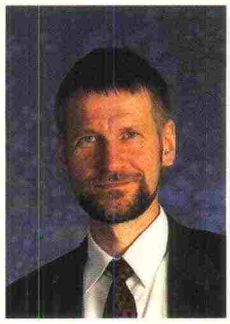
Environmental Report 2001

FINNISH
RAIL
ADMINISTRATION

Contents

This report focuses on the state of environmental matters in the Finnish Rail Administration in 2001. It also summarizes the result of work in the environmental programme period 1999–2001.The report is also available on RHK's website at www.rhk.fi/english



Environmental matters an important part of infrastructure management

The rail sector is going through a period of intense change and development. Organizations have been reformed, activities have been reorganized, legislation has been amended, new rail projects are creating better conditions for rail traffic and the service level is being improved with the help of modern maintenance. Research and development in the rail sector adds its own contribution in this respect.

Change and development are always linked to responsibility, and nowadays this increasingly means responsibility for environmental matters. The point of departure in the Finnish Rail Administration's environmental policy is that activities and development should be guided by the principles of sustainable development. Activities' impact on the environment is constantly monitored so that environmental management can be further developed.

In defining environmental objectives RHK has taken into consideration the objectives and principles adopted by the Ministry of Transport and Communications and the European Union to reduce the environmental impact of traffic. On this basis RHK has developed an environmental system which covers all its activities.

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New challenges for environmental management in the rail sector are presented by the Ministry of Transport and Communications' management by objectives and evaluation of the environmental system. Developing a monitoring system, gauges and indicators is necessary to ensure the efficiency of the entire system.

Environmental matters are also in the spotlight in new projects such as the direct line from Kerava to Lahti, the Vuosaari harbour line and the proposed airport line in the Helsinki region.

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It is always easier to meet new challenges if activities in the past have been managed effectively and on a sustainable basis. This report summarizes key events in RHK's handling of environmental matters during the period 1999–2001. The report indicates that the objectives for the period have been achieved well.

RHK's environmental vision and strategy have provided a good basis for the long-term development of environmental matters. RHK is building an environmental management system in order to develop the environmental quality of its activities, to serve its customers' needs and to take care of its responsibilities and obligations comprehensively.

The environmental management system makes environmental matters part of RHK's normal decision-making. Operating according to the principles of sustainable development requires awareness and responsibility for the environmental impact of activities on the part of every employee.

Helsinki, September 2002

Ossi Niemimuukko
Chief Director

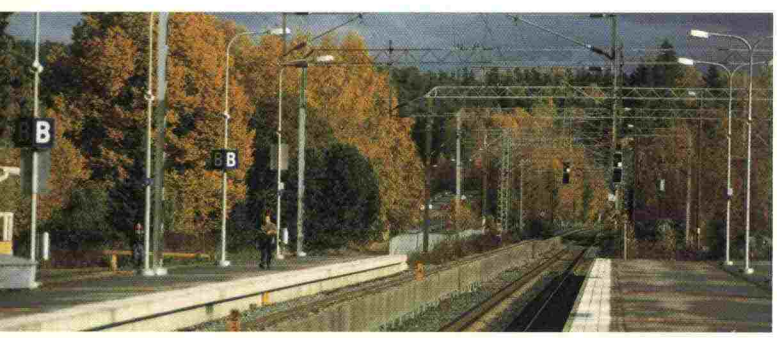
The Finnish Rail Administration (RHK)

Mission and tasks

The Finnish Rail Administration works to improve the operating conditions of rail traffic as an efficient, safe and environmentally friendly mode of transport, both in Finland and as part of the international transport system.

RHK is in charge of maintaining and developing the rail network, is responsible for the safety of rail traffic and provides a competitive transport network for use by rail operators. RHK takes into account the transport needs of industry and commerce as well as the need for public transport and operates in accordance with the principles of sustainable development. It is developing Finland's rail network for international traffic as a key link between East and West.

RHK manages the state-owned rail network together with equipment, structures and land areas. It purchases track design, maintenance and construction work as well as real estate management and traffic control services from outside companies.

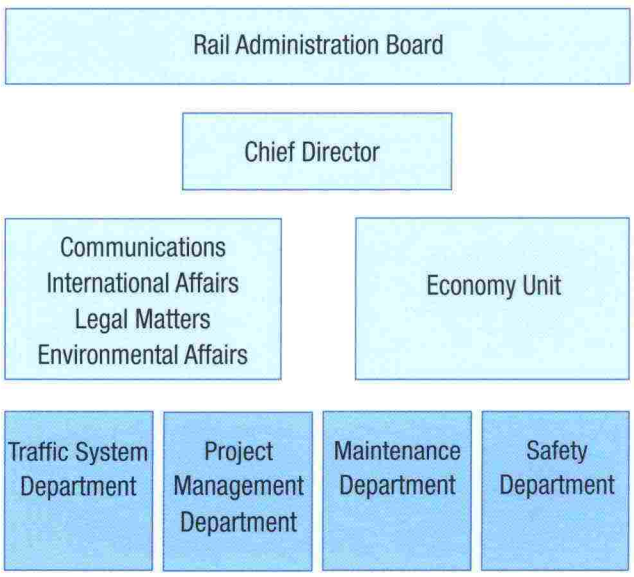


Operating environment

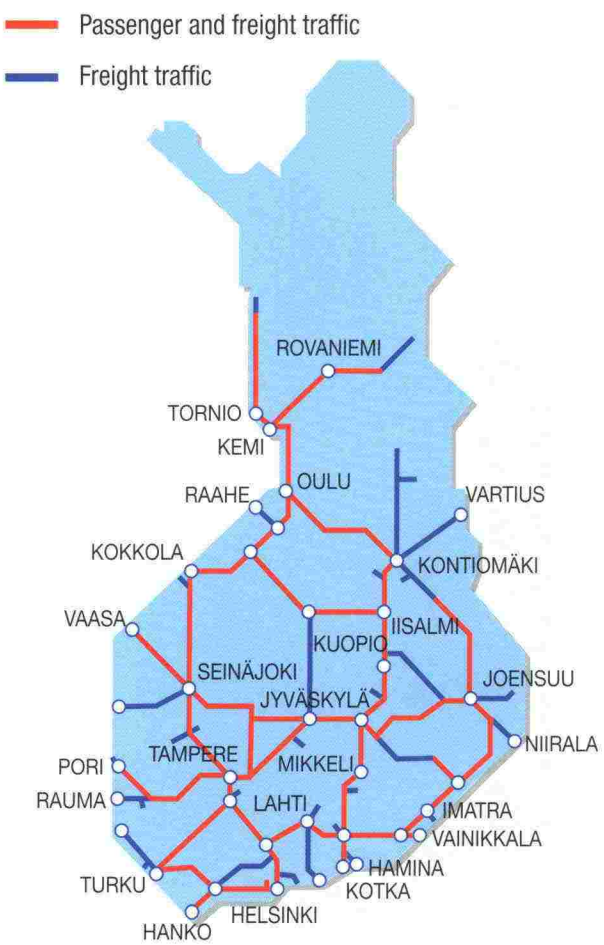
Finland's rail network connects the different parts of the country and also serves international passenger and freight traffic. The rail network comprises 5,850 kilometres of lines, of which 507 kilometres has two or more tracks. The total track length including sidings is 8,734 kilometres. At present Finland has only one rail operator, VR Limited.

The point of departure in maintaining and developing the rail network is the needs of rail operators and customers in the freight and passenger sectors. Infrastructure management creates the preconditions for safe, efficient and competitive rail services. An efficient rail network is a basic precondition for the nation's transport system.

RHK's organization 2001



Rail traffic network



Rail traffic in Finland

The railways serve as a basic carrier for industry in Finland. The forest, metal and engineering, and chemical industries' raw materials and products account for the largest parts of freight. At present around one-fourth of Finland's freight traffic is by rail, while the share in the EU averages about 13%.

The volume of rail freight in Finland totalled 41.7 million tonnes in 2001, which was an all-time high. The average length of carryings fell, however, and tonne-kilometres declined by over 2% compared with the previous year.

The railways account for only about 5% of total passenger-kilometres in Finland, but their share of public transport journeys is about one-fourth. The figure for public transport journeys over 75 kilometres is around 60%.

Passengers made 55.0 million journeys in rail traffic in 2001. This included 11.6 million journeys in long-distance traffic and 43.4 million journeys in commuter traffic.

Over 80% of passenger traffic and about 60% of freight traffic was handled by electric trains.

Strategic lines for infrastructure management

The Rail Network 2020 plan which was published by RHK in April 2001 and revised at the beginning of 2002 provides lines for infrastructure management up to the year 2020. The plan is based on transport policy and infrastructure management objectives and specifies measures to achieve objectives. It includes a proposal for the implementation of development projects and other measures as well as their effects and costs. The replacement and development investments in the plan will make it possible to raise train speeds in passenger traffic and axle weights in freight traffic.

The revised plan took into consideration the effects of three major rail projects beginning in 2002 – the extension of the Helsinki–Tikkurila urban line to Kerava, the electrification of the line section from Oulu to Vartius and

Transport objectives

- Maximum social benefits, minimum disbenefits and costs
- Good quality of nature and the built-up environment
- Improving people's health, living conditions and quality of life on an equal basis regionally and in terms of population groups
- Utilization of smart technology

Ministry of Transport and Communications (2000)

Maintaining and developing the rail network

MAINTENANCE

- Keeping the rail network in the condition required for traffic

REPLACEMENT INVESTMENTS

- Renewing the superstructure and equipments

SAFETY INVESTMENTS

- Expanding the automatic train protection system
- Renewing the railway radio network

DEVELOPMENT PROJECTS UNDER WAY AND APPROVED

- Helsinki–Tampere: raising speed and quality
- Tampere–Jyväskylä: raising speed and quality
- Oulu–Rovaniemi: electrification
- Tikkurila–Kerava: urban line
- Kerava–Lahti: direct line
- Oulu–Kontiomäki–Vartius/Iisalmi: electrification

NEW DEVELOPMENT PROJECTS

- Lahti–Luumäki: raising speed
- Luumäki–Imatra: raising speed
- Seinäjoki–Oulu: raising speed
- Hyvinkää–Hanko: electrification
- Kouvola–Pieksämäki: raising speed
- Imatra–Joensuu: raising speed
- Turku–Toijala: raising speed
- Pieksämäki–Kuopio: raising speed
- Jyväskylä–Pieksämäki: raising speed
- Tampere–Pori: raising speed
- Joensuu region: electrification
- Marja line: urban line
- Leppävaara–Espoo: urban line
- Seinäjoki–Vaasa: electrification
- Luumäki–Vainikkala: additional track

Rail Network 2020, revised summary (2002)

Iisalmi, and the direct line from Kerava to Lahti – on the development of the entire rail network.

The goal of development is to keep tracks in the condition required for traffic, to complete indispensable safety investment – such as automatic train protection – rapidly, and to carry out socio-economically feasible projects as necessary.

Replacement investments and approved and planned development projects will make it possible to raise train speeds on all main passenger lines, expand electrification, raise axle weights in freight traffic, improve commuter traffic and land use in the Helsinki region, increase regional equality and improve the environmental friendliness and safety of rail traffic.

In preparing the Rail Network 2020 plan, the environmental impact of projects was analysed according to guidelines issued by the Ministry of the Environment.

Developing the rail network will improve the environment

Developing the rail network will reduce the direct environmental impact of rail traffic, allow more effective land use and shift traffic to railways, thus reducing total traffic emissions.

Environmental effects of developing rail traffic

- Emissions reduced with further electrification
- Energy consumption reduced with expansion of electric traffic
- Total traffic emissions reduced with increase in rail traffic's share
- Improved safety
- Positive development of regional structure
- More compact community structure

The most effective way to reduce emissions and energy consumption is to expand electrification. Local noise levels can be reduced by renewing superstructures and grinding rails and with the help of track design and structural solutions on new lines.

Raising train speeds and building urban lines will increase rail traffic's share of transport, thus reducing emissions and energy consumption due to road traffic. Developing the rail network, for example by expanding electrification and raising axle weights, will also strengthen the competitiveness of rail freight, which is clearly more energy-efficient than road freight.

