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FINNISH ROAD
ADMINISTRATION

**Finnish Road Administration Research and
Development 2005**

Revision of the 2003-2005 R&D programme

R&D

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Revision of the 2003-2005 R&D programme



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SUMMARY

The Finnish Road Administration research and development programme is based on the strategy adopted in 2002 and research priorities are set according to focal areas. The goal of research and development is to develop new knowledge and skills to improve the function, safety and competitiveness of the whole Finnish road transport system on a sustainable basis. The focal areas of research and development are:

- 1 Client requirements
- 2 Impacts of road management and traffic
- 3 Asset management
- 4 Working markets for procurement of road works and services
- 5 Traffic management
- 6 Management of traffic and road network information.

The Road Administration is also responsible for the whole public road sector's products and services and r&d is also directed at these activities.

The research and development budget for 2005 is 5.5 million Euro. On January 25, 2005, the Road Administration Management Group decided on the following budget utilisation:

Strategic projects	1 068 000
Client requirements	415 000
Impacts of road management and traffic	225 000
Asset management	700 000
Working markets	550 000
Traffic management	250 000
Information management	-
Road planning and design sector tasks	250 000
Technology sector tasks	450 000
Nordic cooperation programmes	144 000
Total	4 052 000

Further programme decisions will be made during spring.

Two strategic projects end in 2005: the Research programme for impact management and the Low-volume road economic maintenance programme. New strategic projects are not planned for the year. The information management projects are now included in the other themes; a research programme will be developed during the year. Programmes will also be made for the impacts or road management and traffic theme and the sector tasks. The programmes of the other themes have been adopted in 2003-04.

Work on a revised research and development strategy will start in 2005.

FOREWORD

Finnra's R&D strategy for 2002-2007 was drafted on the basis of an evaluation of research plans carried out towards the end of 2001. The strategy was approved on 26 February 2002. It's based on Finnra's mission and vision. The goal of research and development is to develop new knowledge and skills to improve the performance, safety and competitiveness of the entire Finnish road transport system on a sustainable basis. Finnra focuses its activities on improving products and services that are based on managing the impacts of road administration and the needs of society. The activities are prioritised in six key areas. As Finnra is responsible for products and services of the entire road transport sector, its R&D activities are also directed at these activities.

The R&D programme for 2003-2005 was approved on 20 January 2003.

The 2005 activities and finance were reviewed on the basis of proposals put forward at Finnra's R&D Cooperation Group meeting by theme and strategic project managers. Finnra's Management Group approved the programme on 25 January 2005.

Helsinki 1 February 2005

Finnish Road Administration

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1 IMPLEMENTATION OF THE R & D PROGRAMME

The Finnish Road Administration research and development programme is based on the R & D strategy for the years 2002-2007. Work on a new strategy will commence in 2005 and it will be finalised in 2006, taking into account the development objectives of the administrative sector of the Ministry of Transport and Communications and other research collaboration in particular. Strategic projects and the themes for which a research plan has been approved will be implemented as planned. The aim is to devise a plan for three themes during 2005.

Strategic projects

- S12 Improvement of main roads: the strategic project was completed in 2003, follow-up of implemented solutions 2004-2006.
- S13 Impact management: strategic project 2002-2005.
- S14 Economical management of low-volume roads: strategic project 2002-2005.

New strategic projects are not expected to commence in 2005.

Themes

- Client requirements, research plan 2004-2007, approved in 2004.
- Impacts of road management and traffic, research plan will be made on the basis of the results of project S13.
- Asset management, research plan 2003-2006, approved in 2003.
- Working markets, research plan 2004-2007, approved in 2004. The Inframodel project 2005 has also been included in this theme (previously under information management).
- Traffic management, research plan approved in 2004. For 2005, decisions have been made on financing the on-going projects and the AINO programme of the Ministry of Transport and Communications. Decision on the remainder of the programme will be made at the beginning of 2005.
- Management of traffic and road network information is included in the other themes in 2005; otherwise, the development of information management is related to the development of information systems. The research plan of the theme will be specified during 2005.
- Road planning and design sector tasks, the research plan will be made on the basis of the evaluation of Finnra's technical expertise.
- Technology services sector tasks, the research plan will be made on the basis of the evaluation of Finnra's expertise.

The share of projects included in the Infra 2010 programme, which will start in 2005, has been estimated at 0.5 – 1.0 million Euro per year in the years 2005-2008; in 2005 the projects will be included in the road maintenance markets theme (see 3.4).

In implementation of the ERA-NET ROAD network for research and development cooperation of European road administrations, Finland's share will amount to a total of 292,000 Euro financed by the EU in the years 2005-2007. Contract negotiations will take place at the beginning of 2005. This financing is intended for the development of international collaboration, not for R & D projects as such.

During the R&D strategy period 2002-2007, funding 2002-2004, proposal 2005 and plan 2006-2007 are as follows:

Theme / strategic project	Implemented			Total 02-04	Proposal 2005	Plan		Total 2005-07
	2002	2003	2004			2006	2007	
S4 Road structures development	248	9						
S12 Main road improvement solutions	533	415	163		115	100		
S13 Impact management	74	379	399		380			
S14 Management of low-volume roads	20	351	504		573			
Strategic projects total				3095	1068	1105	1300	3473
Client requirements	160	210	173	543	415	345	125	885
Impacts of road management and traffic	440	552	326	1318	450	550	600	1600
Asset management	790	697	720	2207	700	700	600	2000
Working markets	460	449	309	1218	550	550	500	1600
Traffic management	599	375	300	1274	500	500	500	1250
Information management	253	455	40	748	to be specified			
Sector tasks of road planning and design	449	570	554	1573	500	500	500	1500
Technology sector tasks	980	1180	1077	3237	900	900	900	2700
Reservations					417	350	475	1492
Total (1000 e)	5006	5642	4565	15213	5500	5500	5500	16500

At its meeting on 25th of January 2005, Finnra's management group decided to allocate from the r&d budget of 5.5 million Euro in the year 2005 the following contracting mandates:

	Mandate, 1000 Euro
S12 Main road improvement solutions	115
S13 Impact management	380
S14 Management of low-volume roads	573
Client requirements	415
Impacts of road management and traffic	225
Asset management	700
Working markets	550
Traffic management	250
Sector tasks of road planning and design	250
Technology sector tasks	450
Nordic collaboration projects	144
Total	4 052

Programming the traffic management theme, the impacts of road management and traffic theme as well as sector tasks will proceed further during the year. The information management theme will be specified. The Nordic collaboration projects are presented in chapter 5.1.

