

# National Growth Programme for the Transport Sector 2018–2022



Ministry of Economic Affairs  
and Employment of Finland

## **National Growth Programme for the Transport Sector 2018–2022**

MEE Guides and other publications 1/2018

ISSN 2342-7914 (printed publication)

ISBN 978-952-327-317-7

ISSN 2342-7922 (electronic publication)

ISBN 978-952-327-318-4

Ministry of Economic Affairs and Employment

Innovations and Enterprise Financing

P.O. Box 32 FIN-00023 Government

Publisher Ministry of Economic Affairs and Employment

Editors: Growth Programme workgroup

Graphic design, layout and illustrations pages. 13, 27: Elvi Turtiainen Oy

Printed by: Ministry of Transport and Communications 1/2018

Cover image: Shutterstock

# Contents

Foreword	4
Abstract	6
<b>1. Introduction, objectives and vision</b>	<b>9</b>
1.1. Introduction	9
1.2. The transport sector: objectives and vision 2030	12
<b>2. Operating environment</b>	<b>15</b>
2.1. The main forces for the change in the transport sector	15
2.2. The transport market	17
2.3. The transport system 2.0	19
<b>3. Growth in the transport sector and the ecosystemic approach</b>	<b>23</b>
3.1. The ecosystemic approach in the National Growth Programme for the Transport Sector	23
<b>4. Roadmap 2018-2022</b>	<b>26</b>
4.1. Common vision and enabling legislation as the basis for renewal process	28
4.2. Cities as a platform for lead markets	30
4.3. Digital data will be put into effective use	32
4.4. Achieving a competitive advantage through research and education	34
4.5. Broad funding base as a lever for development	36
4.6. Through experimentation and trials to the leading edge	38
4.7. Market references and scaling through public procurement	40
4.8. Internationalisation within reach of all companies	42
4.9. Business-driven growth ecosystems as drivers of exports	44
<b>5. Implementation, measuring and monitoring</b>	<b>47</b>
5.1. The organisation and measurement of the implementation process	47
5.2. Monitoring of the effectiveness of the work and measures	48
APPENDICES	49

## Foreword

Policymaking in Finland has a strong tradition of continuity. It has been possible to take the decisions that have been made forward across government terms. Business and industry have emphasised their specific will for predictability. Seen globally, however, we are headed in a direction where the only thing that is predictable is the rapid change in the operating environment. This will require a very robust approach to policymaking and the drafting of legislation. The new products, services and business models of the future will emerge in an environment where regulation is fair, open and genuinely on the side of reform and renewal.

Transport is a part of business and industry where the pressure for change is unusually strong. At the same time, though, the opportunities are huge. In few other industries is user information a platform for internationally scalable business. We have excellent potential for creating conditions where a service structure developing around knowledge and expertise leads to new international business.

The direction and pace of change are not our choice alone, because the emission reduction targets set for Finland are forcing us to modernise and take new directions. The alternative is bleak: restricting transport in order to lower emissions. It is sensible for us to introduce the necessary reforms in such a way that they result in new exportable business. At the heart of change are people with their need for travel and logistics. The new tools, such as artificial intelligence and digital and service platforms, will permit the Finnish-based development of global business based on these needs.

The National Growth Programme for the Transport Sector will boost cooperation between private and public sector actors. The challenges faced by the transport sector and its opportunities are generally so great that not one actor alone can address and respond to them. This is why we need cooperation and an ecosystemic approach.

This Programme will lead to broad cooperation to enable us to achieve the National Growth Programme for the Transport Sector 2018–2022 targets and together implement the measures written into the Roadmap. Join us in this venture and let us make this a turning point. Let's see the change as an opportunity.



**Mika Lintilä**  
*Minister of Economic Affairs*  
Ministry of Economic Affairs and  
Employment



**Anne Berner**  
*Minister of Transport and Communications*  
Ministry of Transport and Communications



**Jari Leppä**  
*Minister of Agriculture and Forestry*  
Ministry of Agriculture and Forestry



**Kimmo Tiilikainen**  
*Minister of the Environment, Energy and Housing*  
Ministry of the Environment



**Jukka Mäkelä**  
*Mayor*  
City of Espoo



**Jan Vapaavuori**  
*Mayor*  
City of Helsinki



**Päivi Laajala**  
*Mayor*  
City of Oulu



**Lauri Lyly**  
*Mayor*  
City of Tampere



**Minna Arve**  
*Mayor*  
City of Turku



**Kari Nenonen**  
*Mayor*  
City of Vantaa



**Pekka Soini**  
*Director General, CEO*  
Business Finland



**Mikko Kosonen**  
*President, Executive Director*  
Finnish Innovation Fund  
Sitra



**Tiina Kähö**  
*Executive Director*  
Helsinki Metropolitan  
Smart & Clean Foundation



**Anna-Mari Ahonen**  
*Region Mayor*  
Regional Council of Häme



**Antti Vehviläinen**  
*Director General*  
Finnish Transport Agency



**Kari Wihlman**  
*Director General*  
Finnish Transport Safety Agency  
Trafi



**Antti Vasara**  
*President, CEO*  
VTT Technical Research Centre of  
Finland Ltd



**Karri Salminen**  
*Chairman of the Board*  
Intelligent Transport Systems (ITS) Finland

# Abstract

## Starting point

The starting point for the National Growth Programme for the Transport Sector 2018–2022 is the promotion of the sector’s business-driven development, growth and internationalisation. Transport is a major driver of the Finnish economy and includes around 35,000 companies employing some 200,000 people. At the same time, the turnover of companies operating in the transport market is estimated at in excess of EUR 60 billion.

## Focus and objectives

The main objective of the new National Growth Programme for the Transport Sector is the promotion of business- and export-driven growth as a collaboration between the public and private sectors and research bodies. The Growth Programme is focused on the development of the ecosystem, in addition to growth, and the purpose is not to concentrate on single transport projects, the general development of the transport sector or transport policy themes. The Programme’s focus is therefore closer to innovation and industrial policy than transport policy.

The Growth Programme will see the creation of a common set of targets and a future scenario for the industry in 2030. It also describes the skills and expertise that exist in the sector, its operating environment, and key measures over the next few years. There is also to be active monitoring of the Programme’s progress. The Programme will help establish a national frame of reference for the digitalisation of transport, RDI, investment and public procurement. It will boost Finland’s position as an internationally recognised forerunner in the areas of transport research and innovation, expertise in the sector, and investment and new business. One underlying principle here is the exploitation of the national market in the development of companies’ knowledge and expertise and in the creation of market references based on customer needs.

The transport industry is going through a time of technological, economic and social change, and its renewal and modernisation will largely rely on the opportunities that digitalisation will bring with it. The transport industry’s global markets offer enormous potential for growth. For example, the MaaS (Mobility as a Service) market is predicted to grow to USD 1 000 billion by the year 2030.

