Road safety 2006–2010

MINISTRY OF TRANSPORT
AND COMMUNICATIONS FINLAND

Road safety 2006–2010
Programmes and strategies 1/2006

Ministry of Transport and Communications

ISSN 1457-747X (printed version), 1795-4037 (electronic version)
ISBN 952-201-582-2 (printed version), 952-201-583-0 (electronic version)

Graphic design
Workshop Pälviä

Printed in
Vammalan Kirjapaino Oy 2006

Cover photograph Antero Aaltonen
Other photos Antero Aaltonen, Seppo Sarjamo, Hannele Sartjärvi, Fotovisio och Futureimagebank

On-line publication at
www.mintc.fi/english and
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To the Ministry of Transport and Communications

The Government resolution of 2001 concerning road safety set the target of reducing annual traffic fatalities to fewer than 250 by 2010. This is a challenging target, since the desired reduction in traffic fatalities over the past ten years has not in fact occurred. The purpose of this Road Safety Programme for 2006–2010 is to specify potential road safety measures for reaching the target.

The Programme was prepared by the Consultative Committee on Road Safety appointed for the period 2003–2005. The Committee consulted a range of outside experts in its work. The secretary of the Committee during the preparation work was **Juha Valtonen**, and the Committee members are listed as signatories below.

Helsinki, 14 December 2005


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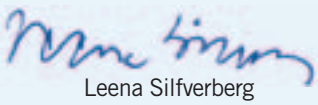
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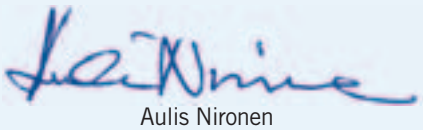
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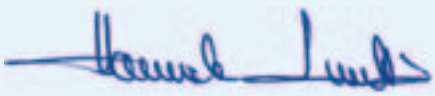
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1 Introduction

This Programme has been prepared by the Consultative Committee on Road Safety, and it is designed to achieve an improvement in road safety in the period 2006 to 2010. Safety is a primary concern in all forms of transport. In road traffic, too, the guiding vision is that fatalities and serious injuries will be avoided altogether.

The vision is made more specific by focusing on the target of reducing annual traffic fatalities to fewer than 100 by the year 2025: this would be one quarter of the present figure. Attaining this target will require carefully programmed development work and the active acceptance of shared responsibility in improving the transport system. Better cooperation is required between the organizations and other parties involved in these efforts. Road users themselves must also take their own share of the responsibility, both individually and collectively.

Transport and mobility are fundamental to the well-being of society. The aim of Finland's transport policy is to build up an "intelligent" transport system which conforms to, and promotes, the principles of sustainable development. Road safety is considered to be one of the key quality factors in our transport system and in the overall safety of citizens. Safety can be improved through the common efforts and will of all concerned and by the collective actions of safety professionals, road users and organizations alike.

Finnish road safety ranks amongst the best in the world. Finland's extensive history of road safety work has been characterized by setting challenging targets and implementing programmes which combine a variety of measures. Cooperation between the competent authorities and organizations on the one hand, and broad-based political support on the other, have been key factors, and good results have been achieved. Whereas in the 1970s almost 1,200 people were killed and 16,000 injured annually in road traffic in Finland, in the 2000s the numbers of annual traffic fatalities and injuries have remained at under 400 and about 9,000, respectively, even though the volume of traffic has tripled in the meantime.

The current practice of preparing road safety programmes was instigated in 1993. They have formed the basis for a Government resolution on road safety, as a demonstration of political will. The Road Safety Programme for 2001–2005 contained a long-term road safety vision approved by the Government:

> *The road transport system must be designed so that nobody should die or be seriously injured on the roads.*

This vision is grounded in the concept that defective road safety is an extensive public health problem that affects many areas of society. The vision provides a shared aspiration and an ethical basis for road safety work. It is based on the notion that human error is unavoidable and that people do not fare well in accidents. Traffic and transport-related services must therefore be developed according to the needs and means of people, minimizing the consequences of errors. This has been a guiding principle in air traffic, shipping, rail traffic and occupational safety for a long time now. The vision identifies human life and health as the primary values that should apply to road traffic too, even if the risk of accidents can never be completely eliminated in everyday life.

Achievement of the road safety vision will be pursued through a series of practical intermediate targets based on an overall timetable. In line with the vision, the target of Finland's transport policy is to improve safety continuously so as to achieve a level of no more than 100 annual traffic fatalities by 2025. This represents just one quarter of current annual fatalities and requires a considerable and rapid improvement in the sluggish trend of improvement in road safety seen over the past decade.

The Road Safety Programme for 2006–2010 presents measures for solving the problems observed in road traffic. Implementation of these measures would improve safety and help to reach the target in a manner consistent with the vision, and would be governed by the socio-economic principle that limited resources should be used in the most economical and productive way possible.

This Programme also emphasizes collective responsibility for road safety. The road traffic system is built up and regulated in interaction with road users. Many parties contribute to its creation and regulation, and the users include a number of different groups that must all work together. Interaction in regulating the system can be improved, cooperation between the various actors involved in road safety can be enhanced, and cooperation in all aspects of traffic can be promoted.

The Programme has been conceived and prepared by a wide-ranging group of experts from the road traffic sector, from research institutions and from various administrative branches. The development and implementation of effective safety measures requires firm cooperation between the administrative sectors of central government, the rest of the public sector and the relevant organizations, including their commitment to the implementation of the safety measures proposed here. The Programme will be monitored through observation and analysis of road safety trends; results will be published in annual monitoring reports.

The use of the term 'accident' to describe adverse unexpected occurrences and losses in traffic has been called into question recently, since these occurrences are man-made events which are not always pure accidents but often instead the result of conscious risk-taking, or at least risk-tolerance, on the part of the system's planners or its users. While retaining such established concepts as 'accident statistics' and 'accident investigation', the present Programme also aims to use the terms 'crash', 'collision' and 'incident', as applicable, alongside the more conventional terms, for instance in 'pedestrian collision' for 'pedestrian accident, or 'incident scene' for 'accident scene'.

2 Road safety as part of transport policy

The smooth functioning, safety and low environmental impact of transport and traffic are policy effectiveness targets of the Ministry of Transport and Communications, and the limited resources that are available must be allocated productively towards their attainment. Finland's promotion of road traffic safety in Finland follows EU policies and is pursued jointly by the authorities, the relevant organizations, transport operators and road users.

The role of the authorities is to issue regulations and establish norms and to implement the appropriate measures in each administrative sector. Organizations, companies and road users contribute to implementing the measures at national, regional and local levels. Conflicts of views or interests cannot be completely avoided when deciding on measures for promoting safety and on the allocation of limited resources, but ways must be found to resolve these conflicts, because improved safety is in everyone's interests and can only be achieved through cooperation.

2.1 Transport policy effectiveness targets

The long-term target of Finnish transport policy is that personal mobility and the transportation of people and goods are to be technologically intelligent and based on sustainable development. This means that economic, ecological, social and cultural aspects of the transport system must be taken into account in transport decisions. National land-use targets require integration of the urban structure, improvement in the quality of the living environment, and a reduction in travel needs. Safety and health are among the principal concerns and targets of transport policy. The short-term policy effectiveness targets of the Ministry of Transport and Communications comprise three focal areas:

- securing the smooth flow of traffic and the efficient functioning of transport services (e.g. infrastructure management and the promotion of public transport);
- promoting road safety;
- reducing environmental impacts.

In practice, the level of resources allocated for the various purposes determines how well the policy effectiveness targets can be attained. In recent years, there has been a trend towards curbing public expenditure in Finland. As a result, road management funding has been under considerable pressure, and no great changes to this are expected during the programme period.

The road safety target can only be met if the limited available resources are used as economically and productively as possible, and if the various administrative sectors and levels of central government pursue ever closer and more methodical cooperation in the management of road safety matters. The Ministry of Transport and Communications and other ministries have drawn up programmes and strategies for their administrative sectors, addressing road safety issues and concerning the programme period. These include the Internal Security Programme, which contains guidelines on cooperation in the event of accidents, and the national Alcohol Programme, which also focuses on ways of addressing drunken driving problems. The strategies and

programmes of the Ministry of Transport and Communications with regard to the promotion of public transport, walking and cycling and unimpeded mobility also serve to benefit road safety. The Programme presented here takes the road safety potential of these parallel programmes into account.

Finland's transport policy solutions are also affected by EU policies. The EU's road safety target is the halving of the number of annual traffic fatalities by 2010. In 2003, the Commission published the European Road Safety Action Programme "to save 20,000 lives a year in road traffic". It cites the major causes of accidents, and thus the major problems to be addressed in road safety work in Europe, as including: excessive and inappropriate speed; the consumption of alcohol and drugs, or fatigue; failure to wear a seat belt or crash helmet; the lack of sufficient protection provided by vehicles in the event of an impact; high-risk accident sites (shortcomings in infrastructure); non-compliance with prescribed driving and rest times by professional drivers; and poor visibility of other users, or drivers having insufficient fields of vision.

2.2 Shared responsibility for road safety

Road safety activities should not be considered as constituting a separate function; instead, road safety considerations should be integrated in all transport-related activities.

The country's administrative organs are responsible for establishing the right framework and operating environment for the safe mobility of citizens, regardless of the mode of transport used. The basic requirements involved include: appropriate legislation; planning of land use and urban planning; construction and maintenance of major transport networks; arrangements for traffic control and surveillance; and medical and health-care measures for dealing with accidents. The public sector also finances much of the research and development work in the area of road safety.

Responsibility for safety also extends to companies and organizations. Business sector attitudes to transport safety are of great importance for road safety as a whole. Businesses can make good use of their particular expertise to incorporate and enhance safety in their own logistics processes and in other business-related traffic.

Road users also bear the responsibility for safety. Even though we must accept that human error cannot be eliminated from traffic, it is everyone's duty to avoid conscious risk-taking, to abide by traffic regulations, and to use the safety equipment and services available. Only thus can users benefit fully from the safety improvements in the system. The public sector is obliged to take road user behaviour into account when developing the transport system, and to provide road users with appropriate information about how the system works. Road users, in turn, must take road safety principles into account in their everyday travel.

In order to achieve results it is essential that all parties involved in these efforts focus on their core competences. And, at the same time, mutually supporting cross-sectoral measures are also necessary. More responsibility must also be delegated to local and regional administrative levels, ensuring that road safety work is brought closer to the citizens and to those those involved in its practical implementation. Public authorities have the task of coordinating activities so that the measures taken complement each other and they all contribute together to the attainment of shared targets. At the national level, the principal responsibility for coordinating road safety lies with the Ministry of Transport and Communications. In practice, this coordination also requires jointly approved programmes and plans, one of which is this Programme for 2006–2010, prepared by the Consultative Committee on Road Safety.

There is general agreement on the need to improve road safety. But the measures to be employed to this end are frequently the subject of heated debate because of fears that, while improving road safety, the measures may have unfavourable consequence with regard to other targets. Speed and safety are often seen as mutually exclusive. High speeds in road traffic increase the risk and severity of accidents. Increased cooperation, open discussion, and commitment to finding solutions are the means by which conflicts can be avoided or resolved.

Decisions regarding transport resources are ultimately political decisions, whether national or local. It is important that decision-makers have enough research data at their disposal in order to be able to judge the safety impacts of proposed measures. A wide range of information on safety matters must therefore be distributed to planners and decision-makers, systematically and at all stages of the process.

Safety programmes must be firmly based on the results of R&D. The means and methods currently being employed must be continuously monitored and evaluated, and experimental measures can be adopted as a way of finding new solutions. The preparation of programmes also helps to reveal needs for further information, and so helps to focus R&D resources where they are needed most.

3 Road safety situation and targets

The vision for road safety is that nobody should die or be seriously injured on the roads. The quantitative target of the programmes governing road safety efforts is to reduce the number of annual traffic fatalities to below 250 by 2010, which means an improvement of 6% to 7% per annum. Relative to the population, the level to be attained is 4.7 fatalities per 100,000 inhabitants, the present figure being 7.2. Finland is near the top of the international road safety league in this respect, although the Nordic countries and some other European countries have overtaken Finland in recent years.

Fatalities occur in all road user groups, though the highest figures are for car drivers and passengers (more than 200 annual fatalities), followed by pedestrians and cyclists (almost 100 annual fatalities). The per-capita risk of a fatal accident is exceptionally high among young road users (aged 15 to 24) and elderly road users (aged over 65). The causes of traffic fatalities are many, but there are often cases of excessive risk-taking. Speeding, drunken driving and failure to wear a seat belt are frequent factors in serious incidents, as are failure to use a cycle helmet and failure to wear a reflector tag or tape.

3.1 Road safety situation in relation to the targets

The overall vision for road safety encourages the setting of challenging targets and promotes continuity in road safety work.

Tangible, quantitative targets measure the effectiveness of the steps taken to improve road safety. In the 1990s, the target was to halve the number of annual traffic fatalities by the year 2000, and Finnish road safety statistics demonstrate that considerable progress was made in this respect (Figure 1). Practically speaking, in 2000 there was only an average of one traffic fatality per day instead of two.

The next target to be set was that of reducing the number of annual traffic fatalities to 250. The original deadline for this was 2005, but in the 2001 Government resolution the deadline was extended to 2010. Prime Minister Matti Vanhanen's Government confirmed this target in the Government Programme of 2004, and added an intermediate target to be achieved during the term of the Government itself: annual traffic fatalities should not exceed 290 in 2007. The long-term target is to reduce the number of annual traffic fatalities in Finland to fewer than 100 by 2025.

So far, road safety has not improved to the extent desired. Achievement of the target for 2010 will require a reduction in traffic fatalities of about 6% to 7% each year from the 2004 level, i.e. an annual reduction of slightly more than 20 traffic fatalities.

In view of the long-term nature of road safety work, it makes little sense to keep shifting targets to fit the current situation. The trend of improvement is clear, and attainment of the target will depend on the resources available and changes in the operating environment; it is thus primarily a question of the time and time-schedule involved.

Keeping to the set target would also mean that Finland would not for the time being be applying the EU target of halving annual traffic fatalities by 2010. Achievement of the EU target would require a reduction in Finland's traffic fatalities to 200 a year, or 3.8 fatalities per 100,000 inhabitants. Finland's present targets for 2007 (maximum 290 fatalities) and 2010 (maximum 250 fatalities) equate to 5.5 and 4.7 fatalities per 100,000 inhabitants, respectively.

The road safety improvement targets for 2006–2010 are:

Continuous reduction of the number of fatalities and serious injuries in road traffic.

No more than 250 road traffic fatalities per year by 2010.

Although the road safety vision concerns serious injuries as well as fatalities, quantitative targets are in practice always defined in terms of the number of traffic fatalities. Finnish statistics do not distinguish serious injuries from other road traffic injuries, which makes it impossible to evaluate or monitor them statistically for the time being.

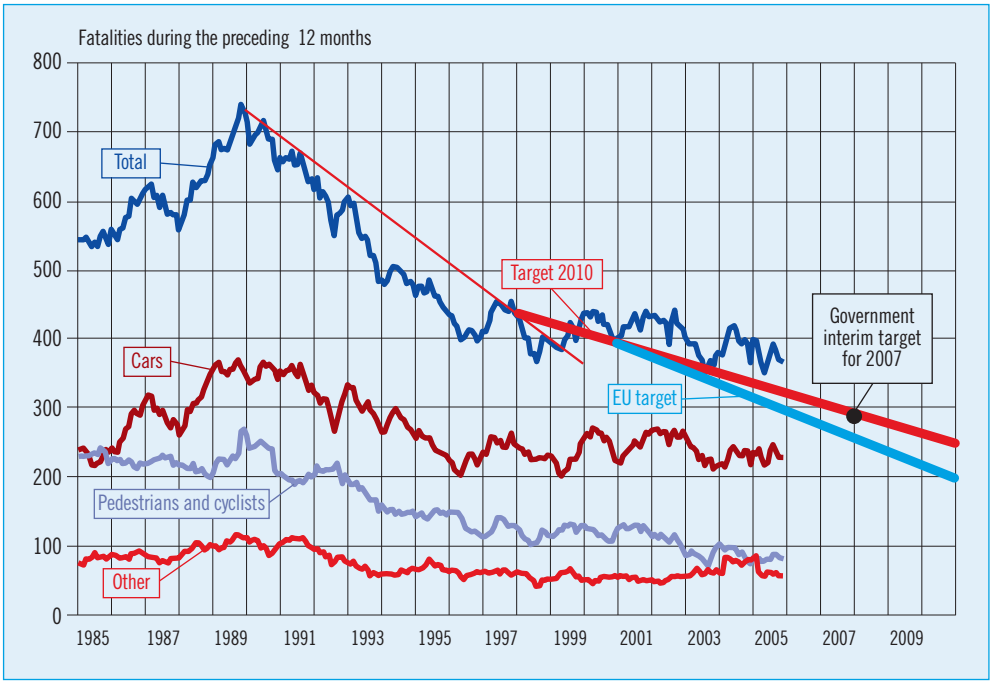


Figure 1. Monitoring the road safety target. Road traffic fatalities 1985–2004 and target for 2010, together with the Government´s interim target for 2007.
Source: Statistics Finland

3.2 Traffic fatalities and injuries

Since the mid-1990s, about 400 people have been killed in road traffic accidents in Finland every year. In 2003 and 2004, the death toll was somewhat lower. The number of annual injuries in traffic accidents reported to the police has been about 9,000, while insurance companies have paid out compensation on some 14,000 incidents each year. Motor insurance compensation for damage is claimed on some 85,000 incidents each year.

