



Ministry of Transport
and Communications

Transport and communications in a digital Finland

Ministry of Transport and Communications – Futures Review 2014



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To the reader

This Futures Review on transport and communications in Finland was commissioned by the Prime Minister's Office and has been prepared by civil servants in the Ministry of Transport and Communications. The Futures Review consists of a section on the changing operating environment and a section on the following three key themes in transport and communications:

- Transport and communications as a service
- Digital information as a source of wellbeing and growth
- Infrastructure as a platform for growth

The Futures Review is based on background material that was published in June 2014. The background material was prepared on the basis of discussions held with stakeholders. The draft of the material was openly available on a Wiki platform for comment by stakeholders and any other interested parties for a period of three weeks in May 2014. This 'crowdsourcing' approach proved popular: about 450 comments and suggestions of different kinds were received.

The idea of the Futures Review is that the preparation of the material does not include any political involvement from Government ministers. However, I hope that during the deliberations on major issues in the next parliamentary term the political process will draw on the matters of substance in this report.

Helsinki, 3 October 2014



Harri Pursiainen

Permanent Secretary

Transport and communications in a digital Finland

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CONTENTS

Summary	5
Operating environment	6
Megatrends	6
Population and society	6
Technology	6
Global economy	6
Climate and environment	6
Weak signals and wild cards	7
Key themes	8
1. Transport and communications as a service	8
Transport services market	8
Energy reform in transport	9
Intelligent user-centric digital services	9
Diversity of content	10
2. Digital information as a source of wellbeing and growth	11
Right to information and making use of this	11
Restoring confidence in the Internet	11
Opportunities to use data for business and other purposes	11
Data and digitisation in transport	12
3. Infrastructure as a platform for growth	13
Reliability and safety	13
Transport and communications links	13
Arctic strategy	14
Funding and economic control mechanisms for the transport system	14

Summary

The transformation of society through the digitisation processes that are in progress has been termed the third phase of the industrial revolution. The digital transformation has radically altered the industrial, commercial and service structures and business models in society, and thus also the basic framework within which Finland seeks to prosper. Digitality permeates all corners of society, and the ability to utilise digital information has become a primary force driving growth and competitive advantage and a foundation for future wellbeing. The digital revolution is having a powerful impact on the daily lives of everybody.

Digital systems are also a key tool with which the public sector can improve its resource efficiency, which is a paramount goal.

Digitisation will have, and is having, a major impact on transport too. The transport system of the future will be a harmonised, interoperable entity composed of infrastructure, services and information. The aim is that transport will be genuinely seen as a service. The principle is that mobility and transport services matching people's needs should be provided on market terms, be interoperable and easy to use, preferably via a single interface. Where a basic service would not otherwise be available, this will be secured with public funding.

As transport systems become more digitised, physical mobility and digital transactions will not only be alternatives but will also complement each other. The emergence of new service markets will be accelerated by the declining appeal of car ownership and the rapidly advancing automation in transport. The customer will have a stronger role, becoming ever more closely involved in designing and developing the services. The increasing utilisation of data and the development of advanced ICT solutions will also improve traffic flow, enhance safety and advance the eco-friendliness of transport, and will therefore help meet the traditional challenges encountered in transport policy.

Transport and communications networks, information and the services covering these serve as a growth platform for wellbeing in society and for corporate and regional competitiveness. The obstacles to utilising digital data are becoming fewer. Nevertheless, the value of data often depends on how it can be combined with other datasets. The issue of data confidentiality and privacy protection is one that must be resolved. This can in part be dealt with by anonymising data.

To ensure progress in these areas, it is important that Finland should have advanced communications networks of the highest standard that meet the growing needs and serve to accelerate the provision and use of digital services. The potential of communications networks and other infrastructure for different services and innovative uses must be utilised in full. The development of digital systems and technologies has led to a very dramatic increase in the provision of media and other content services and has challenged the operating and revenue models of the traditional media. The digital revolution must supply the right conditions for providing a diverse range of content while also encouraging the sector to seek bold and advanced solutions.

The importance of transport infrastructure as a platform for the creation and growth of business activity has been more fully understood in recent times. The transport system is inextricably coupled with the development of Finland's regions and urban areas. Any examination of transport links and their development needs must recognise the factors affecting change within society and in different areas. Among these factors there will be an increasing emphasis in the next few years on energy sources and forms of energy production, the urbanisation process, the rise of the bioeconomy in Finland and the needs of tourism.