Environmental impact of infrastructure management and rail traffic

Consumption of energy and natural resources

Procurement and production of materials used in track construction	Procurement and production of materials for rolling stock
Track construction	Production of rolling stock
Track maintenance and energy supply	Rail traffic and maintenance of rolling stock
Track decommissioning	Decommissioning of rolling stock

KEY ENVIRONMENTAL IMPACTS

- Land use
- Use of aggregates and other natural resources
- Use of energy resources
- Emissions of nitrogen oxides, carbon dioxide and other air pollutants
- Noise, vibration
- Soil and water pollution
- Barrier effect

Cooperation in environmental and transport matters

RHK cooperates closely with the Ministry of Transport and Communications. It has also assisted the ministry in the preparation of legislation and has taken part in projects coordinated by the ministry. In addition it has cooperated with the ministry and the road, civil aviation and maritime administrations in environmental matters and the development of environmental systems.

In 2001 RHK and VR agreed on the division of responsibility for information concerning environmental matters. The goal is to deal with environmental matters as effectively as possible and to ensure their monitoring. RHK's and VR's environmental experts meet regularly to discuss timely environmental matters.

RHK has discussed noise and other questions with the Ministry of Transport and Communications, the Helsinki Metropolitan Area Council and local authorities. It has also cooperated with regional environment centres and local authorities concerning the cleaning of contaminated land, for example.

RHK has participated in transport system planning and travel centre projects with regional councils, municipalities, government agencies and other authorities.

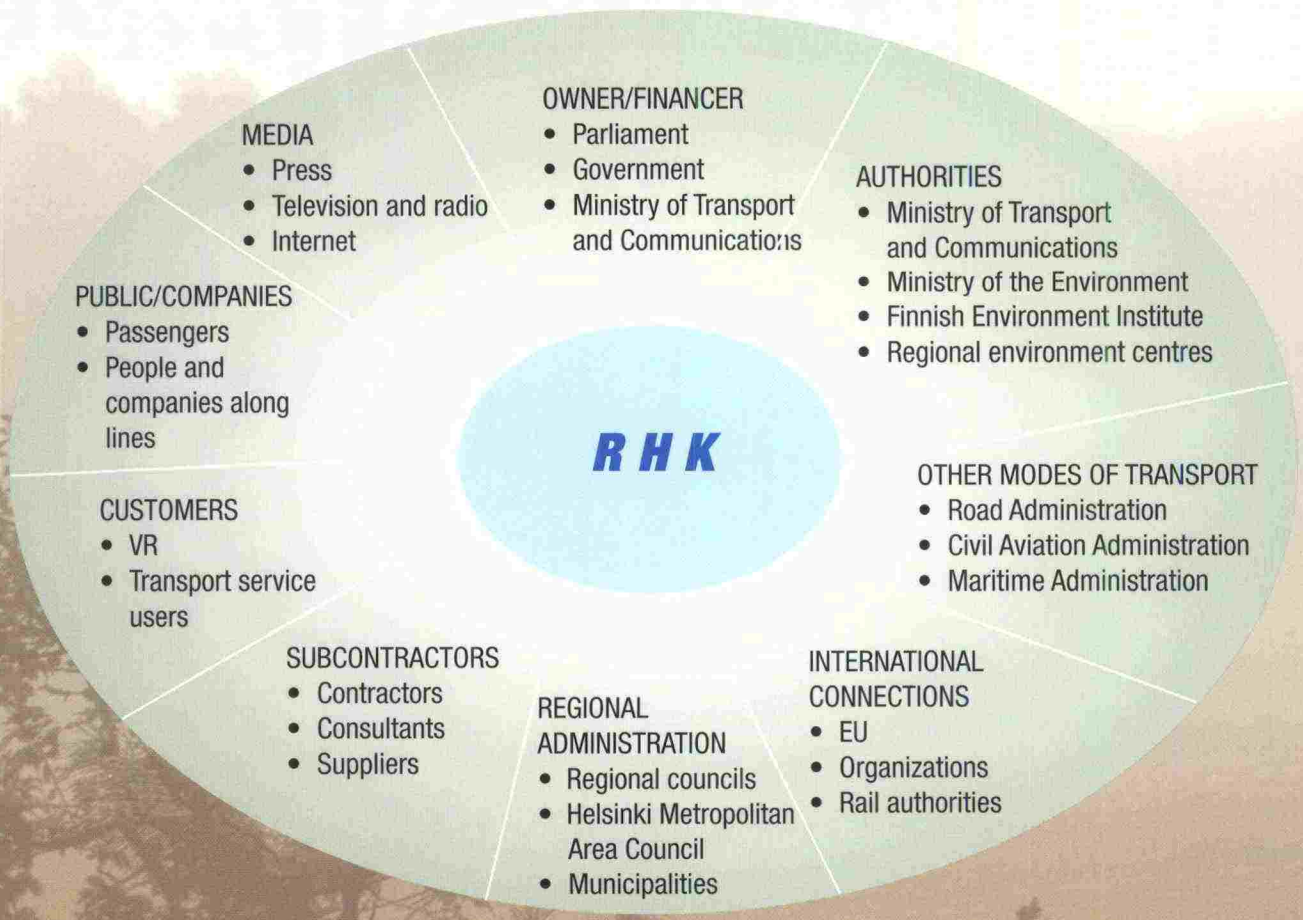
RHK has arranged public meetings and information sessions in connection with the planning of major projects such as urban lines and the direct line from Kerava to Lahti.

RHK purchases track planning, construction and maintenance work from subcontractors, who are expected to take the objectives in RHK's environmental programme into account in their activities.

International cooperation

RHK actively participates in international working groups. Among the most important forums are the UIC's (International Union of Railways) environmental coordinator meetings and working groups on noise and vibration and the European Commission's working group on noise. Environmental cooperation at the Nordic level takes place within the framework of the Nordic Infrastructure Managers (NIM).

Key interest groups in RHK's environmental activities



RHK's environmental programme

Key environmental matters in infrastructure management and rail traffic are energy consumption, air and soil emissions, the use of materials, noise and vibration, and risks to groundwater. The Finnish Rail Administration strives to reduce the harmful environmental impact of infrastructure management and to strengthen the positive environmental impact of rail traffic. RHK directs planning and activities on the basis of its environmental policy and environmental programme.

RHK's environmental policy

Sustainable development

RHK's activities and their development are guided by the principles of sustainable development.

RHK is responsible for the environmental impact of infrastructure management.

In issuing type approval for rolling stock and equipment, RHK is also responsible in its own way for the environmental impact of rail traffic.

General transport policy

RHK promotes the construction of a transport system which is in line with sustainable development by developing the rail network and rail traffic.

The goal is to increase rail traffic's share of transport as well as intermodal transport, which supports a sustainable regional and community structure.

Infrastructure management

The present rail network will be used as effectively as possible.

The service level of the rail network and rail safety will be increased to allow rail traffic which meets demand.

In improving and building lines, attention will be paid to environmental values.

The goal is an effective, safe, environmentally friendly and economical rail network.

In track work preference will be given to technology which causes the least possible harm to the environment.

Environmental management system

RHK constantly evaluates the effects of its activities on the environment and develops its activities and environmental management on this basis.

Environmental matters are taken into consideration in communications and are dealt with openly.

Commitment of RHK's personnel and cooperation partners

RHK's personnel promote the achievement of environmental objectives.

RHK also requires that its cooperation partners pay attention to environmental matters.

RHK's environmental objectives

Long-term environmental objectives have been grouped in RHK's environmental programme according to RHK's environmental policy. In specifying environmental objectives consideration has been given to the programme which the Ministry of Transport and Communications has prepared to reduce the harmful environmental impact of transport as well as the high level of environmental protection required by the European Union. This means reducing and eliminating harmful impacts preferably at their source.

At the end of 1998 RHK prepared an environmental programme for the period 1999–2001. Its objectives were to prevent and reduce the harmful impact of rail traffic on the environment and to eliminate the harmful effects of past activities.

RHK's environmental system is being developed to cover the entire organization's activities. Extensive subcontracting and RHK's role as Finland's rail authority place great challenges on the environmental system and related information collection and documentation as well as the management of environmental matters on this basis. The most significant development needs concern the systematic monitoring of material and energy consumption. Information on energy consumption and emissions in rail traffic is collected and documented in the RAILI database, which is maintained by the Technical Research Centre of Finland.

RHK's environmental vision and sustainable development strategy

A new environmental programme extending up to 2006 will be completed in 2002. Planning and implementing this programme required a new vision of RHK's sustainable development strategy. The development of environmental matters is linked to the operational system work which began in 2002 with the goal of integrating RHK's quality, safety and environmental systems into a single system.

Traffic noise and vibration problems, the cleaning of contaminated land and managing risks to groundwater will also be key focuses in the new environmental programme. The large projects which will be conducted during the programme period, such as the direct line from Kerava to Lahti, will present significant tasks for environmental management.

The environmental requirements placed on rail operators and increasing eco-efficiency by developing recycling and life-cycle evaluation require a bold approach to activities during the programme period.

The Ministry of Transport and Communications' management by objectives and the evaluation of subordinate agencies' environmental systems in 2004 set challenges for the further development of environmental matters and the introduction of gauges and indicators. The development of monitoring to ensure the effectiveness of the operational system is indispensable.

RHK is striving to engage in open cooperation with key interest groups. Together with the City of Tampere, for example, the goal is to develop a programme of action model which will allow effective solutions to the local environmental problems resulting from rail traffic.

Stages in RHK's environmental activities

1995	1996	1997	1998	1999–2001	2002
Establishment of the Finnish Rail Administration.	Head of the Real Estate Unit placed in charge of environmental matters. Environmental working group established.	RHK's environmental policy, long-term environmental objectives and environmental programme completed.	First environmental expert begins work. Three-year environmental plan under the environmental programme approved.	Environmental plan implemented and monitored.	Environmental Manager appointed. First environmental report. New environmental programme prepared.

RHK's environmental activities

The Finnish Rail Administration's environmental activities centre around the implementation of its environmental programme. In addition environmental studies have been conducted and various measures to improve the local environment have been carried out in connection with rail projects. Special attention has been focused on reducing noise and vibration, cleaning contaminated soil and conducting nature and groundwater studies. Projects with a major environmental impact include the direct line from Kerava to Lahti, the Vuosaari harbour line and the proposed airport line in the Helsinki region.

Developing the transport system

RHK has participated in the preparation of regional or urban transport system plans. Other participants have included the Ministry of Transport and Communications, the Ministry of the Environment, the provincial state offices, regional councils, environment centres, the Finnish Road Administration, local authorities and representatives of traffic operators.

Plans cover all the transport infrastructure and all modes of transport in a particular area. RHK's role in planning work is emphasized in areas with a lot of rail traffic. Key questions include the supply of rail services, station and feeder traffic arrangements, rail capacity, level crossings and environmental impacts.

Planned projects in the next 3–4 years are prioritized and their implementation is assured with letters of intent. The signatories agree to implement and promote projects.

Letters of intent have been signed in connection with the transport system plans for the Jyväskylä and Tampere regions, and agreement has been reached on the monitoring of their implementation.

A total of 7 regional and 17 urban transport system plans were ready or in preparation at the end of 2001. RHK is presently involved in the Oulu, Salo, Kemi-Tornio and Helsinki regions, for example. Plans are being prepared for the South Savo, Kymenlaakso and South Karelia regions.

The Turku transport system plan which was completed in 2000 considered possibilities to develop rail traffic in the Turku region and especially between Turku and Salo to meet the needs of commuter traffic. Planning in the Salo region has focused on the level of public transport, bicycle traffic and land use development options.

The revision of the transport system plan for the Helsinki region has included the preparation of a long-term rail transport strategy and the addition of new urban lines to the public transport system.

Objectives

To develop transport systems as a whole so as to promote environmentally friendly modes of transport

To create efficient travel and transport chains in order to reduce traffic emissions and energy consumption

Key measures

1999–2001

- ***Participation in urban and regional transport system plans***
- ***Station arrangements in connection with travel centres***
- ***Construction of new travel centres***
- ***Participation in research programme concerning an environmentally friendly community structure and transport system***

Possibilities to increase commuter services and to develop land use and feeder traffic around rail traffic have been studied in the transport system plan for the central Uusimaa and Hyvinkää-Riihimäki area. A letter of intent will be concluded in 2002. Land reservation needs for a future railway connection east of Helsinki were studied in connection with the transport system plan for Eastern Uusimaa.

The development of freight traffic is emphasized in the transport system plans for the South Karelia and Kymenlaakso regions.

Urban lines part of the public transport system in the Helsinki region

Urban lines allow a more compact community structure in the Helsinki region and increase possibilities to use rail services. Direct bus services to the centre of Helsinki can be reduced and feeder traffic to urban line stations can be increased. A more compact community structure along lines attracts new public transport users.