2 STRATEGIC PROJECTS

Follow-up studies of the **Main road improvement solutions** project (S12) will be made during the years 2003-2006. In 2005, monitoring will focus on new roads with a median barrier (2+1 lanes, 2+2 lanes) and broad-lane roads. Furthermore, the effects of signalling centre and border line markings on road users, the environment and road maintenance will be studied. Studies of traffic flows on roads with a median barrier will continue e.g. on road 9.

Follow-up of the reasons for and repair costs of barrier damages on narrow road sections with a median barrier will continue. Solutions to the management of disturbances on narrow roads with a median barrier are being studied. The driving conditions of the broad-lane stretch on road 6 between Koskenkylä and Kouvola are monitored during the winter season 2004-2005; driving behaviour on the stretch is also monitored.

The **Research Programme for Impact Management** (S13) started in 2002 and is planned to be completed in 2005. At this stage, acquiring additional impact information and development of methods will move to the background. The main emphasis will be on intensifying the use of impact information and implementing new methods.

In accordance with the original plan, instructions, guides and leaflets will be produced during 2005. The purpose of the instructions and guides is to provide repeatability and transparency for impact evaluation in order to improve the conditions for decision-making. The leaflets are intended to help the users of impact information to understand evaluation methods as well as the quality and use of impact information. Working method development serves integration of impact evaluation into road administration operations. In practice, this will be done by applying instructions and guides, by utilising individual results and, to a certain extent, by re-defining the responsibilities of impact evaluation. Furthermore, the results should be tested in practice in order to be able to develop them further.

For utilising the results, an impact portal is needed, i.e. a website containing information on the impacts, classified by impact area and road product. Furthermore, the website will include instructions concerning the use of the methods as well as documentation of the evaluations made.

Putting the results of the research programme into practice requires not only training road administration experts, but also external parties responsible for making impact evaluation. Decisions on training will be made during 2005. For implementing the results, the most important aspect is to inform Finnra's project managers, so that they can develop their contract specifications for impact evaluation to take account of these results. The training will continue in 2006.

A plan for implementation will be drawn up at the beginning of 2005. At the same time, estimates will be made on whether financing the project should be extended to 2006 or whether the final stage of implementation will take place within the impacts of road management and traffic theme.

Commenced in autumn 2002, the **Economical maintenance of low-volume roads** (S14) programme will be completed at the end of 2005. Including the sub-projects, the research programme consists of approximately 20 different projects divided into three main categories: road maintenance policy, technology as well as procurement and costs of road maintenance.

The projects in progress during 2005 include the following:

- Evaluating the interface between public and private roads (in cooperation with the asset management theme)
- Costs and benefits of low-volume road keeping (cooperation with asset management)
- Finalising the frost heave risk unified weight limits directives
- Drainage problems and solutions
- Alternatives to the maintenance of the minor paved road network in poor condition (cooperation with asset management)
- Heavy timber transports on bridges of the minor road network
- Frost heave repairs; programming and methods (cooperation with asset management)
- Pilot projects
- Performance requirements for gravel roads
- Summarising report.

In 2005, the research programme will focus on solving the practical problems of the maintenance of low-volume roads. To ensure a practical approach, a road region representative acts as chairman of the steering group in approximately half of the projects. Several projects will be implemented in cooperation with the asset management theme. In the pilot projects, practical testing of the ideas of contractors, consultants, material producers, etc. will be supported.

The summary report to be drawn up during 2005 will occupy a central position in utilising the research results. The report includes a summary and analysis of the results, as well as suggested measures for enhancing the maintenance of low-volume roads as economically as possible. By emphasising the most important research results, the summary will also serve as an introduction to studying the reports on individual projects.

The results of the research programme have also been estimated to be useful in maintaining private and municipal roads. The results have been designed for presentations to these parties as well as the road regions in regional seminars.

3 THEMES

3.1 Client requirements

Client requirements research proceeds in accordance with the programme approved on 14 June 2004. The objectives are as follows:

- To create a method for the systematic specification of client requirements, including the client's processes and operating environment.
- To create systems of utilisation of client information
- To clarify the needs and expectations of different client groups concerning traffic and road maintenance.
- To specify the changes in the operating environment related to client requirements.

The research programme comprises four focal points:

1. Mobility needs
2. Business requirements
3. Needs related to regional development
4. Development of collaboration.

The research programme includes four research subjects corresponding to the above-mentioned focal points; the fifth subject is systematic utilisation of client information and specification of needs. Development of collaboration also includes the development of interactive planning.

The subjects are linked to each other: utilisation of client information is mapped as follows – where, when and what kind of information is needed concerning client requirements? The information is utilised at several different levels, such as in decision-making concerning asset management, on the Road Administration level, as well as at the regional level. There is plenty of client information and specifications, but information gaps have also been detected. The most important gaps are studied in the mobility needs and business requirements subjects. Partly at the same time and partly after the specification of people's need for mobility and business' requirements, the systems for specification of needs will be documented and described - what sources of information and what kind of sources of information exist, how to utilise the information, how often and in what ways will the information be updated and how will it be managed.

For the needs related to regional development, the critical client requirements of road maintenance and the relevant measures according to location are determined, tools are designed for monitoring the change in client requirements when the operating environment changes and the main changes in the road management environment are specified.