All of this points to the fact that the transport sector in Finland is:

1. A growing sector that promises a future where there will be a good number of business-driven ecosystems aiming at international growth.
2. A source and user of diverse, high-quality research and of the inventions and innovations that result from it.
3. An unbiased lead market in the user-driven piloting of new technologies and services.
4. An attractive area for transport testing and piloting platforms and investment in the industry.
5. A dynamic operating environment for start-up enterprises in the sector and a reliable partner for the international growth of established companies in the industry.
6. An active and proactive area of application for new technologies, such as blockchains, machine learning, artificial intelligence, automation, mass data, etc.
7. A globally well-known and recognised role model for intelligent and sustainable mobility and innovative solutions.

## Preparation of the Growth Programme and its Roadmap 2018–2022

The members of the steering group in charge of preparing the Growth Programme were the Ministry of Economic Affairs and Employment, the Ministry of Transport and Communications, the Ministry of the Environment, the Ministry of Agriculture and Forestry, the Cities of Espoo, Helsinki, Oulu, Tampere, Turku and Vantaa, Tekes (from the 1<sup>st</sup> of Jan. 2018 Business Finland), Sitra (Finnish Innovation Fund), the Helsinki Metropolitan Smart & Clean Foundation, VTT Technical Research Centre of Finland Ltd, the Regional Council of Häme (the Growth Corridor) and ITS Finland. During the preparatory work, meetings of the steering group and working group were held, and there were also four theme-related workshops and interviews with actors.

These determined the following key measures under the Roadmap for the period 2018–2022:

1. A common vision and enabling legislation as a basis for renewal and modernisation.
2. Cities as a platform for lead markets.
3. The exploitation of digital information.
4. A competitive advantage through research and training.
5. Diverse forms of financing as a lever for development.
6. Experimentation to put the sector at the forefront of development.
7. Market references and scaling through public procurement.
8. Internationalisation within reach of all companies.
9. Business-driven growth ecosystems as drivers of exports.

## Implementation and monitoring of the Roadmap

In order to implement the Growth Programme, it is important that companies, public actors and the research sector commit to the wide-ranging implementation of its measures. A steering group consisting of representatives of the state, cities, businesses and the research sector is being set up to monitor implementation. The group will monitor the progress of measures,



Photo: City of Helsinki Materials Bank / Ari Leppä

decide on any new measures to be incorporated into the Programme, and appoint new bodies responsible for the coordination of new functions and tasks. A dynamic Growth Programme portal is to be created to show the general situation with regard to the Programme at any one time, and to measure and monitor its results. This will ensure that the content of the Roadmap is regularly updated and monitored and that the effectiveness of the results can be assessed.



Photo: Shutterstock



# 1. Introduction, objectives and vision

The starting point for the National Growth Programme for the Transport Sector is the promotion of business-driven development in the sector, its internationalisation and its growth. The approach is an ecosystemic one, where the combined efforts of the public and private sector and the research sector establish a systematic process for achieving objectives and targets. The Growth Programme will see the creation of a common set of targets and a future scenario for the

industry in 2030. It also describes the skills and expertise that exist in the sector, its operating environment, and key measures over the next few years. There is also to be active monitoring of the Programme's progress. It has been a thorough and open process drawing up the Programme. During that process there were numerous consultations, discussions, interviews and workshops to hear the views of actors and operators (Figure 1).

## 1.1. Introduction

Finland, like most other developed economies, is going through a time of technological, economic and social upheaval. The changes are connected with processes and business models as they relate to industry, commerce and services. While they call on traditional actors to make changes and modernise, they also create business opportunities for new innovative companies.

The transport sector is one of the fast changing industries whose development is affected at the same time by megatrends – the drivers of change. Some of these are due to climate change and the complex challenges resulting from increasing traffic volumes, while others are associated with the opportunities afforded by digitalisation and technology. The changes



Figure 1. Preparation of the Growth Programme. (See Appendix 4)

are visible across the entire sector and regardless of the mode of transport, both in the area of passenger transport and the transportation of goods, in industry and services, and in the countryside and in the cities.

The most obvious need for renewal is in the cities, where increased reliance on cars has meant that traffic in many places has an adverse effect on urban development and people's well-being. There is no easy solution to the problem, since forecasts suggest that the number of cars in the world will double over the next decade. Private car ownership only accounts for approximately 15% of the world's increasing population at present. The costs of congestion to the global economy are nevertheless massive: more than USD 100 billion in the United States alone<sup>1</sup>. Moreover, more than 1.2 million people lose their lives and as many as 50 million are injured in traffic every year<sup>2</sup>. So there is a real need for change.

Global warming is the greatest challenge we face and emissions from traffic are one of its biggest causes. The obligations to cut emissions under the Paris Agreement and the EU Commission's pro-

posal that followed from it will not be achieved as things stand now. In Finland, the emissions reduction target for traffic agreed in its energy and climate strategy is 50% by the year 2030 compared to the level for 2005. To achieve these targets, a wide range of options will need to be looked at, and the need for change will have to be the practical goal for all those parties involved in the transport system.

**The renewal of the transport sector will largely be based on the opportunities that digitalisation has brought with it.** It will pave the way for developments in the law, technologies, business models and the needs of customers. Finland has excellent skills and facilities for exploiting the digital breakthrough in transport: it has Europe's strongest digital knowledge capital<sup>3</sup> and its digital competitiveness is world-class<sup>4</sup>. In the last few decades, Nokia's legacy and the engendered competence combined with the new generation startup culture and thought leadership in the transport sector all provide an excellent basis for the National Growth Programme for the Transport Sector.



Photo: Rightware

<sup>1</sup> Texas A&M Transportation Institute and INRIX, 2015, Urban Mobility Scorecard.

<sup>2</sup> WHO, 2015. Global status report on road safety.

<sup>3</sup> IMD, 2017. IMD World Digital Competitiveness Ranking 2017.

<sup>4</sup> Government, 10/2017. Research and Innovation Council vision and roadmap.

