

Finnish National Road Administration
Road Safety Program 2005

Finnish National Road Administration

Helsinki 1999

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Districts
Directors
Central administration units
Production

Road Safety Program 2005

Road Safety Program 2005 describes Finnra's measures and objectives for road safety improvement. It specifies the Road Safety 2005 strategy which is Finnra's policy for improving road safety.

Both the road safety strategy and the complementing program have been written for Finnra. However, after the internal differentiation of road administration and production in Finnra, road administration is responsible for road safety objectives and their realization. So the program mainly deals with activities of road administration.

Road Safety Program 2005 guides the planning of action together with the other corresponding documents. When road management programs are compiled, the road management actions which improve road safety are finally chosen in accordance with the objectives set by the Ministry of Transport and Communications and the financing framework of road management.

The road safety program has been compiled by a team of experts which has also heard representatives of interest groups. Each district has compiled its own road safety program in which national guidelines have been adapted to regional problems. Finnra's Road Safety Program 2005 has been summarized on the basis of the programs compiled by the districts and central administration units. It was reviewed by the management of Finnra on March 1, 1999 and by the board on May 3, 1999.

Director general



Lasse Weckström

Director



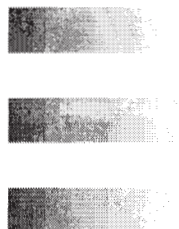
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I Introduction

COMPILATION PROCESS OF THE PROGRAM

In autumn 1997 Finnra's board accepted the Road Safety 2005 strategy which includes Finnra's policy for improving road safety. Already then the need for publishing a separate road safety program arose, the goal being to find measures of reaching these objectives.

Both the road safety strategy and the complementary program have been written for Finnra. However, after the internal differentiation between road administration and production, road administration has the responsibility for road safety goals and their realization. That is why the program mainly deals with road administration activities.

The Road Safety Program 2005 of Finnra was compiled on the basis of the programs of the districts and the central administration units.

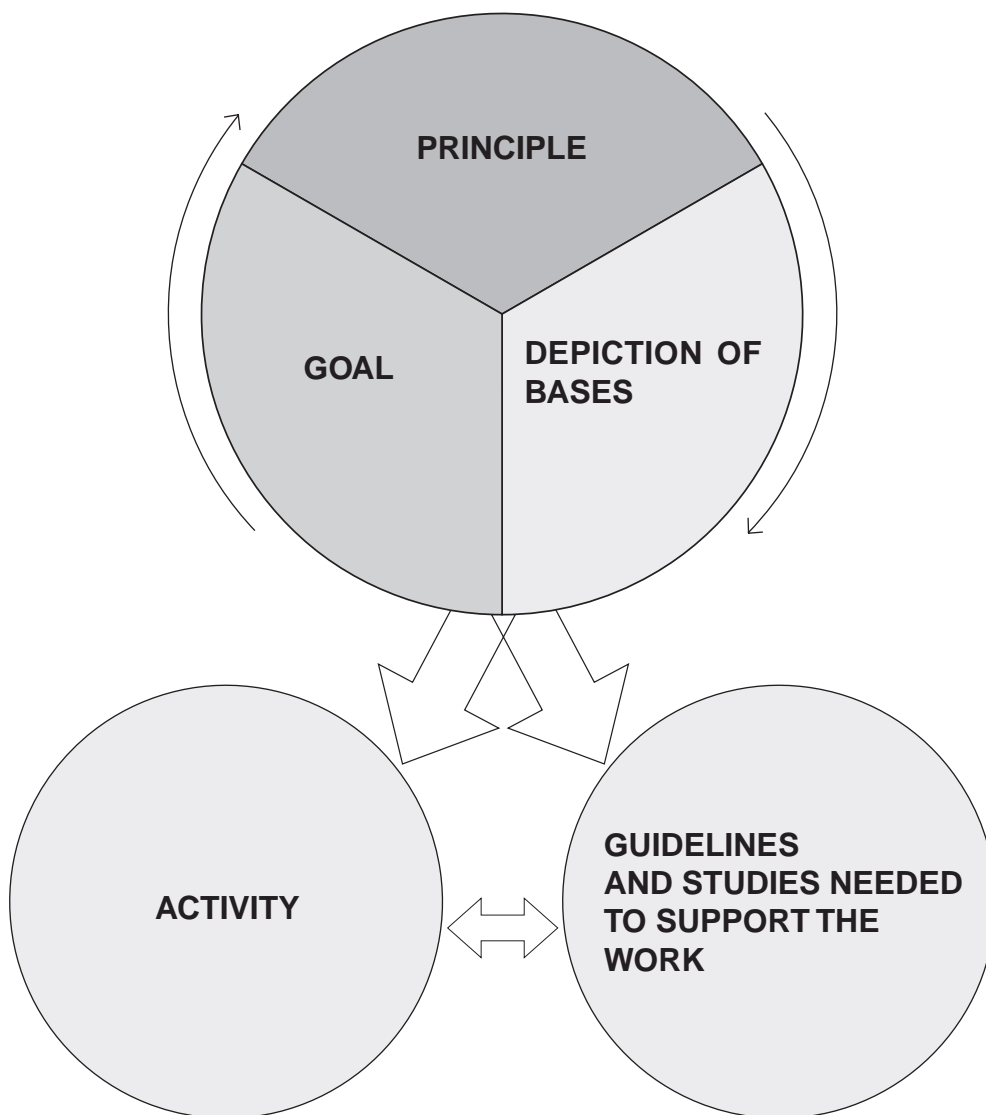
Each district has compiled a road safety program complementing the general policy. The programs take special regional problems into consideration. The programs deal with operational development, minor operations that improve road safety and the efficiency of the operations. The Finnra publication 41/1998 includes efficiency studies. Statistical safety studies have been made as the background of the work, and the most reliable possible safety assessment of the road network has been compiled.

During the program compilation, cooperation between the districts was promoted by organizing national and regional meetings. The districts also organized meetings with regional interest groups. National interest groups were consulted earlier, when Finnra's policy was being prepared. Representatives of the districts and the central administration made their comments on the planned programs of the districts. The districts have published their own regional programs after they have been compiled.

As the basis of studying operational models and methods, the units of the central administration also recorded the central research and development activities related to road safety in the near future, and the needs for different policy and operation guidelines.

STRUCTURE OF THE PROGRAM

In the program each principle of the Road Safety 2005 strategy has been treated as one entity. The central bases of each principle related to road safety have been depicted. After that the goals 2005 related to each principle and activities connected with them have been gone through. Finally, guidelines and studies needed to support the work have been presented.



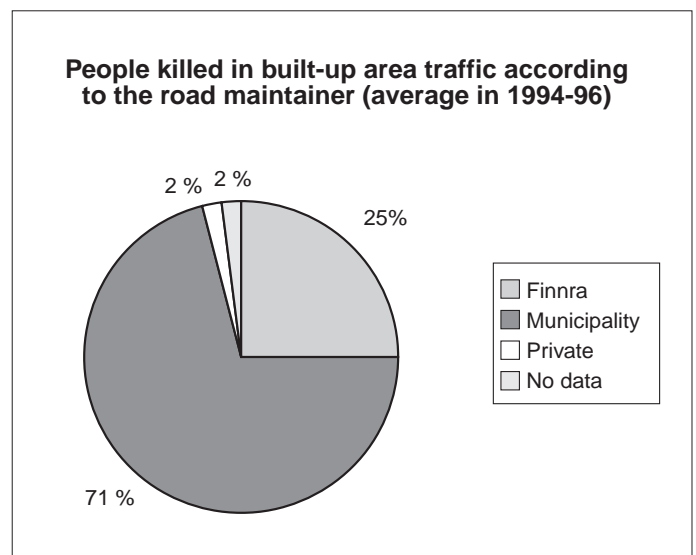
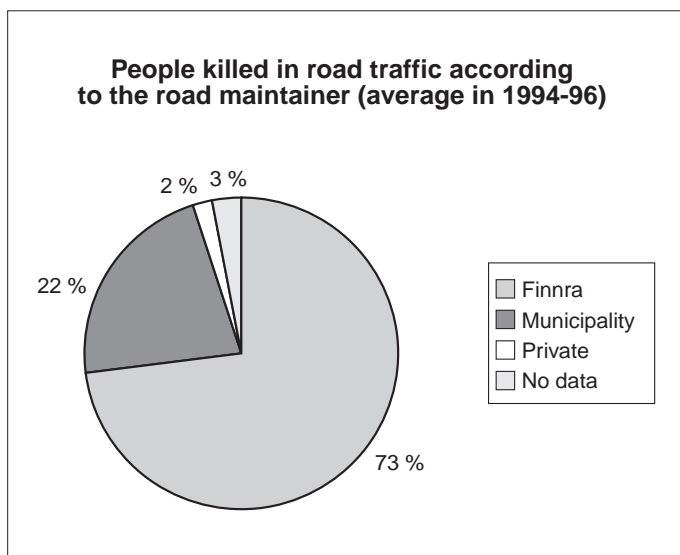
In addition to the above-mentioned road safety program, the effects of the program and the effectiveness of measures have been dealt with in the appendix.

II Safety of road traffic

Whole road traffic

438 people were killed and about 9000 people were injured in road traffic on public, municipal and private roads in 1997. Advance information of the year 1998 is 396 traffic deaths. Most, i.e., three fourths of traffic fatalities and about a half of injuries, occur on public roads maintained by Finnra.

Road traffic in built-up areas is problematic as far as pedestrian and bicycle traffic is concerned: 70 % of traffic deaths on built-up area roads designated by traffic signs involve pedestrians, bicycle and moped drivers. Most of the pedestrian and bicycle traffic injuries and more than a half of the fatalities occur on built-up area roads.

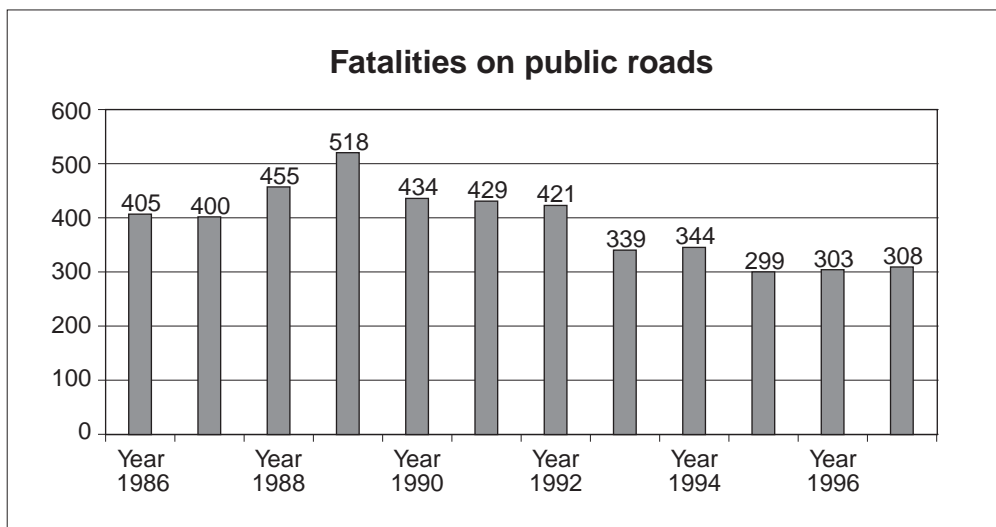


13 % of all the victims in road traffic are younger than 18 years and 25 % are older than 64 years. Most, i.e., about 70 %, of those killed are men. Many elderly people die in built-up area traffic: 40 % of those killed in built-up areas are older than 64 years. In sparsely populated areas the age distribution is more equal.

Moped drivers and motorcyclists as well as pedestrians are in the highest risk of death; the risk is more than ten-fold if compared to car drivers and passengers. Bicyclists' risk of death is also high.