Analyzed by age group, the number of fatalities per 100,000 inhabitants increases sharply when moving from children to young people and from the middle-aged to the elderly. In the over-65 age groups there are almost twice as many traffic fatalities as in the middle-age groups.

The risk of traffic fatalities for children under 15 has decreased in the 2000s as compared with the 1990s. The number of child fatalities decreased substantially in 2004: 13 children were killed, significantly fewer than the average in recent years. Slightly under half of the children who were killed in traffic accidents were passengers in a car. The risks in cycling and riding a moped can be more clearly seen in the over-10 age groups.

The number of traffic fatalities among young people (aged 15 to 24) has remained constant over a fairly long period, with about 85 fatalities each year (95 in 2004). Over 70% of these fatalities occur in car traffic.

The number of traffic fatalities among middle-aged people has decreased slightly in recent years, particularly the number of fatalities in car traffic.

In the present decade, no great changes have occurred in the number of traffic fatalities among the elderly (over-65 age groups), which remains steady at about 100, or a quarter of all traffic fatalities.

The risk of traffic fatalities is relatively high among the elderly, and the percentage of the elderly in the population is foreseen to grow throughout the programme period. It is estimated that the percentage of over-65s in the population will increase from the present 15.9% to 17.4% by 2010, while the percentage of those aged over 75 will increase from 7.3% to 7.9%. The increase in the proportion of elderly people will accelerate in the 2010s. The growing proportion of elderly people will probably not cause any dramatic changes in road safety during the programme period, but it will contribute to the overall challenge of attaining the target.

Car drivers and passengers

Car drivers and passengers account for the greatest number of traffic fatalities. In all, they account for about 60% of traffic casualties (fatalities and injuries). About one third of these cases are young people (aged 15 to 24). Head-on collisions and run-off-road crashes account for about three quarters of traffic fatalities in car traffic.

Of the fatal crashes that occur on main roads, 43% are head-on collisions. These are relatively more frequent in winter conditions than in summer. In a serious head-on collision, the other party is frequently a heavy vehicle. Heavy vehicles are involved in about 100 traffic fatalities each year, over half of which are head-on collisions. Nine times out of ten the collision is caused by the lighter vehicle drifting into the opposite lane, into the path of an oncoming heavy vehicle.

Run-off-road crashes constitute the bulk of severe accidents in the secondary road network. In more than the average number of cases, they involve alcohol, speeding and deliberate risk-taking.

About 70% of the young people (aged 17–24) who are killed in traffic are car drivers or passengers. Each year an average of 63 young people are killed and over 1,500 injured in cars. Although the number of traffic fatalities in cars driven by young people has decreased in recent years, the number of severe accidents among young people is still almost double the average in relation to the size of the age group. A typical accident for a

Table 1. Traffic fatalities per 100,000 inhabitants, by age group, 2004.

Road user	0–5	6–9	10–14	15–17	18–20	21–24	25–34	35–64	65–74	75–	Total
Pedestrian	–	1	–	3	–	1	3	18	10	13	49
Bicycle	–	–	–	1	–	–	3	6	6	10	26
Moped	–	–	2	3	–	1	–	3	3	2	14
Motorcycle	–	–	1	2	–	6	1	8	1	1	20
Car	5	3	–	10	30	30	25	70	24	24	221
• Driver	–	–	–	1	23	20	21	55	14	17	151
• Passenger	5	3	–	9	7	10	4	15	10	7	70
Other vehicle	–	1	–	2	4	2	11	17	3	–	40
Other road user	–	–	–	–	–	–	1	4	–	–	5
Total	**5**	**5**	**3**	**21**	**34**	**40**	**44**	**126**	**47**	**50**	**375**
Population	34,576	241,551	331,433	191,208	193,660	266,601	637,207	2,202,435	450,525	380,415	5,236,611
Fatalities per 100,000	1.5	2.1	0.9	11.0	17.6	15.0	6.9	5.7	10.4	13.1	7.2

young driver is a run-off-road crash in the summer months or on a weekend. High speeds, alcohol and failure to wear a seat belt are usually involved. The driver is usually a relatively inexperienced young man.

The proportion of elderly drivers and passengers among those who are killed in car traffic has grown. Whereas one in six traffic fatalities in a car at the end of the 1990s was a person aged 65 or more, recently the figure has been one in five. Severe accidents involving elderly drivers most frequently occur at intersections.

About 80 people are killed every year in drunken driving accidents. Two thirds of these are drunken drivers and most of the others are their passengers. About eight bystanders are killed in drunken driving accidents annually. In fatal drunken driving accidents, nearly 40% of the drunken drivers are under 25 years old, and 90% are men. The majority of drunken driving accidents are run-off-road crashes or head-on collisions. Some 1,100 people are injured in drunken driving accidents annually, and this figure has been increasing recently.

Pedestrians and cyclists

Traffic fatalities among pedestrians and cyclists have decreased in the 2000s. In 2004, 49 pedestrians were killed – ten fewer than in 2003. Nearly half of those who were killed were aged 65 or over, and about four a year were children. The number of pedestrian crossing fatalities has remained steady in recent years. About half of the pedestrian deaths occur after dark or in poor light.

Cyclist traffic fatalities have decreased considerably in recent years. The number of cyclist fatalities has fallen by half since 2000. In 2000–2002, 55 cyclists were killed each year on average, but in 2004 the figure was 26. The number of cycling fatalities in the summer has dropped to one third of the level of 2000.

Some 1,000 cyclists are injured in traffic annually. It is difficult to estimate an exact figure, however, because the statistics on cyclist injuries are not comprehensive. The accident risk in cycling is relatively high in the age group 10 to 14, and the risk of a fatality multiplies in the age groups over 65.

Moped and motorcycle riders

Traffic fatalities among moped riders have increased in recent years. At the turn of the 2000s, there were eight annual traffic fatalities and the figure has risen to 13 in the last few years, although preliminary data suggest that the number of fatalities for 2005 will be considerably lower than for 2004. The number of injuries among moped riders has risen from 400 to 550 during the same period. Traffic accidents involving moped riders typically occur at intersections in built-up areas. The number of mopeds in traffic has increased substantially in the 2000s, particularly over the past three years.

The number of traffic fatalities among motorcycle riders has roughly doubled since the late 1990s (20–23 compared to 8–13). Preliminary data suggest that the figure for 2005 will be as high as 30.

About half of the fatal motorcycle accidents (53%) are single-vehicle accidents which do not involve any other party; in 99% of cases, the rider is a man. Accidents in recent years have involved larger motorcycles and older riders than before; underlying this is the growth in the number of motorcycles. This trend began in the mid-1990s and has been accelerating in the last few years.

Other serious traffic accidents

About five drivers and three passengers have been killed annually in heavy goods vehicles and buses/coaches in recent years. A major exception occurred in 2004, when 23 people were killed in the coach crash near Konginkangas.

Accidents involving elk and deer have killed an average of ten people and injured over 300 annually in recent years. In 2003, there were 2,200 elk collisions and almost 2,500 deer collisions. Most personal injuries (over 80%) are sustained in elk collisions. The number of accidents involving elk has decreased by more than one quarter from the peak level of 2001.

About 50 accidents occur at level crossings each year, killing an average of 10 people and injuring 25. There are some 3,500 level crossings on the Finnish rail network, about 700 of them with barriers and/or lights. The severity of accidents at level crossings is above average, and level crossing accidents also tend to be more costly than average.

3.3 Finland's road safety in international comparisons

Judged by international comparisons of road safety levels, Finland's road safety is fairly good. In terms of the number of annual traffic fatalities per 100,000 inhabitants, Finland's level of safety ranked sixth in 2003 after Sweden, Norway, Britain, the Netherlands and Japan. In 2004, road safety improved considerably in almost all the top countries, and Finland dropped down three places in the ranking. Indeed, this fatality indicator is now almost one third higher in Finland than in Sweden.

Finland's road safety targets follow the standards of Nordic countries. Yearly fluctuations notwithstanding, road safety has improved at largely the same rate in all the Nordic countries, although Finland has been trailing the leaders, Sweden and Norway, by about 25%. Denmark has for long had poorer safety statistics than Finland, but figures for 2004 show that Denmark has now reached Finland's level, whereas Sweden and Norway have increased their lead. In these top countries, the number of annual traffic fatalities per 100,000 inhabitants fell to 5.3–5.7 in 2004. Recent data suggests that Norway has reached a level of 4.7 in 2005, which is the level of Finland's target for 2010. This demonstrates that Finland's target, though challenging, is not impossible to attain.

3.4 Traffic behaviour

Apart from accident statistics, road safety can also be measured using indicators that reflect how people behave in traffic. These include driving speeds, distances between vehicles, use of safety equipment and running red lights. Systematic compilation of monitoring data on traffic behaviour is intended to highlight phenomena that may anticipate or explain changes in road safety levels. In Finland, bodies such as the Central Organization for Traffic Safety in Finland have been reporting on the monitoring of traffic behaviour for many years.

Average **driving speeds** have remained stable in rural areas since 1992. The percentage of drivers exceeding speed limits by more than 10 km/h has been declining in recent years: in 2004 it was about 7% in 100 km/h zones and 8.4% in 80 km/h zones.

The percentage of drivers who had consumed **alcohol** has declined from 1.02% in 1999 to 0.71% in 2004. Drivers over the drunken driving limit accounted for 0.16%; in other words one driver in 625 is a drunken driver.

Disregarding traffic lights is a common occurrence among both drivers and pedestrians. A monitoring study shows that at the observation points involved one or more drivers ran through the red light at an average of one out of every five light changes. Similarly, almost one out of every five pedestrians crosses the road against a red light. Most of these violations are deliberate, and the most commonly cited reason is that of being in a hurry.

Table 2. Road traffic fatalities and indicators in selected OECD countries in 2004.
(IRTAD 2005)

Country	Year	Fatalities	Population (million)	Fatalities per 100,000 inhabitants
Sweden	2004	480	9.0	5.3
Netherlands	2004	881	16.3	5.4
Norway	2004	259	4.6	5.7
Britain	2004	3,368	60.0	5.6
Japan	2004	8,492	127.7	6.6
Denmark	2004	369	5.4	6.8
Switzerland	2004	510	7.4	6.9
Germany	2004	5,842	82.5	7.1
Finland	2004	375	5.2	7.2
Iceland	2004	23	0.3	7.8
Australia	2003	1,621	20.1	8.1
Ireland	2004	379	4.2	8.9
Canada	2003	2,766	31.6	8.8
EU-15 total	**2003**	**37,286**	**381**	**9.8**

There has been no significant development in the use of **safety equipment** in the 2000s.

The rate of use of **seat belts** in the front seats of cars outside built-up areas has remained steady at slightly over 90% since the mid-1980s. In other words, one in ten still neglects to wear a seat belt. Seat belt use in built-up areas has not changed much since the mid-1980s either. In the back seat, about eight passengers in ten wear a seat belt. Among professional drivers (taxis, heavy goods vehicles and buses/coaches) seat-belt use is uncommon, and no regular monitoring data exists.

Accident investigation boards have concluded that wearing a seat belt would have saved the lives of over half of those who died in an accident involving a car or van and were not wearing a seat belt.

Studies show that 85% of drivers use the **turning indicator**. This has not changed in recent years.

The use of **cycle helmets** increased steadily between 1990 and 1995 (from 4% to 21%), and has since remained steady at about 25%. Cycle helmet use was made obligatory by law at the beginning of 2003. In 2005, about 29% of all cyclists used a helmet, though there was considerable variation between age groups: nine out of ten children under school age use a helmet, while the elderly and young people rarely do. Analyzed by region, cycle helmets are most frequently used in Uusimaa. A cycle helmet is effective at preventing head and brain injuries. It has been estimated that wearing a cycle helmet could have prevented half of all cyclist fatalities caused by head injuries, and one in three of all cyclist injury cases involving head injuries.

About four people in ten wear a **reflector** tag or tape when on a road or street without street lighting. In areas with street lighting, one in three people wear a reflector. A pedestrian on an unlit road without a reflector has an accident risk several times higher than a pedestrian wearing a reflector. Accident investigation boards have concluded that in about one third of pedestrian fatalities darkness was a risk factor and the pedestrian was not wearing a reflector; a reflector could have saved the lives of almost half of the people who were killed. Wearing a reflector in built-up areas too was made obligatory by law from the beginning of 2003.

Using a mobile phone which is not hands-free is prohibited. Yet according to a monitoring survey conducted in 2004, 6% of drivers were holding a mobile phone to their ear while driving.

4 The operating environment and its challenges

Economic growth and employment growth are expected to increase traffic volumes by an average of 10% in 2005–2010. The increase will be unevenly distributed, with an estimated 15% on trunk roads and 2% on rural connecting roads. Economic growth will enable more resources to be allocated to improving the transport system and road safety. On the other hand, the tight rein on public expenditure has caused and will continue to cause cuts in road management appropriations, which will hit improvement schemes particularly hard and force the adoption of cheaper and less substantial means for improving safety.

Rapid technological development offers potential for improving road safety in the near future both through vehicle technology and through traffic control and surveillance. In technological R&D it is important not only to pursue technological advances but also to investigate any obstacles to the wider adoption of such advances. The demographic shift in Finland will mean that the greatest population increase will be in the over-65 age group, while the number of people under 15 will decrease.

4.1 Traffic growth trends

According to the traffic forecast for 2003–2030, traffic volume will increase at all levels of the road network. Growth will be the most rapid in the main road network, particularly the busiest routes, the 'trunk roads', where traffic volume is expected to grow by 38% by 2030, as opposed to 25% growth on all public roads on average.

New industries require transportation that is quick and runs to a precise schedule, with the time of delivery being an increasingly important factor. In the traditional industrial sectors, transport has become an integral part of the production process. Deliveries in small batches are increasingly common, and production-site warehousing capacity is being reduced, thus also contributing to growing road traffic. Growth in heavy vehicles is strongest in the direct route to and from Russia and on certain individual main road segments, where it has exceeded 10% per annum in some cases in recent years.

Migration to urban and other growth centres reduces traffic volumes in the less busy parts of the road network. It is estimated that traffic on connecting roads in the 100 municipalities with the highest net migration loss will decrease by 25% by 2030. Overall traffic growth is foreseen to average 10% a year from 2004 to the end of the programme period in 2010. This will be unevenly distributed, with the highest growth rates on trunk roads (16%) and other main roads (11%) and the lowest on regional roads (9%) and connecting roads (3%). However, traffic volume is expected to decrease by 5%in the 100

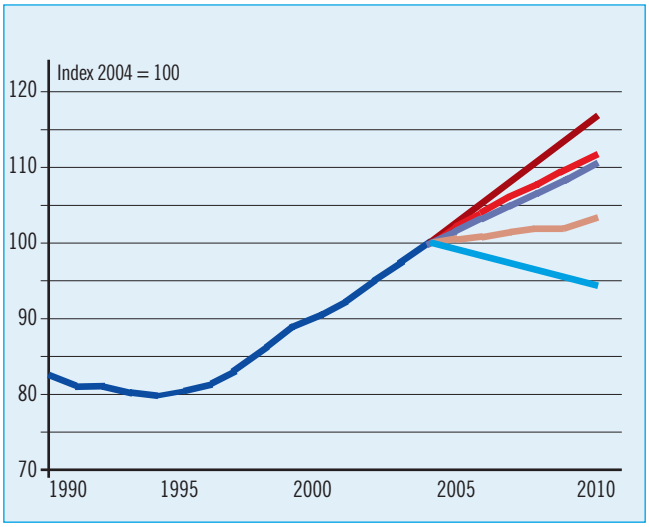


Figure 2. Road traffic growth 1990–2004 and forecast for various road categories 2004–2010.

municipalities with the highest net migration loss by 2010.

Growth in traffic between urban centres and in the Helsinki metropolitan area and the largest cities will add to congestion and make traffic more susceptible to disruption. Every day, 100,000 commuters travel to and from the Helsinki metropolitan area. This figure is estimated to almost double by 2025, by which time the number of inhabitants and jobs in the Helsinki area is estimated to grow by 25%, and vehicle-kilometres by 50%. The commuting radius has increased and now extends 100–150 km from Helsinki.

Traffic growth always represents a threat to road safety, because the sheer volume of traffic means there are more vulnerable road users in the network at any one time. Accordingly, safety improvement measures have to be undertaken even to maintain the present level of road safety. But it has nevertheless been possible to improve road safety despite traffic growth, and this must be the case in the future too, because increased traffic is not an acceptable justification for heightened accident risk from the point of view of the safety of citizens.

The concentration of traffic on main roads and in growth areas is both a challenge and an opportunity for improving road safety. Changes in traffic volume necessitate an evaluation of the infrastructure and the entire transport system, and further investment in the system. In growth areas, the challenge is to curb the growth in car traffic, to promote public transport and non-motorized traffic and to increase their modal share, to channel heavy goods traffic, to manage disruptions and to find efficient means for solving foreseeable problems. In the Helsinki metropolitan area in particular, travel chains involving different modes of transport are important, and the challenge here is to get the different modes of transport to work smoothly together so that transfer from one to another is simple. The importance of non-motorized traffic (principally pedestrians and cyclists) in the transport system is also emphasized in urban areas.