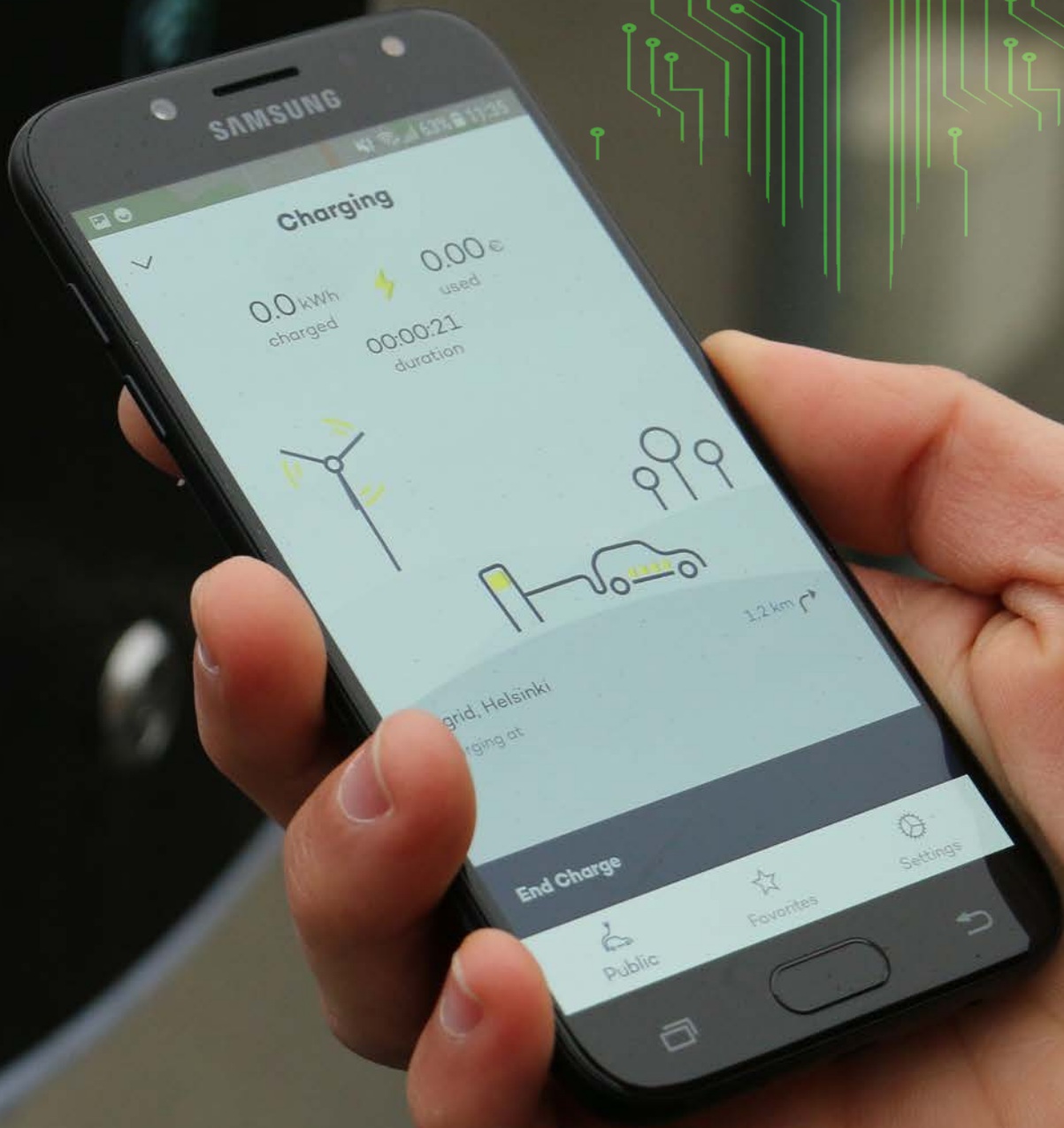


Photo: Virta

## 1.2. The transport sector: objectives and vision 2030

According to the vision and Roadmap of the Research and Innovation Council reporting to the Prime Minister's Office, by 2030 Finland will be the world's most attractive and knowledgeable environment for experimentation and innovation<sup>5</sup>. The Council's vision and roadmap provide a common direction for RDI policy, where solutions to global problems are arrived at and international demand is kept pace with. The Council's long-term aim is for Finland to have several business-driven growth ecosystems involving billions of euros, which produce competitive solutions to meet global needs.

The National Growth Programme for the Transport Sector will ensure that the transport sector is involved in the implementation of the Council's national objective. The Programme will establish a national frame of reference for the digitalisation of transport, RDI, investment and public procurement. It will serve to bolster Finland's position as an internationally recognised pioneer in the fields of research and innovation, investment and new business. The National Growth Programme for the Transport Sector will bring together the key actors associated with the common objective and promote dialogue among the different parties.

A dialogue between ministries, cities and municipalities, research and business as regards the direction of the transport sector, its opportunities and the required measures will help produce an overall picture and create a common growth story. A shared view of the set of objectives and of the future will aid the optimisation of resources and the identification of potential growth areas.

**The guiding principle behind the Growth Programme is the exploitation of national level cooperation and the market for the development of skills and competence in the sector and for the creation of common market references.** In other words, at the same time that the national transport system is being developed, the knowledge and skills of all actors in the sector are being comprehensively improved and solutions for also the international demand are being created. This will raise the profile of Finnish companies among investors and boost the attractiveness of the Finnish market from the angle of the 'Invest in' venture. It will also promote opportunities for cooperation for Finnish actors and operators in global networks when seeking project partners or competing for EU funding.

**The aim of the Growth Programme is the promotion of the transport sector's business-driven and export-led growth as a collaboration of the research, public and private sectors.** The Programme does not focus on individual transport projects, the general development of the transport sector or matters of transport policy. The Programme's priority lies in ecosystemic development, although the Programme also promotes the development of individual innovation solutions. The Programme's focus is therefore closer to innovation and industrial policy than transport policy.

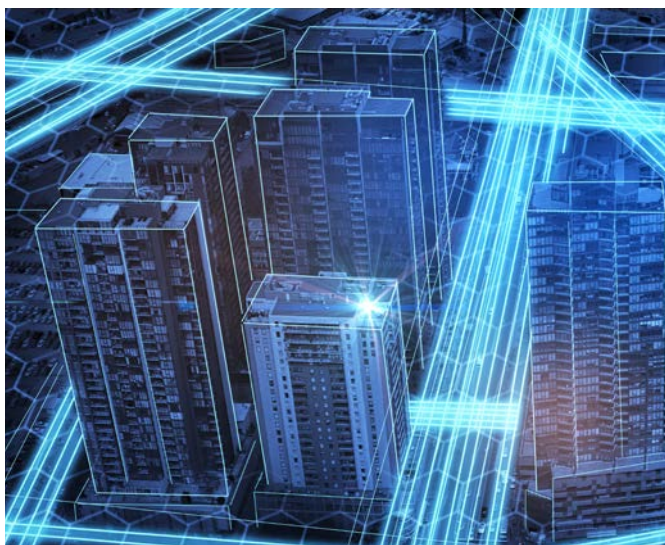


Photo: Shutterstock

<sup>5</sup> Government, 10/2017. Research and Innovation Council vision and roadmap.





Photo: City of Helsinki materials bank / Photo Agency Kuvio

# 2. Operating environment

## 2.1. The main forces for the change in the transport sector

Transport is closely linked to the general change in society. Global megatrends and the new technologies and social innovations made possible by digitalisation steer developments and manifest themselves in everyday life as new user-driven products and services. The signs of change in the transport sector are apparent on a daily basis in the media, in the strategic reviews of leading companies in the industry, in international statistics on patents and in investment news. Automation and electrification are being promoted for all modes of transport and there is widespread investment in the sector's development, mobility services and innovation. Bill Ford, executive chairman of Ford Motor Company, describes the change this way: *"Our new transportation revolution will be like going from horses to cars"*. There is a global race under way for future market leadership and the best innovations.

**Technological development is moving towards electric, autonomous transport and an integrated transport system.** The International Energy Agency (IEA) predicts that the number of electric cars will grow globally from two million to 40–70 million by 2025. Autonomous vehicles<sup>6</sup> and ships will be a common phenomenon in the 2020s and 2030s. Digitalisation permits the existence of an integrated transport system, where the various modes of transport and transport services are interconnected in new ways that favour the user. There is a major change looming: a

move from production- and product-based business to the customer-oriented information and service economy. The biggest business opportunities are hidden away in solutions and business models that bring together different technologies, especially when at the same time they represent clear added value for end users and a combination of the most significant factors for change.

