



**FINNISH ROAD
ADMINISTRATION**

Finnish Road Administration

Road Research and Development Guidelines 2006-2011



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SUMMARY

When the Road Administration and the Road Enterprise were separated in 2001, the Road Administration Management Group decided on the mission and vision of the Administration. This also guided development of the Administration's R&D strategy, which was adopted on February 26, 2002. In 2005 the decision was made to revise this strategy in line with the new Operations Strategy for the Road Administration. The Road Research and Development Guidelines 2006-2011 are also based on projects that develop both cooperation between the administrations of the Ministry of Transport and Communications and international cooperation.

The Administration's Operations Strategy states "the Road Administration has key responsibility for research and development in the road transport sector. We use approximately 2 % of basic road funding for development of the administration's processes and for road research and development."

These guidelines implement decisions on development methodology and the Road Administration's processes. Development programming will be closely linked to strategic planning and the four-year finance and action plan. The goals of R&D have not changed, but the themes, cooperation methods and dissemination and implementation of results have been revised.

The goal of road research and development is to develop new knowledge and skills to improve the performance, safety and competitiveness of road transport, as a part of the entire Finnish transport system, on a sustainable basis. This involves applied research that serves transport system development and road management as well as development and implementation of road management guidelines, performance specifications and methodology.

As the present research programs of the R&D themes end, the content and interfaces of the themes will be revised, aiming at a close linkage to the key tasks of the Road Administration. The 2011 theme structure focuses on the role of the road network, road management and road transport as a part of the whole transport system.

2006 themes	2011 structure
Client requirements	Transport system - level of service
Traffic management	- capacity
A safe and eco-efficient transport system	- eco-efficiency and safety
Asset management	- economy
Co-operative programs	Cooperative programs
Road management sector tasks	Road management sector tasks

R&D is based on an assessment of the whole road management sector, made in collaboration with stakeholders. The main stakeholders in R&D are the Ministry of Transport and Communications and its administrations, our clients and their organizations, providers of R&D services and training, and the civil engineering sector's national and international partners.

FOREWORD

When the Road Administration and the Road Enterprise were separated in 2001, the Road Administration Management Group decided on the mission and vision of the Administration. This also guided development of the Administration's R&D strategy, which was adopted on February 26, 2002. As the Road Administration's operating model evolves, the time has come to revise the strategic work done then.

In the autumn of 2005 the Road Administration Management Group decided on a strategy framework comprised of two strategies: a road management strategy and the Road Administration's Operations Strategy. The principles of R&D policy work were defined in the management's strategy seminar in August 2005. In September the Management Group decided on the itemization and methods of development, which is comprised of operations development, development of the Road Administration's operation and road management R&D.

Development is steered by the Road Administration's Operations Strategy:

The Road Administration has key responsibility for research and development in the road transport sector. We use approximately 2 % of basic road funding for development of the administration's processes and for road research and development. The main emphasis of road management research is on the Road Administration's areas of core competence.

These road management R&D guidelines implement decisions on development methodology and the Road Administration's processes. Development programming and decision-making will be closely linked to strategic planning and the finance and action plan. The goals of R&D have not changed, but the themes, cooperation methods and dissemination and implementation of results have been revised.

These guidelines are also based on projects that develop both cooperation between the administrations of the Ministry of Transport and Communications and international cooperation.

The Road Administration Management Group approved these guidelines on March 27, 2006.

Helsinki, March 2006
Finnish Road Administration

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1 ROAD MANAGEMENT R&D AIMS

The goal of road research and development is to develop new knowledge and skills to improve the performance, safety and competitiveness of road transport, as a part of the entire Finnish transport system, on a sustainable basis. This involves applied research that serves transport system development and road management as well as development and implementation of road management guidelines, performance specifications and methodology.

The Finnish Road Administration's (Finnra's) research and development is focused on managing the impact of road management and on developing products and services based on the needs of society. This requires wide-ranging cooperation with authorities, research institutes, educational institutions and other bodies of specialists.

The Ministry of Transport and Communications (MTC) steers the operation of transport route agencies by means of effectiveness goals. In meeting these goals it is necessary to choose measures and sites and to specify related quality requirements. While other stakeholders in the sector are responsible for technical development of services and materials, it is Finnra's job to ensure that the whole process, from requirements to products, is functional, and Finnra also participates in their development.