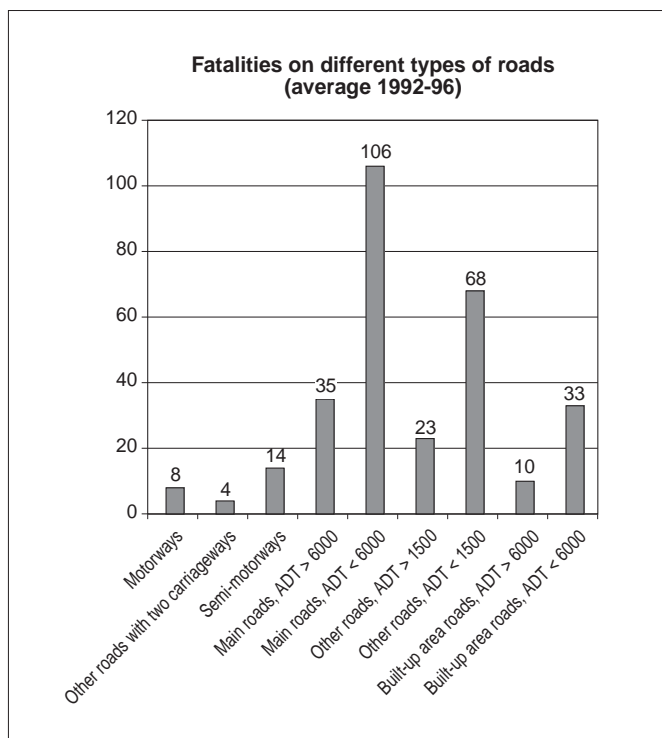
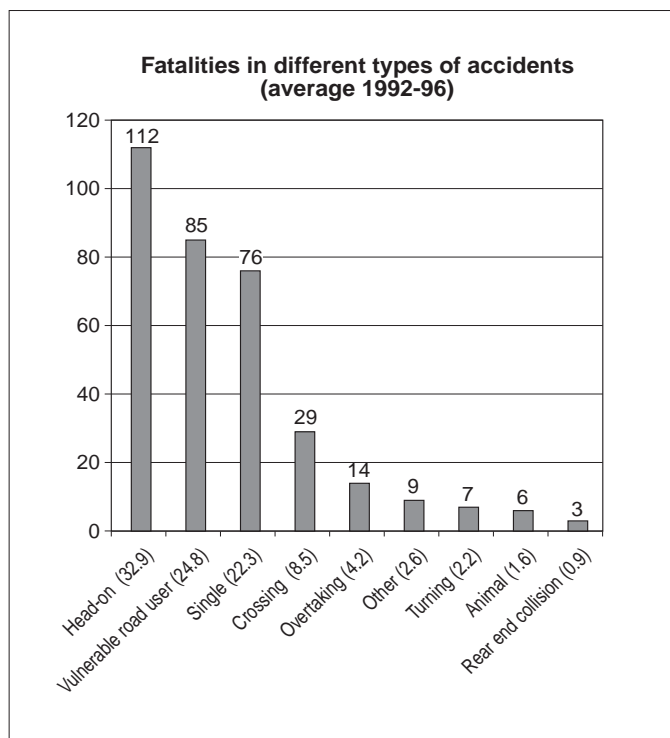
Public roads

The proportion of main roads in traffic fatalities on public roads is almost 60 %, although their proportion of road length is only 17 %.



About 270 people are killed in **head-on, single and vulnerable road user (pedestrian, bicycle and moped traffic) accidents** every year, which means that these three types of accidents cover **about 80 % of all the fatalities on public roads**.

About $\frac{3}{4}$ of fatalities in head-on accidents occur on the main road network in sparsely populated areas. The distribution of fatalities in vulnerable road user accidents is as follows: almost 40 % on the main road network, about a third on other roads in sparsely populated areas and a fourth in built-up areas, their immediate surroundings and villages. The distribution of single accident fatalities is: 40 % on the main road network and about a half on the lower-class road network in sparsely populated areas.



III Road safety program 2005

FINNRA'S PRINCIPLES OF OPERATION FOR IMPROVING ROAD SAFETY

1.	Finnra shall actively work to improve the safety of national, regional and local transportation systems.
2.	Finnra shall commit itself to the goals of road safety improvement defined by society, using available resources in the best possible manner to realize them.
3.	Finnra shall promote the safety of travel and transport in all conditions on public roads in both urban and sparsely populated areas.
4.	Finnra shall search for and implement measures that will decrease traffic fatalities and other serious injuries, in particular, in cooperation with other parties involved in traffic and road safety work.
5.	In developing its organization and operation, Finnra shall improve the public's possibility of participating and ensure the quality of road safety in the product purchasing and product operations of road management.
6.	Finnra shall keep its road safety know-how up to date and publicize road safety information, both independently and in cooperation with other agencies.

1 SAFETY OF THE TRANSPORTATION SYSTEM

Principle 1

Finnra shall actively work to improve the safety of national, regional and local transportation systems.

Bases

Road traffic is in a key position when the safety of a transportation system is improved. Fatalities and serious injuries in road traffic are a big economic problem. In addition to accidents, emissions of motor vehicle traffic are hazardous to health. Emissions are remarkable because they are near the street level where they are easily breathed in and they are difficult to eliminate.

Transportation system planning has been initiated to integrate different modes of transportation and land use better than before. This aims at improving the operation of the entirety and promoting more sustainable travel as far as the environment is concerned, e.g., by changing the demand of transportation and the modal split. The Ministry of Transport and Communications is responsible for national transportation system planning. Regional transportation system planning has been started in the biggest city regions. After these plans have been compiled, the focus of planning will be on other regions and individual municipalities.

In practice, transportation volumes are determined by the transportation system together with land use. As the volumes of road traffic and accidents are connected with each other, minimization of the need for road traffic and channeling of the need for travel to safer modes of transportation are worth pursuing. Besides, integration of land use and the traffic network can prevent the formation of accident-prone locations.

In the transportation system special attention should be focused on freight traffic. Goods traffic has an over representation in the most serious accidents, mainly because of the differences in weight. Transportation of dangerous goods is an additional risk. The size of trucks is increasing as so-called module articulated vehicles are taken into use. If this reduces the number of vehicles at the same time, it might also reduce safety risks and environmental hazards in sparsely populated areas. However, if the roads and streets in built-up areas were measured according to the need for space of module articulated vehicles, e.g. in intersections, safety would fall off because the speeds of other motor vehicles would increase.

The increase in the share of combined transports, which is an objective in the EU region, would improve the safety of the transportation system. However, it

requires the use of new technical and logistic solutions. In the future the improvement of goods traffic logistics will be supported by means of traffic management as well as the flexible common use of different modes in passenger traffic. Especially in the biggest city regions, new ways of traffic control can be taken into use, e.g. in public transport and parking.

Transportation safety planning is also needed in municipalities to complement transportation system planning. Safety planning studies small improvements in the transportation system to be realized in the near future, such as speed control, traffic information and operations needed in other sectors like educational, social and health and rescue services. Traditionally, municipalities, Finnra, Central Organization for Traffic Safety in Finland and the police have participated in compiling road safety plans for municipalities.

Operational recommendations 2005

Objective 1.1

Finnra has participated in the integration of land use and traffic together with provinces, municipalities and other modes of transportation. This cooperative work has developed travel and transport while minimizing the need for car traffic, and it has improved the operating conditions of pedestrian and bicycle traffic and public transport. Transportation system planning is supplemented by regional road safety planning. As a result of these measures, health risks caused by traffic are decreasing.

Activity

The central administration participates in compiling **national transportation system plans**. So the improvement of the safety of the whole system and road traffic is supported. (ca)

The districts promote the compilation of **regional transportation system plans** and pay special attention to important questions regarding road safety. (districts)

Transportation system planning, planning of road and traffic conditions on public roads and regional development plans are compiled in mutual interaction and they support each other. Finnra promotes the realization of projects considered useful in the transportation system plans. (districts, ca)

Finnra participates in activities to promote operational possibilities of public transportation and to build safe travel chains. (districts, ca)

Finnra participates in activities to promote safe pedestrian and bicycle traffic and to improve their position in traffic. (districts, ca)

The districts participate in regional road safety improvement together with other interest groups at provincial and municipal levels. The districts participate in the work of consultative committees dealing with provincial road safety affairs and in compiling **provincial road safety plans**. The districts participate in compiling **municipal road safety plans**. (districts)

Finnra supports municipal road safety work by participating in producing supportive material and by providing information. (districts, ca)

Finnra offers expert knowledge on road safety questions related to land use planning. (districts, ca)

In built-up areas where no road safety plans have been or are being compiled, the districts define the safety problems on public roads. (districts)

Guidelines and studies needed to support the work

- Models are developed to take environmental safety and health problems caused by traffic into consideration as diversely as possible.
- National and international experiences of transportation system planning are assessed and regional and local transportation system planning is supported by guidelines and experiments.
- Development of common realization and financing models of transportation systems and projects related to them is supported.
- Guidelines to integrate traffic and land use together with other interest groups. Development of road safety studies in land use planning is presented to the cooperative parties.
- Material supporting municipalities' own road safety planning is produced and an network of experts is created. Cheap, quickly realized activities are favored on the basis of road safety plans. Operational models for municipal road safety planning are developed, e.g., common municipal plans and regional plans.
- Directives for dialogues on the integration of traffic and land use are developed.
- Studying the winter management of pedestrian and bicycle traffic and specification of guidelines, if necessary.
- Goods traffic is studied in the transportation system of built-up areas.
- The effects of Finnra's activities on the safety of the whole transportation system are evaluated.
- Studying the activities possibly resulting from changes in road, land use and construction legislation.

2 COMMITMENT TO THE ROAD SAFETY OBJECTIVE

Principle 2

Finnra shall commit itself to the goals of road safety improvement defined by society, using available resources in the best possible manner to realize them.

Bases

Society's endeavor to improve road safety is apparent in the Parliamentary Transport Committee report *Transportation 2000* and in the Council of State decisions in principle concerning road safety improvement. The objective of the Council of State decision in principle of 1997 is to continue to reduce the most serious injuries as quickly as in the 1990's and to approach the Swedish and Norwegian safety levels. In that case the annual number of fatalities would be less than 250 in 2005.

In the Road Safety 2005 strategy Finnra has committed itself to a large development of activities and measures in order to continue to improve road safety and increase its efficiency, if necessary. The need for efficiency has resulted in the policy presented in the road safety strategy regarding the channeling of funds to built-up area and main roads. On the other hand, built-up area and main roads take precedence as far as the effective use of resources is concerned because they have the most profitable safety measures. However, effectiveness cannot be the only measure of safety. For instance, as far as the equality of road users is concerned, even if the activities were not the most effective, measures must be directed to vulnerable road users, which is the unsafest mode of travel.

For the sake of the efficiency of activities, improvement measures are directed on the basis of statistical studies of accident risks and density, and earlier accidents can be taken into consideration in determining the order of improvement of the sites. However, problematic situations should be eliminated on the basis of risk assessments before accidents occur. Necessary temporary measures should be realized before permanent rebuilding. Partly due to the decrease in road maintenance financing, the need for temporary measures is greater than before, because from the viewpoint of regional and social equality, everybody has the right to a safe traffic environment everywhere.

The safety effects of road management result from emphasis in policy, the extent of activities and choices in measures. This means the result is partly dependent on the disposable financing of Finnra. The solution to safety problems on the main road network is particularly connected with the whole policy of road management – separate safety activities cannot influence the central problem of head-on collisions. However, the measures on the main road network have an essential influence on safety as a whole.

There is often thought to be a conflict between road safety goals and requirements and other goals. However, integrating and prioritizing different goals is an essential part of road management programs and plans. In any case, clashes of opinions of different interest groups cannot be avoided in planning. Open discussion about conflicts is useful even in problematic cases.

Operational recommendations 2005

Objective 2.1

Finnra has included the safety goals set by the Ministry of Transport and Communications and its own road safety strategies in national road management programs and operational control.

Activity

Finnra collaborates with the Ministry of Transport and Communications in developing result-oriented control. The role of the Economic and Operational Plan (TTS) is strengthened. Focusing of activities, evaluation and monitoring are developed. The road safety goals are integrated in several years' activities. (ca, districts)

Finnra searches for alternative models for solving safety problems and improvement needs at different financing levels and evaluates their cost efficiency. Participation of individual citizens and their organizations is increased. (ca, districts)

The central administration evaluates the safety effects of central road management plans from the standpoint of safety, and their compliance with safety goals and strategy. (ca)

The central administration develops operational models for road safety work and the definition of long-term goals. (ca)

The road safety strategy and program of Finnra is monitored and checked, if necessary. (ca, districts)

Objective 2.2

The road districts have compiled regional strategies for solving safety problems and included the strategies in regional road management programs.

Activity

The districts compile regional policies of road safety improvement in order to improve safety and reach the goals. (districts)

The road safety effects of the Economic and Operational Plan and the projects to be realized are evaluated. The districts search for activities

improving road safety efficiently, integrating them with other goals. (districts)

The districts monitor and maintain their road safety programs. The programs are based on studies on safety problems, accident risks and densities, accident types and their solutions. The realization of national uniformity requirements is ensured. (districts, ca)

Objective 2.3

The requirements of road safety are known. Conflicts between road safety and other goals are handled using methods that suit different situations and conditions.

Activity

In the road management plans, a stand is taken on overall strategy to resolve conflicts; different goals are defined in order of importance for different types of roads and different land-use situations. (ca)

Requirements and conflicts of road safety with other goals are brought out in planning so the bases of solutions can be handled more transparently and the future effects of solutions can be evaluated. (districts, ca)

Guidelines and studies needed to support the work

- The development needs of the sector duties of road administration are studied in comparison with other countries.
- The evaluation programs of the safety effects of road management are developed and maintained: TARVA, IVAR
- Possibilities for diversifying the evaluation of safety effects are studied.
- Effects of emphasizing goals and financing are studied.