**The dramatic trend in urbanisation means that the transport system will have to be reformed.** It is predicted that 70% of the world's population will be living in cities by 2050<sup>7</sup> (cf. 54% in 2016<sup>8</sup>). The rate of urbanisation is fastest in Asia and Africa. This phenomenon presents many challenges for transport (congestion, accidents, air pollution), but it also creates new business opportunities in the area of transport services and logistics. The infrastructure of most cities will not withstand ever-growing volumes of traffic, as the number of people around the world joining the middle classes and aspiring to car ownership for the first time is predicted to increase from three to five and a half billion in the period 2015–2030<sup>9</sup>. The automation, electrification and servitization of the transport system will put urban space to better use and improve the comfort, health and quality of life of customers.

**Curbing climate change will create an enormous growth market for solutions and services that cut greenhouse gases.** In the EU countries, the transport

---

<sup>6</sup> [http://www.driverless-future.com/?page\\_id=384](http://www.driverless-future.com/?page_id=384)

<sup>7</sup> Sitra, Megatrends 2016. <https://www.sitra.fi/en/publications/megatrends-2016/>

<sup>8</sup> The World Bank, 2017. The United Nations Populations Division World Urbanization Prospects.

<sup>9</sup> Homi, K., 2017. The Unprecedented Expansion of the Global Middle Class. An Update. Brookings.

sector accounts for almost one fourth of greenhouse gases<sup>10</sup> and on the global scale almost a fifth<sup>11</sup>. It is the aim of the European Union to cut greenhouse gas emissions from the transport sector by 60% by 2050 compared to the 1990 level<sup>12</sup>. Transport is also of key relevance in the achievement of Finland's climate objectives, because the sector produces around 40% of the emissions of the non-emissions trading sector<sup>13</sup>. Emissions from transport need to be cut particularly in road traffic, which account for 90% of all emissions from transport<sup>14</sup>. New, intelligent, clean and resource-efficient mobility solutions will have a crucial role in the reduction of global emissions from the transport sector.

**Legislation is a driver and enabler.** In Finland, changes in the transport sector are being promoted along a path set by the Government Programme. Regulation of the transport market is currently being undertaken by means of a legislative project: the Transport Service Act, whose first part entered into force on 1 January 2018. The aim of the Act is to establish a regulatory environment in Finland that encourages market operators to develop new services and ena-

bles new companies to operate in the transport sector. On the global scale, the Transport Service Act will be a forerunner in the specific areas of data management and technology neutrality. In the national context, what is new is the fact that the Act will examine the entire transport system (land, sea and air transport).

Finland's legislative environment is very advanced and allows much in the way of experimentation in technologies and services. For example, when an automatic car is proceeding along a public highway, the driver does not need to be in the vehicle, which can be controlled remotely, with a licence from Trafi. The same enabling approach is also evident in the legislation on unmanned aircraft in Finland, which, when compared with other countries, is very permissive policy.

Under way is the complete reform of legislation on land use and building, to address the changes that will be seen in the future operating market, such as digitalisation, climate policy and energy questions, diversification of the regional structure, demographic change, the growth in urban areas, urbanisation and the turning point in mobility.<sup>15</sup>



Photo: Dynniq Finland

<sup>10</sup> Eurostat, 2017. Greenhouse gas emission statistics.

<sup>11</sup> OECD ITF, 2017. ITF Transport Outlook 2017.

<sup>12</sup> European Commission, 2017. 2050 low-carbon economy.

<sup>13</sup> <http://liikennejarjestelma.fi/ymparisto/paastot-ilmaan/liikenteen-kasvihuonekaasupaastot/>

<sup>14</sup> Suomen ilmastopaneeli [The Finnish climate change panel].

[http://www.ilmastopaneeli.fi/uploads/selvitykset\\_lausunnot/Ilmastopaneeli\\_Liikenne\\_2017.pdf](http://www.ilmastopaneeli.fi/uploads/selvitykset_lausunnot/Ilmastopaneeli_Liikenne_2017.pdf)

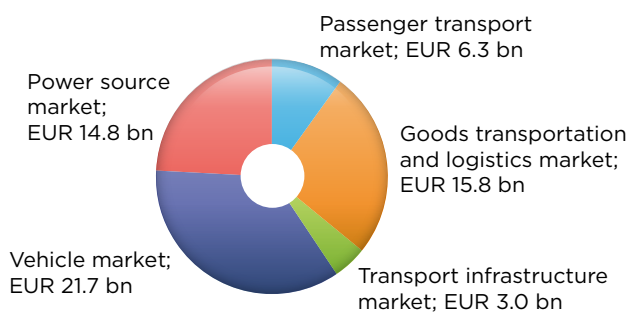
<sup>15</sup> Ministry of the Environment, 2017. Land Use and Building Act (132/2017)



## 2.2. The transport market

Transport is a huge, diverse market. The efficiency and productivity of the transport system make a fundamental contribution to national competitiveness and the smooth day-to-day existence of Finnish citizens. Transport is a major driver of the country's economy. **In Finland in 2012, there were approximately 35,000 companies in the transport sector and its ancillary industries, employing some 200,000 people.** The total transport market is enormous if it is measured in terms of company turnover and the expenditure it incurs for the various sections of society. In a study by Trafi<sup>16</sup>, the entire transport market was examined from the angle of the turnover of companies and a division was made on the basis of the passenger transport, the transportation of goods and logistics, the transport infrastructure, and the vehicle and power source markets. **Statistics Finland estimates the turnover of companies operating in these markets at more than EUR 60 billion in 2012** (see Figure 3).

The transport market can also be viewed in terms of the expenditure on the part of different sections of society. In 2012, households spent EUR 19 billion on transport, of which EUR 15.1 billion was spent on the costs of running a car and EUR 3.9 billion on other forms of transport, including public transport<sup>17</sup>. According to a survey on logistics,



**Figure 3.** Turnover of companies in the transport market 2012. (Source: Statistics Finland)



in 2013 the cost of logistics and transport to industry and commerce was approximately EUR 23 billion, which was around 13% of the turnover of companies<sup>18</sup>. According to Statistics Finland, in 2015, the total expenditure in the transport sector on the part of the country and local authorities was in the region of EUR 5.2 billion, of which the Government share was EUR 2.4 billion, with local administration accounting for EUR 2.8 billion<sup>19</sup>.

**The global transport market is at a turning point.** The forecast for growth in global transport markets is presented in the following diagram. McKinsey Consultants estimated the value of the transport market at EUR 6,400 billion in 2010<sup>20</sup>. A study by Sitra<sup>21</sup> suggests that by 2050 the global annual turnover in intelligent transport systems, fuel cell and electric and hybrid vehicles and self-driving cars will have risen to more than EUR 8,000 billion. MaaS, Mobility as a Service, is predicted to be worth in excess of USD 1,000 billion by 2030<sup>22</sup>.

<sup>16</sup> Trafi studies, 2016. The transport market in Finland.

<sup>17</sup> Trafi studies, 2016. The transport market in Finland.

<sup>18</sup> Turku School of Economics, 2014, Solakivi et al. Logistics survey 2014.

<sup>19</sup> Statistics Finland. State department expenditure by function 1990-2015.

<sup>20</sup> McKinsey, 2012. Mobility of the future.