2 ROAD MANAGEMENT R&D THEMES

As the present research programs of the road management R&D themes end, the content and interfaces of the themes will be revised, aiming at a close linkage to Finnra's key tasks. The 2011 theme structure focuses on the role of the road network, road management and road transport as a part of the whole transport system. The target structure is itemized in line with the European Road Transport Research Advisory Council (ERTRAC) program and vision 2020.

Themes 2006	2011 structure
Client requirements	Transport system level of service capacity eco-efficiency and safety economy
Traffic management	
A safe and eco-efficient transport system	Cooperative programs Road management sector tasks
Asset management	
Cooperative programs	
Road management sector tasks	

Implementation of the target structure will begin on the basis formed by the present themes, and the structure will be taken into use as the present research programs end.

2.1 Transport system level of service

The level of service is comprised of the relationship between requirements placed on the transport system, goals and conditions that define the range of services provided. The objective of the theme is to adapt road management

development measures in such a way that they support a level of service that truly meets the needs derived from social development and the researched demands of various client groups.

Definition of concepts related to the level of service

Concepts related to the level of service are needed in operation management, beginning from monitoring the present state and leading to planning, setting of goals and decision-making. A framework will be created for concepts related to the level of service and then the concepts will be defined. Utilization and regional definitions of client segmentation developed in the client requirements research program will be developed. Client participation in defining the level of service of the transport system will be developed.

Assessment of needs related to the level of service

Changes in the operating environment that are reflected by the level of service will be studied. Society's will regarding the level of service and the significance of a promised level of service in various typical environments and road network classes will be examined, while taking into consideration the conditions and limitations of providing the service. Assessment methods developed in the impact management research program will be utilized in defining concepts related to the level of service and in creating performance meters.

Transport system planning tools

Cooperation methods and tools will be developed for transport system planning, implementation and impact assessment. Operating methods required by everyday information society, such as interactive information services and official services, will be developed.

2.2 Transport system capacity

The goal is to create the prerequisites for developing traffic control, information services and road network maintenance and development in such a way that the target levels of service and other road management goals are achieved as economically as possible from society's standpoint.

Meters and assessment of transport functionality

Descriptions and assessment criteria of the quality of road and traffic conditions will be developed with the goal of creating balanced performance meters and logically integrating the level-of-service goals and the functional quality requirements of road maintenance products. The changing prerequisites and needs of different road user groups will be assessed, deepening the results of the client requirements program and integrating them in road management products. The effects of developing vehicle technology on the features and quality of road management products will be examined.

Traffic control and influencing road network use

In line with the traffic management service vision 2015, operation will be developed so that

- road users and commerce will have access to information needed in daily travel and transport and in planning both trips and transports
- dynamic traffic control methods will promote efficient use of the road network, especially in easily congested urban areas and on trunk roads

- the detrimental effects of traffic incidents on traffic and transports will be minimized and unexpected disturbances eliminated quickly
- location and user-specific, tailored added-value services that significantly improve travel safety can be produced for vehicle terminals; technical development has also made it possible to collect road tolls.

Maintenance

Definition of the requirement level and impact assessment of maintenance will be developed. Solutions for ensuring the day-to-day condition of transport routes and maintaining them will be developed further, based on the results of the economic maintenance of low-volume roads project, especially with respect to the lower-class road network.

Rural transport route infrastructure

Planning solutions, traffic control and services will be developed in such a way that the target level of service is achieved at reasonable cost. Efficient solutions for improving safety, ensuring smooth traffic flow and reducing the number of traffic incidents will be developed while taking into consideration the specific characteristics of different road classes. Investments will be made in the prevention of head-on collisions, the road surroundings, speed control, the recognizability of road types, and to influence the use of the road network. Permanent traffic control solutions will be developed to make them more understandable and user friendly for road users.

Population center transport route infrastructure

Networked and physical models that enhance the usability and performance of transport routes, traffic control and management, and cooperation will be developed. Redivision of the road and street space will be examined and compact transport route solutions that take different modes of transport into consideration will be developed. Solutions will be developed that enhance the smooth flow of public transport and improve the conditions of pedestrian and bicycle traffic. Methods of taking goods transport into consideration better will be studied. Integration of land use planning and transport planning and anticipation of the impact of changes in land use will be enhanced.