For the development of interactive planning and collaboration, the present state of interaction is assessed, the dialogue guide is updated, participation opportunities are developed, and stakeholder collaboration is enhanced. Interactivity and collaboration with stakeholders are essential ways of determining the needs of client groups and society.

The year 2004 was primarily spent on specifying and focusing the programme as well as implementing several collaboration projects that had been agreed upon previously. Many essential results of the research programme will be needed by mid-2006, when preparations for the new government programme start, and consequently, the research programme is rather strongly focused on 2005.

3.2 Impacts of road management and traffic

The Finnish Road Administration needs to be well informed about the condition of the traffic system and road network, as well as the impacts of different measures on them. We should be capable of an allround evaluation and description of the road and traffic conditions and the efficiency and impacts of road management from various points of view. The objective of the theme, apart from continuous improvement of the information and methods, is to follow up and enhance new planning solutions and their effectiveness.

Research on traffic conditions, traffic safety and the environment play a significant role. Research related to traffic system planning is a new sector. Studying these factors supplements the objectives of the client requirements programme and contributes to expanding the contents and methods of traffic system planning and at the same time enhancing efficacy. The strategic project S13 focuses on the gaps in the information system and the development of evaluation methods, as well as unifying evaluation and intensifying the use of information concerning impacts.

A research programme on biodiversity and the environmental cluster research programme "Ekotehokas yhteiskunta" (Eco-efficient society) proceed as a joint undertaking of different ministries. We participate in several of the projects of these programmes. As for the research programme of the Ministry of Transport and Communications, the programme "Kohti esteetöntä liikumista" (Free and unhindered movement) and the research themes environment, bicycle and pedestrian traffic and public transportation involve collaboration projects, in which Finnra participates to the extent that the projects serve the goals of our research themes.

Developing the research programme was postponed until 2005, because the results of project S13 and information on necessary further measures will be available at this time. Consequently, the programmes of the theme and the strategic project can be combined and the focal points selected. The client requirements research programme also provides experiences and information that can be utilised in focusing related research. Some projects intended to start in autumn 2004 have been postponed to 2005, because the objectives and contents as well as the persons responsible for these projects must still be specified (e.g. development of indicators, updating of safety models, environmental issues in procurement and contracting).

As for **monitoring and development of road and traffic conditions**, data acquisition methods will be developed and utilisation of existing information improved. The objective is to create a basis for information service products to provide monitoring information and databases to support planning.

They can also be used in communication on the status of the road traffic system and in providing a rationale for road maintenance operations. There are projects related to the following topics:

- Development of indicators and key figures for the efficacy of road operations
- Defining needs for traffic information and development of information services
- Utilisation of available road safety information
- Management and utilisation of information on the state of the environment (noise and ground water).

The purpose of the **effectiveness of actions** subject is to enhance the effectiveness of planning and design solutions. The subject also includes studies of different solutions before and after implementation. As a result, we will obtain exemplary solutions and information for the evaluation of impacts. The research results can be utilised, for example, in specifications, development of quality and performance requirements and development of the evaluation of impacts.

- Development of the contents and methods of traffic system plans and pilot methods
- Impacts of road maintenance and road traffic on the natural environment and biodiversity
- Background studies for speed limit directive development
- Enhancing unhindered movement in the planning of traffic safety
- Noise abatement in urban areas
- Environmental specifications in contracting
- Monitoring the safety impacts of different measures.

As for the **development of evaluation methods and procedures**, the focus is currently on the development of the methods for evaluation of the effects of the 4-year action and finance plan as well as the development of methods for the evaluation of road safety. The research programme on impact management provides research results and planning methods.

- Updating the unit values (vehicle costs) of socioeconomic calculations
- Updating the maintenance models in the impact evaluation software
- Development of safety models
- Evaluating traffic system planning impacts on well-being.

3.3 Asset management

The research plan of the theme Asset Management for 2003-2006 was approved on 20 January 2003. The research plan is intended to create the information base and information management methods necessary for asset management and to develop a systematic mode of operation by which the road network can be managed more effectively throughout its lifespan. The theme's annual costs amount to 700,000 Euro.

In the latter half of the research programme the focal point will shift from issues that are already better managed. The focus will be especially on the management of gravel roads and roadside structures and equipment, development of basic messages (e.g. budget motivations and other proposals),

the implementation of a management system on a network level as well as supporting strategy development.

- Development of damage inventory of paved roads (2005-2006). Measurement of paved roads' damages with an automatic measurement instrument is planned to be opened to competition 2006-2007 as a separate contract and from 2008 as a part of a service level measurement contract. To employ the new measurement technique, the parameters have to be redetermined. Automatic damage measurement will be prepared by determining the parameters describing the damage level of the road for the needs of strategic management as well as that of programming maintenance and procurement.
- Development of gravel road management (2005-2006). Specifications related to gravel and private roads will be undertaken in cooperation with the S14 project. The project comprises gathering information on gravel roads and the present and target state of management, development of management as well as determining further information needs.
- Implementation of new parameters for service level measurement (2005). An inventory will be made on the state of the paved road network by means of a service level measuring vehicle. The equipment will measure the parameters of the road's longitudinal and cross profile. Nowadays, the parameters measured deal with longitudinal unevenness and rut depth, but there are also several other parameters available. The project will clarify the importance of the new parameters as well as their implementation and utilisation.
- Development of utilisation of asset value (2004-2005). In 2005 the focus will be on producing practices and models in order to ensure better compatibility between planning measures, budgeting and bookkeeping. The goal is also to define parameters that connect the value of bookkeeping with road management goals and produce material both for internal use of the Road Administration as well as for communication related to basic documents.
- Calculation of productive assets (2004-2005). The goal of the project is to draft an alternative method of defining asset value. In addition, the project studies defining asset yield. The research also studies the present value of Finnish road assets.
- Implementation of the network level management system (2005). The HIBRIS system is used in financial analysis for the maintenance of the road network and in defining the optimal condition level. HIBRIS is also suitable for analysing bridges, gravel roads and equipment. The technical approval of the system will likely take place in January 2005.
- Development of roadside equipment and instrument models (2005). In the target stage the amount, value and condition of the equipment is known with reasonable accuracy, the information is centralised in use and it is maintained when measures are undertaken within investments and regional contracts. The necessary information needs are defined, a centralized database is collected and its maintenance is defined.