The basis of the Programme for 2006–2010 is that road safety aspects should be taken into account as far as possible and as professionally as possible in urban planning and transport system planning. This of course requires that vigorous investment is continued in developing a living environment that is as pleasant and safe as possible is continued. The Programme concentrates on existing problems and on the safety measures that can be implemented in the current or foreseeable transport system and environment.

4.2 Economic development

How fast traffic grows depends on how fast the economy grows. Economic growth and high employment increase business transport needs and people's opportunities for travelling and using transport services.

Growth in the national economy enables society to allocate more resources to transport and road safety. Efficient and well-functioning transport connections and services are basic requirements for the functioning of society and business and for the well-being of citizens. Transport is also a significant generator of income and a major employer.

Trends in the world economy have an impact on the operating conditions for Finnish business. Changes in oil prices and the economic trends in Russia and Asia, for instance, have a direct impact on transport development in Finland. In the context of global competition, Finland's geographic position and the distance between Finnish companies and their principal markets means that projects to improve Finland's international competitiveness will receive priority among transport infrastructure investments.

Attempts have been made to support economic growth by curbing increases in public expenditure and by cutting taxes. Growth pressures continue to mount in health care and social welfare because of the ageing of the population, amongst other factors. Funding for road management, too, has been subject to very tight restrictions in recent years. Every year, it has proved necessary to allocate more funding to road management in supplementary budgets in order to safeguard the condition and safety of the road network and to launch road improvement schemes that are considered absolutely necessary. Throughout the programme period, 2006–2010, road management appropriations will remain at a lower level than in the 2005 budget year.

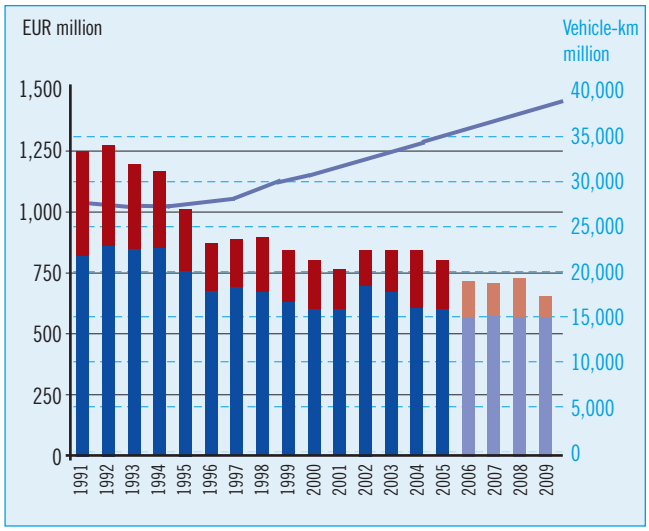


Figure 3. Use of road management appropriations in 1991–2004, in the 2005 budget and in spending limits for 2006–2009; vehicle-kilometres on public roads 1991–2009. Price level: 2005 cost index of civil engineering works 115.

The ministerial working group appointed by the Government submitted a proposal for transport infrastructure policy outlines for 2004–2013. The working group addressed the reform of infrastructure programming, proposed a transport infrastructure investment programme for 2004–2007, commented on projects possibly to be launched in 2008–2013 and made proposals on how to safeguard basic road management. The working group also assessed means for funding the investment programme.

As far as the Road Safety Programme is concerned, this means that the central government will continue to pursue a very frugal policy in the development of transport infrastructure and services. Realization of the proposals of the Government Programme and the ministerial working group would seem to depend on decisions to be made in the budgetary process, and the desired long-term approach to investment will not therefore be the determining factor. It would seem that the only way to increase budget appropriations would be through proceeds from the sale of government property or other one-off solutions. The funding allocated to basic road management is inadequate for undertaking structural safety solutions. Safety matters should be collated into large thematic entities that are big enough to compete with other large projects for funding.

This creates further pressure to find new forms of funding, new procedures and cheaper solutions. More emphasis must also be put on using the existing road network and improving its safety. As structural road projects are delayed, safety must be sought through cheaper means, such as speed regulation, surveillance and publicity.

It has been observed that growth in the economy and related phenomena affect people's values and attitudes, and this is evident in traffic too. In economic boom periods attitudes in traffic have typically worsened and negative behaviour increased. The Programme must aim at promoting a positive atmosphere and behaviour conducive to safety.

4.3 New technology

Rapid developments in IT, communications technology and measurement technology, and their applications in vehicle design and transport, will add new potential for improving road safety in the near future. In the longer term, technology will enable automation of driving tasks and elimination of driver error.

Certain driver-support systems will soon already be in widespread use, such as stability control systems and seat belt reminder systems. Future applications will include speed control systems, lane departure warning systems, driver fatigue warning devices, night vision systems, and so on. The alcolock, which prevents a driver under the influence of alcohol from operating the vehicle, is a further example. In the future, an automatic emergency call system will bring help to an incident scene more quickly, thus reducing the severity of the consequences of a crash. Navigational aids may also help reduce the number of danger situations caused by the wrong choice of route.

Many such technological innovations already exist and work very well, while others are under development. More often than not, the obstacles to the widespread introduction of a particular application are non-technical ones, such as the price of services and systems, the willingness of car-owners and society to pay for them, the need for political approval for implementation, traditional patterns of demand and marketing in the car market, and various organizational and legislative problems. Some applications are resisted because their existence is justified by safety problems that are associated with only a small proportion of all drivers, or because they are considered to restrict driver freedom or violate driver privacy.

There are plenty of relatively simple innovations in vehicle technology that have yet to be introduced to improve safety. For example, the 40-year history of seat belts demonstrates how slowly an application may gain widespread acceptance in use, even when it is technologically a finished product. Despite the indisputable safety benefits of seat belts, even today nearly half of the people who are killed in a car crash in Finland are not wearing a seat belt.

Purely technological vehicle innovations will be introduced by the car industry. The principal means for guiding such developments are provided by international legislation and

standardization, which aim at developing an increasingly global set of standards. From Finland's point of view, the most important forum is the United Nations Economic Commission for Europe (ECE). Only by participating actively in the work of ECE and similar organizations can Finland contribute its expertise in this field and ensure that, for instance, traffic conditions in northerly regions are taken into account more effectively.

Traffic surveillance is an area where technological advances and automation can add to the efficiency and scope of surveillance in revolutionary ways. The main obstacles to this development involve issues of privacy and legal protection. Essential issues with regard to surveillance include automatic identification of a vehicle and its driver (e.g. electronic vehicle identification), and the harmonization of legislation and surveillance methods to the degree required, for example regarding the responsibility of the registered owner. It should also be noted that an efficient combination of surveillance and sanctions can help promote technological solutions for safety problems and motivate their introduction.

New ICT applications are also to be expected in traffic information services, which collect information on traffic or the traffic environment and disseminate it to the road authorities or road users. Because investments in this area involve the infrastructure rather than vehicle design, it is easier to boost efforts at the national level or even locally. Functionally, this area of traffic telematics can be divided into traffic surveillance and information management on the one hand, and information services on the other. Information gathered can be used for instance in traffic control, disruption management or demand guidance.

Information can be conveyed through means derived from traditional traffic control methods (changing traffic signs, information screens, etc.), through the mass media (radio) or through personal communication (mobile phones). Information can be conveyed both from the traffic management system to the car and from the car to the traffic management system. In the future, communication may even take place between vehicles without the drivers being aware of it.

There is a huge potential for improving security through the use of new technological applications in traffic and in vehicles. Introduction of these applications is, on the whole, rather slow. For the Road Safety Programme, this means that particular attention should be paid to analyzing and removing obstacles that stand in the way of the introduction of new technological applications, to dispelling prejudices and to publicity. The introduction of new technology can be promoted by investing in R&D and in experiments. Finland must cooperate actively with other leading traffic safety countries in the various international forums that focus on such work.

4.4 Demographic changes

In Finland, life expectancy is increasing, the birth rate is decreasing, and a considerable demographic shift is thus under way. The population as a whole will decrease in size and its average age will increase. Contrary to conventional wisdom, the ageing of the population does not just mean that there will be a larger number of elderly people, but the relative sizes of the various age groups will also change. Ageing affects the whole of society, since the number of children and the number of people of working age will decrease at the same time as the number of elderly people increases.

According to the population forecast, the number of Finnish citizens aged 65 or over will increase by a staggering 80% by 2030. At that time, one in four people in Finland will be 65 or older. This trend will pick up speed around 2010 as the first of the baby-boom generation reach retirement age. In the years immediately following, there will be more people over 65 than there are under 20 in Finland, for the first time ever. The number of children under 15 will decrease by about 50,000 by 2010, most significantly in the age groups under school age.

Large urban centres and surrounding sub-regions with good connections will enjoy population growth, while net migration loss will be conspicuous in sub-regions in northern and eastern Finland. The populations of large cities, and their percentage of the whole population, seem to be increasing rather slowly. In fact, the greatest population increase is currently occurring in regions surrounding large cities.

The elderly are over-represented in serious traffic accidents in relation to the size of their age group. The main reason for this is their physical fragility, i.e. their inability to sustain the consequences of an accident. The largest group of pedestrian and cyclist fatalities consists of the elderly. The number of elderly drivers will grow rapidly in the near future, and drivers will continue driving to a more advanced age. Along with the demographic shift, there has been a change in how people use their time, and increased life expectancy has so far translated into an increased amount of leisure time.

In the period covered by this Road Safety Programme 2006–2010, the demographic shift will not yet constitute a major safety problem. However, it is clear that as the population ages the problems will multiply, and we should be preparing for this already now.

5 Means for improving safety

The choice of means for improving safety is based on changes in the operating environment and on the need to allocate limited resources according to the effectiveness of the measures. An assessment of the potential for reducing traffic fatalities leads to a focus on six major projects, each with several mutually complementary and mutually supporting measures.

The statistical surveys carried out for this Programme and the effectiveness assessments of a number of safety measures have been used to identify six major projects or problem areas in which road safety can be improved to approach the specific target in keeping with the overall vision.

- Reducing head-on collisions on main roads
- Reducing pedestrian and cyclist accidents in built-up areas
- Speed control
- Reducing accidents involving intoxicants
- Reducing accidents in professional transport
- Alleviating the consequences of accidents

Each major project can involve several measures which support one another and are suitable for addressing many other road safety problems too. For example, speed control will help in the pursuit of the other five major projects. There are many general problem areas and individual safety measures that fall outside the scope of these major projects, and these will be managed as part of the normal road safety work of the authorities and other parties.

However, cooperation within the scope of this Programme will enable cooperation to be closer in normal work too.

In determining the measures to be taken, current safety developments and changes in the operating environment have been taken into account, and experiences in other countries have also been drawn on. We must be able to improve road safety at the same time as traffic volume expands, the population ages and economic growth brings pressures on road traffic and road-user behaviour.

Attaining the set safety targets with the limited resources available requires focusing on those measures that enable road safety problems to be addressed most effectively in the long term. The Programme concentrates on problem areas in which the number of fatalities is high or exposure to risk is high, or both. The distribution of traffic fatalities by operating environment and by type of accident is illustrated in Figure 4.

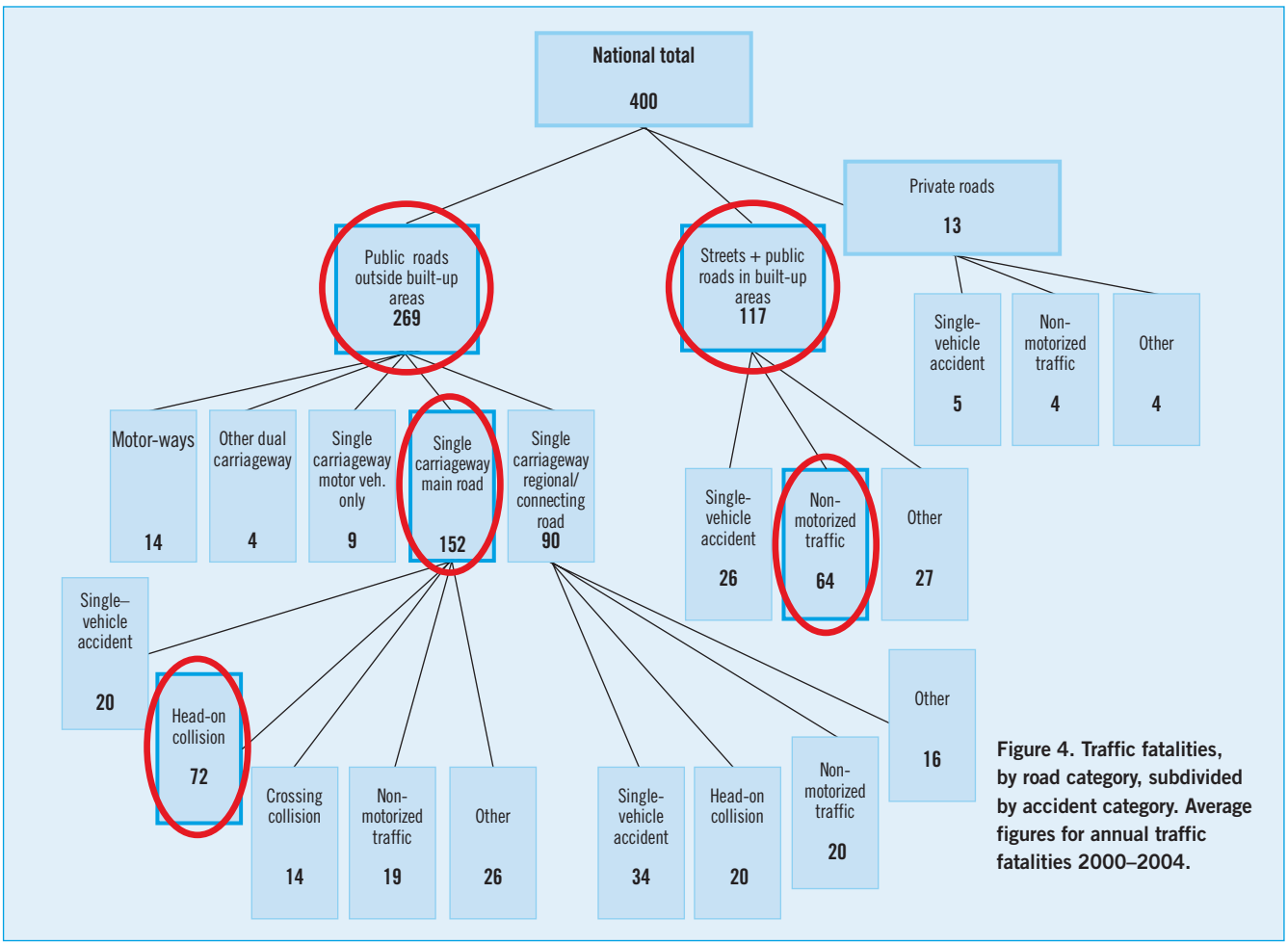


Figure 4. Traffic fatalities, by road category, subdivided by accident category. Average figures for annual traffic fatalities 2000–2004.

5.1 Head-on collisions on main roads

The main road network has about 12,500 km of single-carriageway roads, and head-on collisions on these roads kill about 70 people a year. The percentage of head-on collisions increases as traffic density increases, and there is also a clear current risk of major disasters, as the Konginkangas coach crash shows. The reasons for head-on collisions are many and difficult to eliminate. Structural separation of opposing lanes is in any case one of the solutions to the problem.

Implementation of the projects proposed by the ministerial working group on transport infrastructure policy provides the solution for part of the main roads. In addition to this, more median barriers and overtaking lanes must be built, the target being to cover a minimum of 90 km of road per year, to a total of 450–600 km by 2010. Because structural projects are expensive, they must be implemented to a number of different design standards and on one stretch of road at a time, prioritized by their road safety impact. The measures to separate opposing lanes must be augmented with lower cost solutions. Rumble strips on centre lines and edge lines can reduce fatal head-on collisions by 10% to 20%, and run-off-road crashes by 5%. The separation of opposing lanes will be treated as one of the criteria in setting speed limits.

To improve winter maintenance, new technology for receiving real-time information on road conditions and changes in conditions is already available for the use of road management personnel, transport operators and drivers.

Description of problem

The current number of annual road traffic fatalities in Finland is about 400. About 300 of these are people killed on public roads, of whom an average of about 200 are fatalities on the main road network. The safety problems on main roads are not concentrated at specific high-risk locations; instead, traffic fatalities largely correlate with traffic volume. About 30% of the main road network accounts for about 60% of the fatalities. There has been an 85% increase in vehicle-kilometres on Finland's main roads over the past 20 years, and this increase will continue, as outlined above in section 4.1.

The main road network includes 12,335 km of single-carriageway roads. These account for 68% of the vehicle-kilometres and the bulk (85%) of fatal accidents in the main road network. Nearly half of the fatal accidents that occur on single-carriageway main roads are head-on collisions. The number of these collisions has been constantly increasing, even though there has been no significant increase in the overall number of annual traffic fatalities.

A single-carriageway road carries a risk of head-on collisions that increases with the traffic volume and with driving speeds. The number of potential collisions between two vehicles (i.e. exposure to head-on collisions) increases much more quickly than the underlying increase in traffic volume. The risk of head-on collisions is thus constantly growing.

There are many reasons for a driver drifting into the opposite lane. These include temporary lapse of alertness, falling asleep, losing control of the vehicle, making an unsuccessful overtaking attempt, experiencing a technical fault, or even taking deliberate action. Slippery road conditions, narrow roads and excessive driving speeds increase the risk of a vehicle drifting into oncoming traffic.