<sup>21</sup> Sitra, Frost & Sullivan, 2017. Benefits of Carbon Neutrality in a Rapidly Changing Business Environment.

<sup>22</sup> ABI Research, 2016.

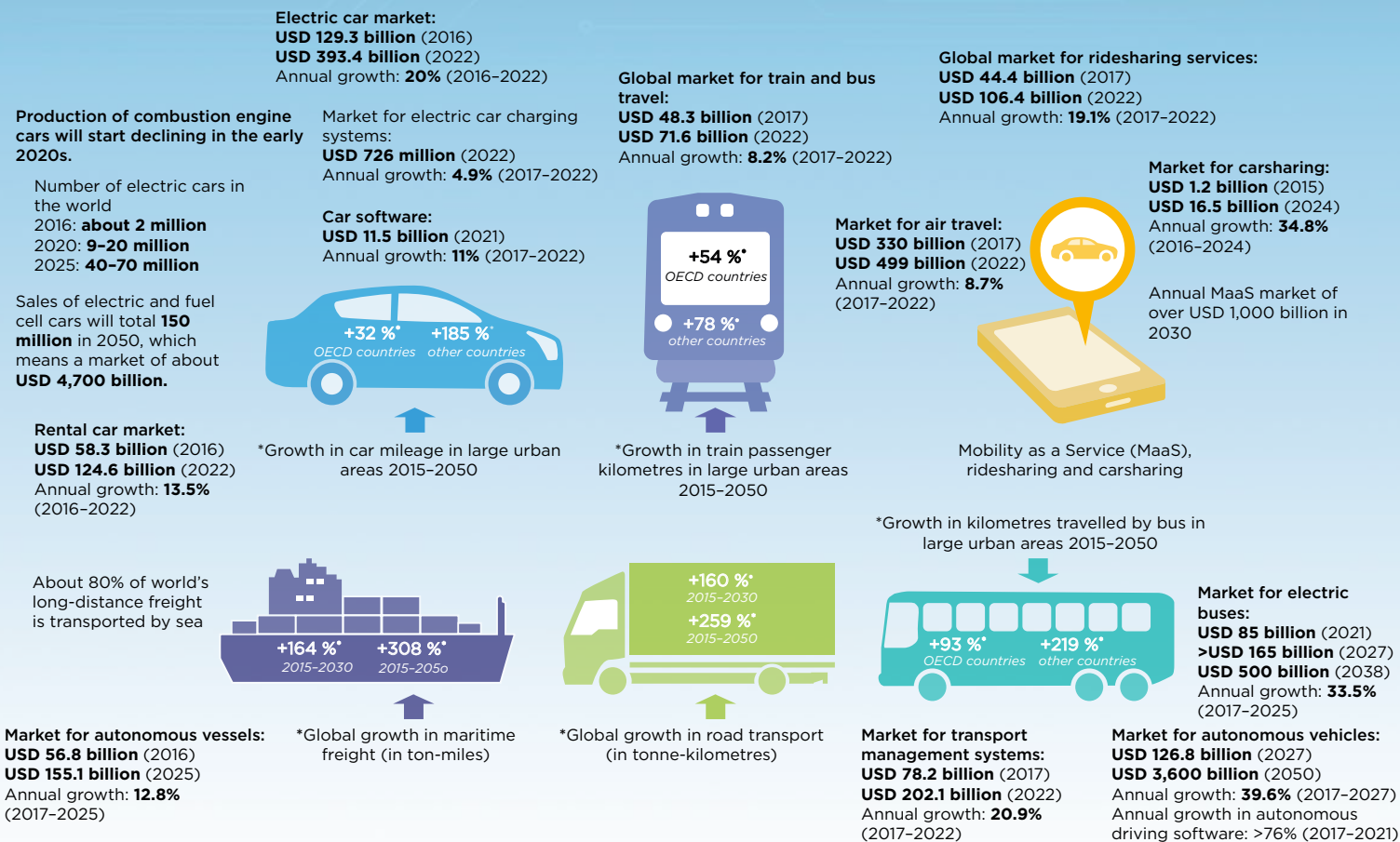


Figure 4. Forecasts for the growth in the global transport market.<sup>23</sup>

From the angle of the growth in transport and international market, it is important to realise that the transport market is an integral part of the global data economy. In 2014, the data economy in the EU was worth EUR 247 billion, i.e. 1.8% of GDP<sup>24</sup>. In Finland, that figure is higher, at 2.5% of GDP. Finland is one of the world's most digitally advanced countries<sup>25</sup>; compared to the other EU countries, the Finns have the best basic digital skills, and the internet is widely used in different aspects of life. This means there are good prospects for success in the digitalisation of transport in Finland. Preserving its position as a forerunner, however, will require continuous development and investment of time and money.

At present, growth is being hindered by a shortage of experts in data analytics, cloud computing, and the various data applications<sup>26</sup>.



<sup>23</sup> See, for example, ABI Research 2017, Credence Research 2017, Global Market Insight 2017, ITF Transport Outlook 2017, OECD/IEA 2017, KPMG 2017, Persistence Market Research 2017, Research and Markets 2017, Report Buyer 2017, Statista 2017, Zion Market Research 2017.

<sup>24</sup> International Data Corporation, "European Data Market SMART2013/0063 First Interim Report 2015"

<sup>25</sup> The Digital Economy and Society Index 2017, [https://ec.europa.eu/finland/sites/finland/files/desi\\_country\\_profile\\_fi.pdf](https://ec.europa.eu/finland/sites/finland/files/desi_country_profile_fi.pdf)

<sup>26</sup> Publications of the Ministry of Transport and Communications 13/2016. Experiences of the skills needs and supply in mass data, MyData and intelligent robotics and automation.

## 2.3. The transport system 2.0

A state-of-the-art transport system relies on a traditional transport infrastructure, data and energy networks, intelligent transport technologies and services, diverse data resources and services, and the mobility and transportation services themselves. An intelligent transport system is one in which all its components can be harnessed to the production of user services using real-time and place-based digital data and reliable data transfer. The user is the main starting point for an intelligent transport system.

From the perspective of the National Growth Programme for the Transport Sector, an intelligent transport system will offer business opportunities at all levels and throughout the system. The biggest areas of business have always been

found in the sectors that add to the system's capacity, but social objectives together with digitalisation are modifying the entire transport sector. Alongside business models based on capacity-building have emerged solutions that focus on the efficiency of the transport system, its sustainability and accountability, and the business operations of current operators and actors are being challenged by radical innovations.

The public sector is in a key role to bring about change. The regulation of transport, and its subsidies, incentives and pricing are an effective way to shape the sector's development and create markets for solutions that will serve to achieve the objectives both of the business world and society.