Operating environment

MEGATRENDS

Population and society

- Urbanisation: urbanisation will continue in Finland and at a global level
- Differentiation of needs: people's needs will become more individualised
- Polarisation: divisions will increase in society – differences will grow between various sections of society
- Ageing: the population will age rapidly, and there will be an increase in lifestyle illnesses

Technology

- Digital revolution in the workplace: work practices and content will change substantially
- Big data: new services will be created around user data
- Automation, robotisation
- Everyday intelligent technology: positioning technology and the advanced connectivity of IoT ('internet of things') will revolutionise the living environment, products and services
- Data-driven economy: potentially EUR 40 billion annually

Global economy

- Global competition: major international companies will become more significant and will transform revenue logic
- Digital distribution channels: even small companies will be able to succeed globally
- Sustainability gap in public finances: changes will occur in the content and methods of service provision, and the role and responsibility of citizens will grow

Climate and environment

- Extreme weather phenomena will become more common and disruptions will be more frequent
- Climate change
- Energy consumption will grow by almost 60% by 2040
- Low-carbon society, renewable energy sources

WEAK SIGNALS AND WILD CARDS

- No personal means of transport: demand generated for new types of services as a result of new attitude to vehicle ownership
- Diminishing cultural capital: decline in quality and quantity of Finnish content production
- Fragmenting Internet: emergence of regional, wireless off-grid versions of the Internet in different countries
- Satellites in solar wind: increase in weather phenomena related to solar wind and impact on telecommunications and transport
- Tipping points in the climate system: for example a more rapid melting of the ice cap than suggested by current forecasts
- Unravelling of monetary union in the EU: insufficiency of actions taken at EU level to tackle the financial crisis
- Crack in digital society's foundations: collapse in trust in the channels and content, or a serious disruption to the Internet (deliberate or otherwise)
- Sudden leaps in technology: sudden shifts in ICT or energy technologies in particular, which are not observed at present

Key themes

1. TRANSPORT AND COMMUNICATIONS AS A SERVICE

Market for transport services

Finland is well equipped to become a front runner in transport sector renewal and in new transport services. Over the next few years, it will be essential to support the development of a transport services market that will improve the productivity of the transport system and enhance its customer focus. This will require a reassessment of public and market-based service provision and the prioritisation of travel and transport that are provided using public funding. Service provision will take into account regional differences and people's different life stages. Solutions for major urban areas and for sparsely populated areas will have to be considered on a more individualised basis and acknowledging that the same solutions will not fit everywhere. Services in sparsely populated areas will be arranged as service packages utilising digital solutions.

In its current form, service provision in the transport system and concerning the transport network is in many cases narrowly based and focuses on a particular product or service. The public sector must take steps to enable the wide-ranging provision of market-based services. This will improve the opportunities for market-based service businesses and will create space for innovations and for the export of these innovations. The emergence of service innovations can be accelerated by boldly performing trials and experiments.

The creation of new services must be encouraged particularly for the interfaces between current transport modes. The idea of combining passenger, postal and goods transport should be given careful consideration with an open-minded approach. Combining services can be encouraged by introducing a platform ('mobility account') that accommodates payment, ticketing and information systems. Such a mobility account could also incorporate elements that encourage eco-friendly mobility, for example.

The government sector will take steps to facilitate these new ideas. Reassessment of the regulations and reshaping of control and procurement procedures will create the right conditions for the development of different sectors and for business activity. Efforts to accelerate the provision of new services must take into consideration the need to avoid being dependent on particular technologies. Operators will be encouraged to develop solutions and services directly for the global market, as the strongly growing markets of the future will be outside Finland and Europe. Globalising business logic will require new expertise from the government sector as well. A networked and open approach (public-private-people partnership, PPPP) will ensure the involvement of customers and stakeholders and their commitment to shared objectives. The role of the Government as an owner of companies that provide transport services will have to be critically reviewed and this role dismantled if necessary.

Legislation concerning transport services and information assets should be made more coherent and should more effectively support market activity. Consideration must be given to gathering together all transport regulations under a unified *Transport Code*, and these efforts should begin by developing the regulations covering markets and information assets. Fair competition will be ensured through legislation, facilitating entry to market and preventing market disruptions. The needs of users will be taken into account by securing consumer protection and privacy protection and the availability and ease of use of services. Finland must also contribute actively in the EU towards the creation of a favourable operating and regulatory environment for new services in the transport sector by furthering the opportunities within the EU for reciprocal provision of transport services.