Figures from accident investigation boards have shown that the principal cause of head-on collisions on public roads is vehicle handling error in 36% of cases, error of observation or anticipation in 19% of cases, and poor positioning in 15% of cases. Falling asleep accounted for 12% of head-on collisions, and suicide for 10%.

The percentage of head-on collisions is slightly higher in winter than in summer. Lapses of alertness are more common in

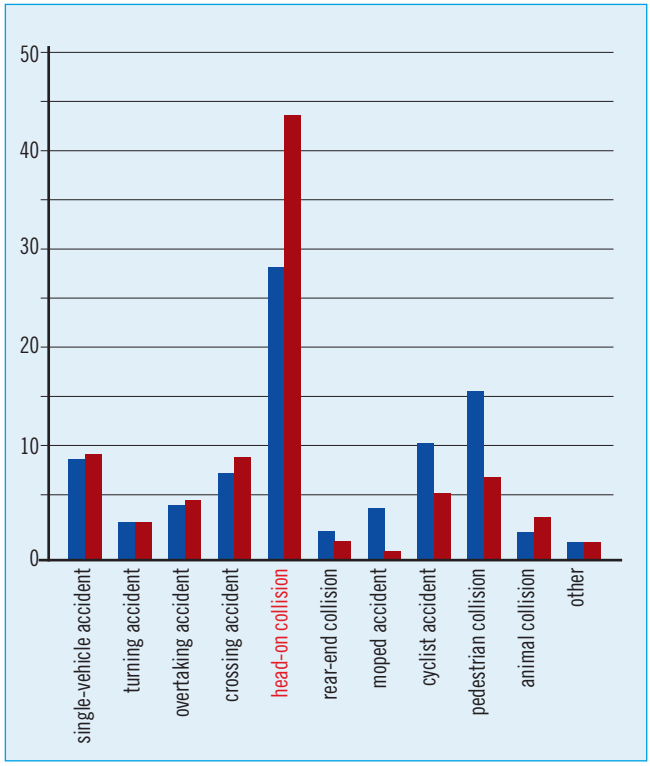


Figure 5. Distribution of annual fatalities by type of accident: percentages 1983 and 2003. Head-on collisions are the greatest safety problem on the main roads (causing almost 50% of fatalities).

head-on collisions in summer, while handling errors, particularly in difficult weather and road conditions, are more common in winter. Slipperiness is the reason for drifting into the opposite lane in 20% to 30% of fatal head-on collisions in winter. Darkness also complicates driver perception. In cases where the driver loses control of the vehicle, it is largely a matter of chance and the volume of on-coming traffic whether the result will be a run-off-road crash or a head-on collision.

A difference in the mass of the colliding vehicles adds to the severity of a head-on collision. In 50% of fatal head-on collisions on main roads, one of the parties is a heavy vehicle. However, it is most frequently a car that drifts into the opposite lane.

Most of the major road disasters leading to multiple fatalities have been head-on collisions, as was the case in Konginkangas (23 killed) in March 2004 and in Loimaa (7 killed) in January 2005.

Median barriers and other road construction solutions

The report of the ministerial working group on transport infrastructure policy outlines the principal main road projects for 2005–2013 and a package of safety measures for improving safety on main roads. The proposed projects are efficient and represent an essential first step towards the target for the main roads. They will remove about one third of the problems of the main roads in general, and about one tenth of the problems on the busiest main roads. Nevertheless, even if all the projects proposed in the report were completed this would not be enough to improve road safety sufficiently, because of the increasing traffic volumes. Other means must also be employed to attain the target.

Structural separation of opposing lanes is an effective way of preventing head-on collisions. Sweden's experience of providing roads with median barriers has been very good. This solution is less far-reaching than building a motorway, and indeed this approach is now being pursued extensively in Sweden. In Finland too, the first median barriers on single-carriageway roads have now been built.

The safety of single-carriageway main roads can be improved with median barriers, either by converting the roads involved into roads with continuous overtaking lanes ('2+1 roads') or by providing intermittent overtaking lanes at regular intervals. On very busy roads, it is even possible to have a narrow four-lane configuration ('2+2 roads'). On a road with a continuous overtaking lane, the median barrier occupies nearly the entire length of the road, while on a road with intermittent overtaking lanes the median barrier occupies about 20% to 30% of the length of the road. A median barrier can also be built without overtaking lanes ('1+1 roads') where suitable.

In the analysis of specific sections of the main road network, technical targets for 2025 have been defined for the principal main roads. The analysis shows that there is a need for 700 km of new four-lane roads, 600 km of roads with a continuous overtaking lane and about 1,200 km of roads with intermittent overtaking lanes. The emphasis in improving the principal main roads is thus on introducing median barriers and overtaking lanes.

In accordance with the Finnish Road Administration guidelines concerning overtaking lanes, all new overtaking lanes will be fitted with a median barrier. It is also the aim that existing overtaking lanes without a median barrier will be fitted with one in the future. At the moment, there are 273 km of overtaking lanes without median barriers. New overtaking lanes are being built at a rate of about 10 to 20 km per year; these serve to eliminate 0.2 to 0.3 traffic fatalities each year.

Road type	EUR million / km
Traditional motorway	3–6
Narrow four-lane road	2–3
Road with continuous overtaking lane	1.8
Two-lane road with intermittent overtaking lanes	1
Fitting existing overtaking with median barries	0.5–0.7
Median barrier installation 1+1 road	0.4

Table 3. Average construction costs for various median barrier designs.

It is proposed that a separate programme be set up to reduce head-on collisions on main roads. This would take into account the following:

- the primary approach is to install median barriers alongside unprotected overtaking lanes and to build new overtaking lanes with median barriers;
- sites will be selected so as to achieve the greatest cost-efficiency in preventing head-on collisions;
- at the same time, the roadside environment will be "softened" and intersections and parallel roads redesigned; and
- to ensure that investment is effective, these measures must support attainment of road safety targets on the road segment concerned.

Head-on collisions on single-carriageway main roads kill 70 people each year. Applying the annual traffic fatality reduction target to this category means that this figure should be reduced by about 40%, or 28 annual fatalities, by 2010 (i.e. by 5 to 6 fatalities each year).

The aim of a particular programme in the first half of the programme period (2006–2008) is to build 70 km of overtaking lanes with median barriers each year. The cost of this measure will be about EUR 70 million per year. The aim in the second half of the programme period (2009–2010) is to separate opposing lanes on 130–200 km of road per year. Taken together, these measures are expected to reduce the number of fatalities in head-on collisions on main roads by 2 to 4 each year.

Further investment should be made in R&D during the programme period in order to identify new, cost-effective measures for preventing head-on collisions and for separating opposite lanes.

Monitoring indicators

Targeted completion of separated opposing lanes on 450–600 km of main roads in the period 2005–2010.

Number of fatalities (and injuries) in head-on collisions on main roads, and number of fatal and personal-injury accidents.

Responsible parties

The Ministry of Transport and Communications is responsible for securing resources in spending limit negotiations and in the budget process so as to enable implementation of its long-term investment policy.

Responsibility for implementation rests with the Finnish Road Administration. This should be taken into account in the performance management process of the Ministry of Transport and Communications.

Centre-line and shoulder rumble strips

A considerable percentage of head-on collisions caused by a vehicle drifting into the opposite lane are due to a lapse of driver alertness. Rumble devices are a cost-effective way of preventing this. They cause vibrations and a howling sound that can alert the driver that he/she is crossing the centre line and can thus prevent a collision. Studies have shown that centre-line rumble strips could have prevented about 10% to 20% of fatal head-on collisions or at least alleviated their consequences. Shoulder rumble strips could have prevented about 5% of run-off-road crashes resulting in fatalities.

In order to reduce head-on collisions on main roads, it is proposed that the Finnish Road Administration continue development of centre-line and shoulder rumble strips. Instructions for their use in various road environments will be issued on the basis of trials.

Monitoring indicator

The quantitative target is to install centre-line rumble strips on 50% of the 2005 main road network as part of road resurfacing projects as applicable.

Responsible parties

Responsibility for implementation as above for median barriers.

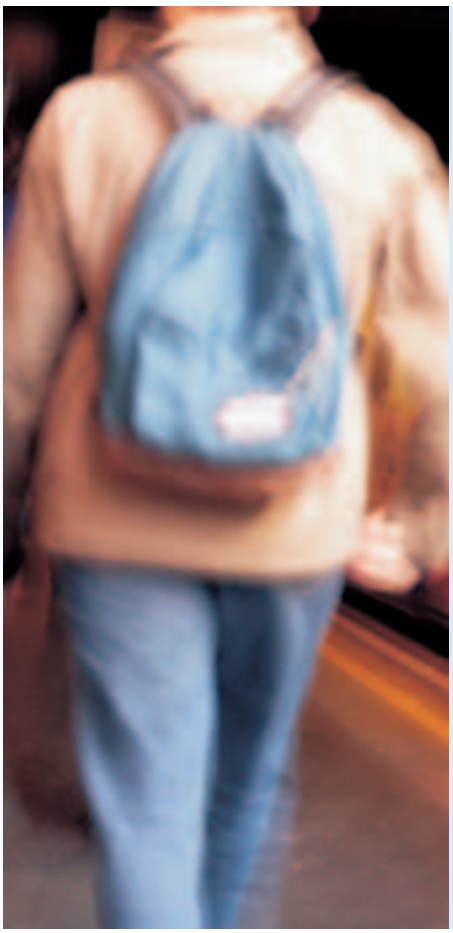
Other measures to reduce head-on collisions

Reducing slipperiness, providing road condition information services and controlling of driving speeds are the primary means for reducing those head-on collisions that are due to slipperiness and other driving conditions. Particular attention should therefore be paid to the points that follow.

The main road network is subject to the highest standards of winter maintenance, and quality-monitoring data shows that the quality of winter maintenance on the main roads is particularly good. It is therefore difficult to improve road safety by further enhancing winter maintenance, especially as regards serious head-on collisions. However, maintenance could be better allocated and timed by developing the collection and dissemination of information on the weather and road conditions. This area should be explored further, because there are still new methods to be discovered. A case in point is the ongoing VARO project.

Problematic road conditions will always be part of winter driving. Safe winter driving can be efficiently promoted through timely provision of information on road conditions and by establishing adjustable speed limits. Such systems will be introduced to a limited extent, initially only on the very busiest roads. Drivers' abilities to operate in changing road conditions can be improved with targeted education and driving practice, in which driving simulators can also be used. New vehicles increasingly come equipped with stability control systems such as ESP. Drivers must be provided with sufficient information on how to consider safety factors when buying a car and how to operate the safety equipment in their cars.

The severity of head-on collisions, as indeed of any accident, depends on the impact speed. In practice, the impact speed should not exceed 70 km/h if car occupants are to have a chance of surviving a head-on collision between two modern cars,. However, reducing speed limits to this level extensively and permanently on main roads is not considered an acceptable solution for avoiding head-on collisions. Nevertheless, from the safety angle, there are no grounds for setting a speed limit higher than 80 km/h on busy single-carriageway roads if there is no median barrier. Speed control is discussed in more detail in section 5.5.



5.2 Pedestrian and cyclist accidents in built-up areas

The safety of walking and cycling is a quality factor that residents appreciate in their neighbourhood. Although trends have been favourable, there are still about 100 fatalities each year on average, most of them occurring in built-up areas. The number of injuries is high but it is not known precisely, since most such injuries fall outside the scope of current statistical compilation. There is a wide and diverse range of causes for this type of accident. Use of cycle helmets and reflectors is often neglected. Calming down the traffic in built-up areas by structural means is an effective safety measure and must be applied more comprehensively in all built-up areas as an integral part of regional programmes.

Together with appropriate structural designs and the separation of motorized and non-motorized traffic, progressive speed limits should be applied: the basic level should be 40 km/h, with lower speed limits imposed in residential and pedestrian areas and higher speed limits set only where the safety of pedestrians and cyclists has been separately provided for. Speed limit markings must be made clearer. Structural measures must be supported with more efficient surveillance, systematic and relevant road safety education in schools, and promotion of the use of safety equipment.

Description of problem

Road safety is an important quality-of-life factor in Finnish communities. A living environment where the adverse effects of vehicle traffic are under control and where children can safely move about on their own is a rarity in the international context. Even though accident statistics show that the safety of built-up areas in Finland has improved significantly, a study of residents' views revealed that the perceived level of safety has nevertheless declined. The underlying cause of this is the constant growth in the number of cars and vehicle-kilometres. One reason for pedestrians and cyclists feeling less safe is their belief that car drivers ignore traffic regulations concerning pedestrian crossings.

In 2000–2004, the average number of annual traffic fatalities among pedestrians, cyclists and moped riders was 110. Over half of the pedestrian and cyclist fatalities, and as much as 90% of the injuries, occur in built-up areas.

There are also pedestrian and cyclist safety problems on main roads, often related to adjoining buildings. On main roads with a speed limit of 100 km/h, the risk of death for pedestrians and cyclists per vehicle-kilometre is almost four times higher where the road runs through a built-up area than in sparsely populated areas.

The average number of annual cyclist fatalities is 49. However, in the last two years there have been exceptionally few cyclist fatalities (only 26 in 2004). There is no difference between men and women with regard to the number of cyclist injuries, but 70% of the cyclist fatalities are men. About 60% of the cyclists killed are over 65 years old. In 20% of cases of cyclist fatalities and 10% of injuries, the cyclist was drunk.

Some 70% of cyclist fatalities are caused by a collision with a motor vehicle, most frequently at an intersection in a built-up area. However, the majority of all cyclist accidents are caused either by falling off a bicycle or by hitting an obstacle.

According to accident investigation boards, about half of the cyclists who were killed died because of head injuries. Of those who did not wear a helmet, about half could have survived the crash if they had worn a helmet. According to helmet-use monitoring data for 2005, 29% of cyclists on average wore a helmet. The situation in urban areas is very different from that in the countryside.

There are 54 annual pedestrian fatalities on average. A quarter of these fatalities and almost half of the pedestrian injuries occur on pedestrian crossings. Alcohol is a significant contributing factor; one in five of pedestrians killed were drunk.

Almost one fifth of pedestrian personal-injury accidents involve children. The risk of children being injured as a pedestrian is almost twice as high, on average, as that of the entire population as a whole. Three out of four personal injuries to children occurred when they were crossing the road, and these cases occurred most often at locations other than a pedestrian crossing.

Nearly one in four pedestrian injuries and 42% of pedestrian fatalities concern people over 64 years old. Two in three of the pedestrians killed on a pedestrian crossing are over 64 years old. The risk of an elderly person being injured as a pedestrian is more than twice as high, on average, as for the population at large.

Half of all pedestrian fatalities occur after dark. It is estimated that half of these could be avoided if people wore reflectors. In 2004, about 40% of pedestrians wore reflectors in areas without street lighting, and about 27% in built-up areas.

Included under the category of 'pedestrian' are activities such as pole walking, rollerblading and skateboarding. Pedestrian traffic often also includes people with limited sensory ability or impaired mobility who use devices such as wheeled walkers or wheelchairs.

It is difficult to estimate volumes and trends in walking and cycling. No comprehensive monitoring has been undertaken. The amount of cycling in particular varies greatly in Finland by time of year and by location, depending on weather and road conditions. Accident data are also incomplete. In particular, a large number of collisions and single-vehicle accidents involving cyclists and pedestrians are never reported to the police.

Moped and light motorcycle traffic is largely confined to built-up areas and residential areas. The number of mopeds in use has been increasing sharply in recent years, judging by registration data. Mopeds are mainly used by young people aged 15 to 17, although recently older people have been increasingly acquiring scooters. Over three quarters of all moped accidents involve young people. The driving speeds of mopeds amidst pedestrians and cyclists are seen as a serious problem.

Calmer traffic for residential areas and centres

Slowing down traffic in residential areas and residential centres significantly improves the safety of pedestrians and cyclists, and the pleasantness of the area itself. This can be achieved by reducing driving speeds and separating traffic.

In recent years, speed limits in built-up areas have been largely reduced to 40 km/h, and in places to 30 km/h. The speed limits have been backed up with structural and environmental features such as roundabouts, raised pedestrian crossings and other speed-retarding measures. These have proved effective.

Measures to calm down the traffic in built-up areas should be continued. The principal responsibility for this rests with the local authorities, who are responsible for the street network. In small municipalities, and on public roads within built-up areas, responsibility rests with the Finnish Road Administration. Cooperation between local authorities and the Finnish Road Administration to ensure a safe and clearly understood traffic environment is extremely important.

The general speed limit in built-up areas is 50 km/h; this is included, by definition, in the official traffic sign designating a built-up area. However, traffic management in built-up areas should be based on a general speed limit of 40 km/h. On streets and roads with busy pedestrian and cyclist traffic, speed limits must be based on the needs of this non-motorized traffic. In practice, this means a speed limit of 30 km/h or the construction of residential precincts or pedestrianized streets. Clearer marking and signing of progressive speed limits should also be investigated so that motorists can easily know the currently permitted speed limit in any given area.

Wherever vehicles are allowed to travel at speeds of over 40 km/h in a built-up area, special attention must be paid to the safety of pedestrians and cyclists. Separate cyclist and pedestrian routes must be provided along principal traffic routes in built-up areas, and, if necessary, cyclists and pedestrians must be prevented from accessing the road.

The spread of housing and other development along public roads, even main roads, serves to blur the distinction between local traffic in built-up areas and main road traffic. Areas which are neither clearly built-up areas yet not purely rural areas are problematic for road safety. In particular, the municipalities surrounding major conurbations function as part of the overall urban structure even though their traffic networks consist largely of public roads instead of streets. The only way to combat the fragmenting of urban structures, the increasing dependence on cars, and the related safety problems in the long term is to pursue integrated land-use planning.