3 QUALITY OF SAFETY OF PUBLIC ROADS

Principle 3

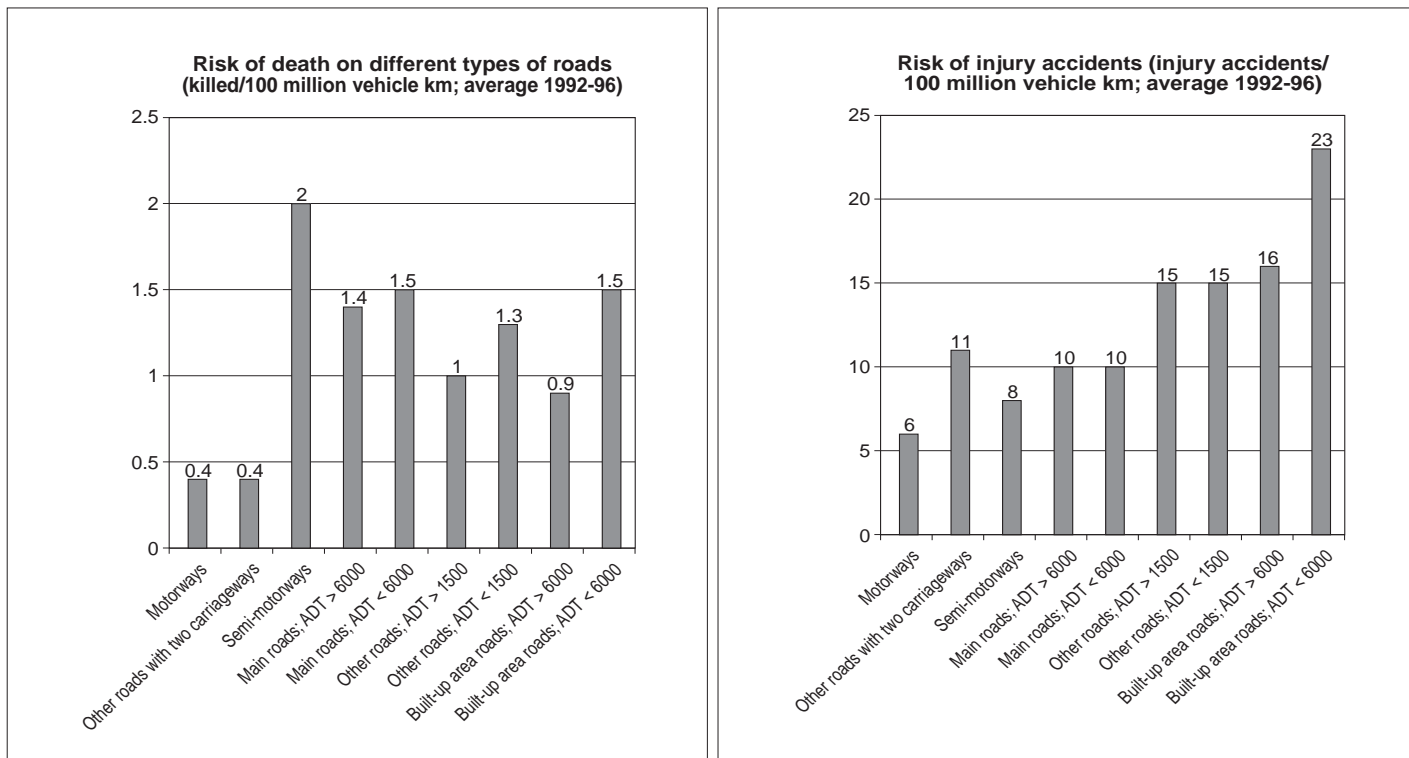
Finnra shall promote the safety of travel and transport in all conditions on public roads in both urban and sparsely populated areas.

Bases

A good traffic environment prevents accidents and relieves their consequences. It decreases and forgives the road users' mistakes. Road users detect traffic arrangements easily and consequently identify the right behavior patterns. Many factors affect this kind of safety quality: integration of land use and the road network, classification of roads, quality requirements of traffic and technical solutions of road classes, maintenance of roads and road sections, traffic control and traffic information. By developing these contributory factors, possibilities for safe travel in different areas and road conditions and at different times are improved.

Safety improvement methods vary on different types of roads according to surrounding land use, the subsequent distribution of travel modes as well as the qualities of the road and its significance in traffic. In safety studies the road network is divided into different types as follows:

- motorways
- other roads with two carriageways
- semi-motorways
- busy rural two-lane main roads; average daily traffic more than 6000 vehicles
- quiet rural two-lane main roads; average daily traffic less than 6000 vehicles
- other busy rural two-lane roads; average daily traffic more than 1500 vehicles
- other quiet rural two-lane roads; average daily traffic less than 1500 vehicles
- busy roads in densely populated areas; average daily traffic more than 6000 vehicles
- quiet roads in densely populated areas; average daily traffic less than 6000 vehicles



When the safety of different types of roads is evaluated, their mutual position changes according to whether injuries or fatalities are used in risk evaluation. On the basis of both injury and fatality risks traffic is the safest on motorways. On the basis of the fatality risk, traffic is the unsafest on semi-motorways and on the basis of injuries, on roads in densely populated areas.

The basic solution of **motorways** eliminates the most common central road safety problems, i.e. head-on collisions, weaving of different modes of travel, land use junctions at high speeds and crossing accidents. However, because of the large volumes of traffic, a relatively high number of serious accidents occur on motorways. Swerving accidents are the biggest problem.

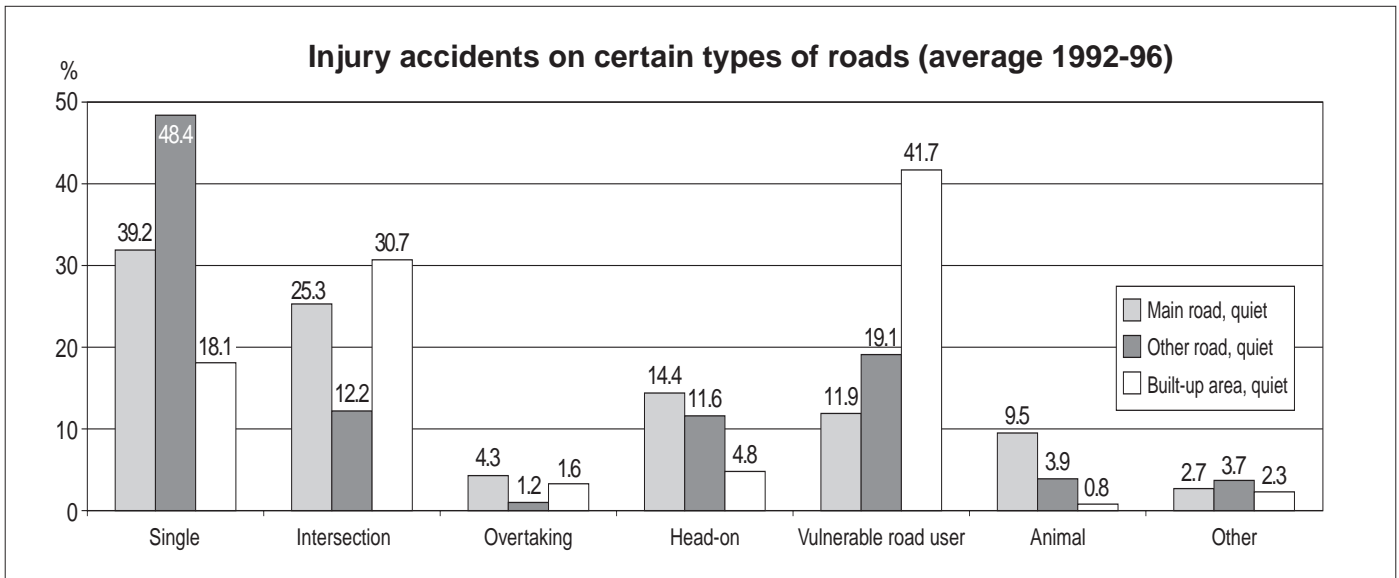
On **semi-motorways** the traffic environment gives a clear impression: traffic interchanges are used, land use junctions and pedestrian and bicycle traffic have been arranged using the rest of the road network, and the roads are relatively broad. Volumes of traffic are large and there is quite a lot of freight traffic. Although the risk of injury accidents is relatively low, accidents are usually serious because of high speeds. The number of head-on collisions is relatively large because the opposite directions have not been separated structurally. Most fatalities in proportion to road length occur on semi-motorways.

On common **two-lane main roads** road arrangements are mostly moderate and the risk of injury is quite low. However, the accidents are fairly serious. There are several problematic factors: opposite directions and different modes of travel have not been separated in spite of relatively high speeds and volumes of traffic, there are collision obstructions on the sides of the road, the safety of intersections needs to be developed, there are many land use junctions in places, the volumes of freight traffic are high and road geometry is insufficient in places. The most seri-

ous problems are head-on, vulnerable road user and single accidents. Quite a number of these types of accidents occur in proportion to the road length.

Most **other roads in sparsely populated areas** are very heterogeneous as far as their qualities are concerned, and land use is based on these roads. That is why the risk of injury is moderately high. As the speeds are nevertheless clearly lower than on main roads, the accidents are not among the most serious ones on public roads. The most common accidents are single, vulnerable road user and head-on accidents. Because of the small volumes of traffic, few accidents in proportion to the road length occur.

On **built-up area roads** the traffic environments and situations are usually complicated. There is an abundance of vulnerable road users as well as turning and crossing motor vehicle traffic. The risk of injury is the highest on this type of road. The central safety problems include vulnerable road user accidents and different intersection accidents (crossing, turning, rear end collision). Although the speed level is the lowest on this type of roads, the speeds are nevertheless disastrous as far as pedestrian and bicycle traffic are concerned. Especially on the fringes of built-up areas and in villages where there is less pedestrian and bicycle



traffic, the arrangements of pedestrian and bicycle traffic are lacking. A relatively large number of serious accidents occur in proportion to the road length.

Winter maintenance of roads is an important factor of safety. More accidents in proportion to vehicle kilometers occur in the winter months (October – March) than in the summer months. Similarly, the risk of injury is slightly higher in wintertime. On busy roads winter is more dangerous in comparison with summer than on roads with little traffic. According to climatic zones, the higher risk of injury is emphasized on the main roads of the coastal area.

Because both the safety problems and their solutions differ from each other in densely and sparsely populated areas, these areas are studied separately in the following chapter because of their different operational recommendations.

3A ROADS IN DENSELY POPULATED AREAS

Operational recommendations 2005

Objective 3.1

Finnra has worked in cooperation with municipalities to maintain and improve a road network hierarchy in built-up areas that is good from the standpoint of the transportation system. Speed limits have been adjusted to accommodate built-up areas.

Activity

In the next few years the districts will place emphasis on small, effective and quickly realized improvements of the traffic environment. (districts)

The districts support a clear route hierarchy in built-up areas and cooperate with municipalities in land use issues, transportation system planning and other planning. (districts)

Speed limits of motor vehicle traffic are managed in accordance with the decision in principle of the Council of State on the basis of the revised guidelines. (districts)

The central roads of built-up areas are rebuilt in places where remarkable needs for improvement of traffic environment occur beside the safety problems. Before rebuilding, minor actions are realized in the most problematic places, if necessary. The road safety of historically valuable built-up areas is ensured by following the principles of Finnra's guidelines for valuable built-up areas. (districts)

On the by-passes of built-up areas vulnerable road users are separated from motor vehicle traffic and special attention is paid to safe intersection and crossing arrangements. If new by-passes or other actions with effects on the network are realized, safety measures and the possible adaptation required by the new traffic situation should also include the old roads in the built-up area. (districts)

If a technically high-level traffic route is not available as a by-pass, traffic should be adapted to the traffic environment and the lower speed limit by building a clearly discernible section of built-up area roads. The character of high-level main routes should be preserved by controlling land use intersections. (districts)

New guidelines that integrate functionality, aesthetic nature and safety are used in planning urban main routes. (districts)

Objective 3.2

Finnra has collaborated with municipalities in promoting built-up areas with safe, healthy milieus for inhabitants and vulnerable road users.

Activity

The districts focus building of pedestrian and bicycle traffic routes on built-up areas and other densely populated areas. More routes are built. (districts)

The districts collaborate with municipalities in making studies related to needs for building network for biking and walking as well as necessary improvements for crossing arrangements of pedestrian and bicycle traffic, links between different modes of traffic and stop and parking area arrangements. The projects are directed to continuous connections and seamless links of pedestrian and bicycle traffic routes with municipal routes. Special attention is paid to the needs of children, elderly people and the disabled. (districts)

Traffic regulation of pedestrian and bicycle traffic and winter and summer maintenance of routes (e.g. maintenance areas) are arranged well from a user's standpoint (integration between municipalities, Finnra and contractors). Maintenance of pedestrian and bicycle routes and stop areas is made more efficient. (districts)

Guidelines and studies needed to support the work

- Speed limit policy and guidelines in built-up areas are revised according to the decision in principle of the Council of State. The use of speed limits is monitored.
- In conjunction with by-passes and other development projects, a stand is taken on the improvement of the central roads in built-up areas (old roads are adapted to a new status in the network and the built-up area).
- A guideline on planning by-passes in the centers is compiled.
- A project of environmental rebuilding of urban routes (examples) and the definition of the policy.