The Helsinki–Huopalahti–Leppävaara urban line was completed in 2001. Commuter and long-distance trains now run on separate tracks, which has made it possible to increase services. The line went into full operation in June 2002.

In June 2001 RHK, the City of Vantaa and the City of Kerava signed a letter of intent concerning the extension of the Helsinki–Tikkurila urban line to Kerava. This project will be carried out in 2002–2004. The urban line will improve the service level and competitiveness of public transport and promote land use along the line.

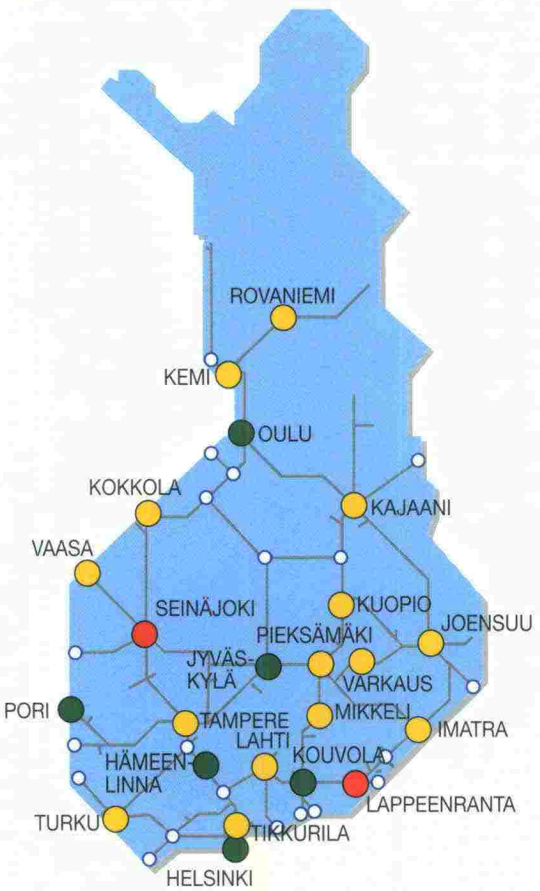
Travel centres

Travel centres make it easier for passengers to use public transport and facilitate transfers. The Ministry of Transport and Communications wants to create 23 travel centres around the country. Passengers can get tickets and timetable information for different modes of transport at travel centres. Special attention is being focused on travel centres' level of service and information as well as their central location in urban areas.

In 2001 the Jyväskylä travel centre reached the construction stage, renewal of the station tunnel got under way in Oulu and an architectural competition was arranged for the Vaasa travel centre. Planning for travel centres continued in Pieksämäki, Varkaus, Kouvola, Kuopio, Joensuu, Lahti and Rovaniemi. Travel centres are already in operation in Seinäjoki and Lappeenranta.

Development of travel centres

- Travel centre completed in 2001
- Travel centre under construction
- Travel centre in the planning stage



Environmental impact assessment and environmental studies

Conceptual view of the Vuosaari harbour line

Objectives

To promote sustainable development and to prevent harmful environmental impacts in RHK's programmes and projects

Key measures

1999–2001

- *Broad new environmental studies in connection with track improvement projects*
- *Instructions concerning the assessment of environmental matters in each stage of planning*
- *Environmental impact assessment for the Rail Network 2020 plan, comparison of options and completion in 2001*
- *Revision of plans and environmental studies for the Vuosaari harbour line*
- *Planning and environmental impact assessment for the proposed airport line*
- *Analysis of the effects of the direct line from Kerava to Lahti beginning in late 2001*

RHK evaluates the environmental impact of its activities in connection with operational and financial plans and the planning of construction and improvement projects. Several reports concerning the environmental impact of rail projects were produced in 2001.

Direct line Kerava–Lahti

The decision to build a direct line from Kerava to Lahti was made in 2001, and RHK began project planning immediately. Construction will start in autumn 2002 and the line is scheduled for completion in 2006. About 80% of the line will follow the same route as the Lahti motorway, reducing the burden on the environment. The line is being designed to blend in with its surroundings as well as possible, and noise will be reduced with the help of barriers and embankments.

Environmental studies

Environmental studies concerning the direct line have been supplemented since the environmental impact assessment which was completed in 1996. A survey of flying squirrel resting and nesting places along the line as well as measures necessary as a result of these began in December 2001. The report will be completed before construction starts in 2002.

A monitoring programme concerning the impact on birds in the Vähäjärvenkallio Natura area in Mäntsälä was also prepared in 2001.

Social impact assessment

Work to evaluate the direct line's effects on living conditions, comfort, transport connections and safety along the route began in November 2001. The goal was to find means so that building the line causes the least possible inconvenience to residents. A social impact assessment was completed in summer 2002.

Vuosaari harbour line

The planning of road and rail connections for the future Vuosaari harbour continued in cooperation with the Finnish Road Administration. Environmental planning has been supplemented and extensive environmental studies have been prepared as part of this work.

An assessment of the environmental impact of the construction and use of the rail tunnels for the Vuosaari harbour was conducted. The planning grounds, environmental aspects and impacts of the Labbacka and Savio tunnels were presented, along with means to reduce and prevent harmful environmental impacts as well as envi-

ronmental observation and monitoring programmes. The report also dealt with the Porvarinlahti road tunnel and land transport connections above ground. As part of the process of planning land transport connections for the Vuosaari harbour, RHK has applied to the Western Finland Environmental Permit Authority for permission to build rail tunnels under the Water Act. Programmes to monitor the effects on birds, plants and groundwater were prepared.

Rail and road lines have been brought closer and made to fit in with their surroundings as well as possible. The Porvarinlahti rail bridge has been designed so as not to disturb its surroundings any more than is necessary. An extensive well survey was conducted in the vicinity of the Savio rail tunnel. This was completed in spring 2001. Noise calculations and environmental planning in connection with the rail line have been revised and presented to the public with the help of conceptual views and scale models.

Airport line

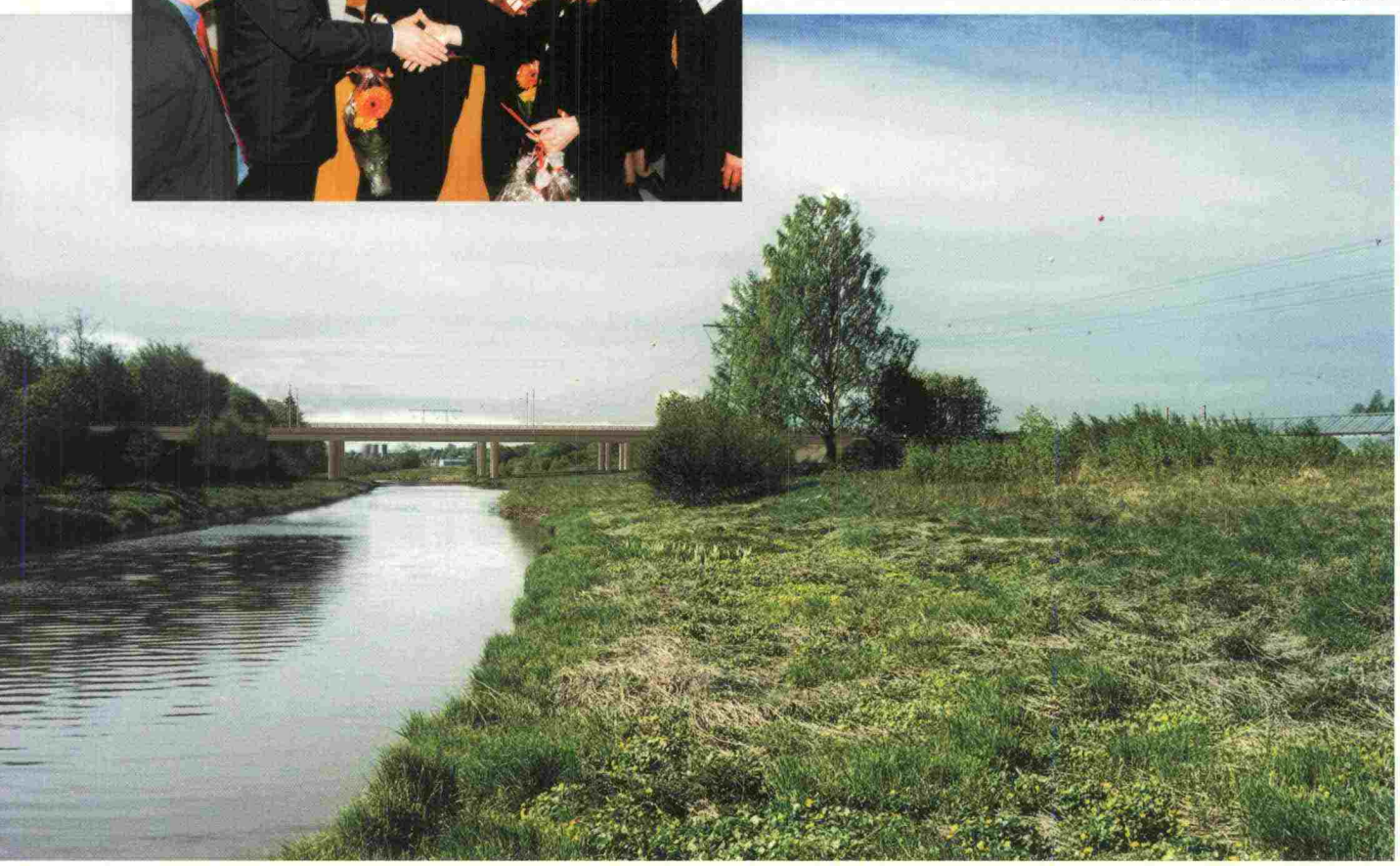
The proposed airport line (Marja line) will run between the Martinlaakso line and the main line to the north. Responsibility for this project was shifted from the City of Vantaa to RHK in 2002.

A large part of general plan work for the project was performed in 2000. Line options were prepared, an environmental impact assessment programme was devised and studies concerning the effects of the project were carried out. A comparison of options and the assessment of environmental impacts were completed in spring 2001.

The Finnish Association for Impact Assessment presented an award to the airport line project for the best environmental impact assessment in 2001. It emphasized the outstanding map-based illustration of environmental impacts and the excellent use of opportunities provided by the local information system as well as the focusing of attention on future residents and the presentation of impacts from the viewpoint of different age groups and residents in different areas. It also cited broad and deep cooperation especially among authorities and easy access to evaluation materials throughout the project via the Internet, for example.

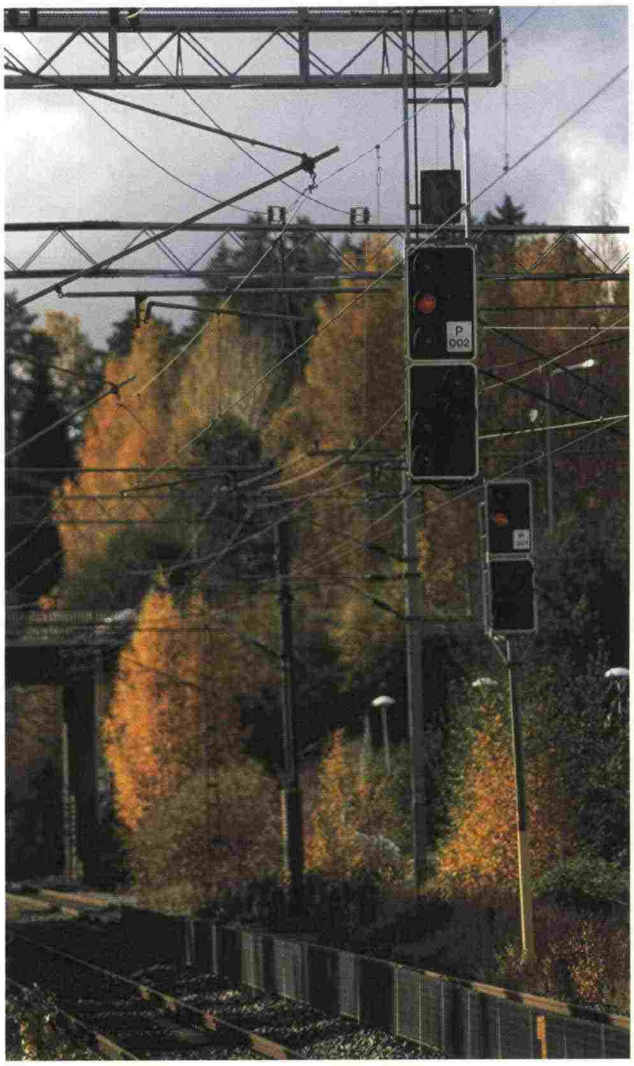
The award presented by the Finnish Association for Impact Assessment was received by (left to right) Seppo Suhonen (JP-Transplan), Heikki Pajunen (City of Vantaa), Tapio Maljonen (City of Vantaa), Markku Pyy (RHK) and Leena Saviranta (Uusimaa Regional Environment Centre). Congratulations were expressed by Päivi Karvinen and Reima Petäjäjärvi (foreground).