2.3 Transport system eco-efficiency and safety

Transport system level assessments will be used to determine how road administration and road management methods as well as cooperation can be employed to promote the goals of eco-efficiency and safety and to promote methods of influencing the distribution of work among different modes of transport. Finnra will participate in influencing mobility and developing logistics together with other stakeholders that produce transport route and transport services. Improvement of cooperation between modes of traffic and transport will be assessed, as well as points of convergence and contradictions between eco-efficiency and safety. Connections to area use planning will be examined.

Eco-efficiency

The role of road management in reducing greenhouse gases by using methods that improve the efficiency of the transport system and by producing tools for cooperation to reduce the pressure on traffic to grow will be studied.

To prepare for a climate change, risk analysis and basic knowledge will be developed, as will support for structural and maintenance measures.

Solutions that save the environment and reduce environmental loading; methods of evening loads on different sectors and areas of the transport system; assessment methods, criteria and indicators of eco-efficient road management; and life cycle assessment of products and services will be developed. Methods of promoting more efficient use of materials and replacing the use of natural aggregates will be developed together with the sector, as well as structural, pavement and maintenance solutions that lower air and noise pollution.

Finnra will participate in studies related to preserving natural diversity and will examine road management methods for identifying sites and actions and for developing operations that are critical from the standpoint of diversity.

Safety

The stakeholders of the transport system are responsible for developing the system so that people can travel without sustaining serious personal injuries regardless of possible human misjudgements and errors. Safety is included in several R&D themes, such as transport system capacity and sector tasks. Interaction ensures sufficient scrutiny of the main viewpoints.

Descriptions of safety situations as well as accident statistics assessment and compilation of their source material and risk analyses will be developed. The safety effects of implemented road management measures and speed limits will be studied. Safety assessments will be included in traffic and land use planning systems and models. The possibilities of enhancing safety with technical systems and their impact on safety will be examined. To promote the road safety vision, Finnra will participate in joint programs and projects of administrations, various stakeholders and numerous scientific fields.

Impact management

To facilitate decision-making, the impact assessment method developed in the impact management research program will be adapted to different planning levels. Operationalization of the effects of road management will be tested and developed further. Concept creation and measurement of effects are characterized by continuous development; understanding and knowledge of the manifestation of issues are continuously changing.

2.4 Transport system economy

In this theme the concepts, methods and procedures used in economic analyses of various sub-areas will be harmonized. The productivity of road management and the performance of processes will be improved significantly, with an eye on efficient road management and road transport, i.e. an optimal balance between resources invested in road management and road transport services and achieved results. Economy will also be examined as a part of the transport system; how resources invested in road management can be used to make operation of the entire system more efficient.

Effective road management products and solutions

Issues related to efficient production of road management products and their combinations will be addressed. Assessment will emphasize transport-related economic effects. Impact assessment methods will also be applied.

Development of product and asset monitoring and control systems will be continued. Operating methods created in the asset management research program will also be applied to other road management products. Road sector service or performance level monitoring and development anticipation procedures will be developed. Monitoring meters will be developed, while taking into consideration how they indicate needs arising from social development and clients' needs. A method will be developed for estimating the relationship between resources placed at different parts of the network and their transport-related significance, with the goal of producing information with which to specify the optimal extent of the network.

Development of the information base and modeling of traffic and road management

Software calculation models and operating principles that Finnra is responsible for will be harmonized, and readiness to use the models in road management planning will be improved. Finnra will map the micro- and macro-level assessment situations related to monitoring and planning in which models can be utilized more than they currently are. The extent to which the road management information base should be developed will be assessed.

Road management cost control

Road management cost information is crucial in meeting the challenge of fitting together financial resources and requirements placed on road management. Investment cost information has been significantly improved in the Infra project cost control development project. Finnra will assess whether a similar procedure can be used to produce information about the unit cost of other products and solutions. Information about the road management costs of road classes and regions will be produced for road management planning needs.