In areas that have almost evolved into built-up areas in terms of land use and traffic, bold measures must be taken to calm traffic. The environment must be rendered self-controlling in the

sense that drivers, in particular, should always be able to recognize the type of traffic environment they are in and adapt their driving accordingly. For instance, the environment must clearly indicate to the driver that he/she is entering a built-up area or equivalent (entry points, roundabouts, speed limits, street lighting). Training and guidance for planners must place greater emphasis on road safety considerations in transport and urban design.

Even today, the design of the traffic environment in residential areas and built-up areas is too strongly based on the needs of vehicles, as a result of which the network of pedestrian and cycle paths is often insufficient, incoherent or poorly planned. Improving the conditions for walking and cycling is the best way of improving neighbourhood safety. However, the Finnish Road Administration's road districts have had such restricted funding for basic road management that many of them have decided not to build even the pedestrian and cycle paths that have already been planned. In many built-up areas the network of cycle routes is far from complete. It is important to complete the principal pedestrian and cycle paths, and other routes which are important for safety reasons, as soon as possible, and to raise the quality of major routes by converting them into 'quality corridors' and to improve the safety of road works arrangements.

Walking and cycling projects should be promoted. An example is the project to improve routes to school in rural settlements, proposed by the ministerial working group. A separate appropriation should be made for walking and cycling projects in road district budgets, and the Finnish Road Administration should be given clear performance targets for the building of pedestrian and cycle paths. At the same time, local authorities should be encouraged to continue building their own networks of pedestrian and cycle paths and to improve the safety of these routes.

In calming down traffic within residential areas and built-up areas, and for instance in the planning of pedestrian and cycle paths and public transport connections, the expertise of local residents can be drawn upon and residents thus offered an opportunity to participate in projects affecting their environment. In studying how obstacle-free a traffic environment is, consideration should also be given to road safety issues. At the same time, residents can be made more aware of the safety problems in their immediate vicinity, and can thus increase their road safety awareness and act accordingly. Residents' associations, village committees, schools, parents' associations and the like can be involved. Arrangements for cooperation in local and regional road safety work already exist to some extent, and these should be widely introduced and activated in locations where they are not yet in use.

Monitoring indicators

Number of pedestrians, cyclists and moped riders killed and injured on streets and public roads in built-up areas.

Trends in speed limits and driving speeds in built-up areas.

The extent of routes for pedestrians and cyclists.

Responsible parties

Primarily the responsibility of local authorities, though the Finnish Road Administration is responsible for public roads.

Other measures to improve the safety of pedestrians and cyclists

In addition to structural designs in the traffic environment, traffic in built-up areas can be calmed through methodical traffic surveillance. In addition to police surveillance, use should be made of municipal resources through partnership arrangements; and local trials and experiments should be conducted.

Children will be provided with comprehensive road safety education so that they can be safe at all times, take care of their health and grow up to act responsibly role in the traffic environment. Finland both respects and promotes the principle of lifelong learning involving all age groups and all road user groups.

With regard to schools, road safety will be improved through voluntary school traffic plans covering the safety of routes to school, safety in the vicinity of the school, and road safety education. These plans should be incorporated in municipal road safety plans. Planning outlines and training assistance are available for schools to help in this work, for instance the outlines given in the "*Safe ways to school*" project,"*Turvalliset reitit kouluihin*".

Safety awareness will be improved through regional campaigns and public education, which will include advice on avoiding dangerous situations when walking, cycling or riding a moped. Principal topics will include traffic regulations, the use of safety equipment, safety surveys of routes to school and various cycling campaigns. These will be implemented in cooperation between the Central Organization for Traffic Safety in Finland, local authorities, the police, road districts and other local bodies. Municipal personnel will be given training in road safety matters.

Pedestrians still do not use reflectors enough. While wearing a reflector is obligatory by law, neglecting to do so is not subject to sanctions. The use and availability of reflectors will be

increased through education and promotion in cooperation with manufacturers, importers and commercial outlets. Pedestrian reflectors and other reflector products will be marketed to motorists. Measures will be targeted more effectively on the basis of information gained by monitoring reflector use. The aim is to increase the use of reflectors to 45% in built-up areas and 60% in sparsely populated areas within three years.

Monitoring indicators

Campaign profiles and effectiveness

Safety equipment availability

Extent to which safety equipment is used

Launching of local and regional projects

Responsible parties

Campaigns: Central Organization for Traffic Safety in Finland, Ministry of Transport and Communications

Local and regional projects: Association of Finnish Local and Regional Authorities, local authorities, Finnish Road Administration

Town planning: Ministry of the Environment

5.3 Accidents involving the influence of drink or drugs

One in five traffic fatalities is the result of an accident where a drunken driver [1] is involved. This percentage has persisted and even increased, even though the percentage of drunken drivers on the roads has gradually decreased. The accident risk increases sharply as the blood alcohol content rises: by a factor of 3 when the blood alcohol content is 0.8 g/l and by a factor of 40 when the blood alcohol content exceeds 1.5 g/l.

For young drivers, even a low blood alcohol content leads to increased risk-taking when driving. Over half of the drunken drivers involved in fatal accidents have suffered intoxicant abuse problems, and they have usually had a history of intoxicant-related offences. The alcolock is a new device for preventing people from driving when drunk. Its widespread use as a means for preventing both problem drinkers and repeat drunken driving offenders from driving should be promoted. It must also be introduced as a supplementary measure for monitoring the health requirements of the Driving Licence Directive and as a criterion in the competitive tendering of transport services and for quality assessment of operators.

In the sphere of international cooperation, too, the installation of the alcolock as standard equipment in new vehicles must be strongly advocated. There is scope for improvement in the focus of surveillance and in publicity. Improved on-site verification of drunken driving offences and simplification of the sanctions process will make it easier to intervene in such offences and would enable drivers to be banned from driving even with a blood alcohol content of 0.2 g/l. Maintaining a culture of disapproval of drunken driving is an important preventive measure, as are early identification of intoxicant abuse and health care guidance. In order to prevent the most difficult cases of recidivism, appropriate guidelines and regulations must be issued to harmonize the procedures for impounding and confiscating vehicles.

Description of problem

Drunken driving is a serious road safety issue. About one in five traffic fatalities is the result of a crash caused by a drunken driver.

Personal injuries caused by drunken driving have not decreased in the same way as other personal injuries in road traffic. Speed limits, seat belt use and a general improvement in traffic behaviour have reduced the overall number of annual traffic fatalities, but these measures have less effect on accidents caused by drunken drivers than on other accidents. This is because a drunken driver typically neglects safety in other respects too and takes deliberate risks.

In most cases, the people who are killed in fatal crashes caused by drunken drivers are the drunken drivers themselves or passengers in the same car. The total number of annual fatalities in such crashes is 79, of which only seven are bystanders.

Even a small amount of alcohol can increase the risk of an accident, particularly for inexperienced drivers. The risk increases by a factor of three when the blood alcohol content is 0.8 g/l and by a factor of 40 when the blood alcohol content exceeds 1.5 g/l.

Studies estimate that about half of the drunken drivers are intoxicant abusers. One in ten drunken drivers is caught drunken driving again within a year, and one in four within five years.

Drunken driving is even more dangerous for young drivers than for older ones. This can be seen from the fact that while traffic flow monitoring shows that young drivers account for about 10% of all drunken drivers, they account for 20% of those actually caught for drunken driving and

[1] The terms "intoxicant" and "drunken driving" are used in this Programme to refer primarily to alcohol and its influence, but where applicable they also may be taken to refer to and include the influence of drugs of all kinds (including medicines), and of sources of substance abuse in general.

about one third of drunken drivers involved in fatal crashes. The high figure for fatal crashes is even more significant when it is borne in mind that young people are physically better able to withstand a collision than older people.

Drunken driving is typically a male domain. In serious drunken driving accidents, 90% of drivers are men. The increase in personal injuries caused by drunken driving in the 2000s is largely attributable to drivers aged 18 to 24.

Alcohol is not only a problem of drunken car drivers, but of others as well: in about one in five traffic fatalities among pedestrians, cyclists and moped riders, the person who was killed was drunk.

The tax on alcohol was cut at the beginning of March 2004, and the prices of spirits in particular dropped. Alcohol consumption increased by 10% on the previous year, and 10% more drunken driving cases were reported to the police. The number of breathalyzer tests conducted has also increased. The number of personal injuries in accidents involving a drunken driver increased by 9% on the previous year. By contrast, monitoring measurements show no significant change in the level of drunken driving between 1996 and 2005.

Alcolock – the key to sober driving

Several approaches have been employed in the prevention of drunken driving, ranging from legislation to social welfare and health care policy. This diversity of approach should be continued, and technical devices should also be introduced. One such is the alcolock, which renders it impossible to drive a vehicle when drunk. Promoting introduction of the alcolock seems to be the most promising approach to keeping drivers who are under the influence of alcohol off the roads.

In order to expedite the widespread adoption of the alcolock, the possibilities of decreeing it to be compulsory standard equipment in all new vehicles should be investigated. The aim is to have the alcolock as a compulsory device in new heavy goods vehicles and buses/coaches by 2010 and in new cars and vans by 2012. This coincides with the targets that have been set in Sweden, and Finland should cooperate with Sweden to obtain a directive containing a provision on the alcolock and to bring the device into widespread use.

A three-year trial was begun in July 2005 whereby a court may, in a case of drunken driving, impose a one-year period of controlled driving instead of a driving ban. To comply with this, the driver must install an alcolock in his/her car, and the police will monitor the driver's progress on the basis of data downloaded from the alcolock's memory. The controlled driving trial also involves an intoxicant abuse assessment programme and follow-up health checks. The experience gained from this trial should be rapidly and widely applied.

Drunken driving usually indicates that the driver lacks control over alcohol use. The large percentage of cases of aggravated drunken driving (blood alcohol content over 1.2 g/l) and the number of repeat offenders are clear indications of the high incidence of drinking problems in the population and of alcoholism generally. There is no simple, single measure for correcting this. The alcolock serves not only to prevent drunken driving but to help alcohol abusers stay sober and thus contributes to decreased alcohol consumption. Promoting use of the alcolock is therefore not only a road safety measure but also contributes to public health and to social welfare and health care targets.

According to the Driving Licence Directive, an alcohol abuser does not fulfil the health requirements for a driving licence. Since autumn 2004, doctors have been obliged to notify the driving licence authorities if a patient's health has permanently deteriorated to the point where the patient no longer fulfils the health requirements for a driving licence. However, there is a high threshold for intervening in alcohol abuse, because doctors consider the matter sensitive and patients tend to conceal it. Medical expertise and health care practices related to alcohol and drivers' health should be further developed.

Efforts should be made to amend the Driving Licence Directive so that an intoxicant abuser could be permitted to drive a vehicle fitted with an alcolock. This would be one means of helping people control their substance abuse. At the same time, it would help to prevent the difficulties that usually ensue in private and working life when a person loses the right to drive. For example, the alcolock could be set as a driving licence requirement for all persons who have been convicted of drunken driving.

In addition to legislation, there are a number of voluntary, or competitive, measures for promoting the use of the alcolock. Progressive transport operators have a written alcohol policy, and they observe zero tolerance and regularly breathalyze their drivers. Companies should be encouraged to include the alcolock in their procedures to ensure that drivers are fit and able to drive. This applies to companies outside the transport sector as well. The clients of transport operators too are not entirely free of responsibility concerning sobriety in traffic, even if their responsibility is largely moral. It is especially important that when the public sector purchases transport services it should specify the alcolock as a competitive factor or even as a requirement. This should be implemented immediately with regard to school transport.

Drunken driving is generally considered to be a road safety problem that is caused by a certain limited group of people – drunken drivers. However, it affects everyone directly or indirectly, and thus it is everyone's responsibility to intervene. The Programme proposes that the use of the alcolock should be promoted both officially and on a voluntary basis, as described above.

Other measures to combat the influence of drink and drugs in traffic

Although the alcolock is highly promising, other more traditional and more readily employable measures to work for drink- and drug-free traffic should be continued. Finland has comprehensive drunken driving surveillance, since the police are allowed to breathalyze any driver at any time, whether drunken driving is suspected or not. This is different from the practice in many other countries. However, there is scope for stepping up surveillance, and thus increasing the risk of getting caught, by focusing on the specific time periods and locations where drunken driving commonly occurs, and by improving publicity about surveillance, for example through information screens.

Drunken driving surveillance can also be enhanced by developing verification devices and by simplifying the surveillance and legal processes. This is possible through the adoption of portable high-precision breathalyzing equipment and new tools for detecting drugs and other intoxicants. This will lower the intervention threshold and enable improved accuracy. Even drivers with a relatively low blood alcohol content (0.2 g/l) should be prevented from driving.

Under current legislation, a person may legally drive if his/her blood alcohol content is less than 0.5 g/l. This conveys the wrong image of the effects of alcohol in traffic. With young drivers in particular, the effects of alcohol are greater than average, and risk-taking in traffic is prone to increase even after the consumption of small amounts of alcohol. The general target for safe driving is complete sobriety, and the current drunken-driving limit weakens the credibility of this target.

A climate of opinion that disapproves of drunken driving is being maintained and enhanced through campaigns. At the same time, the general public is provided with information of various kinds to reinforce the message that the consumption of alcohol must not jeopardize road safety. The funding available for campaigns has decreased, however, while at the same time the level of funding needed for a visible campaign in today's fragmented media field has increased. Steps should be taken to ensure that campaigning continues at least at the current level.

The road safety implications of alcohol use are included in schools' teaching and awareness programmes about drink and drugs. The aim is to ensure that young people are sufficiently well-informed about the risks of alcohol and drugs in traffic before they become eligible for a driving licence. Traffic-related aspects of drink and drug use are also covered in health education. New ways of reaching young people and their parents will be developed.

More information about drunken driving will be given to municipal health care personnel and members of the judiciary. Health care personnel will be provided with information and procedures for intervening in cases where there is a risk that a client will engage in drunken driving. Half of all drunken drivers have sought help for their drinking problem even before being caught drunk at the wheel. A suspected drunken driver will be given information concerning the consequences of drunken driving immediately after being caught, and also given the possibility of contacting the welfare services for substance abusers. The conviction period for drunken driving should be used for initiating and supporting a change in the person's behaviour to reduce the chance of further offences. Programmes aimed at drunken drivers should be further developed and studied.

In the case of multiple offenders, especially when the person is repeatedly caught drunken driving within a short period of time, one way of breaking the cycle could be to impound the car immediately at the surveillance point, and possibly to deprive the person of it permanently (confiscation). These procedures will be harmonized through information and instructions issued to prosecutors and the police.

Monitoring indicators

Number of people killed in drunken driving accidents

Number of drunken drivers caught through surveillance in relation to the extent of surveillance

Implementation of measures

Number of breathalyzer tests

Percentage of drunken drivers in the traffic flow

Responsible parties

Surveillance matters: Ministry of the Interior

Legislative amendments: Ministry of Justice, Ministry of Transport and Communications

Confiscation instructions: Office of the Prosecutor General

Health care: Ministry of Social Affairs and Health

Publicity and campaigns: Central Organization for Traffic Safety in Finland

5.4 Accidents involving professional drivers

Accidents involving heavy vehicles are usually very destructive because of the large mass involved and particularly because of the difference in mass between the colliding vehicles. A heavy vehicle is involved in 20% of all fatal crashes, and coach crashes are frequently major disasters. Although the heavy vehicle is not usually the party causing the accident, improving the driving habits of professional drivers is one possible way of reducing accidents.

Enhancing surveillance by the police in cooperation with the Border Guard and the Customs is a safety measure that can achieve rapid results. Surveillance focuses on driving habits, loading, the condition of the driver and the vehicle, and the journey itself as recorded on the tachograph. Sanctions should also be aimed at transport operators so that transport safety can be ensured at the loading point. Publicity and training should be employed to enhance the public image of professional transport so as to emphasize not only the qualifications of the drivers but also the safety management and risk management of the transport operators. Further training for drivers with regard to safe and economic driving, in conformance with the qualification directive, is part of the package, too. Strict adherence to legislation and agreements must be insisted upon in public procurement, and road safety factors should be used as selection criteria.

Description of problem

Professional drivers are often involved in accidents which are more severe than average. The large size and mass of a heavy vehicle can cause devastating damage to a lighter vehicle in an accident by virtue of the difference in mass alone. If the other party in a collision is a coach carrying passengers, the result may be a major disaster.

Heavy goods vehicles account for about 6% of annual vehicle-kilometres in road traffic, and buses/coaches for slightly over 1%. A heavy goods vehicle is involved in one out of five fatal accidents, whether or not the heavy goods vehicle caused the accident. The percentage of truck trailers in fatal accidents is up to six times higher than the percentage of truck trailers in personal injury accidents. However, in most cases the heavy goods vehicle is not the one causing the collision.

The percentage of heavy goods vehicles in fatal accidents appears to have risen by a few percentage points over the past decade, settling at around 20% of the motor vehicles involved in such accidents. However, because the actual number of incidents is low, the annual variation is great. At the same time, the percentage of heavy goods vehicles in personal injury accidents seems to have risen by about one percentage point, from 6% to 7%. This concerns single-unit trucks and truck trailers alike.