- The realized solutions are evaluated to support the choice of measures on built-up area roads, with the goal of achieving good, efficient actions (effects, durability, maintainability and costs).
- Experiments with suitable solutions to improve the status of pedestrian and bicycle traffic and to take the different groups of pedestrian and bicycle traffic into consideration.
- The need for complementing the guidelines on pedestrian and bicycle traffic is studied.
- Revising the cost division guideline on areas of responsibility in road management.

3B ROADS IN SPARSELY POPULATED AREAS

Operational recommendations 2005

Objective 3.3

The road network, its level of maintenance and speed limits together allow for traffic that is safe, functional and environmentally aware. Emphasis has been placed on keeping the risk for personal injury accidents low, especially on the main road network.

Activity

The districts make investments of improving safety in road sections where the accident density is high, i.e., mainly in busy main roads. As development projects and investments in basic road management, they realize traffic interchanges and arrangements of separating opposite driving directions. Minor actions include softening the area adjoining the road, improving intersections, gates on service junctions on the central lanes of motorways, guard rails of narrow central lanes, dangerous shoulders and bridge pillars, overtaking lanes, road lighting, moose fences by the sides of motorways, edge posts, clearance of bushes, road markings, etc. Routes of pedestrian and bicycle traffic, underpasses and arrangements of private roads are implemented to improve safety. (districts)

On main roads with little traffic, the districts implement moderate-priced measures to soften the area adjoining roads and to eliminate problems. Moderate-priced measures include light improvement of intersections, edge posts, lighting, clearance of bushes, speed limits, road markings and traffic signs. In sparsely populated villages the improvement of safety may require underpasses, pedestrian and bicycle traffic routes and arrangements of private roads. More expensive structural measures can be carried out in conjunction with other improvements. (districts)

If improvement projects are delayed, the districts improve safety temporarily or promote safety with minor actions in problematic places, e.g., by improving intersections, controlling traffic and limiting speeds. (districts)

On the lower-level road network the districts endeavor to reduce the risk of accidents mainly by traffic regulation. The general speed limit of 80 km/h is lowered locally if the roadside settlements so require. Individual problematic places are improved by means of minor actions: traffic signs, road markings, warning signs of abnormal conditions, speed limits, optical guidance and clearance of bushes. Safety-improving structural measures can be implemented in conjunction with other improvements. (districts)

The districts maintain the road network with road safety in mind. In maintenance, the central factors affecting road safety include winter maintenance, prevention of slipperiness and elimination of unexpected variation in quality (the areas of responsibility of districts and limits of maintenance areas are placed in easily detectable places). Maintenance of traffic signs, renewal of roadway markings, suitable sight distances and clearance of bushes in moose danger areas are significant from the standpoint of safety. (districts)

Control of the moose population is negotiated with the game management authorities. (districts)

The districts manage speed limits according to the guidelines. Variable speed limits are used according to the policy of Finnra. (districts)

As far as land-use junctions, location of activities and limitation of traffic growth are concerned, the districts study land use alongside main roads together with municipalities and provincial unions. (districts)

Safety checkings on road network are taken into use after the guidelines have been completed. (districts)

Together with the guidelines, new safe solutions are taken into use, e.g., new types of main roads, overtaking sections of main roads, improvement of road edges, intersections and interchanges of the basic network. (districts)

Traffic centers provide road users with real-time information related to safety, e.g., on weather conditions, traffic jams, roadwork, accidents and other exceptional situations. (districts)

Objective 3.4

Networks which are as safe and continuous as possible have been set aside for vulnerable road users.

Activity

The districts continue to build routes for vulnerable road users. Finnra searches for route solutions and operational models that are more economical than the present ones. (districts, ca)

Signs and route guidance for routes suitable for vulnerable road users are checked. In addition to the routes of pedestrian and bicycle traffic, the network of pedestrian and bicycle traffic may include parts of quiet and safe mixed traffic roads. (districts)

Vulnerable road users are taken into consideration near villages and roadside settlements on both main and lower-level roads. On the problematic main road sections structural solutions are searched for. These include combining the arrangements of junctions of private roads with pedestrian and bicycle routes as well as common underpasses for cars, pedestrians and bicycles. On the lower-level roads and while waiting for structural operations, speed limits can be lowered because of villages and settlements. (districts)

In the arrangements of vulnerable road users, planning, realization and maintenance are made more detailed. (districts)

Guidelines and studies needed to support the work

- The policy of main roads is compiled in conjunction with the long-term plan on road and traffic management. A stand is taken on the solution to safety problems on main roads. The policy of improving safety in different surroundings in sites remaining outside the official programs is defined. The policy regarding an old road is defined when a motorway or by-pass of a built-up area is built.
- A guidelines on safety checkings of a road network.
- Possibilities of more efficient control of land-use joining the main road network are studied.
- Accidents of vulnerable road users in sparsely populated areas and economical possibilities to prevent them are studied.

- Finnra's stand on parallel roads constructed as private roads. A study on the management of pedestrian and bicycle traffic on the main road network by means of parallel road arrangements.
- Guidelines on pedestrian and bicycle traffic arrangements on the main road network.
- The needs for developing intersections on the main road network are studied.
- Planning guidelines on intersections are compiled (revised guidelines on staggered intersections, safety islands and roundabouts, among others). The planning guidelines on intersections with traffic lights are checked.
- Operational recommendations and a planning guideline regarding safety improvement on basic network interchanges are compiled.
- A recommendation on planning overtaking sections on main roads is compiled and risky behavior in overtaking on wide roads is studied.
- Equipment on roadsides are developed for feedback on risky behavior (speeding and tailgating, among others).
- Directives on designing new road types.
- Developing and testing new bridge guard rail types.
- The need for complementing guidelines on winter maintenance of pedestrian and bicycle traffic is studied.
- The cost-division guideline on the areas of responsibility in road management is revised.

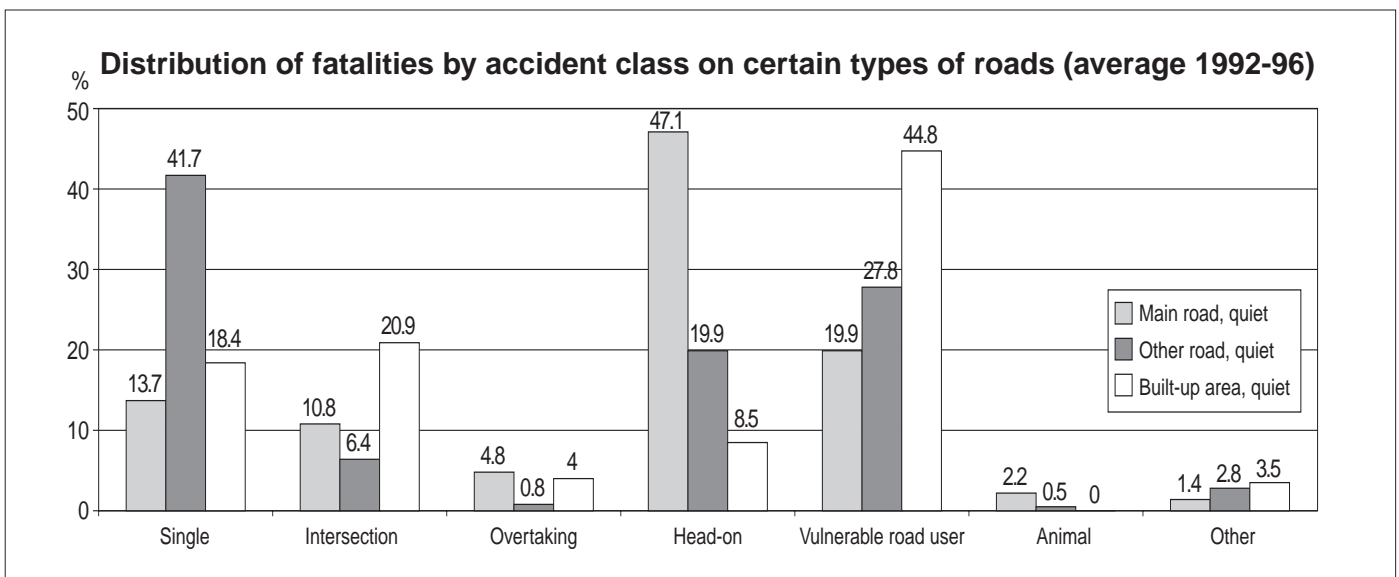
4 LONG-TERM WORK TO PREVENT THE MOST SERIOUS ACCIDENTS

Principle 4

Finnra shall search for and implement measures that will decrease traffic fatalities and other serious injuries, in particular, in cooperation with other parties involved in traffic and road safety work.

Bases

The improvement of road safety requires far more efficient activities to reduce the most serious accidents. The decision in principle of the Council of State defines the prevention of traffic growth, safety improvement in built-up areas, improvement of interaction between road users, decreasing drunken driving, decreasing single and head-on accidents and relieving their consequences as the areas of making safety work more effective. Thus, Finnra is required to come up with additional, more effective actions and develop new actions to prevent head-on accidents, vulnerable road user accidents and single accidents, and to relieve their consequences.



Every year about 80 % of all people killed on public roads are killed in head-on and single accidents and in vulnerable road user accidents. Head-on accidents occur mainly on the main road network of sparsely populated areas, covering 3/4 of all deaths in head-on accidents. 40 % of the deaths of vulnerable road users occur on the main road network, over a third on other roads in a sparsely populated area and a fourth in built-up areas, their immediate surroundings, and villages. 40 % of deaths in single accidents occur on the main road network and more than a half on a lower-level road network in sparsely populated areas.

About 40 % of fatal head-on accidents are caused by one dominant factor; they are alcohol-related accidents, supposed suicides, sequences of falling asleep at the wheel or attacks of illness. The rest of the accidents occur mostly on icy, slushy or snowy roads. In more than one third of accidents that occur in poor driving conditions, one of the reasons is excessive speed and almost half of the vehicles have poor tires. Most accidents occur when the weather and driving conditions are changing. The volume of single accidents is the same in winter and in summer. Single accidents are often caused by alcohol, excessive speed, poor driving and anticipating skills, and refusal to use safety devices. In addition, there are often collision obstructions in the traffic environment and they make the consequences worse.

Speeds in motor traffic have an essential effect on road safety: if traffic arrangements remain unchanged and the mean speed increases 1 km/h at typical speeds in the countryside, the risk of injuries grows 3 % and of fatalities, 6 %.

In densely populated areas speeds are crucial factors in the safety of vulnerable road users. In an accident a pedestrian's risk of death becomes eight-fold if the collision speed grows from 30 km/h to 50 km/h. As the speeds of motor traffic have such an essential effect on the safety of vulnerable road users, the speed limit has to depend on the safety level of the pedestrian and bicycle traffic environment.

Although Finnra commits itself to implementing the present known actions of road management and to developing new actions to prevent fatalities by long-term research and development activities, the possibilities are nevertheless limited. Even the improvement of the main road network and built-up areas takes a long time. In addition, effective cooperation and integration between different parties responsible for road safety are needed to influence the other factors in road safety and to develop these factors. These include reduction in drunken driving, speeding and risk-taking, increase in the use of safety devices, considering the safety qualities of motor and other vehicles, choice of travel time and improvement of all kinds of interaction between road users.

Operational recommendations 2005

Objective 4.1

Finnra has conducted long-term research and development work to prevent traffic fatalities and other serious injuries.

Activity

Finnra studies the development possibilities of winter maintenance on coastal area main roads and in groundwater areas. (ca, districts)

Measures to decrease head-on and single accidents on two-lane main roads and semi-motorways and relieve their sequences are developed. Objects of development include new road types (cross-sections with median barrier), road markings that provide feedback, softening of the road environment and the actions of traffic management. (ca, districts)

The central administration participates in the development and research work of a dynamic speed controller (Intelligent Speed Adaptation, ISA). In the long term it may offer a possibility to control excessive speeds, which are reasons for single accidents, among others. (ca)

Safer solutions than the present ones for same-level crossing arrangements between pedestrian and bicycle routes and roadways are developed. (ca)

The central administration participates in collaboration with different agencies to find measures to decrease the high risk of traffic deaths among elderly pedestrians and cyclists. (ca)

In collaboration with other agencies the central administration searches for ways of influencing the choice of travel time, ways of driving, the watchfulness of a driver, the condition of vehicles and tires and the use of safety devices, reflectors and helmets. (ca)

Objective 4.2

Finnra has reduced the number of traffic deaths by focusing road safety measures on accidents involving vulnerable road users in built-up and rural areas, and on head-on collisions and swerving off the road in rural areas.

Activity

When deciding on policy and financing of road management, Finnra places more emphasis on the existing actions that reduce traffic deaths efficiently. New actions may also be found through research and development work. (districts, ca)

An inventory is made of the roadside environments for maintenance and improvement purposes. After the guidelines have been compiled, the districts experiment and take into use new safer road types and intersection solutions, safer solutions for same-level guidelines between pedestrian and bicycle routes and roadways, road markings that provide feedback, etc.