Conceptual view of the Marja line



Rail safety

Ensuring and improving rail safety is one of RHK's key tasks. Automatic train protection and the elimination or improved protection of level crossings will reduce the risk of accidents in passenger traffic and on freight routes particularly where hazardous substances are transported. Risks will also be reduced by revising and monitoring compliance with regulations on rolling stock and equipment and by improving rail yards. In 2001 yard safety analyses were performed and fire and rescue plans were prepared for yards.



Objectives

To reduce the harmful impact of transport on the environment

To continue improving the safety of transports of hazardous substances, especially in groundwater areas

Key measures

1999–2001

- *Improved collection of information on transports of hazardous substances*
- *Studies of safety measures at yards along routes where hazardous substances are transported*
- *Participation in the EU's TradgGIS project, which is aimed at developing a real-time tool to control the environmental risks of transporting hazardous substances*
- *Expansion of automatic train protection and installation of hot-box detectors on lines*
- *Elimination of level crossings and installation of safety equipment at intersections*
- *Soil and water surveys at old fueling points and yards*
- *Groundwater areas within a kilometre of the rail network in GIS database*
- *Planning of groundwater protection for new line sections*
- *Well and groundwater studies for the Vuosaari harbour line*

Transports of hazardous substances in 1999–2001. Main categories and amounts (thousand tonnes)

	1999	2000	2001
Explosives	0.1	0.1	0.3
Gases	726	719	749
Flammable liquids	4,817	4,516	3,858
Other flammable substances	89	70	62
Oxidizing agents and organic peroxides	89	81	127
Toxic substances	57	71	63
Corrosive substances	869	932	815
Other hazardous substances and objects	6	10	19
Total	6,653	6,400	5,793

Transports of hazardous substances

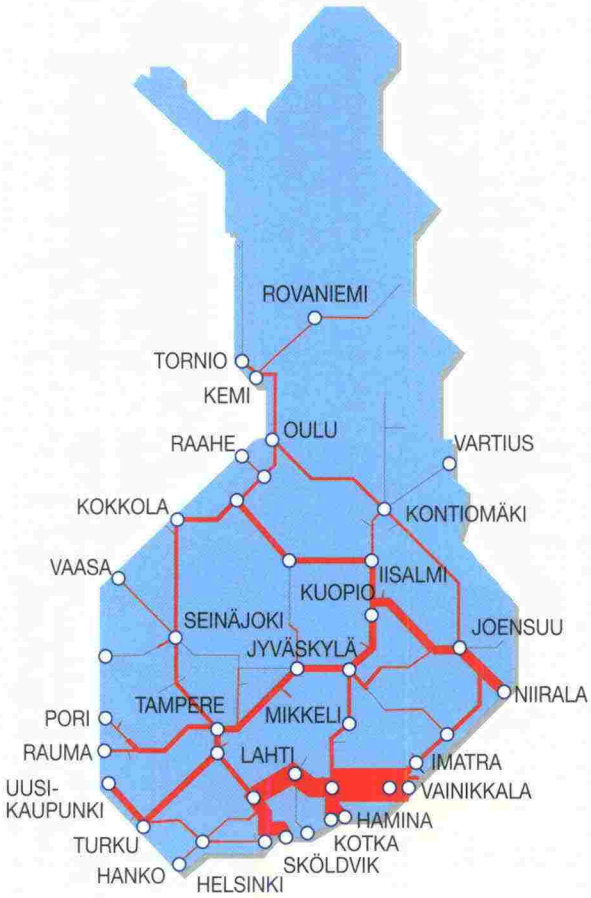
Accidents involving transports of hazardous substances are significant for the environment, since they often result in water, soil or air pollution. Special regulations apply to transports of hazardous substances by rail. These are intended to minimize the risk of accidents and damage in the unlikely event that a train is derailed.

The greatest risks associated with transports of hazardous substances involve switching in yards. No significant accidents took place in 2001.

In 2001 a total of 5.8 million tonnes of hazardous substances was transported by rail in Finland. This was 0.6 million tonnes less than the year before. Flammable liquids were the largest category of hazardous substances, accounting for 67% of the total in 2001.

Transports of hazardous substances were largest between Vainikkala and Sköldvik and between Kouvola and Kotka/Hamina. Safety wagons are used to protect transports of hazardous substances, considerably reducing the risk of damage in an accident. They prevent dangerous reactions between substances in adjoining wagons or the spread of fire, for example.

Distribution of transports of hazardous substances in the rail network in 2001

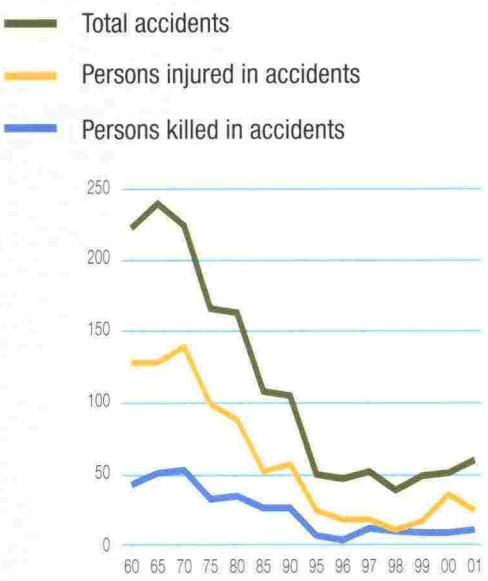


Eliminating level crossings

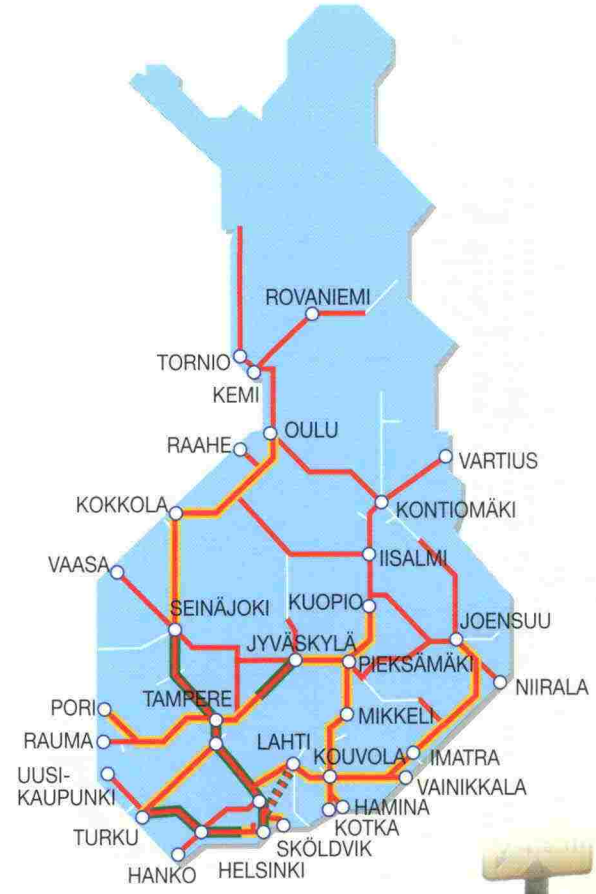
In 2001 Finland's rail network included about 5,100 level crossings. Roughly 3,500 of these were located on main lines, 700 on sidetracks and 900 on private tracks. The number of level crossings was reduced by nearly half between 1970 and 2001.

Since the 1960s accidents at level crossings and resulting deaths have been cut by three-fourths. There were 60 such accidents in 2001. As a result 12 people died and 25 were injured. A large portion of accidents are apparently due to simple carelessness. In 2001 motorists crashed through 127 booms at level crossings and an additional 45 booms were damaged in other ways.

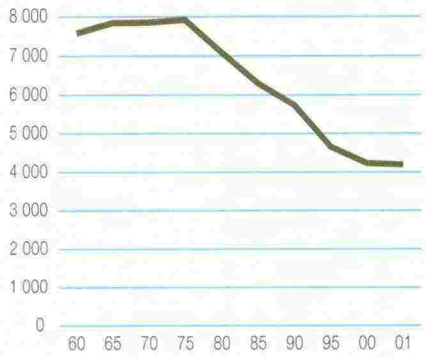
Development of accidents at level crossings, 1960–2001



Improving rail safety



Number of level crossings in the rail network, 1960–2001



In 2001 RHK completed a programme for the elimination or improved protection of level crossings up to 2020. That same year 48 level crossings were eliminated. The largest numbers were eliminated in connection with track renewal on the Toijala–Turku and Tampere–Kokemäki–Pori line sections.

Warning equipment was installed or upgraded at 40 level crossings. This included 39 boom systems and one flashing light and bell system. Six of these level crossings previously lacked safety equipment. The last two mechanical booms were replaced in 2001.

Risks to groundwater areas

Finland's rail network includes about 650 km of lines passing through groundwater areas and about 550 km of lines passing through the most important areas. There are 1,036 groundwater areas located entirely or partly within one kilometre of a railway. This is 15% of all groundwater areas in Finland. There are about 400 groundwater pumping plants in these areas, including 29 which are located in the immediate vicinity of a railway.

The most important groundwater areas are in the Salpausselkä zone and bordering formations. The Hanko–Hyvinkää and Riihimäki–Kouvola–Lappeenranta–Joensuu line sections travel along the Salpausselkä groundwater zone. RHK has a database of the most important groundwater areas and in the future these will also be marked with signs.

The greatest risk to groundwater comes from chemical transports. The risk of accidents involving chemicals and other hazardous substances will be reduced by eliminating level crossings, expanding automatic train protection and revising and monitoring compliance with regulations on rolling stock and equipment.

The rail network and groundwater areas

The monitoring of groundwater has continued at the Hovinsaari, Mussalo, Kouvola, Riihimäki, Sköldvik, Vainikkala and Poitsila yards, where hazardous substances are transported. The monitoring of groundwater will be expanded.

RHK has also begun the constant monitoring of groundwater at four yards where chemical accidents have taken place.

Track construction and maintenance

Materials

RHK is a major user of materials. Rails, sleepers, gravel and other aggregates are the largest categories in this respect. Old rails, switches and sleepers are reused in less demanding line sections if they are still technically serviceable.

In procuring materials, attention is focused on recycling possibilities as well as their suitability for the job.

Reducing material consumption is a significant part of environmental protection. RHK recycles a large portion of the materials it uses, such as sleepers and rails. The need for new aggregates is reduced by cleaning ballast. Ballast removed from tracks is recycled if possible, for example in service road beds. Another use is for structural layers in dumps.

Replacing wooden sleepers with concrete sleepers

There are around 15 million sleepers in Finland's rail network. This includes 5.2 million concrete sleepers and 5.5 million wooden sleepers on main lines. Sleepers on sidetracks are mainly wooden. Concrete sleepers last considerably longer than wooden sleepers, and around 500,000 wooden sleepers are replaced with concrete sleepers each year.

Use of aggregates

Large amounts of aggregates are used in track maintenance and construction. So far comprehensive calculations or accounts of annual material flows have not been made. Information is available on the use of gravel in individual projects, for example.

In the future information on individual projects will be collected in a database so that annual totals can be monitored better. The amount of aggregates used naturally depends on the size of projects and the purpose for which aggregates are used. In some projects aggregates can be reused or materials can be obtained from the line or its immediate vicinity. Cleaning old ballast is a significant way to reduce the need for new gravel and thus quarrying.