- Development of profitability calculations of road maintenance (2004-2005). This is a cooperation project with S14. The project develops a monitoring and calculation method for maintenance of low-volume roads and bridges. This method makes it possible to evaluate the economic efficiency and the social impact of the maintenance measures.
- Supporting operational guidelines (2003-2006). The research programme has compiled a documentation to employ as background information for paved roads operational guidelines. The work will be continued during 2005-2006, with specifications that support operational guidelines for gravel roads.
- Development of utilisation of asset information (2003-2006). In 2005, the focal point of the work is on describing the state of the road network, communication and education as well as on developing the implementation of the results.
- Development of basic messages supporting asset management (2005). The work specifies the substantive needs for communication related to basic messages, charts the documentation and describes information needs as well as drafts a plan for organising the production of communication material.
- Developing information services products from the asset management perspective (2004-2005). In the future, Finnra will concentrate on the determination and procurement of information services from contractors in the sector, no longer using and developing systems by itself.

3.4 Working markets

Finnra's management group adopted the research plan for the theme Working markets for procurement of road works and services at its meeting 24 May 2004. The financing framework for the years 2004-2007 amounts to 1.9 million Euro. Market management, project data management, acquisition methods, performance requirements and new product and service concepts as well as quality assurance and monitoring were specified as the focal points. In line with the programme steering group decision on 15 November 2004, they were developed as follows:

- a confidential cooperation culture
- new technologies
- information management
- innovative acquisition methods
- quality management.

Thus, the theme of productivity will be more effectively emphasised. The steering group's task is also to act as an intermediary for communication in the infrastructure sector.

In the startup year 2004, the focus was on projects related to market management as well as on preliminary development of incentive payment:

- INKA, development potentials and impacts of alternative procurement methods on the operating environment
- risk management in road maintenance procurement
- preliminary study of electronic trading
- life cycle assessment
- customer satisfaction bonus in connection with maintenance contracts.

In 2005, the development of a confidential cooperation culture will be promoted by continuing the development of incentive payment systems. The goal is also furthered by researching the earnings logic of the markets and developing cooperation as well as by continuing the specification of risk management methods and optimal risk allocation. The InfraRYL project, with the objective to develop the whole infrastructure sector's quality requirement system, will continue.

Procurement methods and quality control development to promote innovation encompasses the following projects:

- performance requirements
- development of product approval
- innovation and product development as a part of service production
- life cycle models for bridge construction and repair
- parameters for procurement cost-effectiveness and efficiency
- automated operating model for quality control.

Development of technology and information management is promoted by the Tekes (National Technology Agency of Finland) Infra 2001-2005 programme. The projects are e.g.

- life cycle management with new technology
- computer networked 3D subgrade strengthening automation
- life cycle and eco-efficiency
- Inframodel II, further development of a common data model.

At the end of 2004, the preliminary study for the INFRA 2010 programme, planned as the extension for the Tekes' infra programme, was completed. The financing need for the programme, joining the Ministry of Transport and Communications as well as administrative institutions, enterprises, municipalities and the National Technology Agency of Finland, is approximately 8-10 million Euro and it comprises four project groups:

- Product model and data transfer, with the objective to develop information management during the infrastructure life cycle.
- Operational models and project procedures, with the objective to develop procurement and contracting services.
- Life cycle know-how and eco-efficiency of infrastructure construction, with the objective to develop product acceptance procedures and development readiness of new products
- Know-how and innovation action; the objective is to guarantee enough skilled workers in the sector.

3.5 Traffic management

The research plan of traffic management was preliminarily approved 17 November 2004. The plan will extend into the year 2007. The plan's development areas are traffic disturbance management, real-time acquisition and delivery of weather data and traffic information, real-time traffic control, information for traffic as well as impact evaluation of traffic management.

The financial framework of the plan, 1.5 million Euro, is divided into three years. The main part of the financing will be allocated to the projects in the development areas. In addition, reservations are made for completing the projects started in 2004 as well as for financing other projects in the development area as well as projects included in sector cooperation, such as the transport telematics programmes AINO and VIKING.

The list of individual projects will change during the implementation of the plan, according to what extent Finnra is requested to join the traffic telematic development cooperation agreement and how Finnra's own current needs develop. It has to be noticed that the target states described below can only be achieved as a joint result of these projects, together with development projects on information systems and telematics investments.

Traffic disturbance management

Establishing Finnra's Traffic Information Centre and the Emergency Response Centre Administration as well as the cooperation contract between these provides for more effective ways of working with respect to disturbance management. Finnra reporting now covers only traffic disturbances that have been confirmed by authorities, leaving out a main part of the unexpected disturbance situations that hamper traffic flow.

The target is that, with the help of a cooperation network and new detection systems for disturbances, the traffic centre has at its disposal exhaustive information on both implicit and unexpected traffic disturbances on main roads and on other important roads, as well as in large urban areas. The traffic centre gathers the information on disturbances from other authorities and commercial actors. The traffic and weather condition monitoring systems produce warnings of possible disturbances for the duty officer. All the traffic disturbances are stored in a disturbance database.

As a result of disturbance management cooperation between authorities, it is possible to minimize the disadvantages for traffic and transportation as well as the resulting incident risks. Nationally uniform modes of operation and measures for disturbance management, emergency routes for the main road network as well as instruction, equipment and contracts related to them have been agreed on and implemented. For disturbance management, contact between the authorities is mainly by automated bi-directional data exchange as well as using the authority network (VIRVE) equipment.