As noted above in section 5.1, the safety problem in heavy traffic largely manifests itself as head-on collisions on single-carriageway main roads. In many of the cases, the mere presence of a heavy vehicle constitutes a massive risk to another vehicle drifting into the opposite lane. In some cases, there was nothing the driver of the heavy vehicle could have done to avoid the collision.

Notwithstanding the above, professional transport involves many known risk factors that either cause accidents or act as a contributing factor or exacerbate the consequences. The crash near Konginkangas on March 19, 2004 is a tragic example of the accumulation of such risk factors. It is also an example of how high the casualties can be even in a single road accident if the parties involved are a heavy goods vehicle and a public transport vehicle.

Some of the risk factors in professional transport are due to the sector being highly competitive. The threshold to enter the business is low, and many of the operators are small. Abandoning discretion in the granting of transport licences and an increase in the number of foreign operators has added to the competition. Price is the most significant competition factor in transport, and efficiency may be at odds with road safety.

Under the Road Traffic Act, responsibility for road safety in the goods transport chain rests solely with the driver. As a result, compromising road safety can result in financial gain for the other parties in the transport chain (e.g. the shipper or client, the transport operator, and the recipient). However, under the Drivers Hours Regulation payments to wage-earning drivers, even in the form of bonuses or wage supplements, related to distances travelled and/or the amount of goods carried are prohibited, unless these payments are of such a kind as not to endanger road safety.

Certain unhealthy practices that are incompatible with road safety have emerged in the transport industry, involving contravention of the limits imposed by legislation and agreements as a matter of course. Because of the tight competition, the transport industry itself has little scope for performing surveillance or improving these practices. The authorities too have limited scope for regulating or monitoring these practices except through statutory roadside checks.

The most typical such malpractices in the road transport industry are violations of driving hours and rest periods, overloading, tight schedules and speeding. The purpose of provisions about driving hours and rest periods is to avoid driver fatigue in professional transport. If a driver has not had enough sleep or is otherwise tired, this will affect his/her alertness and responses, much as if the driver were drunk. However, unlike drunkenness, fatigue cannot as yet be measured reliably. Because surveillance is low and sanctions are negligible, the provisions on driving hours and rest periods are commonly violated.

Section 63 of the Road Traffic Act forbids operation of a vehicle if the driver is unable to do so because of fatigue. As there are no reliable ways of measuring fatigue in road surveillance, efforts have been made to limit fatigue in heavy-vehicle traffic by providing for maximum driving hours and minimum rest periods for drivers of heavy goods vehicles and buses/coaches. Driving hours and rest periods are provided for in Council Regulation 3820/85 and tachographs in Council Regulation 3821/85. Finland's Road Traffic Act provides for surveillance, coercive measures and sanctions resulting from a breach of the Regulations. Furthermore, Council Regulation 2135/98 amended Council Regulation 3821/85 to the effect that mechanical tachographs will be replaced by monitoring computers known as digital tachographs. The European Parliament is debating a directive on the surveillance of driving hours, which the Council has approved. This directive would require member states to step up their driving hours surveillance in stages from the current 1% of working days to 4% of working days as the digital tachograph becomes more widespread.

The driving speeds, speed limits and speeding of heavy vehicles are discussed in more detail in section 5.5 'Excessive driving speeds'.

In the view of the general public, professional drivers pay too little attention to road safety and safety-conscious behaviour. This is apparent in their concentration on speed and performance, in the reputation of professional drivers, and in the public's views on their driving habits (taxis in cities, speeding trucks) and the drivers' attitude to safety equipment (resistance to seat belt use by taxi drivers and other professional drivers).

EU harmonization will bring considerable changes to the provisions concerning professional drivers during the programme period. Enactment of the safety belt directive will make seat belts compulsory, and the qualification directive will require a separation of professional qualification requirements and driving licence requirements, which will in turn place new demands on the training system and the advanced training of drivers.

Enhancing surveillance of heavy-vehicle traffic

Heavy-vehicle traffic surveillance is challenging and requires special competence and professional skill in its planning and execution. Demands for better surveillance of heavy-vehicle traffic are increasing internationally.

In order to gain road safety benefits from the introduction of digital tachographs for the monitoring of driving hours and rest periods, it should be possible to increase the number of inspections and the size and scope of sanctions. In particular, neglecting to use the recording equipment should be subject to a sanction much more severe than violation of driving hours or rest periods. Sanctions should also be aimed at all parties responsible for deciding the transportation schedules.

However, because the potential for increasing surveillance is limited, and because in the early stages surveillance will be even more complicated and slower than before due to the existence of two parallel systems, the main focus should be on sanctions. Sanctions should be clearly aimed not only at the driver but also (or instead) at those responsible for deciding the drivers' timetable. (This is also mentioned in the proposals of the working group of the Ministry of Transport and Communications.) A practice should also be introduced whereby a vehicle can be prevented from continuing its journey if the driver has violated driving hours and rest periods. This sanction would be targeted at those responsible for the timetable and would in many cases be very significant financially (involving penalties for delay, etc.) This aspect would then eventually be taken into account in transport agreements and tenders, because it would have an

impact on the reliability of delivery.

Surveillance data should be used to increase preventive efforts together with the parties in the transport chain and in the industry in general by distributing information on anomalies and by offering training in better practices. For example, overloading and shortcomings in securing loads should be eliminated before the vehicle begins its journey. The authorities must ensure that surveillance of heavy vehicle traffic conducted on the basis of risk analysis. Terminals and other departure points, border crossings, etc., naturally constitute suitable surveillance locations. Building and maintaining safe traffic surveillance posts along busy roads is also important, as is the management of transport surveillance at night.

Monitoring indicators

Extent of heavy-vehicle surveillance activities (including HazMat inspections and roadside checks)

Accidents caused by heavy vehicles

Monitoring of violations of driving hours and rest periods

Responsible parties

The parties responsible for surveillance would be those monitoring driving hours and rest periods, i.e. the police and occupational safety and health authorities (Ministry of the Interior, Ministry of Social Affairs and Health) and in other contexts, as applicable, the Border Guard and the Customs

Other measures to improve the safety of professional transport

Measures to prevent head-on collisions, such as separation of opposing lanes, centre-line and shoulder rumble strips and winter maintenance, also serve to reduce heavy-vehicle accidents.

Training in the transport sector will be facing considerable new demands in the near future: on the one hand, enactment of the qualification directive will mean legislative changes with new requirements, and, on the other hand, the ageing and retirement of current drivers will increase the pressure to recruit new drivers. In the future, new drivers will be an increasingly heterogeneous group, including for instance immigrants from diverse backgrounds seeking careers as professional drivers. At the same time, enhancing the status of training and combining work experience with the training is a huge opportunity for raising the professional profile of drivers and improving their appreciation of road safety. The teaching of defensive driving and economical driving can help to provide a firm foundation for any driver training course.

There is a need to improve transport risk management and road safety management on the part of both providers and users of transport services. Some industries are more advanced in this respect than others. As a specific example, there are practices already in place in the majority of hazardous material transport that could be easily applied in other sectors too.

Transport safety should be a competitive factor. Strict adherence to legislation and agreements in transport services should be insisted upon, particularly in public procurement. Safety factors such as the alcolock or a speed control system could be seen as competitive factors or even as criteria for selection, for example in school transport or other passenger transport contracted by the public sector.

Professional drivers are on the road a lot, usually regardless of the weather. New information systems can provide drivers with better and more accurate information, for example about changing road conditions or traffic disruptions. Introduction of these systems requires investments in R&D.

In spring 2005, the steering group on heavy-vehicle safety research drafted an assessment of the safety situation and research needs with regard to heavy vehicles. In charting the research needs in this field, the steering group observed that there are specific R&D needs for improving road safety in all main areas (driver, vehicle, traffic environment). The group also proposed research on responsibilities in the transport chain and on the use of financial sanctions in road safety. The steering group proposed a total of 24 research topics requiring further investigation. Some research projects on these topics have already been launched. It is important to ensure that the research projects proposed by the group can be implemented.

5.5 Excessive driving speeds

As driving speed increases, both the risk of an accident occurring and the severity of any injury or damage caused increases sharply. This is evident in the cause analyses and profiles of fatal crashes: driving speed is the main risk factor both on public roads and in built-up areas. Speed limits and compliance with them affect the level of road safety. The instructions for determining speed limits are being revised to take better account of traffic volume, roadside habitation and the type and degree of separation of opposing lanes. The use of road-specific speed limits will be extended, as will the use of specific speed limits for winter and throughout the darkest time of the year, aided by the use of adjustable speed limit signs if economically feasible. Drivers' ability to adjust their driving speed to the conditions is otherwise insufficient.

The overall road safety problem associated with speeding has two main aspects. On the one hand, serious speeding brings a high individual accident risk. Although the percentage of serious speeding in traffic is relatively small (about 10% of drivers exceed the speed limit by over 10 km/h, and one in a thousand by a substantial amount), it is a major contributing factor in accidents. On the other hand, the percentage of slight speeding is very high (e.g. over 50% exceed the speed limit by less than 10 km/h). In these cases, the individual accident risk may not be very high, but the large number of such cases translates into a significant added risk in the transport system as a whole. Compliance with speed limits is enforced through surveillance. In seeking to curb driving speeds, the focus is on a systematic programme of investment in automatic speed surveillance.

The police force's traffic centre project will be implemented in order to enhance and automate the surveillance process and in order to improve planning, cooperation and publicity in surveillance. Surveillance technology will be developed to improve vehicle identification and accurate measurement of driving speeds. The issue of revising limiter values in heavy vehicles to correspond better to the vehicle-specific limitations specified in legislation will be taken up at the EU level. Introduction of intelligent speed control systems will be promoted, and recording equipment that records driving speeds will be introduced for the purpose of surveillance of vehicles difficult to monitor and for identifying drivers who repeatedly violate the limits.

Description of problem

Excessive driving speeds increase the risk of an accident and the severity of the outcome of any accident that occurs. Driving speed is the prime road safety factor in all operating environments, both in built-up areas and in the main road network.

If speed limits were set according to safety requirements alone, they would be calibrated according to how well the human body can sustain damage in various accident situations. In other words, in environments where there are pedestrians and cyclists, speed limits should be 20–30 km/h. In traffic where vehicles can cross each others' paths, the speed limit should be 50 km/h, and where head-on collisions or collisions with solid objects are possible, the speed limit should be 70 km/h. Obviously, there is

a conflict between safety-based speed limits and the reality of present driving speeds. What is important in setting speed limits is how much weight is given to safety in relation to other targets and values.

The determination of speed limits involves two main aspects: setting of the speed limit appropriate for the traffic environment, and consideration of how well the speed limit will be complied with. Locally, the choice in problem locations is between improving the traffic environment to match driving speeds or lowering the speed limit to correspond to the traffic environment.

Compliance with speed limits in Finland is quite good by international comparison. Observation results show that between 8% and 14% of motorists exceed an 80 km/h speed limit by more than 10 km/h, and between 7% and 10% of motorists exceed a 100 km/h speed limit by more than 10 km/h. No essential changes have been observed in average driving speeds in recent years, either in general or, for example, on Friday or Saturday nights.

The incidence of extremely serious speeding is low; on public roads it amounts to something like one driver in a thousand, depending on how it is defined. Even so, this represents several thousand cases of extremely serious speeding every day, and collectively this represents a major risk factor. An extremely high driving speed is almost always a matter of deliberate and conscious risk-taking, or else the result of recklessness due to alcohol consumption, emotional distress or some similar contributing factor. Very rarely is an extremely high driving speed due to a genuine lack of attention or a real emergency.

The real problem regarding speed limits and prevalent driving speeds is that it has become established practice in Finland to drive at slightly over the speed limit. This practice is tacitly approved through the application of intervention thresholds in speed surveillance and it is further supported by the common practice of heavy vehicles driving at the upper limit of the speed limitation device. In practice, an 80 km/h speed limit on a Finnish road means a speed limit of 90 km/h for many motorists: over half of all drivers exceed the speed limit on a road subject to an 80 km/h limit. The general opinion is that speeding is not really speeding until the driving speed is more than 10 km/h over the limit.

The Finnish speed limit system is generally considered to be fairly satisfactory. The Finnish Road Administration has conducted polls on speed limits, and the majority of respondents consider them appropriate. The satisfaction rate improved after winter speed limits were introduced more widely in winter 2004–2005.

Speed limits are seen as target speeds, and drivers who drive at slightly under the speed limit are considered irritating. This practice is even referred to as ‘failing to keep up with the speed limit’. However, it is often safer to drive at less than the speed allowed by the speed limit, because of the circumstances or for personal reasons, for example when driving in a strange environment.

Drivers do not adapt their driving speeds well to different road conditions or weather conditions. In wet or slippery conditions in particular, drivers do not slow down enough. Heavy vehicle drivers slow down the least. Driving speeds are mainly controlled by introducing lower speed limits in winter and throughout the darkest time of the year on part of the road network. Beginning in winter 2004–2005, some stretches of 80 km/h roads have been subject to a 70 km/h speed limit for the winter period. So far, there has been very limited scope for employing speed limit signs that change automatically according to road conditions, and even where such signs exist, they are used very conservatively.

Controlling driving speeds by speed limits and speed surveillance

Official guidance for determining speed limits is being revised, and its application will be reviewed more precisely and more regularly in the future. The new guidelines take better account of traffic volume, roadside settlements and different road types. The system of road-specific speed limits will be extended to cover a larger portion of the public road network and, in particular, all major roads.

The use of lower speed limits in winter and throughout the darkest time of the year will be extended and enhanced. Adjustable speed limit systems will be introduced where economically feasible. These systems can improve the adjustment of driving speeds to changing road conditions and make speed limits more acceptable to drivers. The detailed operation of adjustable speed limit systems required further development.

Speed limits in built-up areas are discussed in more detail in section 5.2.

During the programme period, the main focus in controlling driving speeds will be on investment in automatic traffic surveillance. On busy main roads and in built-up areas, the only way to step up surveillance and make a permanent impact on driving speeds is through the use of speed cameras. Camera surveillance has led to a permanent reduction of 80% in extremely serious speeding, and 70% in speeding of over 10 km/h. There is also convincing data on the experience of other countries regarding the impact of automatic speed surveillance on driving speeds and road safety.

Automatic speed surveillance will serve to lower the threshold for official intervention, which at present is too high.
A comprehensive and efficient automatic speed surveillance system and a road-specific speed limit system will help to optimize driving speeds according to safety considerations on different types of road and in different traffic environments, taking into account the smooth flow of traffic and the

acceptability of speed limits. Experiments will be conducted to find new approaches.

Measures to increase automatic traffic surveillance are contained in the traffic surveillance development programme for 2005–2007 published jointly by the Ministry of Transport and Communications and the Ministry of the Interior. Fixed automatic speed surveillance will be extended to a total of 1,600 km of high-risk main roads by 2009. To complement the fixed speed cameras and traffic surveillance, in particular, in built-up areas, 20 mobile surveillance units will be acquired by 2009.

The efficiency of automatic traffic surveillance also depends on automation of the sanction process. For this purpose, the small-fine procedure must be simplified; this is currently being debated by Parliament. As a practical measure in the implementation process, the police will be concentrating their speed camera monitoring work in regional traffic centres.

The main responsibility for traffic surveillance work and management lies with the police. In order to improve the targeting and planning of traffic control and surveillance in the main road network, and the publicity and information provided about it, cooperation between other bodies in the transport sector (such as the Finnish Road Administration and the Central Organization for Traffic Safety in Finland) will be enhanced. Traffic monitoring and measurement data can be put to good use in surveillance planning, because surveillance targeting requires a closer analysis of local and regional safety problems. Data gained from the implementation and results of surveillance will in turn be used for evaluating and improving the system. New indicators will be developed for traffic surveillance in general and for automatic speed surveillance in particular. Publicity about the whole surveillance process will be increased in order to improve its preventive and effectiveness impact. The scope for regional cooperation in the traffic centres will be enhanced considerably. Cooperation between the traffic centres and the Finnish Road Administration, the Central Organization for Traffic Safety in Finland and the Occupational Safety and Health Inspectorates, for example, will bring synergy benefits and greater efficiency in solving shared problems.

New surveillance technology needs to be introduced through experimentation and development. The aim should be to progress from spot checks to controlling compliance with speed limits over longer distances. Automatic speed surveillance should also be included in adjustable speed limit systems. Electronic vehicle identification is an essential part of automatic surveillance. In camera surveillance, this can be achieved with the use of automatic registration-number identification devices, and it is planned to introduce these experimentally in 2006. Potential for the use of more advanced vehicle identification systems should be investigated urgently.

Automatic traffic surveillance will not replace traditional traffic surveillance; instead, it will complement and enhance it and free up resources for reallocation. Provision should be made for sufficiently safe surveillance posts along the road network for the surveillance of heavy vehicles.

Monitoring indicators

Extent of surveillance activities

Measured driving speeds

Speed limit measures

Responsible parties

Surveillance: Ministry of the Interior

Speed limits: Finnish Road Administration and municipalities

Legislation: Ministry of Transport and Communications, Ministry of Justice

Publicity and education: Central Organization for Traffic Safety in Finland

Other measures for curbing driving speeds

There are a number of existing technical means for curbing driving speeds. Trucks and coaches have speed limitation devices as required by the respective EU directive. However, the maximum permitted speeds in these devices are higher than the vehicle-specific speed limits for these vehicles in Finland. This has led to the common practice of driving at the upper limit of the speed limitation device, with measurable increase in average overall driving speeds because car drivers tend to conform to the speed of heavy vehicles. Finland will be raising the issue of maximum speeds in speed limitation devices for heavy vehicles during Finland's forthcoming EU Presidency.