In the centers of built-up areas and residential areas motor traffic is adapted to the conditions made by pedestrian and bicycle traffic and the environment: speed limits are less than 50 km/h and they are supported structurally, if necessary (speeds comply with the directives revised in accordance with the decision in principle of the Council of State). To find other quickly-realized actions, the safety problems of public roads are studied at least when no road safety plan has been or is being made in a built-up area. (districts)

On a road network where the general speed limit applies, speed limits are lowered locally because of villages and roadside settlements in sparsely populated areas. On the main road network, speed limits are lowered in problematic villages and roadside settlements while waiting for structural measures. On by-passes of centers speed limits are also lowered if vulnerable road users have not been separated from motor traffic or if intersection arrangements are unsafe. (districts)

Effective and economic ways of managing traffic are taken into use. The districts experiment with and take into use variable speed limits on the busiest sections of main roads, e.g., on motor traffic roads, in according to the policy of Finnra. (districts)

The districts promote acceptance of low speed limits in built-up areas in particular, by informing, supporting speed limits structurally and rebuilding road surroundings to be proportional to land-use and speed limits. (districts)

The districts continue to cooperate with the police in taking automatic speed control devices into use on busy main roads. (districts)

Finnra studies the need for making winter maintenance on the main roads more effective and for developing winter speed limits. (districts)

Traffic centers emphasize safety information: slipperiness, traffic incidents and other risks. Observations on driving conditions are improved. The districts inform road users about the principles of winter maintenance and the bases of different levels of service. (districts)

Finnra supports information about driver and vehicle risks in head-on collisions and single accidents: tiredness, intoxication, poor tires, refusal to use safety devices, risk-taking, excessive speeds and the choice of travel time.

Finnra supports information about pedestrian and bicycle traffic risks: refusal to use reflectors and helmets, intoxication and neglect of traffic regulations.

Guidelines and studies needed to support the work

- The policy and guidelines on speed limits in built-up areas are revised according to the decision in principle of the Council of State. The use of speed limits is monitored.
- Directives on speed limits in roadside settlements and villages and monitoring of the actions taken.
- A study on the effects of making winter maintenance more effective on the coastal main roads, guidance in the changes of policy if necessary, and a study on the effects of maintenance on the lower-level road network.
- The development of statistics in collaboration with other authorities that compile statistics (seriousness of injuries and their location on the road network).
- The project "Improvement solutions on main roads", in which new road types (narrow two-carriageway roads, median barriers etc.), solutions for separating pedestrian and bicycle traffic, principles of planning intersections and solutions for improving the safety of roadside environments are developed and tested.
- Accidents of vulnerable road users in sparsely populated areas are studied, as well as ways of preventing them economically.
- Studies on the possibilities and effectiveness of traffic management to improve road safety in Finland.

- Observations on driving conditions are developed by means of added road weather forecast stations and moving detectors.
- Information about driving conditions (both the situation and a forecast) is developed in cooperation with the Meteorological Institute and mass media. Information about driving conditions of pedestrian and bicycle traffic is also developed.
- Recommendation on the use of road markings that provide feedback.
- The policy of softening the road environment is defined and guidelines are compiled (quickly-realized softening measures, improvement of municipal lampposts, maintenance of guard rails, guard rails in rock cuttings, shaping open ditches, handling the intersections, revising the guard rail guidelines).
- A guideline on the inventory of a roadside environment for maintenance and improvement.

5 PUBLIC PARTICIPATION AND ROAD MANAGEMENT QUALITY CONTROL

Principle 5

In developing its organization and operation, Finnra shall improve the public's possibility of participating and ensure the quality of road safety in the product purchasing and production operations of road management.

Bases

Safety of road management can be studied on one hand as service received by the public and on the other hand as a result of Finnra's internal processes.

The viewpoint of customer service presents the requirements mainly related to customer satisfaction and bringing forward individual and social needs. Safety is often brought up in customer feedback, which tells about its high appreciation. In addition to customer feedback, public opinion is also found out using service level studies. Measures that make public participation possible and active acquisition of information from central agencies are used in planning. In addition to loud customer groups, so-called quiet, unselfish groups (e.g. children) also need to be considered.

The character of road safety work also is anticipative authority operation to prevent disadvantages, which again is related to society's need to reduce social losses caused by accidents. Finnra is obliged to monitor the safety situation and to take the necessary measures which can be studied with the audits of the road environment, for example. These measures should increase road safety as far as customers' and society's needs are concerned.

By developing its organization, Finnra endeavors to make its activity more effective and to produce its services to the public as economically as possible. For this purpose administration and production are being differentiated. In the purchaser-producer model it must be ensured that the important issues regarding road safety are returned to the producer in question. As far as safety is concerned, successful differentiation requires making the road safety viewpoint clear in different processes. The requirements of road safety have to be depicted and defined for decision-making, e.g., in guidelines on road management, quality systems of measures, know-how requirements and contracts.

Finnra is responsible for planning road and traffic conditions, programming road management and realizing set objectives. In renewing road administration, the effects of the decisions on the public must be taken into consideration. Contracts must ensure that road management service received by the public corresponds to safety requirements. Above all, in production with direct effects on road users, the compliance of contracts is ensured by planned control and sanctions.

Operational recommendations 2005

Objective 5.1

Finnra has functional, established procedures for detecting road safety problems and for responding to feedback from the public.

Activity

The public can participate in road safety improvement. Participation of the public is made possible through a customer feedback system, participating planning and opinion surveys. (districts, ca)

Safety checkings of roads are taken into use in the districts. In addition to checkings, other studies related to safety actions are also conducted, if necessary. (districts)

The districts have a system ensuring that deficiencies in traffic control or detected damages (vandalism, other damages or damage caused by natural phenomena) are repaired immediately. (districts)

Objective 5.2

Purchasing has defined road safety requirements for products, and the requirements are followed. Planning, construction and maintenance quality control takes road safety into consideration. Producers must incorporate road safety into the quality systems of their products.

Activity

Road safety is taken into consideration in purchasing road management. The districts ensure that their responsible people have enough expert knowledge and resources to take good care of purchasing as far as road safety is concerned. (districts)

In its contracts, a district requires producers of planning, construction and maintenance to take road safety into consideration and to report on it. The district ensures that the requirements on a producer's knowledge of safety, which are included in the quality system of Finnra, are fulfilled in purchasing. (districts)

Safety-related requirements are defined in the order of a planning project. Planning requires measures making public participation possible, presentation of safety objectives and evaluation of the safety effects of the solution. In choosing a planner, expert knowledge on road safety and the quality system are taken into consideration. (districts)

The districts take safety audits of road plans into use after the guidelines have been compiled. (districts)

Outdated plans are updated from the road safety viewpoint. Drafters of plan decisions know the road safety effects of different solutions. Realization of plans that are old-fashioned from the safety viewpoint is prevented when the validity periods of the plan decisions are not continued. (districts, ca)

The most important safety requirements related to construction and maintenance are defined in the contracts. (ca, districts)

Through quality requirements – in winter maintenance friction, snowiness, evenness, etc. – the trafficability and safety of roads are ensured. (ca, districts)

Guidelines, products, methods and measures that are taken into use are good from the viewpoint of road safety. The safety of traffic and structural solutions has been examined and the quality requirements have been defined. (ca, districts)

In construction and maintenance the contractor plans the management of traffic arrangements, compiles a traffic control plan and appoints the person responsible for traffic arrangements in the way the purchaser has approved. At every site there must be a person who has been trained in safety and who is responsible for road safety affairs. Safety training is a requirement for working on a road. (districts)

During the contract, the contractor is responsible for the management of public traffic arrangements and the maintenance of a road in the agreed way. The purchaser supervises the contract arrangements and possible neglects result in sanctions determined in the contract. (districts)

Audits of contractors' quality systems include the important issues related to road safety. (districts, ca)

In the road area, the license conditions are the same to outside agencies (e.g., electric utilities) as to Finnra. (districts)

Guidelines and studies needed to support the work

- Finnra and the central administration define clearly how road safety affairs are taken into consideration in different actions.
- The customer feedback system is developed so that citizens get information better and that providing feedback is easier.
- Guidelines on making the inventory of a roadside environment for maintenance and improvement purposes are compiled. Later, a guideline on safety checkings of the road network (auditing directive on the existing environment).
- Guidelines on safety audits of plans.
- Guidelines on purchasing are developed and maintained so it also includes the road safety viewpoint. Consideration of safety in production is ensured, as well as the flow of information between the producer and purchaser. Requirements on the producer's safety know-how are defined (professional skill, degrees)
- The quality manual of road planning related to road safety affairs is checked. Planners' required qualifications regarding safety knowledge are defined and the methods of proving qualifications are developed. The task definition guideline of planning work is developed so that it includes the important issues regarding road safety (e.g., emphasizes the definition of the road safety goals of a project).
- Consideration of road safety in competitions in pilot objects is studied.
- Guideline on road management (planning guidelines, among others) include sufficient information about road safety. Maintenance of roads is ensured.
- Training is arranged and advanced training for contract supervisors, compilers of traffic control plans and traffic controllers is planned (Road Safety Training 1 and 2).

6 ROAD SAFETY AWARENESS

Principle 6

Finnra shall keep its road safety know-how up to date and publicize road safety information, both independently and in cooperation with other agencies.

Bases

Awareness as a concept means interpreted and understood information (Consultative Committee of Information Society Affairs). Man's awareness increases if he takes new information and procedures into use. The operational environment should support the use of new information and operational models.

A lot of information about road safety is available, but in practice information may not be easily applicable. Continued processing of information should be improved, e.g., in the expert systems of road management. Only part of road safety know-how can be delivered in training seminars and meetings or by reporting on research. Besides the official flow of information, unofficial flow, e.g., through data networks, is also of importance.

Statistics on accidents and use of the statistics must be developed further in cooperation with other participating agencies. The use of data for road safety analyses requires data reliability. The study of road register addresses of accidents, which today requires quite a work contribution, should be developed.

The most important basis of road safety research is still in statistics and probability calculus, although in studying man's behavior, the effects of technical solutions and social factors, researches of other scientific fields are also needed. The truth can be approached through versatile research and new viewpoints can be brought out and old mistaken ideas can be corrected.

On its part Finnra takes care of the continuance of road safety research and development. In a wider field Finnra takes part in research cooperation together with the Ministry of Transport and Communications, Ministry of the Interior, Ministry of Social Affairs and Health, Central Organization for Traffic Safety in Finland, Vehicle Administration Center and Traffic Safety Committee of Insurance Companies as well as in research projects of the EU, OECD and the Nordic Countries.

Finnra's traffic centers ensure direct informing to customers. In up-to-date traffic information directed to vehicle drivers the main emphasis is on radio-based media. Planning a trip beforehand can be assisted by information through the Internet, for example.

Finnra takes part in informing about road safety affairs together with other agencies responsible for traffic and road safety. There is an endeavor to improve citizens' know-how and to thus increase their possibilities of performing well in traffic in the different phases of life. Campaigns concentrating on one theme and continuing for several years have the best possibilities of success. Positive traffic-related attitudes and choices can be best supported in groups having positive attitudes towards safety beforehand.

Information has an affect only if the receiver of a message considers it significant, understands the benefits produced by it and if the message offers him/her clear ways of action. The effect of a message is often reduced by a so-called countermessage which offers competitive operational models. However, a road user most easily accepts the change of action whose advantages he/she considers more profitable than the disadvantages. Safety information has the best effect if it is simultaneously connected with other actions increasing safety.

Operational recommendations 2005

Objective 6.1

Finnra has provided its employees training in road safety and supplied them with sufficient, up-to-date road safety information. Employees are responsible for developing their road safety know-how and for incorporating road safety in their own work.

Activity

Employees' knowledge and know-how are kept up to date. Finnra sees to it that offered training and information is sufficient and up-to-date. Employees are encouraged to acquire information and to participate in training, and the use of new knowledge and operational models is supported. (districts, ca)

Information about the road safety situation and about ways of improving it is given. Information related to safety and its improvement is given more efficiently to road users, through expert systems, among others. (ca)

Objective 6.2

Finnra has focused its research and development of road safety on the main safety problems and development needs, and has made use of current domestic and foreign developments. Results are efficiently implemented.

Activity

The currentness of knowledge and know-how is ensured by sufficient research and development activity (r&d). Employees and interest groups are supplied with data resulting from r&d activity and from national and international interaction. The data and research results are utilized in the developing Finnra's activity. (ca, districts)

The districts bring up new research and development needs, produce the initial data needed in research and participate in r&d projects in other ways, too. The central administration is aware of current research and development needs and the development of research work. Development of new operational models and products is promoted, and data about experiments and their results are spread. (ca, districts)

Statistics on accidents are maintained and developed in cooperation with other parties. (districts, ca)

The usability and use of registered data are promoted. Safety data systems are improved. Monitoring and statistical sifting of the safety situation as well as the common use of different positional (GIS) data are developed. (ca)

Information about traffic in different road conditions and pedestrian and bicycle traffic is improved. (ca)

Objective 6.3

Finnra has publicized changing and changed road traffic conditions that affect road safety. Good traffic behavior has been supported in cooperation with other organizations in the field of road safety by means of campaigns and public information channels. Interaction between authorities has been developed.