Real-time road weather conditions and traffic information

Nowadays, traffic monitoring is mainly based on approx. 330 automated measurement stations. These stations are placed along the road network mainly taking into account the information needs of road maintenance planning.

The information is too scattered for the needs of real-time traffic monitoring. On a few road sections, the flow of traffic is also monitored by measuring travel duration. The method has proved to be reliable.

The road weather station and weather camera network intended for weather condition monitoring is quite exhaustive, providing pictures of the weather conditions for those road sections where the device is installed. Finnra's road weather service and weather services acquired from the Finnish Meteorological Institute and Foreca Oy sufficiently support the control of the winter maintenance of roads.

The target is to develop the observation network for traffic monitoring in accordance with the national general plan. The unit costs of information gathering will be reduced to 12% of the 2003 level. Traffic information relating to measuring points in congested road sections is available at intervals of one and five minutes and the information is used for short-time forecasts. Mobile phone based or similar monitoring produces reliable link-related travel times from the main road network.

Finnra and its contractors have at their disposal high quality information on weather and road conditions. The information is produced cost-effectively. The contractors' road condition reports and information on measures can be utilised according to the quality level defined in maintenance contracts. The degree of processing the weather and road condition information has been enhanced by means of different analytical methods. The Detector Vehicle Technique is utilised as a supplement to the point information system in urban areas and along the most important main road links.

Real-time traffic control

There are real-time traffic control systems, mainly variable speed limits, on approx. 310 km of the main roads. In addition, there are point-related variable limits and signs, e.g. in school areas. Those variable speed limit systems that function automatically on the basis of information from road weather stations have proved to be reliable, with the result that such a solution improves traffic safety.

The use of the means of traffic control is based in the target state on needs orientation and corridor principles (e. g. E18). The control principles are nationally uniform and followed in all road regions. Control measures take place automatically, based on high-quality and real-time information. The management and monitoring of control system modes are procured as a purchase service. Finnra has the ability to deliver dynamic control information for use in the vehicles' internal systems.

Information for traffic

Finnra's Traffic Information Centre reports on traffic disturbances, traffic and road weather conditions by conveying reports for the benefit of radio stations and by maintaining real-time traffic information on the internet service. The first commercially produced traffic information services that can be ordered by traffic users are available on the market. Above all, conveying information related to traffic disturbances and dangerous road weather conditions in such a way that reach motorists and road users in time, is still a challenge.

In the target state, Finnra offers comprehensive information for road traffic mobility and transportation needs as well as creates the basis for information services in cooperation with other actors. The road users are given reliable information that is, at the most, 5-15 minutes old, as well as predictions of road weather conditions and the traffic situation. Information is especially given in emergency situations. For information conveyance, mass media are utilised, above all radio and the internet. The representation and mode of information promote intelligibility and usability of the message. The information conveyed is regionally allocated. Traffic information changes road user behaviour by promoting performance and road traffic safety.

Impacts of traffic management

The impacts of telematic investment is systematically examined by means of before and after studies. Methods for assessing the impacts of traffic information and disturbance management yield information on these measures' impacts on traffic. There is still very little knowledge of the long-term impacts of traffic management applications. There is still too little information on impacts of traffic management in the impact evaluation systems utilised by road planning.

In the target state, the performance requirements of the most important traffic management services are determined, the impacts of measures are well known and, on the basis of these impacts, traffic management can be more effectively used in operation, resulting in measures being more precisely directed. The best practices for evaluating the long-term impacts are in use.

3.6 Information management

During 2005, the information management focal area plan will be reconsidered. Research and development for information management will be implemented within the framework of the other focal areas and continuation of the Inframodel project is placed in the working markets theme. The starting point of research and development is the strategy of information management. Finnra's main task is to initiate and promote development work as well as to support joint action. Examining the application of sensor technology to road management as well as delivery route and travel dynamic control are important trends.

3.7 Planning and design sector tasks

The sector tasks of planning and design comprise three parts:

- LINTU programme projects
- traffic engineering projects
- Tiennäyttäjä, the Finnra research and development journal and R&D programming tasks.

Projects that benefit traffic safety the most are annually selected for the long-term **traffic safety research and development programme (LINTU)**. The programme got underway in the spring of 2002 and the first projects started in the autumn of 2002. The programme will continue until the end of 2005.

The Ministry of Transport and Communications is primarily responsible for the project, but funding is also received from the Road Administration and the Vehicle Administration. Finnra's annual share of the funding is 120,000 Euro.

The proposed amount for financing **traffic engineering** in 2005 is 320,000 Euro.

Developing means of improving safety:

New means of improving safety are developed, studied, implemented in pilot projects, and their effects will be monitored. This task includes gathering information and experiences from other countries as well as cooperation projects with other actors. In 2005, projects include, among others:

- Developing speed reduction solutions for urban roads and defining guidelines for their use
- Ways of influencing speeds in rural areas, literature review and assessment of the efficacy of means
- Developing crossing arrangements of bicycle and pedestrian traffic. Study of new methods, evaluating usability and planning possible experiments and programming
- Warning drivers of driving outside the designated lane: means and their efficacy and cost, negative effects
- Participating in the projects of other actors.

Guidelines for main roads in urban areas:

The guidelines for main roads in urban areas were last developed in the early 1990s. They need to be renewed and supplemented. The work will be launched in 2005:

- Evaluating the current directive deficiencies and the need for development and defining further measures, as well as formulating a research programme.

Projects relating to junction policies and solutions:

The principles of use of different types of junctions, especially in the main road network, need to be developed and specified. More information as well as experiences of feasibility of different junction solutions and their effects on safety are needed. Also, solutions on how land use and junctions could be integrated into the public road network need to be developed.

- The principles of use of junction types and design, especially in the main road network
- Increasing awareness of the effects of advanced junction solutions on safety and capacity
- Connecting land use and road system junctions to the existing public road network, complementing background information.

Road user service areas

A programme will be formulated and background information gathered to prepare renewal of regulations (parking areas and rest areas, gas stations, checkpoints &c).