Objectives

To select materials so that products have as long a service life as possible and cause the least possible harm to the environment

To monitor aggregates and other natural resources used in construction and reduce them if possible

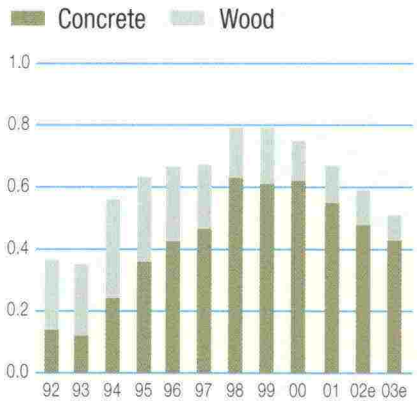
To require that subcontractors and planners comply with RHK's environmental programme

Key measures

1999–2001

- *Developing the monitoring of the use of natural resources and other materials*
- *Replacing wooden sleepers with concrete sleepers*
- *Maintenance agreement with VR-Track Ltd concerning compliance with the environmental programme*
- *Promoting the use of less environmentally harmful herbicides*
- *Taking RHK's environmental programme into consideration in orders and delivery terms*

Installed sleepers in 1992–2001 and projection for 2002–03, million



Sleepers on main lines and amount of concrete and wood used in new sleepers

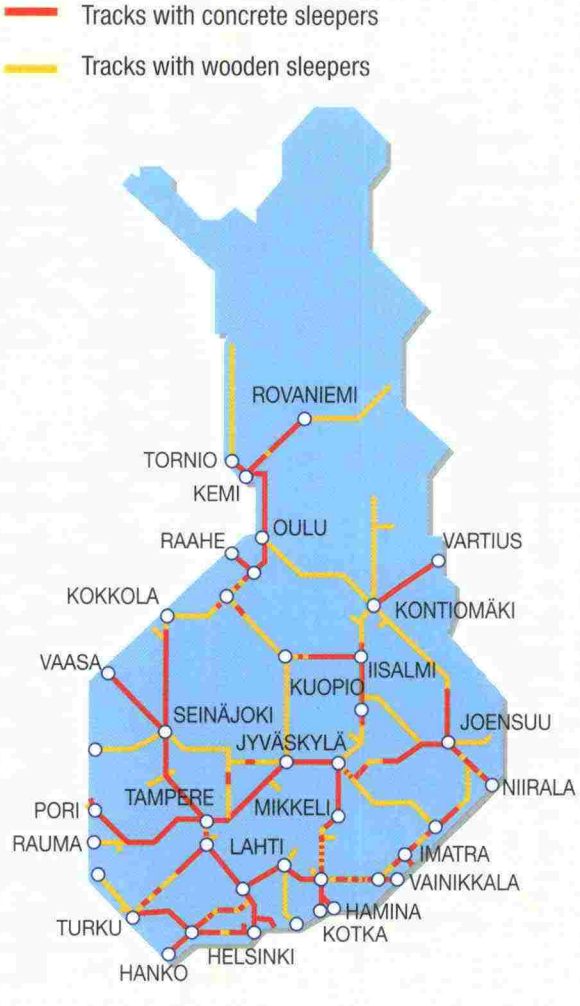
		1999	2000	2001
Wooden sleepers	No.	6,549,700	5,990,300	5,492,600
Concrete sleepers	No.	4,144,300	4,749,400	5,241,400
New concrete sleepers	No./yr	613,100	557,000	553,600
- Amount of concrete used	m^3/yr	101,800	92,500	91,900
New wooden sleepers	No./yr	134,200	129,000	125,000
- Amount of wood used	m^3/yr	15,600	15,000	14,500

Consumption of most important products used in track maintenance in 2001

Rails		
Total in use	km	17,486
Reused	km	170
Recycling method	Reused if serviceable, otherwise resmelted	
Concrete sleepers (*		
Total in use	million	5.2
Reused	No	1,500
Recycling method	Reused if serviceable, otherwise recycled in crushed form	
Wooden sleepers (*		
Total in use	million	5.5
Reused	No	15,000
Recycling method	Reused if serviceable, otherwise used as fuel	

(* Number of sleepers on main lines.

Tracks with concrete and wooden sleepers in 2001



Indirect life-cycle emissions

Part of the environmental impact of materials comes from indirect life-cycle emissions.

Track construction, renewal and maintenance involve life-cycle impacts which RHK has not yet evaluated. These include the energy used in different stages of producing and handling aggregates and construction materials such as gravel or steel, for example. Obtaining information on these impacts requires the development of the collection and documentation of environmental data concerning purchased services.

Harmful substances

Various harmful substances and chemicals are used in track maintenance. Weeds and saplings must be removed to ensure traffic safety and prevent damage to track structures. Nearly 8,400 kilos of Zeppelin herbicide was used for this purpose in 2001. Small amounts of glyphosates are also used around electrical feeder stations.

RHK is developing information collection concerning harmful substances used in its own activities and by subcontractors. As a result of extensive subcontracting, it is important to develop materials accounting and documentation, which should be updated at least annually.

With regard to rail steel, sleeper wood, creosote, paint, lubricants, graffiti removers and certain other substances, information collection is already quite advanced. There is plenty of room for improvement in monitoring the use of aggregates and metals, however.

Purchased services

Most of RHK's production is in the form of purchased services. In 2001 purchased services totalled around 370 million euros. The extent of purchased services emphasizes the need to take environmental matters into consideration in tenders and in planning and other subcontracting commissions.

RHK expects subcontractors to be able to present environmental information concerning products and services. Suppliers of concrete sleepers have certified environmental systems, for example.

RHK's main purchased services in 2001, million euros

Replacement investments	142.5
Track maintenance	120.8
Development investments	47.8
Helsinki–Leppävaara line	11.6
Traffic control	37.2
Real estate activities	10.3
Planning etc.	4.0

New steel rails used by RHK and total length of rails in 1999–2001

		1999	2000	2001
Length of new rails	km/yr	297	253	254
Amount of new rails	t/yr	17,845	15,070	15,439
Length of old rails	km/yr	69	57	40
Amount of old rails	t/yr	7,430	6,156	4,320
Total length of rails	km	2 x 8,680	2 x 8,705	2 x 8,734

Energy consumption and emissions

Objectives

To reduce energy consumption and resulting emissions in relation to rail traffic volumes

Key measures

1999–2001

- *Further electrification of the rail network*
- *Documentation and analysis of emissions and energy consumption using the RAILI calculation system which is maintained by the Technical Research Centre of Finland*
- *Guideline values for diesel locomotive emissions*

Rail traffic is eco-efficient

Rail traffic and track construction and maintenance consume energy. Together they account for less than 2% of Finland's total energy consumption in the transport sector, however. This is much lower than rail traffic's 12% share of transport.

Energy consumption and emissions in the rail sector are low compared with other modes of transport. Energy consumption and emissions per passenger-kilometre or tonne-kilometre indicate that rail traffic is eco-efficient. RHK is still working to reduce emissions of carbon dioxide, nitrogen oxides, sulphur dioxide and particles nevertheless.

Energy consumption in the rail sector, as in other areas of life, influences the greenhouse effect, for example through emissions of carbon dioxide. Generating electricity and burning diesel fuel also result in emissions of carbon dioxide, hydrocarbons, nitrogen oxides, sulphur dioxide and particles.

The goal is to shift from diesel to electric traction as much as possible. Electric traction is clearly more efficient than diesel traction, and the nitrogen dioxides, carbon monoxide and particles emitted in the generation of electricity do not directly contaminate the air around lines.

Traffic emissions and energy consumption in Finland in 2001

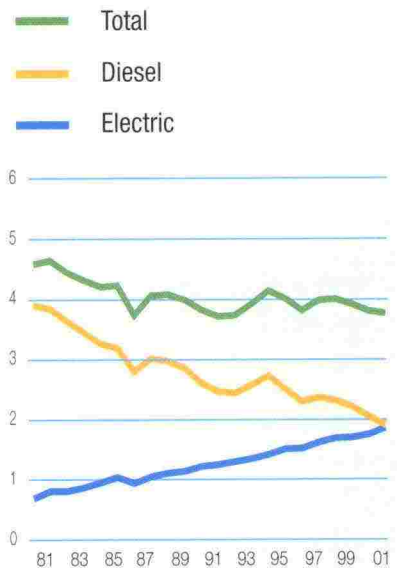
Emissions in thousand tonnes, energy consumption in petajoules

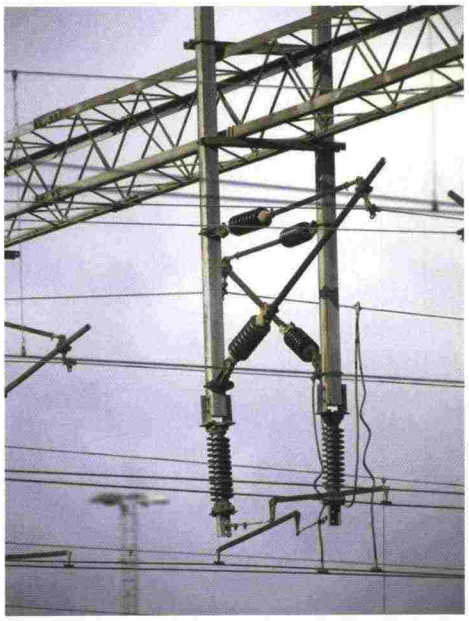
Mode of transport	Carbon monoxide CO	Hydro-carbons HC	Nitrogen oxides NO_x	Particles PM	Sulphur dioxide SO_2	Carbon dioxide CO_2	Energy consumption
Rail traffic	0.5	0.2	3.4	0.1	0.2	255	3.7
Road traffic	320.3	40.1	75.2	3.9	0.2	11,032	151.0
Water traffic	28.7	10.5	73.7	2.1	18.9	3,307	46.0
Air traffic	3.2	0.4	3.4	–	0.3	1,138	15.0
Total	352.7	51.2	155.7	6.1	19.6	15,732	216.0

Source: LIPASTO

Energy consumption figures for infrastructure management exclude information on energy consumption in rail traffic. Heating switches in winter accounts for nearly half of the energy consumed in RHK's own activities. Operating safety equipment, heating buildings and lighting yards also require considerable amounts of energy. Expanding the use of electrical equipment, which is important for safety, will increase energy consumption. Handling aggregates, producing building materials and operating machinery used in track maintenance also consume energy.

Development of energy consumption in Finnish rail traffic, petajoules





Rail traffic reduces energy consumption

Annual energy consumption in Finnish rail traffic has fallen from about 4.5 petajoules to less than 4 petajoules in the past twenty years. Meanwhile the volume of passenger traffic has increased by 6% and the volume of freight traffic by 21%. The energy efficiency of rail traffic has improved considerably. RHK and the rail operator are still striving to reduce energy consumption in relative terms, so that more people and goods can be transported with the same amount of energy.

Emissions and energy consumption in Finnish rail traffic in 2001

Emissions in tonnes, energy consumption in petajoules

Mode of transport	Carbon monoxide CO	Hydrocarbons HC	Nitrogen oxides NO_x	Particles PM	Sulphur dioxide SO_2	Carbon dioxide CO_2	Energy consumption
Passenger traffic	119.9	29.6	589.9	27.1	119.0	96,511	1.4
Freight traffic	386.6	159.8	2,681.9	69.0	109.5	154,226	2.2
Locomotives alone	12.2	5.5	96.8	1.8	1.9	4,131	0.1
Total	518.8	194.9	3,368.6	98.0	230.4	254,868	3.7
Electric traffic	80.6	10.1	206.4	23.7	171.2	105,721	1.8
Diesel traffic	438.2	184.8	3,161.3	74.3	59.2	149,148	1.9
Long-distance traffic	105.0	27.7	551.7	22.7	87.3	76,959	0.3
Commuter traffic	14.9	1.9	38.2	4.4	31.7	19,552	1.1

Source: RAILI 2001

In 2001 rail traffic consumed 514 million kWh of electricity and 52.8 million litres of diesel fuel. Electricity accounted for over 40% of total energy consumption. The share will continue to rise as electrification of the rail network proceeds. Electric trains handled 83% of passenger traffic and 57% of freight traffic in 2001. Electric traction's share of total freight and passenger traffic was 73%.