Activity

Finnra takes an active part in cooperation with other authorities responsible for road safety and promotes goal-oriented activity to minimize the risk of travel. This includes an annual national road safety campaign. In addition, Finnra's own campaigns and exhibitions are arranged. (ca, districts)

Road users are given feedback about their behavior from the viewpoint of road safety. Communication directed to citizens emphasizes continuous offering of information. (ca, districts)

Through information the districts support changes in road users' behavior when concrete changes are made in a road environment and traffic regulation. (districts)

Road safety questions as well as the safety of international tourism and goods transport are brought up in local cooperative projects. (ca, districts)

Guidelines and studies needed to support the work

- Finnra's annual road safety meeting on actual issues is arranged.
- Road safety questions are dealt with on a special theme day of road and traffic planning.
- Safety data material for planning.
- A training seminar on road safety for planners (in 2000).
- Training in road safety (Tieturva) is continued and developed.
- In the r&d program sufficient financing is assured for important research work regarding safety. The r&d program covers the essential safety problems.
- Participation in national and international level road safety r&d projects.

- A study of the road register addresses of accident data, a closer study of traffic injuries and the improvement of the contents and quality of accident data are developed in cooperation with the police and other authorities.
- The accident register provides free information service about processed data and data available with a moderate work contribution.
- Data systems are developed. The common use of road, accident and position (GIS) data as well as map presentations of accidents are improved.
- Traffic volumes of pedestrian and bicycle traffic (traffic statistics) are studied. Entering the data on pedestrian and bicycle traffic into data systems is made possible.
- A system combining the data from road weather and traffic measuring stations is developed for safety researches, for example.
- The work of the traffic center is developed to emphasize and affect safety.

ROAD SAFETY PROGRAM 2005

Observations on effects and efficiency

EFFECTS OF THE PROGRAM ON ROAD SAFETY

The purpose of the road safety program is to develop Finnra's activity and methods of action to take safety-related factors into better consideration. As safety is somehow related to almost all road management affairs, Finnra's activity has been taken into wide consideration in the program. However, no quantitative estimations of the effects of the operational recommendations and guidelines and studies improving road safety can be presented. Quantitative estimations can only be presented on examined concrete road management actions. In practice, the final effects of measures depend on financing as well as on the choice of measures and their focus on different parts of the road network.

The operational recommendations and other supportive actions include many possibilities to make improvement of road safety more effective. Some of the actions affect within a fairly short time, others only later in the future. The following table presents the central effects of the measures connected to the different principles of the program.

<i>Principle</i> – <i>the most important measures</i>	<i>Effect the most important measures</i> <i>have on road safety improvement</i>
1. Safety of the transportation system <ul style="list-style-type: none"> – Safety more apparent in the planning of the transportation system – New guidelines for municipal transportation system planning 	<ul style="list-style-type: none"> – over a long period, changes in the integration of land-use and traffic, traffic demand and modes of travel – activation of municipal safety work, quicker solutions to the problems of public roads in built-up areas
2. Commitment to the road safety objective <ul style="list-style-type: none"> – Development of the contents of result guidance and road safety work – Study of the safety effects and effectiveness of measures 	<ul style="list-style-type: none"> – diversification of action, better command of the flow of information and the entity – focusing of resources as efficiently as possible from the safety viewpoint (also considering the other objectives) – temporary actions of the most problematic objects (in-between projects) – better command of conflicting objectives
3. Quality of safety of public roads <ul style="list-style-type: none"> – Investments that improve safety are focused on built-up area roads and busy main roads – Investments of moderate prices in a quiet main road network – Winter maintenance of a road according to its significance in transportation – Focusing the building of pedestrian and bicycle routes in densely populated areas 	<ul style="list-style-type: none"> – improvement of the detectability of a road environment and road users' feelings of safety – calming down built-up area traffic, reduction in vulnerable road user accidents as well as motor traffic accidents in intersections in built-up areas – reduction in the number of vulnerable road user, single and junction accidents on busy main roads – reduction in the number of single and vulnerable road user accidents on a quiet main road network

<i>Principle</i> – <i>the most important measures</i>	<i>Effect the most important measures</i> <i>have on road safety improvement</i>
<p>4. Long-term work to prevent the most serious accidents</p> <ul style="list-style-type: none"> – Methods of reducing head-on collisions – More efficient cooperation and development of common actions to prevent the most serious injuries – Lowering speed limits in built-up areas and villages – Use of known and developed methods 	<ul style="list-style-type: none"> – focusing research and development work on the most important safety problems – prevention of traffic fatalities by affecting different factors – reduction in the number of head-on collisions, single accidents and vulnerable road user accidents – reduction in the number of the most serious injuries
<p>5. Public participation and road management quality control</p> <ul style="list-style-type: none"> – Making public participation possible – Practice of purchasing takes the road safety requirements into consideration 	<ul style="list-style-type: none"> – considering public feedback in safety improvement – preserving and improving road management quality control
<p>6. Road safety awareness</p> <ul style="list-style-type: none"> – Training in road safety – Research and development – Information 	<ul style="list-style-type: none"> – know-how of employees is developed – quality and usability of safety data material are improved – affecting public traffic behavior

ROAD MANAGEMENT IN ROAD SAFETY IMPROVEMENT

The study of different measures improving road network safety was part of the compilation of the districts' road safety programs. The objective was not to define safety improvement up to 2005, but it was a question of the evaluation of operational possibilities. The study defined the possible road management measures for problematic safety sites of the near future, as well as their costs and effectiveness in safety improvement. The investment costs per reduced injury or fatality were used as indicators. The effects of the measures were estimated with the TARVA program. In each district the most effective safety-related measures were compiled as measure categories, later called a **measure menu**.

The measure menus of the districts were formed as follows:

- The measures were collected from economic and operational plans, from road safety plans and other plans related to the road network and projects and from customer feedback.
- As many kinds of safety improving measures as possible were included in a menu.

- The measures included in a menu were limited so that the costs of an injury accident reduction of an individual measure would be less than 100 million marks and the average costs of an injury accident reduction of the whole menu would be less than 30 million marks.
- The measures of the menu are mainly investments in basic road management. No large development investments or small measures improving road safety or speed limit changes are included in the menu to the same extent as in annual operation. Table 1 shows the comparison.

Table 1. *Proportions of the measure categories of basic road management in the reduction in the number of injury accidents; comparison between the realized operation of 1998 and the measure menu of the safety program.*

<i>Measure category</i>	<i>Proportion of injury accident reduction in 1998 %</i>	<i>Proportion of injury accident reduction in the measure menu %</i>
- pedestrian and bicycle traffic arrangements	11	18
- road improvement	10	19
- improvement of a road environment	31	24
- improvement of intersections	10	18
- speed limit changes	18	3
- other traffic control	7	4
- improvement of built-up area roads and small measures related to them	6	12
- other measures	7	1
Total	100	100

The measure menu includes about 3000 investments of basic road management improving safety effectively; their total length is about 6000 kilometers. About 95 injury accidents and 12 traffic deaths would be saved with the investment of 2.6 billion marks needed for the measures. The average preventive costs of the injury accidents to be saved annually would be 28 million marks. The sum is quite the same as the present preventive costs of injury accidents produced with the investments of basic road management, which have been about 30 million marks in recent years.

The reduction in injury accidents according to the measure menu of the whole country as a function of measure costs is shown on the following page.

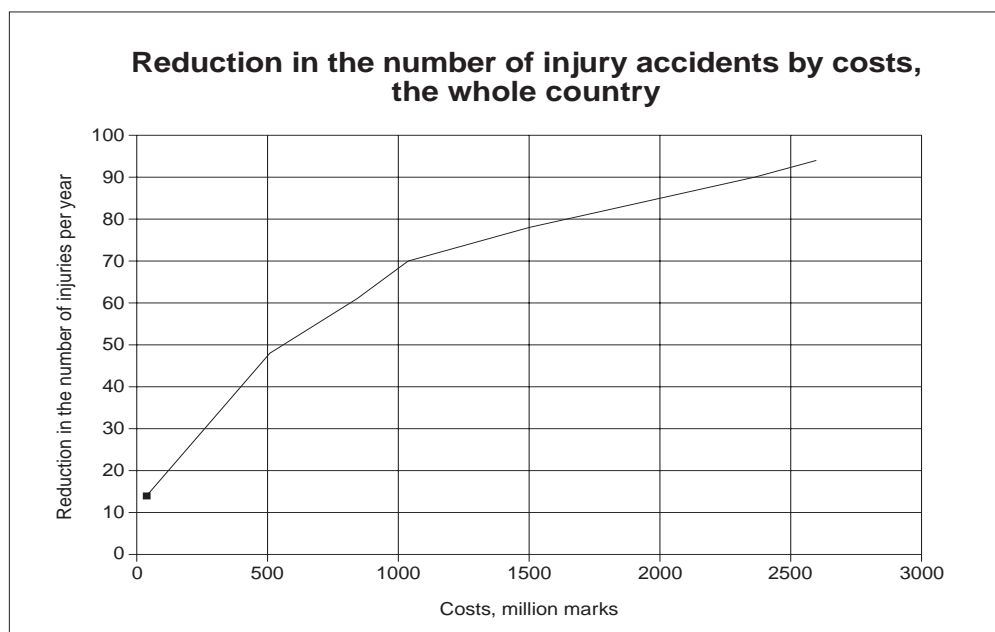


Table 2. Cost efficiency of measure categories in reduction in injury accidents and traffic deaths; calculated on the basis of the measure menu of the whole country.

Measure category	Measure km	Costs Mmk	Reduction in injury accidents per year number	Reduction in traffic deaths per year number	Costs/reduction in injury accidents Mmk	Costs/reduction in traffic deaths Mmk
- pedestrian and bicycle traffic arrangements	1117	916	17.20	1.745	53	525
- road improvement	1094	717	17.88	2.241	40	320
- improvement of a road environment	1567	250	22.38	4.383	11	57
- intersection operations	300	450	17.12	1.847	26	244
- speed limit changes	105	1	3.11	0.464	0	2
- other traffic control	1600	5	3.66	0.484	1	10
- measures in built-up areas	169	253	11.40	0.974	22	260
- other measures	81	18	1.08	0.186	17	98
- own measures	5	1	0.03	0.002	26	415
Total	6038	2612	93.87	12.326	28	212

The measure menu and the measures included in it do not constitute a realizable program as such. It is an efficient safety-related measure category from which projects can be taken out to be realized by the Economic and Operational Plan (TTS) and which can be used as a standard of comparison when measures are chosen for different programs.

An analysis of the measure menus of the districts and the measures included in them from the viewpoint of safety effects and safety efficiency have been published in a separate report "Road safety programs of the districts – Efficiency analysis of measures and the present state of safety (Internal studies of Finnra 41/1998).

ACHIEVEMENT OF ROAD SAFETY OBJECTIVES IN ROAD MANAGEMENT MEASURES

In Tables 3 and 4 the annual financing need for basic road management has been studied in a case where the annual injury accident reduction is 30–40. The financing need in Table 3 has been calculated on the basis of the measure distribution of the measure menu of the whole country and in Table 4 on the basis of the measure distribution realized in 1998.

Because a short-term objective is to implement lower speed limits in built-up areas, it can be estimated that the proportion of speed limits and small road safety measures is not getting lower than the present situation in the next few years. In a case in which the safety objective is the reduction of 30–40 injury accidents, and only investment-related actions would be used to produce safety effects, the financing need calculated on the basis of the measure menu would be 800–1100 million marks per year. According to the measure distribution of realized actions, in which the proportion of speed limits and so-called small road safety actions is almost one fourth of all the produced injury accident effects, the financing need would be 550–700 million marks per year.

Table 3. *Financing levels required by the realization of the safety objective of road management as the basis is the investment activity in accordance with the measure menu of the road safety program.*

<i>Measure category</i>	<i>Measure menu (the whole country)</i>		<i>Safety objective and estimation of necessary financing</i>		
	<i>Reduction in injuries %</i>	<i>Costs Mmk/ injury accident</i>	<i>Financing for reduction of 30 injury accidents, million marks</i>	<i>Financing for reduction of 35 injury accidents, million marks</i>	<i>Financing for reduction of 40 injury accidents, million marks</i>
- pedestrian and bicycle traffic arrangements	18	53	290	339	387
- road improvement	19	40	228	266	304
- improvement of a road environment	24	11	78	91	104
- improvement of intersections	18	26	141	165	189
- speed limit changes	3	0	0	0	0
- other traffic control	4	1	1	1	1
- improvement of built-up area roads and small actions	12	22	79	93	106
- other actions	1	6	2	2	2
Total	100		822	959	1096

Table 4. *Financing levels required by the realization of the safety objective of road management with the measures realized in 1998 as the basis.*

<i>Measure category</i>	<i>Realized activity in 1998</i>		<i>Safety objective and required financing</i>		
	<i>Reduction in injuries %</i>	<i>Costs Mmk/ injury accident</i>	<i>Financing for reduction of 30 injury accidents, million marks</i>	<i>Financing for reduction of 35 injury accidents, million marks</i>	<i>Financing for reduction of 40 injury accidents, million marks</i>
- pedestrian and bicycle traffic arrangements	11	53	174	204	233
- road improvement	10	40	120	140	160
- improvement of a road environment	31	11	102	119	136
- improvement of intersections	10	26	78	91	104
- speed limit changes	18	0	0	0	0
- other traffic control	7	1	2	2	2
- improvement of built-up area roads and small actions	6	22	39	46	52
- other actions	7	6	12	14	16
Total	100		529	617	706

In both the tables above, the costs of average accident reduction relating to measure categories in the whole country have been used. The costs include the internal distribution of a measure category to different-priced measures and the distribution of measures on the road network. This is more closely represented in Table 5 "Safety efficiency according to measures on different road groups". If measures could be focused in a different way, for example on busy main roads and built-up areas, the reduction of 35 injury accidents could be produced by the investment of about 775 million marks. The costs of the same accident reduction by focusing the measures of the original menu are 950 million marks. Similarly, a lower financing need could be achieved by emphasizing cheaper measures within the measure categories.