Road management cost control includes optimization of the entire life cycle of the road infrastructure. With correctly timed, planned and focused measures, life-cycle costs can be minimized and the yield of placed resources can be maximized. This requires long-term knowledge about the factors that influence road management.

Road transport driving costs

The unit values of road transport driving costs will be updated in 2009-2010. In that conjunction Finnra will examine a renewal of the value of time, based on a study of willingness to pay, and the basis of the unit values of traffic noise.

Road transport pricing

Finnra will study the impact of road transport pricing, the technical possibilities of implementation, the principles of specifying payment and specification of costs used as a basis for payment.

Efficient road management procurement methods

Procurement methods and bonus systems that motivate stakeholders to produce desired road management effects will be developed further. Finnra will assess the effectiveness of implemented road management procurement models as well as other implemented and planned procurement methods of infra construction in order to determine the strengths and weaknesses of different procurement methods in different environments. Development of road management market's monitoring tools will be continued.

2.5 Cooperative programs

Cooperative programs support active participation in program creation and implementation. The goal is to develop and use common domestic and international technological solutions, operating methods and standards in a controlled way and to strengthen the sector's know-how, attractiveness and capability.

Finnra will participate in cooperative programs and projects that contribute to the implementation of the R&D themes. If a program can be easily placed within the framework of a certain theme, it belongs in its research program. Programs that are difficult to place within a theme because of their scope, timing or other characteristic are placed under cooperative programs.

The MTC's administrative sector's R&D strategy can produce programs in which Finnra can participate through this theme, but for the most part its common projects are situated within other themes.

The INFRA 2010 development program started by the MTC's transport route committee aims at increasing the sector's productivity and attractiveness. The purpose of the program to be implemented in 2005-2008 is to gather the sector's important areas of research and development into an entity that will promote the sector's competitiveness. The program comprises four project entities:

- a product model and information transfer, with the goal of developing information management during the life cycle of the infrastructure
- operating models and project processes, with the goal of developing service entities related to procurement procedures
- life cycle know-how and eco-efficiency of infrastructure construction, with the goal of developing the product approval procedure and readiness to create new products
- know-how and innovative activity, with the goal of ensuring enough competent employees for the sector.

ERA-NET ROAD, the common R&D programming development project of ten EU road administrations, was started in 2005, and by 2008 it will create a basis for creating joint programs, common funding and mutual procurements. Continuation in the period after 2008 will require the participation of several road administrations and would correspondingly mean that the EU would participate in financing the projects.

The sub-projects of the Gemensam Nordisk Anläggningsmarknad program that is studying the pan-Scandinavian construction markets will be completed in 2006. A decision-in-principle has been made to continue the pro-

gram. The framework agreement of the NordFoU vej&trafik cooperative program of the Scandinavian road administrations was made in 2004. The objective of the program is to strengthen Scandinavian cooperation by developing new work methods, project management models and projects.

2.6 Road management sector tasks

This theme comprises research and development of road management planning, road engineering and geotechnology, and bridge engineering. The theme continues the research program compiled for 2006-2009, which will be reviewed in accordance with Finnra's core competence reviews. The studies deal with transport engineering, traffic control, road equipment, pavements, super- and substructures, and bridges and tunnels to the extent that the results serve planning and procurement of construction and maintenance.

Many projects will be implemented and funded in cooperation with other developers, the road administrations of other countries, or companies. The results serve the compilation of Finnra's and the sector's common quality standards, instructions and recommendations.

The theme encompasses studies and investigations that are used to

- carry out Finnra's responsibility for maintaining and developing transport route technology know-how and for compiling guidelines with respect to substance areas belonging to sector tasks
- develop quality standards and tools needed in procurement procedures that promote the use of new technology and companies' R&D
- examine the functionality of current practices and the need to improve them and search for and develop improvement proposals.

The theme enhances connections to information produced in other research themes, especially related to client requirements, traffic management, eco-efficient and safe transport system, and asset management.

3 FUNDING

According to the funding objective, Finnra's investment in development should increase to 2 % of basic road management, of which R&D's share is about one half. Another goal is that about half of the funding should be used for broader cluster and cooperation programs. The share of cooperative programs at Finnra will grow during this period, but their size will be determined by the projects included in the programs and how they support the implementation of Finnra's R&D objectives.