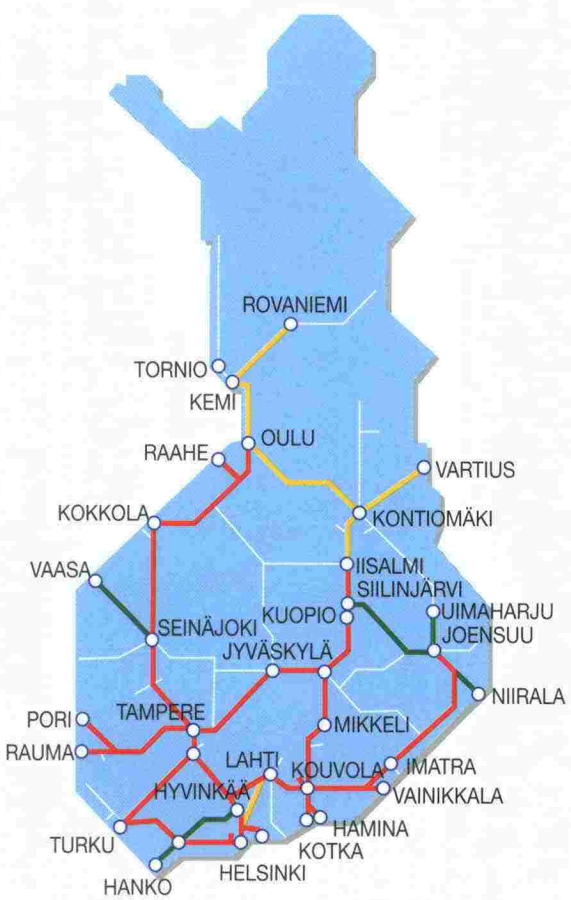
Energy consumption and emissions in rail traffic are documented and analysed in a system maintained by the Technical Research Centre of Finland. The RAILI model in this system calculates results for passenger and freight traffic at the national level and for individual line sections and yards. It differentiates diesel and electric traction and commuter traffic. The model focuses on energy consumption in rail traffic and does not cover infrastructure management. Emissions from the generation of electricity used in rail traffic are included in the summary information and tables which have been cited in this report.

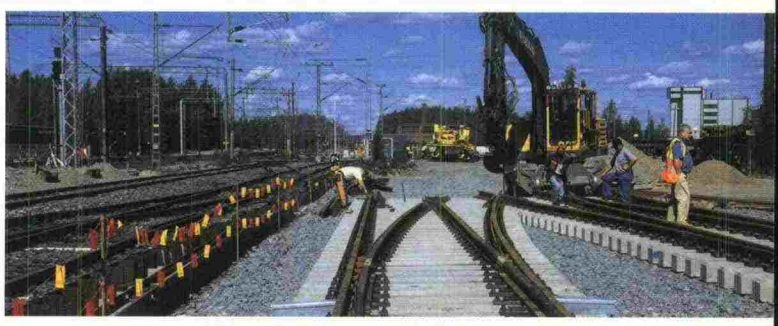
Electrification of the rail network

Electrified

Under construction

Line sections scheduled for electrification





Energy consumption in infrastructure management

Infrastructure management consumed around 87 million kWh of energy in 2001. Heating switches and preventing icing accounted for about 30 million kWh of this total. Yard lighting, safety equipment, booms and certain other functions consumed nearly 57 million kWh.

Track construction and maintenance machines and the production, transport and handling of construction materials also consume energy. This indirect energy consumption has not yet been documented in RHK's environmental system. The amount of energy consumed in construction projects varies considerably from year to year.

Electrification increases energy efficiency

Electrifying the rail network is the best way to increase energy efficiency, since electric traction is clearly more efficient than diesel traction. In 2001 44% of Finland's rail network was electrified and over 70% of rail traffic was handled by electric trains. Electricity's share of energy consumption in rail traffic has doubled in the past two decades, from less than one petajoule to nearly two petajoules. During the same period diesel traction's share has fallen from about 86,300 tonnes of fuel in 1980 to 54,500 tonnes of fuel in 2001.

Electric trains do not cause local emissions which can contaminate the air along lines. Emissions from the generation of electricity can also be purified more efficiently at power plants, although carbon dioxide released from fossil fuels cannot be eliminated economically with present technology but escapes and contributes to the heating of the atmosphere.

All measures related to reducing emissions are part of long-term activities. The environmental programme does not include precise annual objectives for these. The monitoring of energy consumption to heat buildings and switches should be improved.

RHK issued target values for diesel locomotives' emissions in instructions concerning rolling stock in 2000.

Noise

In Finland around 30,000 people live in areas which are exposed to over 55 dB from rail traffic during the day (7am–10pm). Noise is being reduced by welding rails, shifting to new and quieter rolling stock, grinding rails and building noise barriers. With these measures noise has effectively been reduced in spite of growing traffic.

The number of people who are exposed to noise has risen in the past twenty years as a result of new housing construction along lines, especially between Helsinki and Tikkurila. Thanks to the development of rolling stock, rail grinding and the erection of noise barriers, noise is not a big problem in the Helsinki region, however, despite the increase in traffic.

In 2001 eleven written complaints were received concerning noise, and noise was measured in seven different places. The decision has been made to survey noise levels in Tampere and Turku comprehensively.

Objectives

To reduce noise from rail traffic throughout the rail network and above all in residential areas

To prepare a programme to reduce noise from rail traffic, with the primary goal of eliminating noise exceeding 65 dB(A) in residential areas

Key measures

1999–2001

- *Noise prevention programme for the Helsinki region together with local authorities and the Helsinki Metropolitan Area Council*
- *National noise survey materials in the local information system in summer 2000*
- *Annual noise measurements*
- *Construction of noise barriers on the Helsinki–Huopalahti–Leppävaara urban line together with the cities of Helsinki and Espoo*
- *Reduction of noise with the help of rolling stock norms and the setting of noise limits*
- *Noise control system to support the specification of noise areas and the preparation of noise projections*
- *Rail grinding*

Efforts to reduce noise

In addition to rolling stock and track maintenance, the most important thing with regard to noise is to avoid increasing the population or building additional housing in areas exposed to noise. RHK is actively striving to influence planning in this regard.

RHK can also influence rolling stock through type approvals, for which it is responsible. Norms can be set for brakes and wheels, for examples. Technical specifications concerning such things as rail fastenings, connectors and bridge design can influence noise. Noise barriers have been built in cooperation with local authorities along the Helsinki–Leppävaara urban line and the Rekola–Korso passing track, which is part of the Tikkurila–Kerava urban line.

Shunting in yards may cause noise which bothers people living nearby. In order to avoid noise at night, shunting has been shifted to other parts of the day as far as possible. This approach has been taken at the Riihimäki yard, for example.

RHK's noise control system has been created to support the specification of noise areas and the preparation of noise projections. In 2001 about 20 noise maps were produced for local authorities from its database.

Noise prevention programme for the Helsinki region

In 2001 the Helsinki Metropolitan Area Council, local authorities and RHK prepared a railway noise prevention programme for the Helsinki region. This programme covers the period up to 2020.

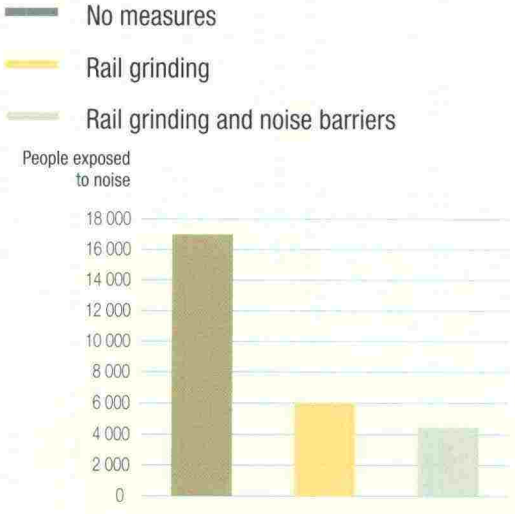
According to a survey which was conducted in connection with the programme, around 9,100 people are exposed to over 55 dB(A) from rail traffic in the Helsinki region. By 2020 the figure would rise to around 17,500 people without preventive measures.

The noise prevention programme includes intensified rail grinding and the construction of noise barriers at 14 places with a total length of about 45 km.

As a result of the measures in the programme, the number of people exposed to over 55 dB(A) from rail traffic in the region will fall to around 4,600 in 2020, and no one will be exposed to over 65 dB(A) in practice.

The City of Helsinki and RHK have agreed on the construction of noise barriers in 2003–2005. Noise barriers will be built in Vantaa and Espoo in connection with the construction of urban lines.

Effect of noise prevention measures on the number of people exposed to over 55 dB(A) railway noise during the day in the Helsinki region



Source: Railway Noise Protection Plan for Helsinki Metropolitan Area for years 2001–2020

Vibration

Vibration particularly from freight trains can be a problem if the soil is clayey or marshy. Vibration rapidly fades over distance. Means to reduce vibration include track foundation and reinforcement measures and the use of vibration-damping structures near residential areas during the construction stage. Eliminating vibration entirely is not feasible or even technically possible.

Areas where vibration is a problem are surveyed in cooperation with local environmental authorities. This ensures that RHK receives accurate information on problem areas and that local authorities can take vibration into consider in planning land use.

Risk surveys can be used to anticipate the level of vibration in planning. Measuring points are selected on the basis of surveys. Complaints were received in 2001 concerning vibration in four places, and studies were completed in 51 places up to the end of 2001. Vibration problems had been surveyed in most of the rail network by this time.

The worst vibration problems are on the Vainikkala–Sköldvik and Vartius–Raahe line sections, which are important for eastern traffic. People living along these lines are disturbed especially by freight trains conforming to Russian standards.

The accompanying map shows areas where vibration is a problem and measures taken to determine the reasons for vibration in the Finnish rail network. On the basis of previous measurements, RHK has imposed temporary traffic restrictions at seven points because of vibration. In all but one case these apply to heavy freight trains conforming to Russian standards.

Objectives

To investigate areas where vibration is a problem and take measures to eliminate the problem

Key measures

1999–2001

- *Surveying vibration areas*
- *Setting vibration limits*
- *Preparing plans to improve the situation in vibration areas*
- *Participating in research projects to reduce vibration*

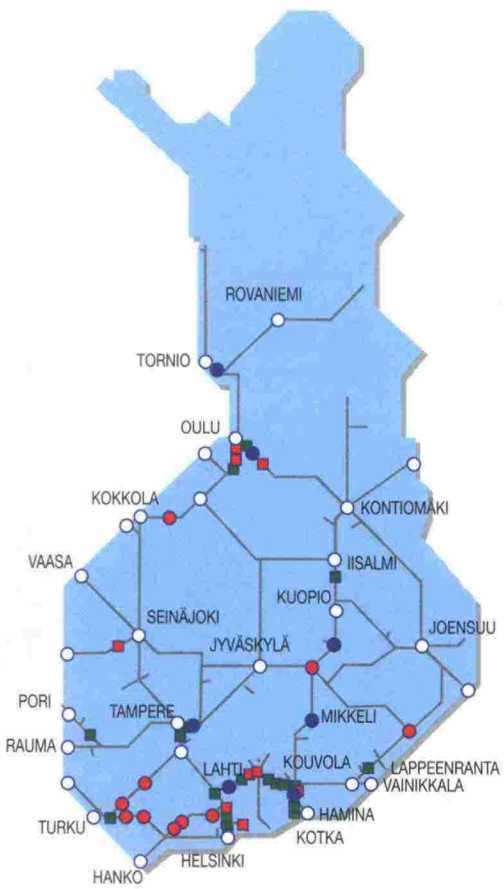
RHK has prepared guidelines for surveying and measuring vibration in the rail network, and these have been in trial use since 1998. RHK and the Technical Research Centre of Finland published a report on the effect of vibration on structures and means to measure damage in 2001. This publication, which sets vibration limits, will replace the existing guidelines.