Table 5. *Safety efficiency according to measures on different road groups.*
 (The explanations of road categories can be found at the end of the table)

Measure	Measure length km	Costs altogether 1000 mk	Annual reduction in injury accidents	Annual reduction in traffic deaths	Costs Mmk/ saving in injury accidents	Costs Mmk/ saving in traffic deaths	Profit of the first year %
101 Pedestrian and bicycle traffic route							
sm way	5	5000	0.07	0.011	76	455	2.0
other 2c	24	17564	0.30	0.056	58	314	2.9
busymrd	65	58591	1.28	0.253	46	232	3.8
qtmrd	141	109105	1.32	0.211	83	517	1.8
busyrd	194	149958	2.11	0.206	71	728	1.4
qtrd	183	125661	1.08	0.068	116	1848	0.6
rdserv	71	56718	1.27	0.098	45	579	1.8
rdnoserv	224	175606	3.27	0.284	54	618	1.7
TOTAL	905	698203	10.69	1.187	65	588	1.7
102 Interchange of pedestrian and bicycle traffic							
other 2c	2	4400	0.31	0.011	14	400	3.5
busymrd	3	6550	0.13	0.025	50	262	3.4
qtmrd	18	30149	0.38	0.076	80	397	2.2
busyrd	8	17840	0.53	0.039	34	457	2.4
qtrd	6	11475	0.06	0.003	209	3825	0.3
rdserv	11	26572	0.91	0.082	29	324	3.2
rdnoserv	20	53931	1.27	0.108	43	499	2.1
TOTAL	67	150917	3.58	0.344	42	439	2.3
103 Elevation of a pedestrian crossing on a main road							
other 2c	0	40	0.03	0.002	2	20	53.2
busyrd	6	730	0.10	0.009	7	81	12.5
qtrd	7	1060	0.03	0.002	34	530	2.1
rdserv	5	487	0.19	0.014	3	35	30.7
rdnoserv	14	3377	0.19	0.018	18	188	5.4
TOTAL	33	5694	0.53	0.045	11	127	8.2
105 Pedestrian crossing arrangements							
qtmrd	0	20	0.01	0.001	3	20	47.7
busyrd	0	300	0.01	0.000	50	.	0.4
qtrd	7	610	0.04	0.002	14	305	4.1
rdserv	8	1450	0.12	0.008	13	181	6.0
rdnoserv	11	1050	0.06	0.002	18	525	2.7
TOTAL	27	3430	0.23	0.013	15	264	4.4
106 Improvement of a pedestrian and bicycle traffic route							
busymrd	1	400	0.01	0.001	50	400	2.4
qtmrd	1	900	0.01	0.002	100	450	2.0
busyrd	17	14301	0.63	0.038	23	376	3.0
qtrd	1	350	0.01	0.001	58	350	2.6
rdserv	15	11335	0.52	0.027	22	420	2.9
rdnoserv	29	27382	0.84	0.055	33	498	2.2
TOTAL	63	54668	2.01	0.124	27	441	2.6
107 Parallel route for pedestrian and bicycle traffic							
busymrd	22	3296	0.16	0.032	21	103	8.6
TOTAL	22	3296	0.16	0.032	21	103	8.6

Measure	Measure length km	Costs altogether 1000 mk	Annual reduction in injury accidents	Annual reduction in traffic deaths	Costs Mmk/ saving in injury accidents	Costs Mmk/ saving in traffic deaths	Profit of the first year %
Road group							
202 Improvement of alignment, countryside							
qtmrd	43	115660	0.58	0.079	198	1464	0.6
busyrd	43	69544	1.53	0.115	46	605	1.8
qtrd	85	63345	0.47	0.039	136	1624	0.6
rdserv	1	1843	0.17	0.010	11	184	6.2
rdnoserv	22	19091	0.39	0.028	49	682	1.6
TOTAL	194	269483	3.13	0.271	86	994	1.0
203 Making a narrow road broader, countryside							
busymrd	2	2900	0.13	0.016	23	181	5.2
qtmrd	249	143824	3.61	0.516	40	279	3.3
busyrd	5	3200	0.11	0.006	30	533	2.2
qtrd	9	6600	0.04	0.001	174	6600	0.2
rdserv	41	16850	0.82	0.095	21	177	5.5
rdnoserv	40	28886	0.69	0.075	42	385	2.5
TOTAL	345	202260	5.38	0.709	38	285	3.3
204 Overtaking lane							
busymrd	29	24300	0.48	0.072	51	338	2.7
qtmrd	122	79704	1.48	0.224	54	356	2.6
rdnoserv	16	4000	0.23	0.036	17	111	8.3
TOTAL	166	108004	2.19	0.332	49	325	2.8
205 Private road arrangements							
other 2c	6	3000	0.27	0.026	11	115	8.7
busymrd	99	40910	2.83	0.382	14	107	8.8
qtmrd	171	59598	2.66	0.382	22	156	6.0
busyrd	7	5390	0.23	0.015	23	359	3.1
qtrd	41	3850	0.16	0.013	24	296	3.6
rdserv	19	4292	0.24	0.027	18	159	6.1
rdnoserv	38	18778	0.68	0.077	28	244	4.0
TOTAL	381	135818	7.06	0.922	19	147	6.4
209 Building of a central lane							
rdnoserv	0	48	0.07	0.006	1	8	128.4
TOTAL	0	48	0.07	0.006	1	8	128.4
210 Bus stop in the countryside							
qtmrd	2	310	0.01	0.000	52	.	0.4
busyrd	3	798	0.01	0.000	80	.	0.3
rdserv	1	160	0.02	0.001	8	160	7.5
rdnoserv	0	330	0.00	0.000	110	.	0.2
TOTAL	7	1598	0.04	0.001	42	1598	1.0
301 New road lighting, rigid posts							
qtmrd	8	1250	0.07	0.008	18	156	6.2
busyrd	10	1370	0.10	0.009	13	152	6.8
qtrd	48	5532	0.17	0.008	33	692	1.8
rdserv	13	2450	0.18	0.013	13	188	5.8
rdnoserv	23	2724	0.15	0.008	19	341	3.5
TOTAL	103	13326	0.67	0.046	20	290	3.8

Measure	Measure length km	Costs altogether 1000 mk	Annual reduction in injury accidents	Annual reduction in traffic deaths	Costs Mmk/ saving in injury accidents	Costs Mmk/ saving in traffic deaths	Profit of the first year %
302 New road lighting, yielding posts							
m way	13	4900	0.72	0.085	7	58	16.7
busymrd	105	21763	4.06	0.939	5	23	37.7
qtmrd	330	54982	5.55	1.352	10	41	21.4
busyrd	104	15387	1.45	0.213	11	72	12.9
qtrd	289	42250	1.81	0.237	23	178	5.3
rdserv	22	3301	0.28	0.036	12	92	10.4
rdnoserv	86	13201	1.51	0.231	9	57	16.1
TOTAL	949	155784	15.39	3.093	10	50	17.6
303 Yielding posts instead of rigid ones							
m way	1	7	0.06	0.007	0	1	979.3
other 2c	3	30	0.07	0.019	0	2	544.1
busymrd	26	271	0.50	0.209	1	1	641.4
qtmrd	60	826	0.38	0.159	2	5	160.1
busyrd	9	1180	0.04	0.009	31	131	6.7
qtrd	25	1748	0.04	0.009	47	194	4.5
rdserv	8	58	0.06	0.017	1	3	249.3
rdnoserv	17	1097	0.13	0.047	8	23	36.1
TOTAL	148	5217	1.27	0.476	4	11	76.5
304 Softening of surroundings or a guard rail							
m way	1	60	0.01	0.002	4	30	31.1
other 2c	24	9058	1.07	0.134	8	68	14.1
busymrd	30	11576	0.54	0.170	21	68	12.5
qtmrd	60	17814	0.63	0.224	28	80	10.6
busyrd	7	5610	0.03	0.006	193	935	0.9
qtrd	8	2033	0.01	0.003	169	678	1.3
rdserv	18	5923	0.24	0.068	24	87	9.8
rdnoserv	12	3387	0.16	0.032	21	106	8.4
TOTAL	160	55461	2.69	0.639	21	87	10.0
305 Clearance of visual obstructions							
busymrd	3	26	0.00	0.000	13	.	1.7
qtmrd	50	503	0.15	0.009	3	56	20.5
busyrd	9	86	0.01	0.000	10	.	2.3
qtrd	15	166	0.00	0.000	42	.	0.5
TOTAL	76	781	0.17	0.009	5	87	13.6
306 Game fence, on the side of a motorway							
m way	32	4440	0.85	0.085	5	52	19.1
busymrd	6	828	0.69	0.001	1	828	19.1
qtmrd	11	1480	0.13	0.007	12	211	5.6
rdnoserv	7	750	0.13	0.008	6	94	12.1
TOTAL	56	7498	1.80	0.101	4	74	15.7
307 Game fence, short							
busymrd	10	1770	0.06	0.001	30	1770	1.2
qtmrd	64	10597	0.34	0.018	32	589	2.0
TOTAL	75	12367	0.40	0.019	31	651	1.9

Measure	Measure length km	Costs altogether 1000 mk	Annual reduction in injury accidents	Annual reduction in traffic deaths	Costs Mmk/ saving in injury accidents	Costs Mmk/ saving in traffic deaths	Profit of the first year %
401 Construction of a roundabout							
other 2c	1	8000	0.53	0.027	15	296	4.1
busymrd	1	4000	0.53	0.090	8	44	20.4
qtmrd	4	13200	0.47	0.066	28	200	4.7
busyrd	4	10070	0.59	0.057	17	177	5.7
qtrd	1	1340	0.08	0.007	18	191	5.3
rdserv	12	39700	2.26	0.201	18	198	5.2
rdnoserv	13	41685	2.00	0.148	21	282	3.8
TOTAL	36	117995	6.45	0.596	18	198	5.1
402 Construction of an interchange							
qtmrd	2	54850	0.54	0.076	102	722	1.3
qtrd	0	1175	0.00	0.000	1175	.	0.0
rdnoserv	3	43175	1.10	0.104	39	415	2.4
TOTAL	5	99200	1.63	0.180	61	551	1.8
403 Complementing an interchange							
m way	0	3000	0.07	0.002	41	1500	1.1
sm way	1	3000	0.03	0.008	97	375	2.3
qtmrd	2	1550	0.03	0.004	62	388	2.4
qtrd	0	100	0.00	0.000	100	.	0.2
rdnoserv	2	900	0.13	0.008	7	113	10.1
TOTAL	5	8550	0.26	0.022	33	389	2.7
404 Combined underpass for vulnerable road users and passenger cars							
busymrd	1	4000	0.12	0.018	33	222	4.2
rdnoserv	1	5500	0.08	0.009	67	611	1.6
TOTAL	2	9500	0.20	0.027	47	352	2.7
405 Staggered intersection							
busymrd	3	13800	0.47	0.074	29	186	4.9
qtmrd	19	30770	1.53	0.264	20	117	7.8
busyrd	1	3000	0.19	0.020	16	150	6.6
qtrd	0	300	0.01	0.002	21	150	6.2
rdserv	1	1600	0.06	0.004	28	400	2.7
rdnoserv	5	9097	0.53	0.061	17	149	6.5
TOTAL	29	58567	2.79	0.425	21	138	6.7
406 Removal of an intersection to a better place							
busymrd	1	500	0.02	0.003	24	167	5.6
qtmrd	9	8800	0.24	0.031	36	284	3.3
busyrd	2	1163	0.07	0.005	16	233	4.7
qtrd	3	2152	0.03	0.001	86	2152	0.6
rdserv	0	390	0.01	0.000	65	.	0.3
rdnoserv	2	730	0.11	0.009	7	81	12.9
TOTAL	17	13735	0.48	0.049	29	280	3.5
407 Complete channelization of a four-way intersection							
busymrd	3	4600	0.15	0.020	30	230	4.1
qtmrd	11	13100	0.30	0.044	44	298	3.1
busyrd	2	4000	0.06	0.003	68	1333	0.9
qtrd	2	3400	0.05	0.004	76	850	1.2
rdserv	3	10500	0.17	0.012	63	875	1.2
rdnoserv	8	19100	0.49	0.037	39	516	2.1
TOTAL	27	54700	1.21	0.120	45	456	2.2