Energy reform in transport

The entire transport system must have an all-encompassing basic readiness to use renewable fuels or electricity in all transport modes. The aim is to reduce dependence on oil and to achieve a position where the export value (in euros) of renewable fuels for transport exceeds the value of fossil fuel imports. Other transport emissions, such as sulphur emissions from shipping and carbon dioxide emissions from aviation, could also be considerably restricted via the adoption of new propulsion systems. The use of new fuels and propulsion systems must be promoted by removing obstacles to market-based distribution and through choices in Government procurement.

The use of electricity as a genuine alternative will be promoted in urban transport in particular. Electrically powered transport will open up new opportunities regarding the production of electricity in towns and cities and at the level of individual properties. In the future, electrically powered transport will be able to operate not only using battery systems but also hydrogen or compressed air. The public sector, with its procurement needs, will be able to establish reference cases on the Finnish market. As the choice of different propulsion systems becomes more diverse, it will be essential to ensure that vehicle purchasers have access to objective information on the alternatives.

Intelligent user-centric digital services

To have intelligent solutions for commercial, industrial, transport and other service systems it will be necessary to ensure that the relevant background systems and legislation are in order. The aim is also to ensure that the digitisation of information systems on which public services are based and the openness of their interfaces support the wider adoption of intelligent systems in public services. Usually new solutions cannot be introduced straight away but first need to be in trial operation. The government sector must establish the framework to allow such trials and experiments to be conducted conveniently – nationally or locally.

Many of society's services can be improved and more efficiently provided by means of digitisation and the use of digital systems. However, this will require determined efforts from central and local government. In the current parliamentary term, the ministries have drawn up intelligence strategies for digital development in their own administrative domains. This work must be continued and ambitious goals set for all entities at all levels of public administration.

The spread of digital systems throughout society means that services and functions are increasingly available in electronic form. We are gradually moving to the stage where, for example, all transactions with public authorities will be performed digitally. This will require services that are carefully designed, unrestricted and easy to use. Progress towards this can be accelerated by means of incentives and service targets. Finland would also be equipped to transfer to fully digital public administration. In the future, it will be essential at all times to make use of advanced technologies in solutions regarding health service provision, the ageing of the population, environmental protection, energy efficiency improvement and other areas. The planning of public services will also have a strong emphasis on aspects of service design. Service provision will have to meet privacy protection requirements.

The revolution in electronic communications is also affecting postal services. Traditional communication by letter is on the decline, but the demand for parcel and freight services is growing. The competitive position on the service market is also changing. Digital solutions will allow the development of cost-effective services to meet customer needs.

Diversity of content

The Internet has brought a major expansion in the provision and use of all kinds of content services. It has also become a significant distribution channel for traditional audiovisual services. The switching of television broadcasts to broadband distribution will need to be considered in the 2020s. Such a transfer will need to be done in a controlled manner using various transition periods also for the traditional distribution channels. This will not simply be a change of technology but will also affect content, business models, user expectations and user habits.

Finland still has a strong and high quality media sector in which the operating environment is extremely competitive. In this rapidly changing environment the companies in the sector have to be able to quickly absorb new methods and revenue models. At the same time there is also a need to further develop traditional publications. Continued development of a robust and dynamic content industry and new business activity can be supported by means of legislation to encourage this and appropriate policies on licences and innovation.

Amid the digital revolution it is essential to develop the right conditions for content provision by encouraging the sector (both commercial entities and Finland's national public service broadcasting company Yleisradio Oy) to seek bold and advanced solutions. The operating licence system for terrestrial broadcasting must be reassessed as well. Content production can also be promoted through innovation support, by including content production as part of the national innovation policy and as a separate programme for the content industry if necessary. Making use of solid Finnish expertise in the digital and creative sectors will generate competitive advantages. It is also important to ensure that the regulations have as neutral an impact as possible on the different entities offering consumable content in different distribution platforms under various business models. The competitiveness of new digital content must be secured in tax and copyright related issues.

2. DIGITAL INFORMATION AS A SOURCE OF WELLBEING AND GROWTH

Right to information and making use of this

Responding to the digital revolution requires an all-embracing digitisation strategy that focuses on digital business and the commercialisation of digital opportunities (cloud services, mobility, data centres, utilising big data, international telecommunications). In its activities and decision-making, the government sector must also make full use of the opportunities offered by developments in technology and the growing volume of digital information assets.

