transport on our European roads.

traffic mode	area	fatality rate passenger km.
road	Eur. Comm. 1)	3.5×10^{-9}
rail	West Eur. 2)	1.6×10^{-10}
air	USA 3)	0.4×10^{-10}

Table 1. Risk per transport mode

- 1) Gerondeau report (1.3 passengers per vehicle).
- 2) Schopf (1989).
- 3) Based on NTSB publications.

The gradual upgrading of the road system nowadays constitutes a network of roads which is more an unpredictable concatenation of a nearly endless variety of road sections by an also endless variety of cross-connections. The result is a road system which is too complex for the road user to allow reliable predictions for the next oncoming situation. Only the layout of the motorway system permits relative reliable predictions. Since this road category is relative well predictable and because speed variation is relative low it is a relative safe type of road, in spite of the high speeds driven. The fatality rate per kilometrage on motorways approximates the safety of rail and air transport. The same level of safety holds for well designed residential calming areas, where speeds are so low that the variation in speeds is also low.

Road type	Max. km/h	Mixing fast/slow	Level crossings Oncoming traffic	Injury rate per million veh. km.
calming area	30	yes	yes	0.05
resid. street	50	yes	yes	0.80
urban main road	50	yes/no	yes	1.20
rural main road	80	yes/no	yes	1.40
rural motor road	80	no	yes	0.30
rural moter road	100	no	no	0.11
motorways	100/120	no	no	0.07

Table 2. Injury rate for road categories with different speed limits, road user mix and traffic directions in The Netherlands 1986.

As can be seen from the above table of injury rates on Dutch roads, which belong to one of Europe's most safe road networks, all other road types than motorways and calming areas have considerable higher injury rates. The lack of safety varies with the combination of the level of speeds and the amount of variation in speeds due to discontinuities (level crossings

and oncoming traffic) and mixture of slow and fast categories of road users on the road type. The rural main roads and the urban arterial roads are the most dangerous ones. The redesigning of the road categories between motorways and residential calming areas to limited number of categories of self-explaining roads with well predictable uniform layouts of routes and crossing types is most urgent. This is a major long term tasks which should be undertaken in a coordinated way on a European level, since diversity in the Community increases the unpredictability for the foreseen increase of cross-national travel of road users in Europe.

The ingredients of such a redesigned road network ask for more research on safer layouts, but some elements are know already. Separation of slow and fast traffic and traffic with large mass differences is one of the safe design principles. This means only pedestrians on sidewalks and cyclist on separated cycle paths, while crossings for pedestrians and cyclists on rural main roads and arterial urban roads preferably should not be designed as level crossings. It also may mean special truck routes - for inter-regional heavy good transport and limitation of masses of trucks in urban areas, where delivery by smaller vans from just-in-time transit centers outside towns can be foreseen. Separation of tracks for oncoming traffic on rural main roads and urban arterial routes is also needed, combined with increased safety on reconstructed crossings and accesses to these roads. Research in France and The Netherlands has shown that the British round-about with priority for round-about traffic is a much safer level crossing than sign-regulated or unregulated crossings; reductions to even 10% of the accidents has been observed after reconstruction of crossings to round-abouts. The relative low share of fatal car-car accidents in the UK, compared to other Western European Countries may be explained by the frequency of the British round-abouts in their road network. On the other hand could the British authorities learn from other countries how their relative high share of fatal pedestrian and cyclist accidents can be reduced by safer road constructions for these road users. There is a long way to go before such a consistent road categorization can be established. The first steps, according to the proposals in the Gerondeau-report are the conceptual creation of the hierarchical structure of the categorized and homogenized road network and the clarification of its principles on a European level. We also have proposed to begin with the introduction of a systematic, periodical external compulsory inspection of the safety of the road system and to prepare and disseminate reference material with all the principles and rules for an upgrading to

the safest-possible road network by building new roads and rebuilding and modified maintenance of the existing road network. It must be possible to achieve such a safer road network in time scope of the next 30 years, but we must begin with it now otherwise there will be 1.5 million Europeans killed on the roads in the Community in the next 30 years.

The Expert Committee has also proposed 21 measures directed to actions of vehicles and certain categories of road users as well as 4 proposals for the improvement of the assistance to the injured. The proposals range from improved active and passive safety of motorcars, heavy vehicles, powered two-wheelers and cyclist to programmatic schemes for pedestrian safety, first aid, alert and emergency services. Again nearly all proposals are proven to be effective in one or more of the Member States or the USA, but not generally applied or less intensive applied in all Member States of the Community. Except the proposal for less dangerous car fronts to pedestrians and cyclists, the proposed measures in this area do not need much further research. The measures could be introduced today, the only obstacle is the time needed for regulation if the willingness for the introduction of these measures is present.

3. A Policy for Sustainable Road Safety

In view of the sad record of European road safety, compared with other industrialized continents as well as compared with other modes of transport, there clearly is a need for an active road safety policy. The Expert Committee has expressed the opinion that road accidents are too often seen as the inevitable price for the utility of travel and transport. And hence the possibility of an active road accident prevention policy is ignored. Such an active policy, however, can be possible on the basis of the recommendations discussed above and formulated in more detail in the report of the Expert Group to the European Commissioner for transport (Gerondeau, 1991). The Expert Group has asked the European Community, that is the Parliament, the Ministers of Member States and the European Council of Commissioners, to provide assistance in the work undertaken by the Member States against road accidents, because the Community is in the right position to do so. It has done so in matters of environmental protection and the advancement of science and technology in Europe and the Community should surely take a comparable action in a matter to which its citizens are highly sensitive, since it concerns the preservation of life itself and the safety of millions of those citizens.

It seems not a too ambitious task to bring the level of road safety in the whole of the Community on the level of the USA, which is also level of safety in some of the more advanced countries in the Community; this would save 20.000 lives and over half a million injured on a yearly basis. In the achievement of such a target the national States (and their regional and local authorities) still have to play a major role, but on the Community level the promotion of and assistance to the implementation of a common transport policy within which road safety is an integrated major element should be undertaken without further delay. At present there is no entity on the Community level that matches these tasks and the establishment of such an organization, comparable to the European environment or technology organizations, is needed barely in view of the economic and human problem described above. It is, however, not only a matter of organization and political dedication. In a democratic Europe the basis for common action and their resource allocation is based on public support, the Community, therefore, should by an active social marketing promote the need for a common road safety policy and defeat the unjustified belief that road accidents are an inevitable phenomenon. Road transport is a man-made technology and what the Expert Committee, at least, has shown is that this man-made technology can be made much safer. The know-how is mainly there, the organization for that improved safety and the measures for its realization are proposed in concrete terms, the response to the appeal of the Expert Committee has to come from the responsible bodies in the Community.

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