Measure	Measure length km	Costs altogether 1000 mk	Annual reduction in injury accidents	Annual reduction in traffic deaths	Costs Mmk/ saving in injury accidents	Costs Mmk/ saving in traffic deaths	Profit of the first year %
408 Complementing channelization of a four-way intersection							
other 2c	0	2600	0.01	0.001	217	2600	0.4
busymrd	2	3700	0.07	0.007	50	529	1.9
qtmrd	2	2850	0.09	0.008	32	356	2.9
rdserv	2	4055	0.05	0.004	75	1014	1.1
rdnoserv	4	7850	0.17	0.011	46	714	1.6
TOTAL	11	21055	0.40	0.031	53	679	1.6
409 Channelization of a three-way intersection							
busymrd	2	3950	0.10	0.013	38	304	3.1
qtmrd	5	8800	0.09	0.012	96	733	1.3
busyrd	2	5700	0.03	0.001	190	5700	0.3
qtrd	0	1000	0.00	0.000	333	.	0.1
rdserv	0	1000	0.01	0.000	143	.	0.2
rdnoserv	4	4020	0.07	0.003	61	1340	0.9
TOTAL	14	24470	0.30	0.029	81	844	1.2
410 Construction of a diversion space							
busymrd	1	200	0.05	0.007	4	29	33.2
qtmrd	59	9295	1.13	0.164	8	57	16.4
busyrd	8	1865	0.20	0.017	9	110	9.5
qtrd	4	880	0.04	0.002	21	440	2.8
rdserv	1	440	0.03	0.001	15	440	3.2
rdnoserv	6	3665	0.13	0.009	28	407	2.7
TOTAL	80	16345	1.59	0.200	10	82	11.7
411 Acceleration lane for an interchange							
sm way	1	1150	0.06	0.014	18	82	10.7
rdnoserv	0	400	0.01	0.001	33	400	2.6
TOTAL	1	1550	0.08	0.015	21	103	8.6
412 New traffic lights, a four-way intersection							
other 2c	1	900	0.20	0.006	5	150	10.0
busymrd	0	500	0.06	0.009	9	56	16.5
busyrd	0	2000	0.04	0.003	48	667	1.6
rdserv	2	3000	0.32	0.024	9	125	8.6
rdnoserv	1	2200	0.13	0.010	17	220	4.8
TOTAL	5	8600	0.75	0.052	12	165	6.6
413 New traffic lights, a three-way intersection							
other 2c	0	700	0.03	0.002	27	350	3.0
busymrd	0	400	0.01	0.003	29	133	6.6
rdserv	0	400	0.03	0.005	13	80	11.4
rdnoserv	1	1600	0.04	0.003	39	533	2.0
TOTAL	2	3100	0.11	0.013	28	238	4.1
414 Vehicle actuated traffic lights							
other 2c	1	220	0.07	0.004	3	55	20.9
busyrd	0	100	0.03	0.004	3	25	37.7
rdserv	0	20	0.01	0.001	3	20	47.7
TOTAL	2	340	0.11	0.009	3	38	27.4

Measure	Measure length km	Costs altogether 1000 mk	Annual reduction in injury accidents	Annual reduction in traffic deaths	Costs Mmk/ saving in injury accidents	Costs Mmk/ saving in traffic deaths	Profit of the first year %
415 Light improvement of an intersection							
sm way	0	200	0.02	0.002	13	100	9.5
busymrd	4	2620	0.22	0.025	12	105	9.2
qtmrd	21	2845	0.21	0.033	13	86	10.7
busyrd	9	525	0.10	0.007	5	75	14.6
qtrd	17	1450	0.05	0.002	32	725	1.8
rdserv	3	1450	0.03	0.001	47	1450	1.0
rdnoserv	10	3540	0.14	0.009	25	393	2.9
TOTAL	64	12630	0.76	0.079	17	160	6.2
502 Lowering of speed limit from 50 km/h to 40 km/h							
busyrd	1	7	0.06	0.006	0	1	867.9
rdserv	9	50	0.25	0.046	0	1	826.6
rdnoserv	0	3	0.00	0.000	.	.	0.0
TOTAL	10	60	0.31	0.052	0	1	790.1
504 Lowering of speed limit from 60 km/h to 50 km/h							
busyrd	3	24	0.24	0.038	0	1	1455.7
qtrd	2	2	0.00	0.001	1	2	422.7
rdserv	0	3	0.01	0.001	1	3	303.6
rdnoserv	4	15	0.11	0.018	0	1	1098.8
TOTAL	9	44	0.36	0.058	0	1	1208.5
506 Lowering of speed limit from 70 km/h to 60 km/h							
other 2c	5	49	1.08	0.081	0	1	1771.2
busymrd	1	1	0.05	0.013	0	0	11230.0
busyrd	1	1	0.01	0.003	0	0	2645.2
qtrd	3	13	0.01	0.002	1	7	141.8
rdserv	0	10	0.00	0.000	5	.	4.4
rdnoserv	2	4	0.01	0.001	1	4	227.7
TOTAL	12	78	1.17	0.100	0	1	1326.4
508 Lowering of speed limit from 80 km/h to 70 km/h							
other 2c	2	3	0.32	0.027	0	0	9309.0
busymrd	1	1	0.05	0.012	0	0	10450.0
busyrd	1	1	0.01	0.003	0	0	2645.2
rdserv	3	13	0.09	0.019	0	1	1297.6
rdnoserv	1	3	0.00	0.001	1	3	289.1
TOTAL	8	21	0.48	0.062	0	0	2798.0
510 Lowering of speed limit from 100 km/h to 80 km/h							
busymrd	6	5	0.42	0.120	0	0	20559.9
busyrd	3	6	0.03	0.007	0	1	1011.7
qtrd	7	15	0.04	0.007	0	2	422.1
rdserv	0	5	0.00	0.000	5	.	4.4
rdnoserv	6	10	0.11	0.017	0	1	1561.4
TOTAL	21	41	0.60	0.151	0	0	3191.2
513 Lowering of speed limit from 100 km/h to 80 km/h in summer							
qtmrd	2	2	0.01	0.002	0	1	834.5
TOTAL	2	2	0.01	0.002	0	1	834.5
517 Lowering of speed limit from 80 km/h to 60 km/h							
busyrd	0	4	0.03	0.004	0	1	932.6
qtrd	38	407	0.11	0.026	4	16	55.9
rdserv	2	1	1.0	1.00	2	16	161.6
rdnoserv	2	18	0.03	0.005	1	4	248.2
TOTAL	42	440	0.18	0.037	2	12	74.4

Measure	Measure length km	Costs altogether 1000 mk	Annual reduction in injury accidents	Annual reduction in traffic deaths	Costs Mmk/ saving in injury accidents	Costs Mmk/ saving in traffic deaths	Profit of the first year %
519 Variable speed limit							
qtmrd	1	100	0.01	0.002	10	50	17.8
TOTAL	1	100	0.01	0.002	10	50	17.8
601 STOP sign at a T intersection							
qtmrd	0	5	0.01	0.001	1	5	177.8
rdnoserv	1	5	0.00	0.000	1	.	17.4
TOTAL	1	10	0.01	0.001	1	10	97.6
602 STOP sign at an X intersection							
qtmrd	2	24	0.25	0.036	0	1	1394.4
busyrd	1	13	0.07	0.005	0	3	410.7
qtrd	0	2	0.00	0.000	1	.	32.7
rdserv	0	4	0.03	0.001	0	4	331.3
rdnoserv	0	4	0.03	0.002	0	2	537.2
TOTAL	5	47	0.37	0.044	0	1	900.9
603 Marking of a center line							
qtmrd	40	71	0.04	0.004	2	18	57.5
qtrd	560	1012	0.70	0.061	1	17	62.1
rdserv	86	154	0.15	0.010	1	15	71.5
rdnoserv	5	9	0.01	0.001	1	9	110.9
TOTAL	691	1246	0.90	0.076	1	16	63.4
604 Marking of center and border lines							
qtrd	6	30	0.01	0.001	3	30	34.0
TOTAL	6	30	0.01	0.001	3	30	34.0
606 Marker posts, 100 km/h							
qtmrd	861	3287	2.18	0.337	2	10	94.4
rdnoserv	27	127	0.14	0.020	1	6	146.9
TOTAL	888	3414	2.32	0.357	1	10	96.4
607 Marking of a sharp curve							
qtrd	2	21	0.00	0.000	21	.	1.0
TOTAL	2	21	0.00	0.000	21	.	1.0
608 Making intersection markings more effective							
other 2c	0	20	0.01	0.000	3	.	6.5
busymrd	0	50	0.01	0.002	4	25	36.9
qtmrd	0	10	0.00	0.001	3	10	86.7
qtrd	5	125	0.02	0.001	6	125	10.1
rdserv	0	10	0.01	0.001	1	10	93.3
TOTAL	7	215	0.05	0.005	4	43	23.4
701 Rebuilding of a central shopping street & speed limit							
busyrd	1	8000	0.24	0.025	33	320	3.1
qtrd	1	1500	0.04	0.003	37	500	2.2
rdserv	13	39444	2.46	0.256	16	154	6.4
rdnoserv	14	47286	1.67	0.165	28	287	3.5
TOTAL	28	96230	4.40	0.449	22	214	4.6
702 Speed bumps & speed limit							
busyrd	1	599	0.58	0.045	1	13	79.6
qtrd	4	2300	0.09	0.007	26	329	3.2
rdserv	11	6717	1.48	0.109	5	62	17.5
rdnoserv	11	8234	0.66	0.048	12	172	6.3
TOTAL	27	17850	2.81	0.209	6	85	12.6

Measure	Measure length km	Costs altogether 1000 mk	Annual reduction in injury accidents	Annual reduction in traffic deaths	Costs Mmk/ saving in injury accidents	Costs Mmk/ saving in traffic deaths	Profit of the first year %
703 Rebuilding of a built-up area road							
qtmrd	2	800	0.03	0.003	32	267	3.6
busyrd	16	22370	0.64	0.048	35	466	2.3
qtrd	2	1000	0.01	0.000	100	.	0.2
rdserv	22	50542	1.20	0.075	42	674	1.7
rdnoserv	33	52201	1.38	0.094	38	555	2.0
TOTAL	75	126913	3.25	0.220	39	577	1.9
704 Attention to speed limits							
other 2c	2	291	0.09	0.010	3	29	33.5
busyrd	3	512	0.09	0.014	6	37	25.2
rdserv	3	2591	0.05	0.008	55	324	2.8
rdnoserv	7	1404	0.22	0.028	6	50	19.0
TOTAL	14	4798	0.45	0.060	11	80	11.8
705 Speed bumps							
busyrd	0	150	0.01	0.000	30	.	0.7
qtrd	1	130	0.01	0.001	12	130	7.8
rdserv	15	5230	0.37	0.029	14	180	5.9
rdnoserv	8	1480	0.10	0.006	15	247	4.6
TOTAL	25	6990	0.49	0.036	14	194	5.5
803 Interchange of a railway							
qtrd	0	11400	0.00	0.000	2850	.	0.0
rdnoserv	0	2300	0.00	0.000	1150	.	0.0
TOTAL	0	13700	0.01	0.000	2283	.	0.0
805 Camera control, Finnra's share							
other 2c	25	3500	0.89	0.111	4	32	30.3
qtmrd	56	1000	0.18	0.075	6	13	62.4
TOTAL	81	4500	1.07	0.186	4	24	37.4
901 Construction of a deceleration lane							
qtmrd	2	360	0.02	0.002	23	180	5.3
rdnoserv	2	360	0.01	0.000	33	.	0.7
TOTAL	4	720	0.03	0.002	27	360	3.0
902 Construction of a traffic island on an access road							
qtrd	0	20	0.00	0.000	20	.	1.1
rdnoserv	0	30	0.00	0.000	30	.	0.7
TOTAL	1	50	0.00	0.000	25	.	0.9
903 Signals warning of a school							
qtrd	0	25	0.00	0.000	25	.	0.9
rdnoserv	1	35	0.00	0.000	18	.	1.2
TOTAL	1	60	0.00	0.000	20	.	1.1
TOTAL	6038	2611770	93.87	12.326	28	212	4.5

Explanations of road categories:

m way = motorway

sm way = semi-motorway

other 2c = other road with two carriageways

busymrd = busy main road ADT > 6 000

qtmrd = quiet main road ADT < 6 000

busyrd = other busy road ADT > 1 500

qtrd = other quiet road ADT < 1 500

rdnoserv = road in a built-up area, no roadside services

rdserv = road in a built-up area with roadside services

Other explanations:

Red.inj.acc/yr = reduction in accidents that cause injuries

Red.death/yr = reduction in deaths per year