In information-based activities the key issue will be who has access to the digital data collected in various contexts. In regard to personal data, the principle should be that the individual has the chance to make a decision about his or her personal data and its use. In a digital operating environment the issues surrounding privacy protection will be especially important.

Datasets published using public funding (open data) must be available to citizens and to businesses and other organisations and must be easy to use. Making information assets available is something that must be continued systematically, paying particular attention to ensuring that these assets can be used to create new business activity and to improve the efficiency of public sector activities. Companies too have significant information assets, and sharing these on the basis of the companies' own strategic decisions could enable more effective development of applications and services that use these information assets.

Restoring confidence in the Internet

The efficient functioning of a digital society is based on establishing confidence and further reinforcing it. Success will depend on the extent to which there is confidence in information technology, digital service provision and regulatory compliance (on the Internet as well). Ensuring information security and reinforcing confidence are the concerns of all service providers and users. It is essential to invest in information security awareness and expertise throughout society.

A key component of trust is that it should be possible to ensure the reliability of processing digital information in all circumstances and that this information processing should be based on generally accepted practices. The opportunities for users to access and manage the information that is gathered about their own usage must be improved. Special attention must be focused on ensuring that processing information related to people's fundamental rights is transparent and that any measures restricting fundamental rights are not disproportionate to the purpose in question. A digital global operating environment requires calculated measures to combat vulnerabilities and cyber threats. Various international forums will play a key role in the collaboration to build trust. Finland's information security will be a competitive strength on global markets.

Opportunities to use data for business and other purposes

Finland is well equipped to accommodate major new data centres that will need to be built in the coming years. Competition to attract these investment projects will be extremely tough and so a very determined effort will be needed to lure these projects to Finland.

It is likely that the activities created around these data centres will include the development of cloud services, and these will experience substantial growth. This will not be just a matter of ICT but above all a transformation of the business models and structures in all sectors of the economy. Rapid investment to strengthen expertise in cloud services will enable Finland to become a significant developer of cloud services.

In a digitised society, datasets, information based on analysis of data, and decision-making based on that information will constitute major elements of added value creation. As digital systems develop, the collection of data will become an ever more industrial function.

Success in a digital operating environment will require the ability to combine the use of cloud services, big data, mobility and the advanced connectivity of IoT ('internet of things'), along with their various applications. The opportunities offered by robotics must also be exploited. Finland has strengths particularly in mobile operating environments and in the use of big data. Investment must be made in developing the use of cloud services, IoT and robotisation, which are areas in which Finland has an urgent development need in relation to its key competitor countries. In developing services and applications it will also be important to make sure that the solutions are as energy efficient as possible throughout their life cycles.

Data and digitisation in transport

The digitisation of transport is just beginning, and in the future the opportunities this brings will greatly increase. The pace at which the technologies are developed could well be very fast. The most significant enablers for transport will be: strong growth in the amount of mobile terminal devices and applications, the opportunity to be constantly connected to a telecommunications network, access to information assets, big data and an increase in positioning and navigation services. Information assets and architectures in transport will require a strategic overview in the next few years as well as appropriate legislative provisions.

As technology develops, transport infrastructure and vehicles will increasingly feature intelligent systems and transport users will have a greater role as producers of data, heightening the need to integrate the different parts of the transport system. These developments will also improve the performance of the transport system. Automation will bring opportunities for replacing human labour especially in traffic control. The developing service sector will exploit technological innovations and produce new applications and services based on user needs.

3. INFRASTRUCTURE AS A PLATFORM FOR GROWTH

Reliability and safety

The ease with which daily activities are undertaken will depend to a great extent on the efficient functioning of the communications networks, information systems and terminal devices making up the basic digital infrastructure. It will therefore be critical to ensure that these are always reliable, in operation, disruption free and secure. It is essential that any problems in communications services, which could occur for all kinds of reasons, such as natural phenomena, can be rectified quickly. In particular, enduring solutions must be found to issues concerning the security of electricity supply.

The operating reliability of transport connections is essential for all parts of the passenger and goods transport chains. Climate change will increase the frequency of extreme weather phenomena, which will affect both the reliability and safety of transport. With information services and data it will be possible to reduce and manage the risks concerning reliability of operation. On the other hand, dependence on technology will add to the reliability risks in the transport system.

The most efficient way of improving the smooth flow, safety and reliability of transport is by means of intelligent transport and traffic management systems. Critical to improving traffic safety will be the cooperation of all concerned, regardless of administrative domain, in focusing on certain themes (attitudes, fitness to drive, driver health, vehicle stock, spatial planning and opportunities offered by new technology). This cooperation must be managed and performed on the basis of jointly determined strategic and operational objectives and indicators.