According to Finnra's plan of action and financial plan, development will be funded as follows:

Function	Real.	Real.	Est	Plan period				
	2004	2005(€)	2006	2007	2008	2009	2010	2011
Road management R&D program	4,5	4,5	4,0	4,0	4,0	4,0	4,0	4,0
Operational development program*		1,9	3,5	3,5	3,5	3,5	3,5	3,5
Operations development		1,0	1,0	1,0	1,0	1,0	1,0	1,0
Total (millions of euros)		7,4	8,5	8,5	8,5	8,5	8,5	8,5

*costs included in administrative expenses

4 IMPLEMENTATION

4.1 R&D programs and projects

According to the 19.9.2005 decision of Finnra's Management Group, development planning and decision-making is linked to strategic planning and the plan of action and financial plan. The focal areas and principles of development are handled in the management's strategy seminar and they are decided on by Finnra's Management Group. Road management's four-year research and development program, like Finnra's four-year operational development program, is compiled separately and decided on by the Management Group. The results are recorded in Finnra's plan of action and financial plan.

The main office is responsible for the focal areas and lines of development and preparation of the programs.

Process owners and heads of separate functions are responsible for defining development projects with the support of development groups and product and specialist networks. Development needs are defined on the basis of strategic policies and self-evaluation. Cooperation between process owners ensures balanced development. Common criteria are created for project assessment and prioritization.

The specialist services unit is responsible for implementing road management R&D projects. Projects that will be implemented in the coming year are recorded as part of the result agreement. Implementation of the yearly program is monitored by means of result monitoring as well as interim and annual reports.

A 3 – 4-year research program is compiled for each theme. A steering group is assigned to the research program. The steering group supervises realization of goals and the plan of action, and if necessary, makes steering decisions concerning content. Depending on the length of the planning period, 1-2 interim reports are compiled for review by Finnra's Management Group. Management of program projects is specified in the operational system.

Projects related to research and development activity are implemented in the districts

- as part of the road management R&D program

- as part of the regional development program of the districts and their co-operative partners
- as part of road management or road project responsibility, i.e. follow-up.

Projects linked to the road management R&D program are included under centralized programming, funding and reporting. As far as other projects are concerned, programming, progress and results must be reported adequately. R&D is wide-ranging; the results of districts' innovations must be recorded and made available to the entire administration.

4.2 Cooperation

Finnra's research and development is based on an analysis of the entire road management sector, which Finnra carries out together with its interest groups. The main stakeholders in R&D cooperation are the MTC and its administrative sector, clients and their representative organizations, producers of R&D services and know-how, and national and international partners in the infra sector.

As the distribution of tasks between **civil engineering and transport organizations** changes, the responsibilities for developing the sector have partly been left unclear. The sector's common funding will be investigated in line with the administrative sector's R&D strategy, with the goal of enhancing long-term basic research, transport system-level R&D, stakeholders' cooperation, and interaction. Finnra will participate in this work.

The common themes of the **MTC's administrative sector's** R&D are:

- a common information base for operational planning
- effects of the transport system and measures focusing on it
- methods for improving the transport system
- development of the efficiency and profitability of administration.

The administrative sector's joint projects are created within the framework of these themes. From the standpoint of the administrative sector's R&D, the critical factors of success are correct focusing, sufficient volume, ensuring the utilization of results, and ensuring internal profitability and efficiency. One of the goals of the administrative sector's strategy is to clarify the roles of the Ministry and agencies so that operational activity is increasingly carried out by agencies. This will also expand Finnra's responsibility for the administrative sector's programs and projects.

The **other primary financiers of research and development** are TEKES, other ministries, and the Academy of Finland. Finnra's goal is to increase the amount of funding allocated to joint programs in cooperation with the MTC's administrative sector in order to create effective, focused long-term investments. This will also contribute to the development of know-how.

To ensure the sector's competence and competitiveness, Finnra develops cooperation with R&D producers such as **research institutes, educational institutions and consulting agencies**. Programming and procurement methods are developed in such a way that road management R&D also

- supports educational institutions' work of producing specialists for the sector through framework agreements
- supports research institutes in creating centers of expertise
- reinforces consultants' prerequisites for developing their competitiveness by employing methods that reward innovative work methods.