Traffic engineering directives:

Current traffic engineering design manuals are updated and renewed to correspond with the procurement procedure. In 2005, the focus will be on:

- Safety and performance of grade junctions
- Cross-sections
- Road alignment
- Road tunnels
- New road types.

Traffic control:

Regulations concerning traffic control will be renewed and complemented and background studies for this purpose will be formulated:

- Developing principles for service area signing: regional route signing plan, signing principles and signs, preparation of legislation
- Developing road markings and related regulations
- Developing readability and comprehensibility of signs and guides
- Guideline updates.

Tiennäyttäjä, the Finnra research and development journal, will be published 6 times in 2005. Estimated cost 45,000 Euro. Finnra also publishes a corresponding quarterly in English, Finncontact. The newsletter is published to inform about road technology, highlights in technical and management issues, written and visual material available, and training.

3.8 Technology sector tasks

The technology sector tasks focus on the following topics:

- structures and equipment
- road surface quality
- geotechnical engineering
- bridge technology.

Structures and equipment, cost level estimate 188,000 Euro:

Guidelines and quality standards are changed to correspond with new forms of contracts. The results also serve the Infra-RYL project.

- Design manual and product requirements model for structural improvement 2004-05
- Excavation works; rock structures 2005
- Road lighting 2004-05
- Contractor's quality reporting 2003-05
- Guidelines on by-product use 2004-06
- Edge support 2005, new materials taken into consideration
- Quality standards for foundations 2004-2005.

In 2005, there will be no funding for the project on using bearing capacity measurement as a quality standard.

Others

- Road Structures project, drainage, several follow-up objects
- Collision tests with concrete parapets 2004-05
- COST reinforcements 2002-05
- Services related to EN standards.

The maintenance of noise barriers project will start only if there is a joint effort.

The project on equipment listing in plans, promoting electronic information management in contracts, will also only start if there is a joint project. There are no resources targeted for these purposes.

Quality of road surface, cost level proposition 110,000 Euro:

The performance standards for road surfaces will be developed towards condition liability contracts and works with a period of warranty of 5 years. These standards will replace traditional technical standards.

- Performance requirements for rut depth, testing the ideal value of the rut depth of the warranty period and developing mathematical modelling
- Developing performance requirements for pavement cracking, defining the harmfulness of irregularities in transverse cracks; developing parameters for an automatic result for damage measurement and comparing it with the old parameters. The project should be implemented in 2004-2007. However, there is no funding for it in 2005.
- Defining whether there is a need for a requirement concerning friction in 2005
- Quality requirements for road pavement weather resistance 2001-05.

Tekes projects

- Infra servicelife: General models for infrastructure service life 2004-05
- Stabilisation of the road base 2002-06
- Road deformation and follow-up projects
- Low-noise pavements, monitoring 2004-05.

The proposal for funding **geotechnical engineering** is 80,000 Euro. Generally, the whole field participates in the projects and the majority of the projects have received financing from Tekes. In cooperation projects, the topic is developed from a broad perspective. Product development work can be included, but Finnra will not participate in it. Finnra supports such projects by participating in, for example, the compilation of quality standards. The following matters have been developed:

- quality standards and threshold values
- quality assessment methods
- databases
- procurement procedures
- calculations for product life cycle cost.

The traffic induced vibration project is managed by the Ministry of the Environment. In the project, recommendations for the limit values of vibration will be formulated as well as a study of the effect that methods of construction have on the degree of vibration. Finnra participates 2003-2005.

A new procurement procedure will be developed in relation to measuring settlement profiles and criteria. As a result, a method of measuring the deviation from the gradient will be developed and information about the feasibility of the standard values permitted for the gradient changes, 2003-2005.

Tekes projects

- GeoSuite, calculation software for geotechnical design 2002-2005
- KallioINFO, database on bedrocks, and a user interface 2003-2005
- Rocks and the environment, a study on environmental management of excavation, 2003-2005.

Design manuals and quality standards

- Pile slabs design and construction.

In CEN standardisation, special attention is paid to taking specifically Finnish characteristics into consideration in formulating standards.

Participating in the development of the bridge technology sector, proposed cost level 270,000 Euro.

Projects will mainly be implemented in cooperation with other stakeholders and sponsors, taking the development of the total infrastructure field into consideration. Development will be channelled more effectively into the economical maintenance of bridges and long-term sustainability. The field is divided into four categories.

- Design:
 - Bridge and soil interaction, 2003 - 2008. Developing a bridge where no bearing or expansion joint device is needed, with significantly lower costs for management and maintenance. In 2005, a loading test for the Haavisto river bridge, final analysis and an intermediate report will be implemented.
 - Developing steel bridges: the economic efficiency of composite girder bridges will be improved by developing the integration of design into the construction and by developing the use of panel shells in the making of bridge decks.
 - Revising the wooden bridge type. The work will begin in the end of the year, provided that the necessary funds are received.
- Construction:
 - Concrete and steel structure research, among the topics 2005 are the factors that start corrosion of reinforcements, fibre optical measuring methods, environmentally friendly painting systems.
- Management, maintenance and repair:
 - How can bridge renovations be accelerated? New effective bridge renovation methods will be developed, taking into consideration traffic disturbance.
 - Follow-up project analysing and reporting the performance of technical solutions, methods for widening bridges and utilisation of old structures.
- Operation, safety and reliability of bridges:
 - Bridge monitoring, a joint project for automated monitoring of bridge condition, 2005-2008.
 - Bearing capacity study for bridges in the heavy transport network and loading tests for determining permissible loads.

Bridge technology regulations and quality standards, proposed cost level 252,000 Euro

Bridge technology regulations and quality standards are formulated for the needs of Finnra and the whole bridge sector. Cooperation will be intensified with the procurement teams.