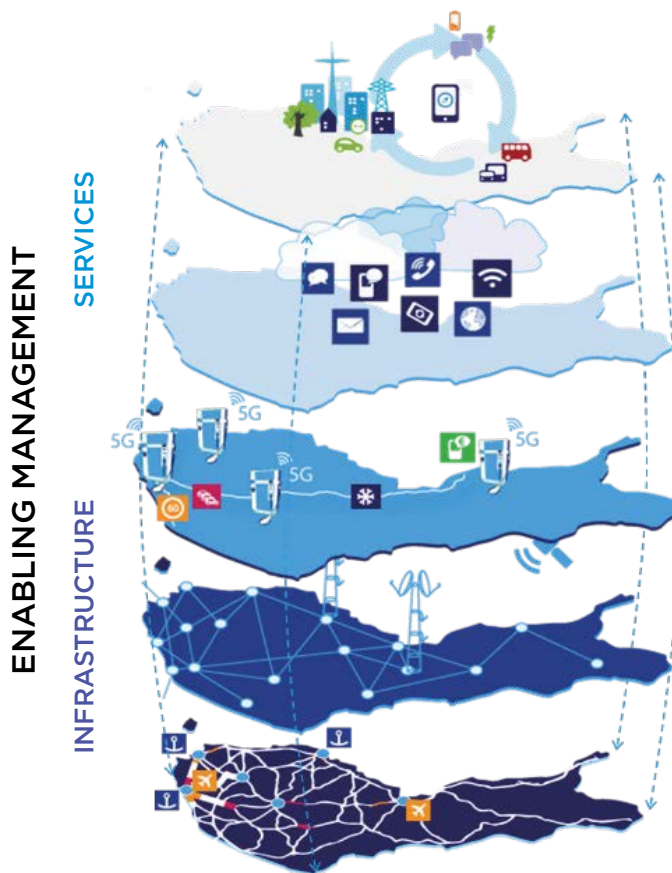


Figure 5. The transport system.

### Mobility and transport as services

- Interoperable travel and transport chains
- MaaS operators, sharing services, service design
- Insurance, financial and payment services

### Cloud services, data, interfaces and platforms

- Cloud services, open data and interfaces, mass data, analytics
- Artificial intelligence, machine vision, machine learning
- Blockchains, platforms, computer security

### The intelligent transport infrastructure

- Information and payment systems
- Variable-message signs, intelligent traffic lights, intelligent parking
- Traffic management and control, transport system operation

### Communication and electric transport infrastructure

- Data and electricity networks
- Fixed and mobile broadband, 4G/4G LTE/5G
- Intelligent electricity networks, charging infrastructure

### Basic transport and mobility infrastructure

- Roads, railways, ports, airports
- Development, service and maintenance
- Passenger and freight transport systems and fleet/rolling stock/equipment



Photo: City of Helsinki materials bank / Photo Agency Kuvio

**Table 1.** Summary of the strengths, weaknesses, opportunities and threats associated with the Finnish transport sector.<sup>27</sup>

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>■ Strong digital knowledge capital and first-rate digital competitiveness</li> <li>■ Transparent cooperation within the public sector and between the public and private sectors</li> <li>■ A strong vision and mindset among operators and actors as regards renewal of the transport sector</li> <li>■ Stable, predictable conditions and society</li> <li>■ A viable transport system, including a digital infrastructure</li> <li>■ Progressive 'Arctic' know-how</li> <li>■ The world's first Maas operators and Finland's reputation as a global pioneer</li> <li>■ Insight of autonomous transport and the measures it requires, including legislation, test sites and business development, such as the One Sea</li> <li>■ A tradition of the development of global open standards</li> </ul>	<ul style="list-style-type: none"> <li>■ Small-scale operation, including the domestic market, financial resources and limited trials</li> <li>■ The fragmented nature of the action and indetermination</li> <li>■ The mismatch between goals and targets on the one hand and resources on the other</li> <li>■ Limited and still undeveloped venture capital</li> <li>■ Existing structures dependent on financial control</li> <li>■ Inexperience in the development of ecosystems involving billions of euros and the commercialisation of platform solutions</li> <li>■ Lack of any determined international representation of interests</li> <li>■ Lack of large companies in the automotive industry</li> </ul>
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>■ Enabling legislation</li> <li>■ Strong expertise in industries linked to the transport sector (sensor technology, 3D modelling, environmental information, computer security, artificial intelligence)</li> <li>■ Variable weather and road conditions offer a unique testing environment</li> <li>■ Strong networking between growth and start-up companies</li> <li>■ Global leaders in the sector attracted to Finland</li> <li>■ Building the common Finnish transport sector growth story</li> <li>■ Transport and mobility</li> </ul>	<ul style="list-style-type: none"> <li>■ Big global actors dominate the market</li> <li>■ Public actors can always prevent or delay development as well as enable it</li> <li>■ Closed ecosystems being created that are not exportable</li> <li>■ Lagging behind in electronic and platform economy related development</li> <li>■ The challenges of megacity mobility are not fully appreciated in Finland</li> <li>■ Unable to make choices and prioritise adequately in the allocation of resources</li> <li>■ Other markets attract the best international experts and companies</li> <li>■ The ownership of Finnish growth companies and the main focus of operations transferring to international markets</li> </ul>

<sup>27</sup> The SWOT -analysis is based on interviews with experts, the outcome of workshops and pre-tasks (advance assignments) received.



Public transport



Taxis



Cars



City bikes



Photo: MaaS Global

# 3. Growth in the transport sector and the ecosystemic approach

It is important to make ecosystemic development part of business and innovation policy. It makes the change in the global operating environment and the operational models required of it of key importance and relevance to policy-making. These models include openness, cooperation, interaction, continuous learning and the ability to adapt to change. The public sector cannot directly lead ecosystems, but it has an important role in the building of ecosystems and their development. This means not just a concern about a very functional operating environment (including education, training, research, finance, infrastructure) but also that actors should strive to address key social challenges. That will

require the active facilitation of networks and close dialogue with Finnish and international companies as well as research institutes.<sup>28</sup>

Transport is an example of an industry facing immense social challenges. To solve them will require broad cooperation, a wide range of resources and options and an ecosystemic approach. This Growth Programme establishes a framework for, and a systematic approach to, continuous network-based work, the main goal being to identify and support business ecosystems that may in future turn into entities involving billions of euros.

## 3.1. The ecosystemic approach in the National Growth Programme for the Transport Sector

A transport sector ecosystem means a network of experts that complement one another. The actors in the ecosystem compete with one another and with other ecosystems, and at the same time deliver added value for them, but especially for customers, in the shape of products, services, functionalities, know-how and information. The competitiveness of an ecosystem goes beyond the overall performance of its members; the ecosystem is therefore more than the sum of its parts. Acting as one serves to grow the total market, meaning there is more to share.

**These ecosystems operate on the basis of long-term Public-Private-People-Partnership models of**

**cooperation, the aim being to develop competitive business ecosystems internationally.** The system focuses around a common platform, where it is possible to cross-sell, develop expertise, offer complementary services, expedite the transition to new markets, use shared resources or integrate the good product services of others with the entire ecosystem<sup>29</sup>. The aim of the ecosystem is to establish a spiral of positive development, where successful openings attract more actors, operators and customers.

<sup>28</sup> Publications of the Government's analysis, assessment and research activities 28/2017. Innovation ecosystems as reinforcers of cooperation in business and research.

<sup>29</sup> Tekes publication 2017, The platform economy roadmap. Jukka Viitanen et al.