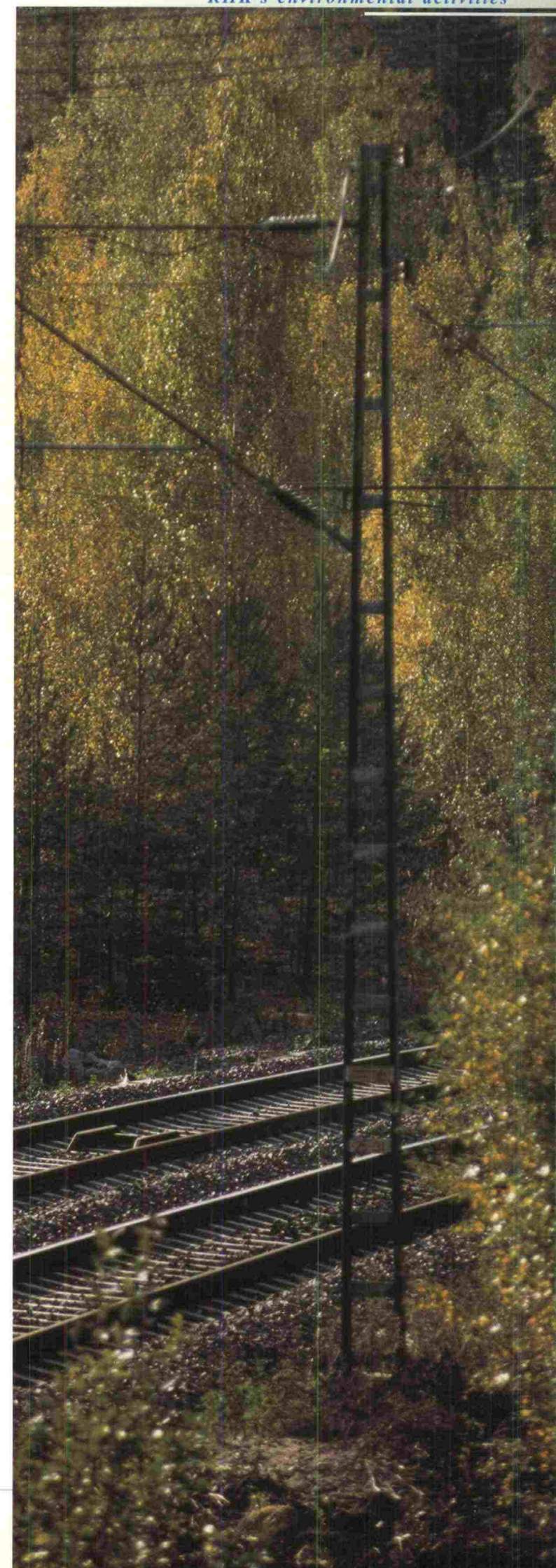
RHK has also investigated the elimination of vibration in the NORDVIB vibration study together with the rail authorities in the other Nordic countries. The study has been conducted by Nordic universities and leading research institutes in the field. No cheap solutions to the problem are in sight.

Measures to dampen vibration, such as strengthening track foundations, can only be considered when we know the present situation in the entire rail network and the effect of different measures.

Vibration areas and measures taken in the Finnish rail network

- Complaint received, further measures under study
- Situation survey or building damage report done
- Measuring done
- Speed restriction





Waste and recycling

Most of the materials used by RHK can be recycled, for example in low-traffic line sections, track foundations or energy production. This considerably reduces the amount of waste resulting from infrastructure management. In track construction and renewal, excavated soil and aggregates are used as effectively as possible.

Wooden sleepers are recycled or used as fuel

If they are still in good condition, wooden sleepers which are replaced during track renewal can be reused on sidetracks. Otherwise they are chipped and used as fuel in power plants. Burning of old wooden sleepers takes place in Rauma and Kajaani. Damaged concrete sleepers can be recycled as such or in crushed form in road, track, yard and other projects, where they are used for filling and reinforcing purposes.

Steel rails and switches which are replaced during track renewal can in some cases be used on sidetracks, in yards or on low-traffic line sections. The rest are recycled for other purposes or resmelted. Some switch parts are used as spares in repair work. Surplus parts are passed on to recycling companies for resmelting.

Track ballast can be recycled as a gravel substitute or as a filler in construction projects.

Waste management at real estate holdings

Waste sorting at RHK's real estate holdings varies from place to palce The annual volume of waste at real estate holdings controlled by RHK has not been studied. Owing to their small volume, offices' paper, glass, plastic, metal and other waste were mainly sorted in the same way as household waste.

Objectives

To reduce the amount of waste

Key measures

1999–2001

- *Recycling most materials used in key track construction and renewal*
- *Recycling wooden sleepers in energy production and concrete sleepers in track and road construction*
- *Recycling rails and switches which are taken out of service*

Land areas and buildings

Objectives

To take environmental viewpoints into consideration in managing land areas and buildings

Key measures

1999–2001

- *Paying attention to cultural values in managing station areas*
- *Planning a maintenance classification for station areas*
- *Guidelines for storing materials used in track maintenance and construction*
- *Surveys of contaminated areas and soil studies*
- *Cleaning of fueling points*
- *Composting of soil from the Vainikkala oil spill*
- *Monitoring of groundwater quality at yards*

Building stock

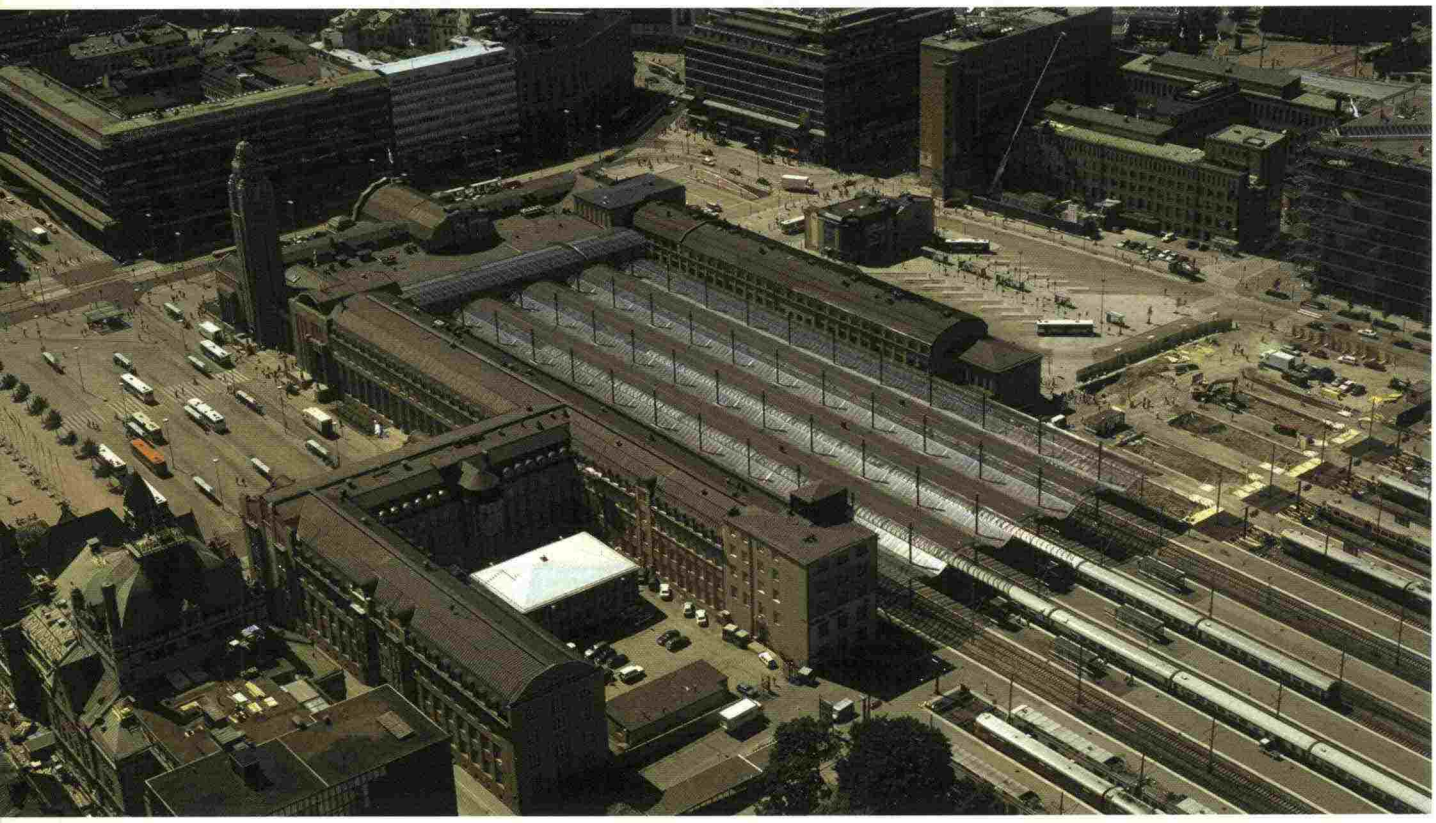
RHK controls 2,777 buildings and around 28,000 hectares of land. The building stock is old. A large portion of buildings have been classified as valuable for the nation's cultural heritage.

The goal is to develop station areas by continuing the present use of buildings or by seeking new uses which will maintain their cultural heritage value in connection with further construction. RHK mainly uses the land areas and buildings which are under its control for the needs of rail traffic.

Renewal of station areas

In 1998 RHK concluded a significant agreement with the Ministry of the Environment, the National Board of Antiquities, VR-Group Ltd, the Finnish Forest Research Institute and the State Real Property Authority concerning the preservation of station areas which are valuable for the nation's cultural heritage.

The agreement covers 115 station areas with 872 buildings in 85 municipalities. The goal is to develop these station areas by continuing the present use of buildings or by seeking new uses which will maintain their cultural heritage value in connection with further construction. In 2001 RHK renewed station areas in Pasila, Hämeenlinna and Riihimäki, among other places, and spent around a million euros on maintaining and refurbishing buildings and station areas.



In 2001 a maintenance classification model was developed for greenery in station areas, with areas being classified on the basis of their significance for transport and cultural heritage values. This classification will be used to set maintenance levels and prepare maintenance instructions for station areas. The present state of greenery in station areas around Finland has been surveyed in connection with the development of the maintenance classification.

Substantial improvements at the central railway station in Helsinki have included the construction of a pedestrian tunnel under the platform area and the covering of platforms. The pedestrian tunnel allows passengers to change platforms or traverse the platform area underground. It is also equipped with lifts to improve accessibility.

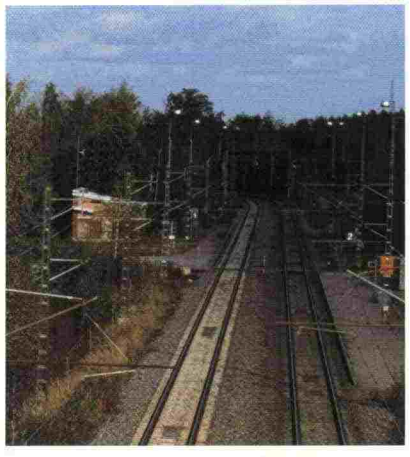
VR-Group Ltd covered the area next to the central station in a manner which is in harmony with the original architecture by Eliel Saarinen. RHK continued this work in the platform area between the station's wings, maintaining a similar style. This project, which was completed in August 2001, has increased passenger comfort and improved the station's service level as well as the effectiveness of the platform area.

Resources to survey and clean contaminated areas

Railways generally have a long history, and they can become contaminated over time. Fueling points, areas around tanks and oil sumps, depot facilities for diesel locomotives, shunting tracks for chemical wagons and areas around switches are liable to become contaminated. Soil can also become contaminated in places where chemicals are handled, such as sleeper treatment plants, or as a result of spills.

RHK has surveyed the condition of soil in 22 places which have come under its control, especially yards and fueling points. The necessary clean-ups will be conducted in cooperation with VR Limited and VR-Track Ltd as well as local environmental authorities.

Soil has been cleaned in eight places. The most important project involved cleaning the Hakkila scrap yard for heavy metals and PCBs in an area of about 3 hectares. The costs of this project amounted to about 1.7 million euros in 2001, and RHK's liability for future cleaning is about 1 million euros.



Challenges for RHK's environmental activities in the coming years

- Reducing noise and vibration problems caused by rail traffic
- Cleaning contaminated soil
- Controlling risks to groundwater caused by traffic
- Minimizing the negative environmental impact of large rail projects
- Reducing lines' barrier effect and improving landscaping
- Increasing the eco-efficiency of infrastructure management by developing recycling and life-cycle evaluation
- Environmental requirements for rail operators
- Integrating quality, safety and environmental systems
- Developing monitoring systems and introducing gauges and indicators
- Developing new operating models to resolve key environmental problems
- Requirements in the EU's new noise directive
- Measures required by legislation concerning the coordination of the Trans-European rail system

Glossary

Automatic train protection (ATP)
The ATP system consists of equipment on tracks and in locomotives. The purpose is to ensure that trains comply with speed limits, warning signs and line signals. If a train exceeds the permissible speed, the brakes come on automatically. Automatic train protection will be installed on all passenger lines and the most important freight lines in Finland by the end of 2005.

Barrier effect
Railways form a barrier to the movement of people or animals.

Carbon dioxide, CO_2
Carbon dioxide is released when biomass decomposes or burns. It is also released in the combustion of fossil fuels such as coal, gas and oil. The release of carbon dioxide from fossil fuels contributes to the greenhouse effect.

Carbon monoxide, CO
Odorless and colourless gas which is formed as a result of incomplete combustion and which can cause poisoning by preventing oxygen from being absorbed into the blood stream. Carbon monoxide can contribute to the greenhouse effect by preventing the oxidation of methane.