Implementation of Eurocodes and European standardisation increase the need for more substantial investments in this field. Many standard project drawings are outdated and they need to be renewed. The field is divided into three categories:

- Design:
 - Preparing the implementation of Eurocodes, with translations, comparative calculations, national appendices, cooperation with interest groups, 2003-2008
 - Updating the standard project drawings of bridge parts
 - Renewal of the concrete construction regulations
 - Design manual for steel-pipe bridges.
- Construction:
 - Updating the general quality standards of bridges to meet the new Eurostandards and procurement procedures
 - Renewal of the basis for contract sanctions
 - Guidelines for bridge-specific product requirements
 - Smart bridge.
- Operation, management, maintenance and repair:
 - Regulations and quality standards for repair
 - Quality standards for special bridge inspections
 - Formulating an electronic handbook for bridge management.

The cost level is a restricting factor in launching necessary projects. In addition to previous projects and in relation to the development of the sector, projects that now cannot be implemented would be targeted at wooden and concrete bridge design and cost estimates. In relation to regulations, projects would be targeted at completing regulations, electronic bridge site documentation, renewing scaffolding regulations and calculating bridge bearing capacity.

4 OPERATIONS IN ROAD REGIONS

Regional road administrations conduct projects related to research and development activity

- as a part of Finnra's R&D programme
- as a part of the regional development programme of the road authority and its partners
- as a part of road management or road project requirements, e.g. in monitoring.

Only projects directly connected to the R&D programme are included in centralised programming, funding and reporting. The needs of these projects are determined by the process owners within the core processes. Details of these can be found in the research plans of the relevant themes. For other projects, the region and the R&D coordinator together ensure that their programming, progress and results are adequately reported. R&D is comprehensive; the results of regional innovation must be registered and made available to the entire administration.

Within the cooperation network of the Häme, Turku and Uusimaa regions a project plan will be compiled to develop R&D operations. The regional administrations aim to systematically ensure the implementation of strategic projects. Previous cooperation with universities will be deepened and expanded. R&D work will be integrated in know-how development.

Projects implemented in the **Uusimaa** road region are, for example:

- Bachelor's thesis on interactive design and Finnra's customer contact surfaces, linked to the client requirements programme.
- Study of road user satisfaction in the Helsinki metropolitan area.
- Master's thesis on Finnra's land acquisition for road projects.
- Relating to the AINO programme, research on managing the disturbances of large road works and ramp control design and realisation.

Projects implemented in the **Turku** road region are:

- Developing E18 Muurla-Lohjanharju life cycle model
- The life cycle model's challenges to design, Master's thesis
- Heavy traffic drivers' views of traffic safety, two Master's theses
- Continuing the 2004 cooperation project on improving the traffic safety of Main Road 8, follow-up of effects
- Ferry traffic procurement and tendering
- Follow-up research of the usage of the high-quality express bus stops on Road 110.

In the **Häme** road region, there are Master's theses in preparation on

- Structural improvement projects quality control and quality specifications
- Development of regional contract works.

As part of the S14 project, a Polyroad pilot and monitoring will be conducted in Janakkala. Guidelines for gravelling regulations will be developed. The project concerning "Divergent and specialising regional development, the significance of road management in regional development in Southern Karjala, Pirkanmaa, Northern Ostrobothnia and Southwest Finland" continues.

The projects of the **Southeastern Finland** road region focus on traffic control:

An elk warning system aims at improving traffic security in elk routes. The warning system's experimental site is on Main Road 5 in Mäntyharju. Problems in the technical performance and reliability of the original system installed in 1997 were mainly linked to detector function. In 2003, an alarm system based on pattern recognition was installed. Also, a video monitoring system that continuously records visual information from the area was installed. The information will be analysed and a report on results of the experiment and recommendations for further improvement will be made at the beginning of 2005.

For several years, Finnra has tested the station and sensor technology relating to roadside weather monitoring. In the winter 2004–2005, a new weather sensor using optical observation is being tested in Utti. Monitoring the Boschung roadway weather information station, two simplified weather stations and a frost sensor installed in 2003 will continue. Reports on different tests will be completed by the end of 2005.

During 2005, relating to Finnra's weather camera system, a new video server will be tested, because the manufacture of the current AXIS video server will end in the near future. A substitute will be chosen on the basis of the tests.

Savo-Karjala road region specialises in management of the low-volume road network, customer orientation and environmental know-how. Research aims at

- developing the region's preparedness in these fields
- analysing the effects of road maintenance
- improving the allocation and efficiency of road management resources
- improving customer satisfaction and furthering the development of environmentally adapted products and methods.

The goal of the inexpensive speed-reducing solution project is to develop a device supporting speed limits. The idea is a 3-5 centimetres deep transverse groove that is cut in the full width of the roadway. The groove would replace the bump and it would work as a speed-reducer in both directions or work in one direction akin to an elevated zebra crossing or a sloped junction. The objects have been implemented in 2003-2004.

Possibilities of reducing chloride content in ground water are studied in a potassium formate experiment in Lintuharju on main road 9 and Jaamankangas on main road 6. The project was launched in 2004.

The aim of the performance standards for gravel roads project is to develop performance standards for regional maintenance contracts to define the desired surface condition, structural condition and drainage performance. The project was launched in 2004 and it terminates in 2005. The study is part of Finnra's strategic project S14.

"Increasing customer-orientation in winter road maintenance" is a thesis that aims at improving road user services. The study will be finished in spring 2005.

In **Central Finland** road region, a Master's thesis is under way on waste transports in the area. The study will be finished in 2005.

SORAVOL pilot:

The project on the standard of service of the gravel roads in Vaasa, Oulu and Lapland road regions provides practicable structural solutions and repair methods for gravel roads in the regions. In the pilot project, solutions will be tested in various environments and their usability will be established through monitoring and reports.

Traffic information services in the Oulu region:

The project develops the operational model, content and implementation of traffic information services in the Oulu urban region as a public-private partnership. Based on the study, decisions on starting a prospective service pilot will be made. The objective is a model that can be applied nationwide.