Photo: Infotripla

The ecosystems identified in the National Growth Programme for the Transport Sector may be divided into various early stage and established ecosystems, which operate in a dynamic and symbiotic relationship with one another.<sup>30</sup>

1. **In early stage growth innovation ecosystems** new research data, know-how, test environments and innovations are produced.
2. **In early stage growth entrepreneurship ecosystems**, meanwhile, growth-oriented entrepreneurship is generated and start-up companies are created.
3. **In growth ecosystems for more established and internationally competitive businesses**, fast growth (five- to ten-fold) relies on existing expertise, products and services. International growth is stepped up by networks.
4. **Open business ecosystems** for more established businesses are boosted by one or more big companies and platforms or technology standards, for example, are developed by them. The resources, global distribution channels and international networks of these ecosystems make possible support fast growth, especially in export markets.

**New value is created together and in continuous interaction with customers.** The actors involved in the ecosystem accept the idea of profit sharing as consideration for the share of risks and better access to the customer interface. Acting as one means growing the total volume of the ecosystem business, making it easier to distribute shares in a growing market.<sup>31</sup> Ecosystems cannot be built artificially, and out of the worldwide, national and local context. On the contrary, internationally competitive business ecosystems must be based on the matching of national/regional/local competitive advantage with international demand.<sup>32</sup> The identification of new potential ecosystems involves the bringing together of international markets with value chain experts and domestic specialists in ecosystem preforms and competitive advantages. These are the crucial starting points when evaluating the business opportunities afforded by a new ecosystem (see Appendix 1).

In the preparatory stage of the National Growth Programme for the Transport Sector, ecosystems or knowledge/skills areas that would function as a collaboration between the public, the research and the private sector were identified, for which it would be possible to create internationally competitive ecosystems. These include: 1) automatic transport, 2) an intelligent infrastructure and maintenance, 3) intelligent light rail transport, 4) electric transport, 5) MaaS, Mobility as a Service, and 6) an autonomous maritime transport ecosystem. An autonomous maritime ecosystem is already up and running and its growth is being supported by new growth industry PPP partnership (see Appendix 2). The preparation of the other ecosystems mentioned here is under way and the aim is to embark on at least one new project in 2018. The other potential skills/knowledge areas identified in the preparatory stage include rural mobility services, digital logistics, test business and Hyperloop<sup>33</sup>. The prerequisites for their promotion and project planning is genuine market demand and a wider interest on the part of companies and their participation.

<sup>30</sup> Government 28/2017. Innovation ecosystems as reinforcers of cooperation in business and research.

<sup>31</sup> Tekes publication 2017. The platform economy roadmap. Jukka Viitanen et al.

<sup>32</sup> Government 28/2017. Innovation ecosystems as reinforcers of cooperation in business and research.

<sup>33</sup> <http://www.saloon.fi/sijoitumenesty/hyperloop/default.aspx>



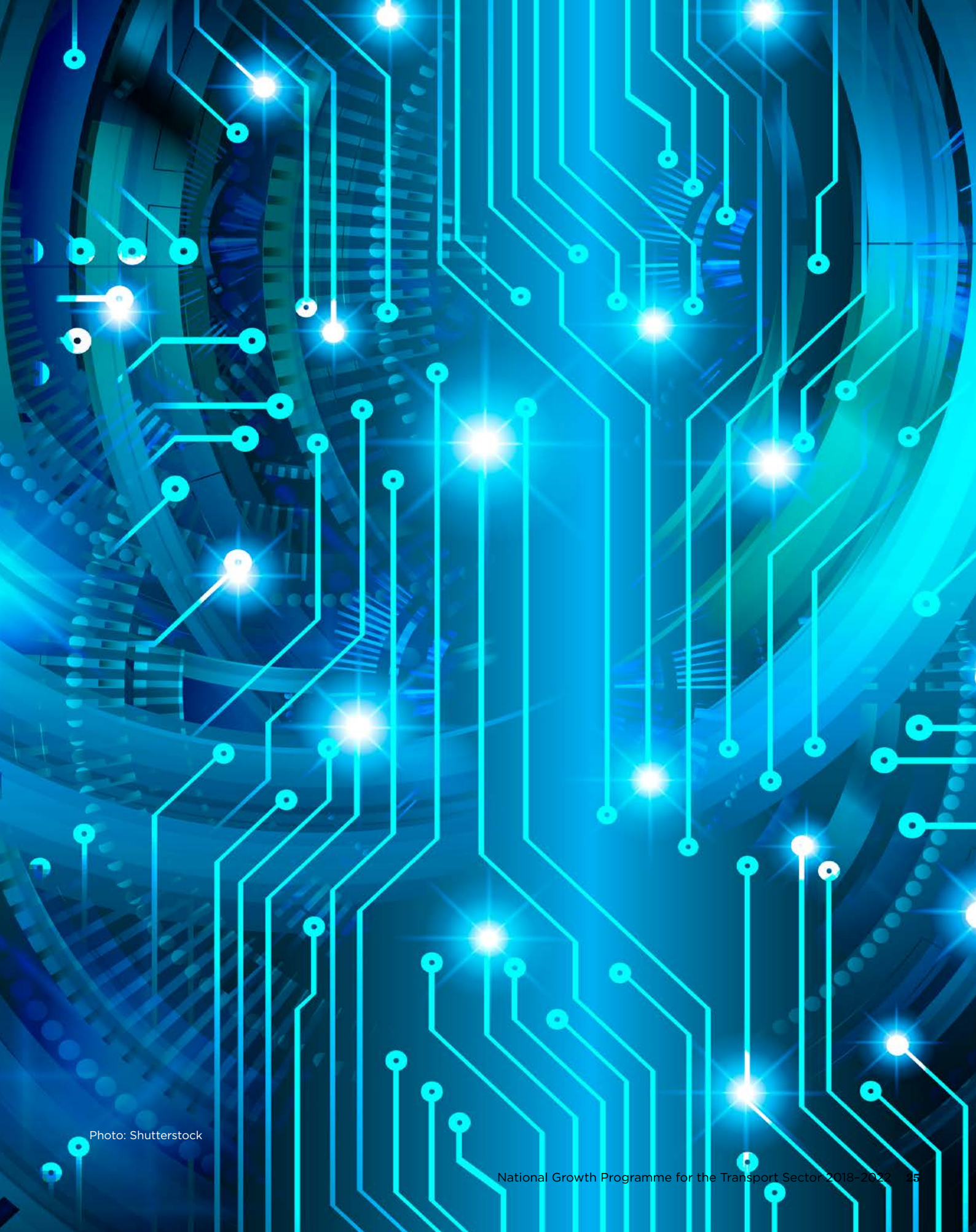


Photo: Shutterstock

## 4. Roadmap 2018–2022

**The starting point for determining the measures chosen for the Roadmap was their direct or indirect impact on the development of ecosystems and on business-driven growth.** The Roadmap measures combine to form a whole: they complement one another and are closely connected.

They will generally rely on collaboration and cooperation between several actors. Coordination bodies will be agreed upon for the measures, the aim being to start implementing them across as broad as possible to ensure their optimal effectiveness. No one measure will suffice on its own: it is the combined effect of the measures that will be required to achieve the targets of the Growth Programme. The planning of each project related to the measures will entail a detailed examination of its content, its schedule and the resources needed.