The goal of the know-how cluster model is to ensure operational development, the availability of know-how and specialists, and technological development, and also to steer development. Finnra also supports post-graduate doctoral studies and other thesis projects of its staff.

The framework agreement procedure will be developed together with the rest of the administrative sector. R&D procurements will be carried out by means of framework arrangements and other tendered procurement procedures in such a way that fair development and functionality of the market is ensured. Procurement documents specify the open usability of development results, while securing the business secrets and technological innovations of service providers.

Scandinavian and international cooperation is directed on one hand toward projects funded by the EU, for example, and on the other hand toward joint programs. Finnra's goals are to

- fully utilize international road management know-how in Finnish road management
- support the international projects and connections of national stakeholders
- provide the initiative in focusing and implementing projects and programs
- enhance dissemination of information about projects and their results, for example through congresses and professional publications.

Finnra will invest in the creation of joint programs in which funding and project management are also jointly implemented. This model will be developed in the NordFoU vej&trafik program and the ERA-NET projects, and it is expected to be taken into broader use after 2008.

4.3 Dissemination and implementation of R&D results

Utilization of the results of R&D will be developed further. The project procurement and management guidelines included in Finnra's operational system also contain procedures for taking into use and for quality assurance. The MTC's administrative sector will develop common R&D communication routes and harmonize the operating methods of different administrations.

Research and development of road-related structures and equipment and research and development methods are mainly funded and implemented by enterprises. Finnra will support the research and development of enterprises by means of clear-cut quality requirements, by developing markets and product approval and by participating in the sector's joint projects and experiments according to Finnra's needs and possibilities. At the same time Finnra's goal is to ensure fair development of the markets. In joint experiments, the results of experiments initiated by Finnra are public. Finnra accepts the fact that some product information is confidential or patented.

Finnra offers experimental construction sites for development projects and pilot experiments and also supports experiments as far as reference structures, functionality monitoring and development of quality measurement methods are concerned. Contracts include such development sites and sector-developing R&D that could result in a development award if implemented successfully.

Finnra will strive to develop quality requirements and approvals common to different countries in order to make the markets sufficiently attractive. As a standardizing body of the road sector, Finnra will ensure that common standards take Finnish needs into consideration.

5 APPENDIX

The Road Administration participates in several national and international cooperative programs:

Ministry of Transport and Communications programs:

- AINO, dynamic traffic information program
- DIGIROAD, national road and street information system
- ELSA, towards unobstructed mobility
- LINTU, long-term road safety R&D program.

Ministry of the Environment programs:

- Eco-efficient community, environmental cluster program
- UUMA, new material technology for civil engineering
- Environmental cluster projects include LIIKEVÄ, traffic-induced vibration, MELUTTA, noise prevention in population centers and NIINI, effects of mowing on diversity.

Ministry of Agriculture and Forestry programs:

- MOSSE, natural diversity research program.

Finnish Funding Agency for Technology and Innovation (TEKES) programs:

- Infratechnology program, which ended in 2005
- INFRA 2010 program
- SERVE, innovative services program
- MASI, modeling and simulation program

DECOMB, planning and management of the built environment, is a TEKES-funded group project.

Other domestic programs:

- Competitiveness of rock construction development program.

Scandinavian co-operative programs:

- GNA, Gemensam Nordisk Anläggningsmarknad is a program that develops the infra markets of Scandinavian road and rail administrations
- NordFoU vej&trafik, Scandinavian road administrations' road and transport-related cooperative R&D program.

Cooperative networks and programs in the transport engineering sector:

- traffic behavior and road planning
- NMF, road accessories and equipment
- NORTEK, traffic control and traffic sign development.

The umbrella organization of these groups is Vägregelgruppen, a cooperative network responsible for technical guidelines.

EU programs:

- FWP 6, 6th framework program for research; the Road Administration is participating in implementation of the Sustainable Bridges project
- COST, EU's research cooperation development program
- ERA-NET TRANSPORT, MTC's R&D cooperation program
- ERA-NET ROAD, road administrations' R&D cooperation program
- VIKING, road traffic management development program.

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