Transport and communications links

Transport infrastructure and services are, above all, enablers for society's key functions (education, housing, travel to work, and productive activity), and at the same time facilitators of economic growth. The design and implementation of the transport system involve multidisciplinary and cross-sectoral cooperation. The need for target-oriented cooperation between transport, regional, business and innovation policies will be particularly important.

The needs of businesses can change very quickly. Transport infrastructure and services must be able to react to such changes rapidly and efficiently. The response must focus on understanding customer needs, monitoring real-time status and systematic forecasting. The needs of businesses must be met proactively with new solution models that emphasise digital services.

The procedure for letters of intent covering land use, housing and transport in major urban areas will be broadened by more effectively integrating with it service structures and business operating conditions. This integration will focus especially on digital service structures, improving the operating conditions for business activity through intelligent solutions, and collaboration between different administrative domains. Development work concerning the integration of land use, housing, transport, service structures and business operating conditions will concentrate on major urban areas. Measures agreed jointly between the Government and local authorities to serve the strategic goals of the major urban areas should be brought together into a single package by means of broad-based agreements that transcend administrative boundaries. The aim will be to promote the competitiveness, growth and sustainable development of the major urban areas.

Finland is committed to the development of the Trans-European Transport Network (TEN-T). The TEN-T guidelines lay down common requirements for infrastructures. The requirements are technical and do not reflect actual national needs in detail. Finland will exert its influence at EU level to seek to ensure that the guidelines take into account the needs regarding the creation of digital services in transport and bringing information platforms up to date.

The volume of data transmitted in data networks is rising constantly and the use of services over the Internet is increasing, which means that network quality and availability demands are growing across the country. The fundamental requirements for digital development must be secured so

that high-quality telecommunications connections are available which make use of wireless and fibre solutions that complement each other. The aim is that everyone should at least have access to telecommunications connections that enable use of utility and entertainment services that are publicly available. The development of communications networks must nevertheless seek to constantly increase connection speeds and quality.

Key roles will be played by operating licence and spectrum policies and by regulatory development to keep up with the development of markets and customer needs. The quality of connections will be determined by their capacity, territorial coverage, energy efficiency, reliability and security. Networks must be built cost-effectively and using the latest technology, and must also make use of existing solutions, while paying attention to energy efficiency requirements as well.

Arctic strategy

Interest in Arctic matters has grown globally. This may create opportunities to use Finland's Arctic expertise, for instance in maritime transport, icebreaking and meteorology.

The development needs regarding transport, logistics and new connections in northern areas have been highlighted by various factors: the growth outlook for mining, the needs of tourism, the growing energy industry in the Barents area, and the gradual opening of the Northern Sea Route. These connections typically cross national boundaries, and so it will be important to examine them as a whole together with Finland's immediate neighbours in the north. However, the infrastructure required is very costly and there is no prospect that the financing mechanisms at their current level will allow such projects to be funded. The rationale for implementing these projects will depend on the actual demand for transport.

Telecommunications networks and digital services that are reliable and have sufficient capacity will provide a basis for developing economic activity in Finland's northern conditions and more generally for improving the competitiveness of the entire country. There are plans for a new telecommunications connection between Germany and Finland which will raise the international links between the two countries to a new level. The new connection, together with a possible telecommunications link built along the Northern Sea Route to join Europe and Asia, will open up new opportunities for Finland to become a world-class telecommunications hub.