Current problems with surveillance and the violation of speed limits can be eliminated by technical means, for instance Intelligent Speed Adaptation (ISA), driving speed recorders ('black boxes') and Electronic Vehicle Identification (EVI). However, the widespread introduction of such devices will require international regulations and agreements. They should nevertheless be tested and studied, and the resources and conditions for introducing them should be secured. For example, ISA systems usually require electronic map-based data on speed limits, and Finland's DIGIROAD system is suitable for this purpose. The systems should initially be introduced in cases where surveillance is otherwise difficult (e.g. motorcycles) or for drivers who evidently have trouble observing speed limits (repeat offenders).

The adaptation of driving speeds to changing conditions has proved to be a particularly difficult problem, so new methods and practices should be developed for disseminating information about changing weather and road conditions and other exceptional circumstances. The VARO system currently under development would enable this.

Serious or repeated violations of the speed limit will have consequences with regard to a driver's right to drive. Monitoring of compliance and publicity about driving licence sanctions should be improved in order to enhance the preventive impact of the system.

5.6 Alleviating the consequences of traffic accidents

The seat belt is the most important tool for reducing the severity of injuries to drivers and passengers in a crash. An estimated 50 traffic fatalities could be prevented each year if all road users wore seat belts. Technical means should be introduced to ensure the use of seat belts. Failure to wear a seat belt should be made an offence with sanctions that apply to the driver's licence; this requires the development of the sanction system into a 'penalty points' system. Automatic surveillance of seat belt use should also be tried. Technological developments offer potential for improving both passive and active safety in vehicles. Action must be taken at several levels to bring technical improvements and vehicle safety benefits into everyday use.

The preparation of international regulations (EU/ECE) must be supported in order to develop standards and provisions and to implement them more rapidly, and market behaviour must be guided through pricing and overall motoring costs. Use must also be made of publicity to promote safety-consciousness among drivers. A high standard of rescue and medical care services contributes to alleviating the consequences of accidents. The use and availability of safety devices and equipment must be monitored and evaluated regularly.

Description of problem

In a crash, the severity of the injuries caused to the driver and passengers in a vehicle depends most of all on the forces generated by rapid deceleration. In order for human beings to survive their injuries, the primary consideration is to ensure that speeds immediately prior to crashes are not too high. Secondly, the number of solid objects in the traffic environment can be reduced. 'Softening' of the traffic environment through the use of self-buckling street light posts and railings, etc., has been found to substantially reduce the impact forces in a crash, and this type of solution can be further improved. The third and final consideration is the protection afforded by the vehicle itself in a crash. In recent years, cars have been designed so as to absorb impact energy better than before and to keep the passenger compartment as intact as possible. As a secondary consideration, we may note that car structure and design nowadays also take into consideration the need to minimize damage to the other party, for instance a pedestrian, in a collision.

For the driver and passengers to benefit from the collision protection afforded by the vehicle, they must use seat belts or similar devices. Without such restrictions, anyone in the vehicle will be catapulted against the internal structure in a collision and will be uncontrollably subjected to considerable forces.

The number of cars with airbags that deploy automatically in a crash has increased in recent years, as has the number and type of airbags (passenger airbags, side airbags, etc.). However, airbags are designed to work together with seat belts, so seat belts remain the single most important safety device in a car, whether the car has airbags or not. The only weakness with seat belts is that they do not afford automatic protection: they must be actively put in place.

Seat belt use is compulsory in cars and vans, and during 2006 it will also be made compulsory in taxis, trucks and buses/coaches, except for buses in local transport. The usage rate of seat belts on the front seat of a car is over 90% outside built-up areas and about 85% in built-up areas. The rate for back-seat usage is somewhat lower.

The seat belt usage rate (drivers and passengers) in fatal traffic accidents in 1999–2005 was below 70%, and below 60% for those killed in such accidents. Accident investigation boards estimate that simply wearing a seat belt would have saved the lives of an average of 50 people per year between 1999 and 2003. Other safety equipment and more safely designed vehicles would also have saved several lives.

The crash safety of cars has improved significantly in recent

years. A Finnish study shows that the risk of injury in modern cars is 20% lower than in cars 10 years old. This trend is due to the crash-test requirement imposed on new car models in 1998 and on all models in 2003, and also to the EuroNCAP crash tests and their public evaluation.

In addition to the improvement of passive safety for car drivers and passengers, attention has recently been given to safety in collisions between cars and pedestrians, and in the vehicle's impact on the other party in a collision in general. For example, a pedestrian injury test has been introduced in crash tests. However, it should not be forgotten that, technological advances notwithstanding, the primary factor affecting severity of injuries in a collision between a car and a pedestrian or cyclist is the impact speed.

More attention has also been given recently to the safety of heavy vehicles in crashes. Front Underrun Protection Systems have been developed and introduced to reduce the chance of smaller vehicles or pedestrians from sliding under a heavy vehicle in a collision. The provision of impact safety zones in heavy vehicles is also under design.

So far, the only passive protection available to drivers and passengers of non-enclosed motor vehicles (motorcycles and mopeds) consists of the crash helmet and protective clothing. Nearly all motorcycle and moped riders in Finland wear a crash helmet. However, moped riders in particular often fail to fasten the helmet properly, in which case the crash helmet will be the first thing to come loose in a collision, thus affording no protection at all.

The upward trend in the use of cycle helmets has almost come to a standstill, at slightly over 25%, despite the fact that the obligation to use a helmet was entered in legislation in 2003. In 2005, an average of 29% of all cyclists wore a cycle helmet. Only children demonstrate a satisfactory rate of helmet usage; although usage declines as children reach secondary school. Accident investigation boards have found that over half (52%) of the cyclists who died in 2002 had sustained fatal injuries to the head. Of those who did not wear a helmet, almost half (49%) could have survived the accident had they been wearing a helmet.

Some of the most important safety devices that prevent more severe injuries, such as seat belts, require active use. The problem is that regardless of all the measures undertaken to increase usage, such as publicity and surveillance, the usage rate will always be less than 100%. Some people, for one reason or another, will always neglect to use the available, proven and purpose-designed means of protection, evidently in the belief that they will not be involved in a crash. Failure to use safety equipment is also frequently linked to other risk factors such as drunken driving, speeding, and so on.

Safety designs in vehicle technology, both of new safety equipment and of structural features, will only improve and come into use as the vehicle stock is replaced. Indeed, new features usually appear first in the most expensive car models and as optional extras; only later do they become standard equipment in all models. Even if a particular technical feature were to be made compulsory for all new cars today, it would only be present in about one third of the vehicle stock at the end of the programme period. At the moment, a large percentage of vehicles in daily use do not have the safety equipment and impact resistance that is included as standard in all new cars. Because of high vehicle taxation, the vehicle stock turnover in Finland is slow compared with other countries. The average age of the vehicle stock in Finland is over 10 years, and the average age of a scrapped car is 18 years. By comparison, the average age of vehicles in Sweden is about 9 years, and in central Europe generally about 7–8 years. Furthermore, older and less well-equipped cars are unfavourably distributed among drivers from a road safety point of view: they are used by young drivers or drivers who drive very little, for example as a second family car, or in the countryside, where the risk of a fatal traffic accident is relatively higher.

Reducing the severity of accidents by increasing the use of safety equipment

The use of safety equipment in Finland is good by international comparison. Traditional means for increasing its use include regulations, education and surveillance. These methods will continue to be used, but new measures will also be introduced. However, inducing the 'final five per cent' to use seat belts in the front seats of cars, for instance, will scarcely be possible without technical solutions.

Once the obligation to wear seat belts is extended to new categories of vehicle with the national enactment of the seat belt directive in 2006, the obligation will come to apply to vehicles in which seat belts have not previously been used very much. The opportunity should be taken to make full use of the change in legislation and it should be supported through effective publicity. Because coach passengers will have to wear seat belts too, drivers or other personnel will have new responsibilities in informing passengers of this.

The use of automatic surveillance to reduce instances of failing to use a seat belt should be tested. This would be one way of increasing the risk of being caught and could improve the rather low seat belt usage rate in built-up areas. Failure to wear a seat belt or a helmet should also be included in the list of offences which, if repeated, affect the right to drive. This requires that the sanction system be developed into a 'penalty points' system.

However, the most effective way to increase seat belt use is by means of technical devices, which can either urge or compel the use of a seat belt. An example of the latter is that if a driver or passenger leaves the seat belt unfastened, the car will not

start, or its top speed will be limited to 20 km/h. As a minimum, the device should emit a loud sound. Such seat belt reminder systems are becoming commonplace in new cars, and the presence of such a device is taken into account in EuroNCAP point scores. To make seat belt reminders compulsory would require a decision at the EU level. Finland must be active and take the initiative in this matter in the EU and at the ECE.

Safer vehicle designs and new safety equipment will be introduced gradually as the vehicle stock is replaced. Car taxation must be developed so as to encourage introduction of new cars, guide drivers towards choosing safe cars and acquiring safety equipment, and, in particular, contribute to the quicker removal of old cars from traffic. The current high car tax, based on the value of the vehicle, is counter-productive in this respect. Simply cutting the car tax is not sufficient to guide developments in the right direction. It should continue to be easy and free of charge for an owner to scrap an old, unsafe car. The scope for providing incentives for doing this should also be investigated. In the near future, car taxation will probably be reformed on grounds that will include environmental considerations. At that time at the very latest, road safety aspects should also be taken into account in taxation.

The obligation for a cyclist to wear a helmet was entered into Finnish legislation in 2003, but in such a way that neglecting to do so is not subject to a sanction (*"...a cyclist must usually wear a cycle helmet..."*). However, helmet use has not increased to a satisfactory level, except among small children. Regionally, helmets are used more frequently in the Helsinki area than elsewhere in the country. A target should be formulated for the increased use of cycle helmets, encouraging all family members to wear a helmet, and occupational safety and health bodies in schools and at workplaces should be encouraged to adopt recommendations on cycle helmet use. The target specified here is to raise the average rate of cycle helmet usage to 40% in three years.

Surveillance on the use of safety equipment must be regular and sufficient so that the effectiveness of measures can be evaluated and so that the data can be used in publicity and in monitoring. Changes in the use of safety equipment can be monitored through annual counts and background interviews. Changes in the vehicle stock can be monitored through the Vehicle Register. Data on the equipment in new cars and their availability should be gathered and published more extensively than at present to improve the level of consumer education. Material gathered by accident investigation boards will give an indication of the impact of the measures on traffic fatalities.

Monitoring indicators

Safety equipment usage rates, monitoring data

Seat belt surveillance data

Equipment in new and existing vehicles

Responsible parties

Legislation (national/EU): Ministry of Transport and Communications

Surveillance: Ministry of the Interior / police

Publicity: Central Organization for Traffic Safety in Finland, Ministry of Transport and Communications, Ministry of the Interior, Automobile and Touring Club of Finland, car importers, Finnish Vehicle Administration

Other means for reducing the severity of accidents

The crash safety of cars should be emphasized in consumer education. EuroNCAP and other international testing programmes provide increasing amounts of independent and reliable information. Car marketing and publicity should be encouraged to become more safety-conscious, and instruction and training in the use of new safety equipment should be provided for car buyers. At the same time, greater efforts should be made to influence public opinion with regard to safety-conscious driving.

In addition to passive crash safety, there are other approaches available through vehicle technology. New developments are to be expected for instance in the form of various devices to support driving functions, such as anti-skid brakes, stability control systems, Intelligent Speed Adaptation (ISA), anti-collision radar, lane departure warning systems, headlights that change according to the circumstances, brake assist systems, anti-collision systems, etc. For example, stability control systems can be expected to alleviate the severity of accidents by reducing the number of lateral collisions due to a driver losing control of the car. Introduction of these systems should be promoted from the safety angle as far as possible.

Softening of the environment around roads and streets (protective barriers, buckling structures, etc.) has been shown to alleviate the consequences of accidents. This should be considered an important component of road management in the future too, and it should be taken into account in road management funding.

Rapid emergency care on-site, rapid patient transport and the capacity of the health-care system to function even in a major accident situation are important factors. Phoning to report an

emergency and locating the incident scene can be made quicker with the eCall system. A recent survey of accident investigation board reports shows that this system would have reduced the number of fatalities in motor vehicles in recent years by 5% to 10%. Rescue helicopters make evacuation of patients and the provision of emergency care quicker, especially in sparsely populated areas where distances are great and in areas where traffic congestion slows down conventional ambulances. These aspects too need further development.

In collisions with animals, usually only collisions with elk have severe consequences, though a collision between a motorcycle and a smaller animal can also be serious. In order to reduce animal collisions, the elk and deer population must be kept as small as natural viability allows. In regions with high elk populations, roadside environments must be kept clear, speed limits lowered and more fences installed.

Responsible parties

Consumer education: Automobile and Touring Club of Finland, car importers, Finnish Motor Insurers' Centre

Prevention of collisions with elk and deer: Finnish Road Administration, Ministry of Agriculture and Forestry

5.7 Other problems and measures

The elderly are over-represented in traffic accidents, not only as pedestrians and cyclists but also as car drivers and passengers. Although the age of the driver does not seem to correlate significantly with the risk of a serious accident, illness is a more common accident factor in older age groups. In addition to that, the elderly are physically more fragile and less able to withstand injury in a collision. Reducing traffic speeds in built-up areas is one way of helping the elderly cope in traffic. Health monitoring and diagnostics related to the right to drive must be improved, and elderly drivers must be encouraged to undertake self-assessment and to make use of whatever means of assistance are available. The number of elderly drivers will increase rapidly beyond 2010, and a specific programme for the elderly must be prepared to address this. Doctors have new obligations with regard to the health requirements for drivers, and the requirement to notify the authorities under the Driving Licence Directive. Training in the branch of medical science known as 'traffic medicine' must be added to the basic training of doctors and other health care personnel, and competence in this area must be improved by concentrating the related teaching and research in a special unit set up for the purpose.

The growth of the motorcycle and moped stock can already be seen in an increase in serious motorcycle and moped rider injuries. High speed is a major factor in these incidents. Alcohol is a risk factor in one out of five incidents, as indeed with car drivers. Driving licence and driving instruction requirements for motorcycle and moped riders must be made stricter in order to improve their command of traffic situations and risk management. Raising the permitted age limit to 16 for mopeds and 18 for motorcycles should be considered. Further training should be required of those who take up motorcycling again after a long break or who take it up for the first time but who have a driving licence issued before 1990. The "tuning-up" of mopeds and restricted motorcycles should be addressed with a view to the responsibility of sellers and importers too.

Providing for the growing proportion of elderly road users

During the programme period it will be essential to prepare for the growth in the number of elderly people and in the proportion of elderly people in the total population. According to the population forecast, the number of citizens aged 65 or more will begin to grow significantly around 2010, when the first of the baby-boom generation reach retirement age. An increasing number of elderly people have a driving licence, and the percentage of elderly drivers on the road will increase. It is becoming increasingly important to reconcile the demands of enabling the elderly to retain their mobility with road safety issues.

Considering the size of the age group, the elderly are over-represented in serious traffic accidents. The risk of an elderly person being killed in traffic – as a pedestrian or a cyclist or in a car – is higher than average due to a variety of factors including physical fragility. About 40% of all annual pedestrian fatalities, and nearly one in four injuries, concern people over 64 years old. Two out of three pedestrians killed on a pedestrian crossing are also over 64 years old. The accident risk increases with elderly drivers who drive a lot and suffer from multiple illnesses. Dementing diseases affecting cognitive

performance are a particular risk factor. Health monitoring and diagnosis of dementing diseases are important in assessing the driving ability of elderly drivers. Doctors need to be more informed about the content of the Driving Licence Directive and provided with better methods for assessing driving ability. Taking a practical driving test with a driving instructor gives a more reliable picture of driving skills and of how the driver copes in traffic. Training should therefore be provided for officials authorized to approve driving examinations and for driving instructors, so that they have sufficient competence to assess the driving ability of elderly drivers.

Medical assessment of driving ability will become more important as a basis for being issued a driving licence in the future, as the health requirements of the Driving Licence Directive stipulate. A significant step in this direction was taken when doctors were charged with the obligation of notifying the driving licence authorities of any permanent detriment to a patient's driving ability. In order to improve the guidelines and to ensure uniform and fair practices, and to develop legislation further, training in traffic medicine should be developed both in basic medical training and by creating a special unit for traffic medicine expertise. Such a unit could also decide, or help to decide, the more demanding cases in the practical assessment of driving health. The unit could also form a medical centre of excellence in the field. So far, it has been difficult to find medical expertise for cross-sectoral projects in road safety, because the expertise required is fragmented across several specialist medical fields. Greater interest in road safety issues among doctors, and in the health care field in general, would serve the interests of road safety much more broadly than just in the matter of special issues related to the elderly. It could also benefit other forms of transport besides road traffic.

A healthy elderly person is usually fairly good at adjusting his/her driving to compensate for age and health, even though an elderly person's faculties decline gradually. It is important for the mobility of the elderly that those who are used to having a car can continue driving safely for as long as possible. Self-assessment methods and opportunities for training and guidance should be available for drivers.

As people grow older, it takes them longer to do things. This should be particularly taken into account in controlling driving speeds. Measures to make the traffic environment safer for elderly pedestrians and cyclists must be continued, for instance by building traffic islands to make it easier to cross streets, revising speed limits as required, and extending the duration of green lights at light-controlled crossings.