Creosote
Oily substance distilled from coal tar which is used as a preservative for wooden sleepers and telephone poles, for example. Creosote is a toxic substance which contains volatile hydrocarbons. It also irritates the skin.

Eco-efficiency
Measures the amount of natural resources consumed in relation to the product or service produced and indicates where attention should be focused to reduce the consumption of resources.

Energy intensity
Energy consumption per unit produced. In rail traffic energy intensity is often measured in megajoules per tonne-kilometre or passenger-kilometre. In international comparisons energy intensity is sometimes measured in relation to tonne-kilometres plus passenger-kilometres.

Energy efficiency
The efficiency of energy generation, use and transmission.

Environmental impact assessment, EIA
A procedure used for identifying the environmental effects of a project, measure or activity, generally in advance. In large projects this is required by law.

Environmental study
Report on the state of the environment, changes in it or factors influencing it.

Environmental system
System for managing environmental matters. The principle is the constant monitoring of environmental aspects and impacts and the constant development of environmental activities.

External costs
Estimated costs and benefits to the neighbouring community caused by the environmental impacts of activities.

Finnish Rail Administration (RHK)
The Finnish Rail Administration, which operates under the Ministry of Transport and Communications, is responsible for maintaining and developing the rail network and for rail safety. It owns the rail network together with related equipment, structures and land.

Fossil fuels
Unrenewable fuels which have been stored in the earth's crust for thousands of years, such as oil, coal and natural gas.

Glyphosates
Chemicals used to control weeds around tracks and yards. Glyphosates are less harmful to the environmental than other herbicides which were previously used for this purpose. They rapidly break up in the soil.

Greenhouse gases
Gases such as water vapour, carbon dioxide, methane, nitrous oxide, ozone and hydrofluorocarbons which allow solar radiation to reach the earth but prevent longwave radiation from bouncing back into space.

Greenhouse effect
Natural warming process in which greenhouse gases allow solar radiation to reach the earth but prevent longwave radiation from bouncing back into space. This heats the atmosphere and contributes to global climate change.

Greenhouse emissions
Emissions of gases which contribute to climate change in the atmosphere. Rail traffic causes mainly carbon dioxide emissions.

Groundwater
Water absorbed and stored in the saturation zone which is in direct contact with the ground.

Hazardous substances
Substances which can cause damage to people, the environment or property as a result of their explosiveness, flammability, radiation, toxicity, corrosiveness etc.

Helsinki Metropolitan Area Council
The Helsinki Metropolitan Area Council is responsible for promoting the development of the Helsinki metropolitan area (Helsinki, Espoo, Vantaa and Kauniainen) by producing high-standard public transport, waste management, air protection and development planning services.

Hot-box detector
Derailings can be prevented by using hot-box detectors on tracks. The information they provide makes it possible to stop trains before axle damage occurs as a result of overheated bearings.

Hydrocarbons, HC
Hydrocarbons result from the incomplete combustion of fuels. Some hydrocarbons have direct toxic effects. Many organic compounds in hydrocarbon emissions are carcinogens, which means they can cause cancer.

Infrastructure management
Maintaining and developing the rail network, which includes maintenance and replacement investments, development projects, traffic control, real estate activities and official tasks.

Length of line
Total length of main and secondary lines excluding sidings.

Life-cycle calculation
Evaluation of the environmental impacts and benefits of a product throughout its life cycle. It takes into account energy and water consumption, soil, water and air emissions, waste and problem waste.

Life-cycle evaluation
A method which determines what environmental impacts a product or activity will have on the environment throughout its life, from the procurement of raw materials and energy to the disposal of waste resulting from its use.

Material input per service, MIPS
The amount of material in kilogrammes required to produce a particular product or service.

Natura area
Special area included in the European Union's Natura 2000 network and intended to protect birds or other natural values.

Nitrogen oxides, NO_x
Products of combustion and to some extent reactions between nitrogen and oxygen in the atmosphere. They cause acidification, eutrophication and corrosion and contribute to the formation of ozone in the lower atmosphere.

Noise
Sound which is unpleasant or otherwise harmful to health or well-being.

Noise control system
In 2001 RHK introduced a noise control system which can be used to designate noise zones in the rail network.

Nordic Infrastructure Managers (NIM)
Cooperation body for Nordic rail authorities.

Particles
Small particles in exhaust gases are mainly carbon, with other harmful compounds on their surface. Particles are harmful to health and cause respiratory illnesses, for example. The effects depend on the size of particles. The smaller they are, the deeper they can travel in respiratory organs.

Passenger-kilometre
Unit representing the transport of one passenger over one kilometre.

Rail network
The entire system in which rail traffic is operated.

Recycling
The reuse of waste as a raw material in manufacturing.

Shunting
Shunting includes moving coaches and wagons in marshalling yards to assemble trains or to deliver wagons to customers' loading or unloading locations.

Specific load
The environmental load per product, raw material or performance unit.

Sulphur dioxide, SO_2
Gas resulting from the use of fossil fuels which causes acidification and damages plant life.

Sustainable development
Constant and guided social change at the global, regional and local level aimed at ensuring present and future generations good possibilities for life. In a broad sense it includes four functional dimensions: ecological, economic, social and cultural.

Tonne-kilometre
One conveyance kilometre of one ton of goods.

Track
Includes rails, sleepers, rail fasteners and rail extensions. Tracks are divided into main tracks and sidetracks.

Track length
Total length of main and secondary tracks plus sidings.

Tractive stock
Includes locomotives, motorized trains, small locomotives and track machinery that are driven by onboard machine power.

Train-kilometre
Distance of one kilometre covered by the train.

Traffic performance
Product of transport units and distances.

Transport system plan
Long-term strategic plan which covers transport as a whole and coordinates the development of the transport system and land use.

Travel centre
A travel centre is a transport service point in a central position in a town, enabling convenient interchange between different modes of transport. It serves local, regional and national transport.

Type approval
Inspection in which equipment is checked to see that it meets technical and safety requirements.

UIC (Union Internationale des Chemins de Fer)
The International Union of Railways is a forum for cooperation between national infrastructure managers and railway operators. Its goal is the general development of railway transport.

Information on the rail network and rail traffic

Gauge: 1,524 mm

Total length of railway lines: 5,850 km

Total track length including sidings: 8,734 km

Lines with two or more tracks: 507 km

Tracks with concrete sleepers: 3,118 km

Sleepers/km: 1,640

Long-welded tracks: 4,307 km

Type of new rails on main lines: 60E1 (weight 60 kg/m)

Electrified line: 2,400 km

Electrification system: 25 kV 50 Hz

Block-protected line: 2,278 km

Centrally-controlled line: 2,159 km

Tunnels: 42

Total length of tunnels: 25,284 m

Railway bridges: 2,119

Bridges over railway line: 814

Number of level crossings: 4,192, including 3,496 on main lines

Land owned by the Finnish Rail Administration: 28,100 ha

Buildings owned by the Finnish Rail Administration: 2,777 with a total volume of 1.4 million m^3

Rail passenger journeys		*2001*	*2000*	*1999*	*1998*	*1997*
Long-distance traffic	million	11.6	11.8	11.8	12.0	12.0
Commuter traffic	million	43.4	43.0	41.4	39.4	37.9
Total	million	55.0	54.8	53.2	51.4	49.9
Rail passenger-kilometres						
Long-distance traffic	million	2.6	2.7	2.7	2.7	2.8
Commuter traffic	million	0.7	0.7	0.7	0.6	0.6
Total	million	3.3	3.4	3.4	3.3	3.4
Rail freight traffic						
Tonnes transported	million	41.7	40.5	40.0	40.7	40.3
Tonne-kilometres	million	9.9	10.1	9.8	9.9	9.9

Rail traffic emissions and energy consumption

	CO	*HC*	*NOx*	*Particles*	*SO_2*	*CO_2*	*Fuel*	*Energy consumption*	*Electricity*
	t/yr	*t/yr*	*t/yr*	*t/yr*	*t/yr*	*t/yr*	*t/yr*	*GJ/yr*	*MWh/yr*
Passenger traffic									
Long-distance traffic, electric locomotives	34.4	4.3	88.2	10.1	73.1	45,169.3		779,153	216,431
Long-distance traffic, diesel locomotives	63.9	20.3	426.7	11.1	13.5	29,880.6	6,868	289,833	
Shunting, diesel locomotives	6.7	3.0	36.8	1.5	0.7	1,908.9	604	25,473	
Total long-distance traffic	105.0	27.6	551.7	22.7	87.3	76,958.8	7,472	1,094,459	
Commuter traffic	14.9	1.9	38.2	4.4	31.7	19,552.4		335,184	93,107
Total passenger trafiic	119.9	29.6	589.9	27.1	119.0	96,511.2	7,472	1,429,643	309,538
Freight traffic									
Electric locomotives	31.0	3.9	79.5	9.1	65.9	40,719.5		698,051	193,903
Diesel locomotives	278.4	120.9	2,179.2	42.2	35.1	91,554.3	28,904	1,219,755	
Shunting, diesel locomotives	77.2	35.1	423.2	17.7	8.4	21,952.4	6,942	292,944	
Total freight traffic	386.6	159.8	2,681.9	69.0	109.5	154,226.3	35,846	2,210,750	193,903
Uncoupled locomotives									
Electric locomotives	0.2	0.0	0.5	0.1	0.5	279.3		5,586	1,552
Diesel locomotives	11.9	5.5	96.3	1.7	1.5	3,851.8	1,219	51,451	
Total uncoupled locomotives	12.2	5.5	96.8	1.8	1.9	4,131.1	1,219	57,037	1,552
Total rail traffic									
Total electric rail traffic	80.6	10.1	206.4	23.7	171.2	105,720.5		1,817,974	504,993
Total diesel rail traffic	438.2	184.8	3,162.3	74.3	59.2	149,148.0	44,537	1,879,456	
Total electric and diesel rail traffic	518.8	194.9	3,368.6	98.0	230.4	254,868.6	44,537	3,697,430	504,993

Source: RAILI 2001

Contact information

Finnish Rail Administration
P.O.Box 185 (Kaivokatu 6), FIN-00101 Helsinki
Tel: +358 9 5840 5111, fax +358 9 5840 5100
E-mail: info@rhk.fi
Internet: www.rhk.fi

Contact persons

Environmental management
Arto Hovi
Tel: +358 9 5840 5036, mobile +358 40 548 7599
E-mail: arto.hovi@rhk.fi

Noise matters
Arto Hovi
Tel: +358 9 5840 5036, mobile +358 40 548 7599
E-mail: arto.hovi@rhk.fi

Vibration matters
Tuomo Viitala
Tel: +358 9 5840 5184, mobile +358 400 480 014
E-mail: tuomo.viitala@rhk.fi

Transport systems
Arja Aalto
Tel: +358 9 5840 5121, mobile +358 40 548 7572
E-mail: arja.aalto@rhk.fi

Chemicals, emissions
Kari Pulli
Tel: +358 9 5840 5185, mobile +358 40 548 7606
E-mail: kari.pulli@rhk.fi

Use of areas and buildings
Southern Finland
Ilkka Saari
Tel: +358 9 5840 5167, mobile +358 40 765 1401
E-mail: ilkka.saari@rhk.fi

Western and Eastern Finland
Simo Kariluoma
Tel: +358 9 5840 5170, mobile +358 40 548 7598
E-mail: simo.kariluoma@rhk.fi

Northern Finland
Eero Liehu
Tel: +358 9 5840 5178, mobile +358 40 733 6308
E-mail: eero.liehu@rhk.fi

Environmental agents

Southern Finland
Kari Hiltunen
Tel: +358 307 20798, mobile +358 40 862 0798
E-mail: kari.hiltunen@vr.fi

Eastern Finland
Jyrki Tarvainen
Tel: +358 307 37104, mobile +358 40 863 7104
E-mail: jyrki.tarvainen@vr.fi

Western Finland
Raimo Kuusisto
Tel: +358 307 30620, mobile +358 40 863 0620
E-mail: raimo.kuusisto@vr.fi

Northern Finland
Kalervo Räisänen
Tel: +358 307 45225, mobile +358 40 864 5225
E-mail: kalervo.raisanen@vr.fi

Finnish Rail Administration's Environmental Report 2001
ISBN 952-445-074-71
Photos: Oy HeliFoto Ab, Timo Huhtinen, Inclus Studio, Risto Laine, Markku Nummelin, Leif Rosnell
Layout and DTP: Inclus Communications Oy
Printing: Libris, Helsinki, 2002