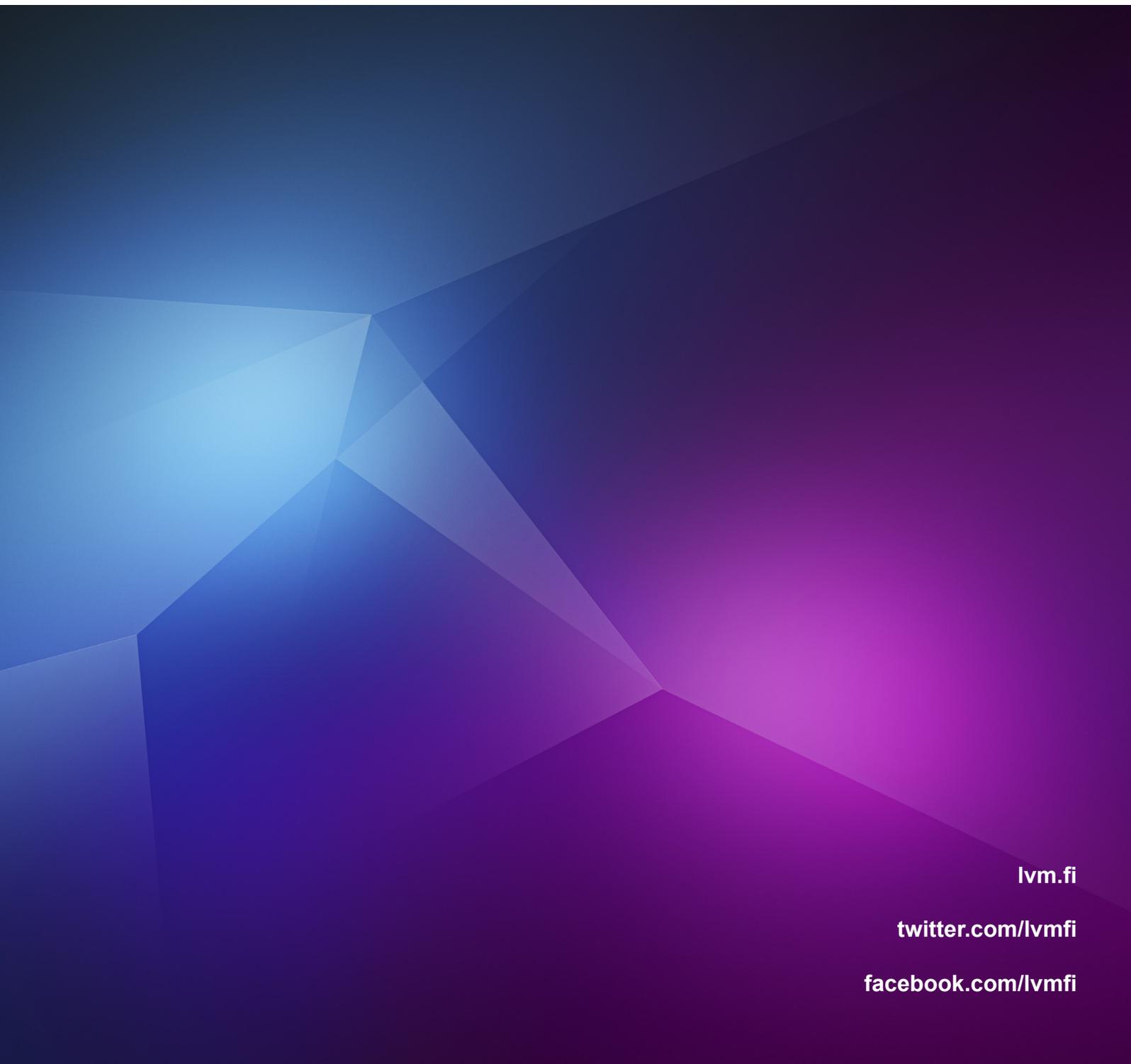
Funding and economic control mechanisms for the transport system

Key transport policy challenges for the next few years include the deteriorating service level of the transport network and the growth of the repair backlog for upkeep of the infrastructure. Too little has been invested in basic infrastructure management over the years. In the short term it will be essential to concentrate on bringing the funding for basic infrastructure management to a sustainable level and safeguarding the purchasing power of this funding.

Finland's transport system, and especially its main road network, is used inefficiently in relation to its capacity. Its capacity utilisation could be increased with the aid of private service provision and business activities. In terms of transport network ownership this means turning the network or parts of it into a platform for service business that would be based on the desire and ability of users to pay for the service they receive.

The efficiency of the transport system could also be improved by developing transport pricing, i.e. by introducing payments based on user pays principle and by modifying the taxation arrangements. Pricing based on user pays principle would make personal travel decisions highly transparent to the users. Transport system users would be able to influence the price of their travel more effectively than at present through their independent choices and travel behaviour. Users would also have a genuine incentive and opportunity to take into account the externalities of transport in their decision making. This economic control mechanism could thus also support environmental policy objectives. A position on renewal of the car and vehicle tax system ought to be taken in the next government term.

Efficient and economical management of the transport system will require modification of the budgeting procedures so as to facilitate the use of a diverse set of tools and comparison of different alternatives. The budgeting procedures must more flexibly enable parties benefiting from a project to take part in the funding of projects. It has to be possible in the future to coordinate the funding for travel and transport in the public sector's different administrative branches more flexibly than at present.



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