Furthermore, alternative means for day-to-day mobility must be provided or allowed for when it is no longer feasible to drive. The development of public transport must be continued so as to make it functional, safe and obstacle-free for the elderly. Service buses must be available for those who can no longer use conventional public transport.

In making the transport system safer for the elderly, it is important to consult elderly road users and other parties during the planning process. Organizations for the elderly, municipal bodies representing the elderly and the disabled, organizations of the disabled, and experts in the field should all be consulted in the planning process. Risk-site surveys conducted by the elderly themselves give road authorities first-hand information on safety problems perceived by elderly road users. Mobility and safety issues can also be discussed during home visits to persons aged 75 and above.

During the programme period, a separate plan for improving the safety of the elderly before the baby-boom generation reaches retirement age should be prepared.

Responsible parties

Legislation and safety plan for the elderly:
Ministry of Transport and Communications

Traffic medicine training: University of Helsinki,
Ministry of Social Affairs and Health,
Ministry of Transport and Communications,
Ministry of Education

Controlling the increasing use of motorcycles and mopeds

The numbers of motorcycles and mopeds have been increasing at an accelerating rate in recent years. Both are high-risk, unprotected types of motor vehicle. Mopeds and motorcycles in particular are primarily used for leisure and hobby purposes. The age at which one can ride a moped or a light motorcycle is lower than for any other motor vehicle, and such riders have very little traffic experience. Moreover, driving instruction is not very extensive and nor are the requirements for passing the test. The risk of being killed in traffic is significantly higher for young people aged between 15 and 17 than on average, and moped and motorcycle riders account for about one in four of the traffic fatalities in this age group.

Motorcycling has also become common as a hobby among men in other age groups, and this too is clearly evident in the number of traffic fatalities. Most frequently, the person who is killed in a motorcycle crash is the rider or passenger, usually as the result of running off the road or other loss of control. The most common reason for losing control is excessive speed and unfamiliarity with the machine.

Moped use is most common in built-up areas, where road safety has generally improved in recent years. As a result, traffic fatalities involving moped riders have not increased so far despite

the increase in the number of mopeds on the roads. By contrast, this growth in moped use has been reflected in the number of injuries.

The regulations concerning the carrying of a passenger on a moped changed in autumn 2005. Under the new provisions, a passenger may be carried on a moped if it has been registered for that purpose. A moped passenger must wear a crash helmet just like the rider. Previously, only a child below the age of 10 could be carried as a passenger on a moped.

The driving licence and driving instruction requirements for both vehicle groups should be revised. At the moment, a moped driving licence can be obtained just by passing a theoretical exam. Driving instruction and a driving test should be added to these requirements (and this would require raising the age limit for a moped licence). Driving instruction in motorcycling should be converted to a two-stage process as with car driving. The age limits should also be reappraised. An option to be considered would be to raise the age limit for moped licences to 16 and the age limit for light motorcycle licences to 18. In addition, it is worth considering whether people with a pre-1990 car driving licence, and who therefore automatically have permission to operate a motorcycle, should be required to undergo further instruction before operating a motorcycle if they have never operated one before, or if it has been a long time since they last did so.

More effective measures should be taken to combat the tuning up of restricted motorcycles and tampering with the settings of speed limiters. This should also take into account the responsibility of the manufacturer or the importer representing the manufacturer, and the retailer. Overall, motorcycle maximum speeds should be regulated throughout the EU, and it must be made possible to monitor compliance with the technical requirements effecting the speed and safety of motorcycles, and monitoring must be improved.

Responsible parties

Legislation: Ministry of Transport and Communications

Tuning up engines: Finnish Vehicle Administration, Ministry of Transport and Communications, manufacturers' representatives

Improving the monitoring of road safety

The number of annual traffic fatalities is statistically so low that there is considerable random variation if the numbers are analyzed by region or by road-user group. If analysis is based on number of injuries or the number of casualties (fatalities and injuries) instead, the problem of random variation due to small sample sizes can be avoided. The problem with the latter approach, however, is that the statistics are not always consistent, in that the reporting of 'injuries' can vary considerably between regions or over time. The health care sector is the only party that can reliably assess injuries, but this source of information is used very little for the compiling of traffic accident statistics in Finland. The only statistical measure that is truly reliable in international comparisons is the number of fatalities (e.g. per capita), though here too the compilation and coverage of statistics differ from one country to another.

The compilation of statistics on traffic accidents should be developed so that the number of serious injuries can be monitored with sufficient accuracy. One possibility is to classify injuries requiring hospitalization into, for example, those requiring one or two days of treatment and those requiring three days or more. The aim should be to improve the potential for international comparisons. With this in mind, the potential for establishing a common practice in the Nordic countries and, further afield, throughout the EU or the OECD should be investigated.

Responsibility for maintaining traffic accident statistics should be shifted more to the road authorities, in practice to the Finnish Road Administration, which should have 'sectoral responsibility' for using the accident data reported to police as input for the needs of road and street management. All parties responsible for roads and the traffic environment should have access to the data on a cost basis. Privacy issues and other such issues should be resolved for the whole of the data chain so that the usability of the data is not unduly compromised. Cooperation between the parties responsible for compiling accident statistics and the parties using those statistics should be increased, and the use of map-based tools for statistical data should be further developed.

The traffic accident investigation board system generates detailed information and encourages proposals for safety improvements. The information and proposals should be used more extensively at both the local and the national level. The implementation of safety proposals should be monitored more systematically than at present.

In addition to traffic accident data, other monitoring methods are needed for road safety work in order to help understand the reasons for any changes that occur in accident profiles and in the severity of accident outcomes. In addition to the effectiveness of measures, it is also important to follow developments in safety work itself. Continuity must be ensured in the organization and resourcing of research, if necessary through international cooperation. Monitoring of developments elsewhere will ensure that information is updated and reflects the current situation.

The basis for all this is the 'performance prism' introduced as a fundamental concept in central government administration.

The principle is that effectiveness is generated jointly through the measures of different administrative sectors and actors. Achieving effectiveness is a primary target in today's society, and as such is principally the responsibility of ministries. Organizations responsible for the actual work naturally also have responsibility for effectiveness, but their particular task is to produce high-quality safety measures as efficiently as possible. They are also responsible for developing the expertise required in their particular fields.

Thus, both performance indicators and process indicators are needed for monitoring. Performance indicators demonstrate effectiveness or the impacts of preceding stages such as traffic behaviour impacts. Process indicators show what measures have been implemented and to what extent. Effectiveness cannot be attained without good processes and the necessary resources, including expertise, for managing them.

Development of monitoring requires the following

The definition of a sufficiently wide range of performance indicators to evaluate how well effectiveness has been attained.

The development of indirect indicators for measures in which direct evaluation of effectiveness is difficult (e.g. education, training, publicity).

The definition of process indicators for the major areas of administration for monitoring the extent, quality and impact of measures.

The monitoring of the implementation and effectiveness of plans, the impacts of measures and the work itself, and the determination of the corrective action required to address nonconformities.

Monitoring indicators

Introduction of functional performance and process indicators

Responsible parties

All organizations are responsible for developing and introducing their own performance and process indicators

Securing the aggregate resources and conditions for promoting road safety

Under the principles expressed in the Government Programme, road safety work requires stronger management and commitment and better cooperation between administrative sectors. The need for efficiency and the tightness of resources have led various organizations to focus more closely on their core operations. However, in order to achieve good results in road safety work, simultaneous and mutually complementary measures in various sectors are needed. The wider picture has to be taken into account, and this inevitably means allocating resources to areas that are not necessarily of primary interest in a particular agency's own operations.

The road safety authorities also face a new challenge in creating stronger and more effective management processes in safety work. The management and implementation of road safety work has traditionally been highly centralized. In future, more responsibility must be delegated downwards to regional and local organizations (e.g. provinces and municipalities). This will bring road safety closer to the active parties and the general public and thus enable the meeting of a variety of needs and the generation of new ideas.

Developing the appropriate operating conditions for road safety work will require the following

Improvement and enhancement of cooperation between administrative sectors, including the management and organization of cooperative arrangements. In addition to the Consultative Committee, a road safety steering group is recuired, consisting of parties representing strategic management.

Allocation of sufficient resources to pursue road safety work in key areas. New forms of funding should be developed for this purpose.

Changes to the transport system and its service principles, e.g. regarding mobility and enabling safe alternative modes of transport.

Taking safety and human requirements into account more effectively in planning and in planning principles.

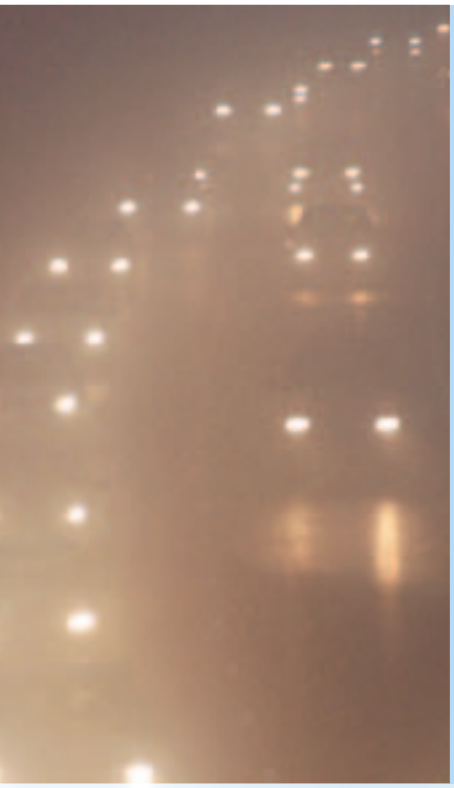
Commitment to selected policies requiring long-term efforts to improve safety.

A new kind of bearing of responsibility by companies, organizations and road users themselves.

Delegation of responsibility downwards in the administration and provision of the required resources (e.g. in the provinces and municipalities).

Enabling the generation and introduction of new ideas by providing for the required R&D.

6 Monitoring the implementation and effectiveness of the programme



Progress in implementing the programme, and the results thus achieved, will be reported to the Consultative Committee on Road Safety each year. The common performance measure for all parties involved in implementing the programme is the number of serious injuries and fatalities, which will be compared against the targets of the programme. The work of the parties responsible for implementation will be monitored through process indicators related to their particular duties, and cooperation will also be evaluated.

Indicative evaluations can be made of the effectiveness of the programme and its measures, and these can also be assessed in relation to the costs required. Such evaluations will verify whether the programme targets are realistic. If the appropriate resources are available, the programme should attain its targets.

6.1 Monitoring the implementation of the programme

The central government administration will monitor the attainment of targets set for the overall programme and for its individual measures through regular performance reports. The implementation and results of this programme will be reported to the Consultative Committee on Road Safety annually.

The results can be examined in many ways and at many levels. This multiplicity of levels is depicted through the 'performance prism'. On all three levels of the performance prism, it is possible – and necessary – to use indicators that show whether measures are producing results in keeping with the targets. In road safety organizations, the top level in the prism (policy effectiveness) is evaluated in terms of safety improvements, usually expressed by comparing the annual traffic fatalities.

At the next level, the process level, the indicators may refer to the implementation of planned measures or the extent of other measures designed to improve road safety.

At the resource level, the measurement focuses on professional expertise and human resources, and the well-being of the personnel in each organization. Cooperation is a resource necessary for implementing the programme, and its quality and smooth running can also be evaluated. In cross-sectoral programmes, a joint working group with representatives from the responsible parties is required for discussing and agreeing on practical coordination and mutual support.

It is beneficial for target-setting and monitoring if quantitative targets can be set. If this is not possible (if a feasible unit of measurement cannot be found), qualitative evaluation will have to serve. With regard to one-off measures included in the programme, it is sufficient to note whether a measure has been implemented or not.

The three-level monitoring system is thus built up as follows:

1. The leading indicator for policy effectiveness common for all organizations is the improvement of road safety, measured by the number of serious road traffic accidents and the number of fatalities and injuries. The basis for comparison against which these figures are evaluated is the programme target: an average improvement of 6% to 7% in safety each year. A favourable trend will also generate a subjective perception of safety, which people appreciate as a quality factor in their living environment.

2. The work of organizations participating in the programme's implementation, and the effectiveness of their work, will be shown through indicators related to the principal responsibilities of each body:

   Ministry of Transport and Communications:
   annually available financial resources for promoting road safety

   Finnish Road Administration:
   number of annual traffic fatalities and injuries on public roads

   Finnish Vehicle Administration:
   safety level of the vehicle stock

   Ministry of the Interior / Police:
   number of fatalities in intoxicant-related traffic accidents, level of automatic traffic surveillance

   Ministry of Social Affairs and Health:
   level of control of driving hours and rest periods

   Association of Finnish Local and Regional Authorities / local authorities:
   number of traffic-calming zones in residential areas

   Border Guard / Customs:
   level of inspections annually

   Central Organization for Traffic Safety in Finland:
   safety-consciousness of road users in the use of safety equipment and active safety attitudes

3. The performance prism is based on the human resources and expertise of the participating organizations and their capacity to use that expertise for the achievement of their own targets and for the benefit of the overall programme. In the annual reporting on the programme results, an evaluation of how well the cooperation has worked will be requested from all parties.

6.2 Evaluating the effectiveness of measures

The proposed road safety improvement goal is a challenge, but it is based on estimates that show that its attainment is possible. This is supported by recent trends in countries with the best road safety records, whose road safety situation in relative terms is already approaching Finland's target for 2010.

Before the programme was prepared, a project to evaluate the road safety impact of various measures and their safety potential in the Finnish context was conducted as part of a long-term road safety research programme (LINTU). A method and a tool (the 'TEPA' tool) were created for this purpose in the project (Peltola et al.: "Tieliikenteen turvallisuustoimenpiteiden arviointi ja kokemukset turvallisuussuunnitelman laatimisesta", *Lintu-julkaisuja 1/2005*). The tool can be used to evaluate the effectiveness of various groups of measures on road safety. The effectiveness and costs of the measures proposed in the Road Safety Programme have been assessed by the researchers using this method.

The effectiveness estimates for the proposed measures given in the original study come from a Norwegian handbook on road

safety (Elvik & Vaa 2004), which contains a worldwide compilation of results of road safety studies, augmented with Norwegian research findings.

Evaluation of the measures required to attain the road safety target is a highly challenging task, not least because road safety trends are affected by much more than just road safety work. There is much research data on the subject, but information on effectiveness is often fragmented, of uneven quality, conflicting, and based on small samples. Evaluation methods are best suited for evaluating the average impact of measures that have been known about for a fairly long time. Naturally, there are not nearly as reliable evaluation methods available for evaluating newly developed measures. The impact of measures covering a particular stretch of road or for a particular type of accident is easier to evaluate because of its limited scope, as opposed to measures addressing road safety in general, e.g. education and campaigns.

The table below shows an estimate of the impact of the measures proposed in the Road Safety Programme on annual traffic fatalities and the costs of their implementation. The precise extent of a measure, for instance the length of road involved, is only given for selected measures in the Road Safety Programme, so the effectiveness calculations in this table are mainly based on sample estimations of the extent of the measures. Many measures are such that their effectiveness was impossible to evaluate simply because there is no research information available on the impact of those particular measures. Thus, the reductions in annual traffic fatalities and the costs of the measures given in this table should be considered as indicative only.

The table shows impact assessments for 2010 as a result of the measures proposed in the Road Safety Programme. Many of the technological measures proposed, such as the alcolock, are not expected to have generated any safety impact data by 2010. The costs given only include the costs of the road authorities, the police, and so on, not fuel or time costs incurred in traffic. The costs of the measures have been calculated over a 20-year time span.

In each case, the reductions in annual traffic fatalities shown in the table assume that the measure assessed is the only measure implemented. The accidents targeted by the different measures overlap to some extent, so the combined effect of the measures will actually be less than the sum of their impacts in the table. The TEPA tool indicates that accounting for overlap will reduce the impact assessment by about 10%.

The assessed measures would reduce the number of annual traffic fatalities by about 147 without accounting for overlap, and by about 132 when overlap is taken into account. Because some measures could not be assessed, the implementation of the entire Road Safety Programme is expected to reduce annual traffic fatalities by considerably more than 132.

According to this assessment, the cost of one annual traffic fatality prevented each year is more or less equal to the theoretical price of one annual traffic fatality. The model takes no account of the income in traffic fines generated through the proposed measures, which would improve its cost-benefit ratio, and it also ignores other benefits of safety improvement over and above the reductions in fatalities.

In summary, we may observe that implementation of the assessed measures can be considered worthwhile in view of their safety benefits. We should note, however, that the calculation is indicative only and contains a large number of assumptions, for instance concerning how the measures are to be carried out.

Measures	Reduction in annual fatalities [1]	Cost, EUR 1,000 per reduction of annual fatality [2]
5.1 Head-on collisions on main roads	7.2	2,800
5.2 Pedestrian and cyclist accidents in built-up areas	20.2	2,600
5.3 Accidents involving intoxicants	4.8	6,600
5.4 Professional transport accidents	3.3	1,300
5.5. Excessive driving speed	35.0	590
5.6 Alleviating the consequences of traffic accidents	76.5	
5.7 Other problem areas and measures,	0.2	
All measures for which impact assessment was available	**147.2**	**2,800**

[1] If only this measure is implemented (no overlap).

[2] Annual costs of preventing one annual traffic fatality. The total only includes those measures for which the costs are known.

Table 4: Estimated effectiveness of Programme measures, using the TEPA evaluation method.

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