5 COOPERATION

5.1 Developing cooperation

Road regions undertake cooperation with universities under agreements made by Finnra:

- The Turku road region has a cooperation agreement with the Department of Psychology and the Department of Geography of the University of Turku and with the Centre for Maritime Studies
- The Häme road region has a cooperation agreement with the Tampere University of Technology.

The Central Finland road region aims at an agreement with the Faculty of Information Technology and the Psychology Research Institute of the University of Jyväskylä. The prospective forms of cooperation will be specified this year. Other agreements are being prepared.

The working group studying R&D cooperation in the administrative branch of the Ministry of Transport and Communications gave its recommendations on developing cooperation on June 13th 2003. The group proposes forming a R&D strategy for the whole administrative branch as well as developing common methods of procurement, project management and communication.

The Ministry's statement of 8.12.2004 notes the Ministry's units as well as the departments and research institutes of the administrative branch should pay special attention to their policies regarding internationalisation in planning R&D activities in 2005.

In its statement concerning infrastructure know-how and organisation of R&D activities, MANK, the consultative committee for the sector, proposed the following on 15.11.2004:

- increasing significantly the funding for long-term development of know-how and R&D activities, to a target level 2% of production value, i.e. approximately 70 million Euro of private and public funding. 15% of the sum would be channelled into basic research in the field, 35% into applied research and 50% into product development.
- establishing a special research fund
- starting a new Tekes research programme
- ensuring sufficient training and entrants to the field
- supporting the development of innovative work communities, networking of the operators in the field and international cooperation as well as developing the procedures of implementing R&D results. Development of procurement procedures that promote innovations should be continued with joint efforts led by the Finnish Association of Building Owners and Construction Clients (RAKLI), for example.

The development programme Infra 2010, launched by the governmental Infrastructure Forum, aims at securing the continuation of the investments of Tekes' INFRA Construction and services technology programme that was recently completed.

The objective of the programme is to improve the quality of construction and maintenance and increase productivity for users, owners and producers. The programme was published in December 2005.

In 2004, Nordic road administrations have agreed upon two development programmes:

- Together with rail administrations, the decision was made on the "Gemensam Nordisk Anläggningsmarknad" programme that promotes Nordic markets and long-run performance in the sector. Nordic cooperation for development of procurement procedures and operational methods was launched in 2003 and its first stage was completed in 2004. The work will continue by implementing the projects that were approved in the first stage. Finnra is responsible for two sub-projects: Terminology and concept database and Developing Procurement Procedures and alternative forms of cooperation.
- The road and traffic research programme "Nord-FoU vej&trafik" will launch an estimated four new projects in 2004-2005. The agreement aims at increasing the Nordic research contribution in the road sector. A project-specific cooperation model is included in the agreement. Finnra is responsible for the project concerning bridge life cycle analysis. The implementation of the project will start in the spring 2005.

NordFoU vej&trafik	2005	2006	2007
Nord2000 Road Engineering Model (responsibility: DK))	34	34	
Night-time road works illumination disturbance (S)	5	5	5
Flexible pavement deterioration modelling (N)	5	5	5
Bridge life cycle analysis (FI)	30	30	30
(1000 e)	74	74	40
Gemensam Nordisk Anläggningsmarknad, Finland's part, tot, Terminology and concept database Procurement procedures and alternative forms of cooperation	60...70		

These programmes will be executed in cooperation with the relevant sections of the Nordic Road Association.

ERA-NET ROAD is a three-year programme for R&D cooperation of European road administrations. The programme focuses on the launching and coordination of research in the field of management and maintenance of the strategic road network. Countries jointly participate in the funding and as a result national programmes are also opened to international cooperation.

Finnra coordinates two of the seven WPs of the programme: study and evaluation of the procedures in different countries as well as analysing possibilities and needs for cooperation. Finnra has also made a significant contribution to studying joint activities in current programmes. One aim is to start one or two projects as quickly as possible in order to develop and test more efficient cooperation procedures.

Finnra representatives participate in projects of ERA-NET TRANSPORT, the Ministries of Transport programme. This programme started in 2004.

5.2 Cooperation programmes

Finnra participates in several national and international R&D programmes. Programmes of the Ministry of Transport and Communications are:

- AINO, R&D programme for transport telematics services
- DIGIROAD, national road and street database
- ELSA, free and unhindered movement
- LINTU, long-term traffic safety research and development programme

Programmes of the Ministry of the Environment are:

- Ecoefficient society, part of the environmental cluster programme
- Environmental cluster projects are LIIKEVÄ, traffic-induced vibration, MELUTTA, noise-reduction in urban areas and NIINI, the effects of mowing on diversity.

Programmes of the Ministry of Agriculture and Forestry are:

- MOSSE, biodiversity research programme.

TEKES programmes are:

- Infratechnology programme 2001-2005
- INFRA 2010 programme

DECOMB - Design Concepts and Management of Built Environment is a group project in 2005-2006 funded by Tekes.

Other Finnish programmes include:

- Competitiveness of the rock construction development programme (Finnish Tunnelling Association).

Nordic cooperation programmes are:

- Gemensam Nordisk Anläggningsmarknad, the programme developing the infra markets of Nordic road and rail administrations
- NordFoU Vej&trafik, the road and traffic R&D cooperation programme of the Nordic road administrations

In the field of traffic technology, cooperation networks and programmes between Nordic road administrations concern:

- road user behaviour and road design
- road equipment development
- traffic control and route signing development.

The umbrella organisation of these groups is Vägregelgruppen, a cooperation network for persons responsible for technical guidelines in Nordic road administrations. Decisions on common R&D projects have been made case by case. There is a list of the projects that is checked each year.

EU programmes are:

- FWP 6, the sixth research framework programme, Finnra is participating in the Sustainable Bridges project
- COST, EU research cooperation programme
- ERA-NET TRANSPORT, R&D programme of Ministries of Transport
- ERA-NET ROAD, the planned road administrations R&D cooperation programme
- VIKING, programme developing traffic control.

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