The measures with the most significant impacts have been chosen for the Roadmap. In addition, a number of measures were identified during the preparatory work that were important as such but smaller in scale. All measures that support the objectives of the

Growth Programme are to be exported to the Growth Programme portal to be set up (See Chapter 5.2). The portal is a guarantee of the dynamic nature of the Roadmap, a tool in which the measures will be actively updated and their implementation monitored.

**The measures under the Growth Programme rely on a combination of enabling legislation, proactive research and the diverse skills and expertise of innovative companies.** Renewal and modernisation in cities are to be promoted by enabling market experimentation and pilots, and accelerating the scaling of good solutions through procurement. The introduction of new innovations and growth in business ecosystems are to be promoted through the development of the availability and quality of information, carefully targeted RDI funding, and support for putting together and coordinating business-driven ecosystems. The internationalisation of companies and the ‘Invest in’ venture are to be encouraged through strengthening Finland’s internationally recognised reputation as a forerunner in the field of transport and mobility as well as by promoting various internationalisation activities.



Photo: City of Tampere

Figure 6.  
National Growth Programme for  
the Transport Sector 2018–2022



## OBJECTIVES OF THE TRANSPORT SECTOR

1. Growth sector with a large number of business-driven ecosystems
2. World-class research expert and user
3. Bold pioneer market
4. Attractive for investors as well as for actors seeking testing platforms
5. Dynamic business environment
6. Active and proactive application platform for new technologies
7. Globally recognised leader in sustainable mobility

## MEASURES 2018–2022

1. Preparing the playbook for the transport sector
2. Establishing a mechanism to communicate on any development bottlenecks of the sector
3. Developing financial steering mechanisms
4. Promoting sustainable and low-emission transport systems
5. Enabling seamless travel chains
6. Testing, developing and service platforms for intelligent transport systems in cities
7. Development zones for automated traffic in urban areas
8. Providing real-time snapshot of transport systems in urban areas
9. Digital transport solutions for large urban development projects
10. Making more public data available and harnessing the opening up of private data
11. Developing methods to integrate data across sectoral boundaries
12. Providing transport services in accordance with My Data principles
13. Launching the TransDigi cooperation and innovation platform
14. Competence foresight forum to identify and anticipate changes in the sector
15. Drawing up a transport sector development and internationalisation programme
16. Providing regional mobility funding for spearhead projects
17. Systematic improvement of the quality of EU funding applications
18. Developing a systematic approach to inform actors on most suitable funding opportunities
19. Ensuring coverage of motor insurance scheme aligned with the increasing automation
20. Network of testing areas for intelligent transport allowing market-based trials
21. Making the Smart Countryside theme into a strong Finnish expertise area
22. Making test platform data available in one place
23. Development of procurement expertise
24. Conducting a market dialogue on procurement
25. Development of procurement criteria
26. International procurement cooperation
27. Development and harmonization of contract processes
28. Joint story, marketing strategy and material of the transport sector
29. Mapping out relevant international forums and working groups to strengthen activities of Finland
30. Identifying key growth ecosystems with global business potential
31. Common rules for growth ecosystems
32. Joint and coordinated development of growth ecosystems

## 4.1. Common vision and enabling legislation as the basis for renewal process

**The ecosystem perspective focuses on developing a common operating environment for businesses and remedying market shortfalls while also emphasising the importance of public administration's role as an active partner to the business community and a builder of new markets.** Public administration creates possibilities for the development of new business ecosystems<sup>34</sup>.

Its main role is to act as a facilitator through trials, procurement, legislation and policy. An active ecosystem policy is the solution for coordinating measures that complement one another. Rather than selecting winning companies or industries, the public sector endeavours to identify and develop ecosystems that appear promising in close interaction with actors in the business community. Legislative work involves anticipating and preparing for the opportunities afforded by new solutions and changing needs, and making room in the market for new operating models.

**The entire sector in Finland has joined its forces to purposefully take the digitalisation of transport forward.** The Intelligent Strategy for Transport created a basis for the introduction of ecosystem thinking to the transport sector: 'The implementation of the Second Generation Intelligent Strategy for Transport will enable further development of the ITS sector in Finland. This will serve simultaneously to achieve the objectives of both national transport and business policy.'<sup>35</sup> The National Growth Programme for the Transport Sector is the logical continuation of the Transport Sector Intelligent Strategy.

Having a consistent and long-term policy is vital for boosting private sector product development and investment. It is particularly important to gain the maximum possible commitment of both the public and the private sector to the set objectives, policy, legislation and strategy.

Within the framework of the Growth Programme, all the various parties involved will attempt to strengthen the enabling role of the public sector in the promotion of company growth and the building of trust. For example, the transport administration organisations, both the current and future agencies and special companies will commit to the objectives and measures of the Growth Programme.

In addition to corporate growth, the Growth Programme will support public investment in innovations that improve resource efficiency and cost-effectiveness.

In addition to the measures listed on the following page, the Growth Programme takes account of the synergies with other public actor programmes that are significant for the objectives of the Growth Programme. These include the Land Use, Housing and Transport Agreements<sup>36</sup>, Finland's Artificial Intelligence programme, Roadmap of Development Measures for Transport Automation and Robotics 2017–2019, and the Digital Logistics Programme (see Appendix 3).

---

<sup>34</sup> Government analysis, assessment and research publication 28/2017. Innovation ecosystems as reinforcers of cooperation in business and research.

<sup>35</sup> Ministry of Transport and Communications 2013. Intelligence in Transport and Wisdom in Mobility Finland's Second Generation Intelligent Strategy for Transport

<sup>36</sup> [www.ym.fi/fi-FI/Maankaytto\\_ja\\_rakentaminen/Maankayton\\_suunnittelun\\_ohjaus/Maankayton\\_liikenteen\\_ja\\_asumisen\\_aiesopimukset](http://www.ym.fi/fi-FI/Maankaytto_ja_rakentaminen/Maankayton_suunnittelun_ohjaus/Maankayton_liikenteen_ja_asumisen_aiesopimukset)  
[http://www.ym.fi/en-US/Land\\_use\\_and\\_building/Steering\\_of\\_land\\_use\\_planning/Landuse\\_housing\\_and\\_transport\\_letters\\_of\\_intent](http://www.ym.fi/en-US/Land_use_and_building/Steering_of_land_use_planning/Landuse_housing_and_transport_letters_of_intent)

## MEASURES 2018–2022

- 1. To create a playbook to clarify the roles of the private and public sector in the market and to have all actors commit to common rules.** The playbook will highlight the main actions the public sector can take to promote business-driven growth while achieving its own goals more effectively. (Ministry of Economic Affairs and Employment, Ministry of Transport and Communications, companies, cities and municipalities, RDI actors: 2018).
- 2. To establish a mechanism whereby Growth Programme companies and ecosystems can effectively communicate information on any bottlenecks** encountered to the Programme steering group. (Growth Programme steering group; see Chapter 5: 2018–).
- 3. To examine and develop new financial steering mechanisms and those already in place** (incentives, aid and tax practices) to ensure that they support both the aims of sustainable policy and the Growth Programme. (Ministry of Transport and Communications, bodies responsible for steering mechanisms as a whole, RDI actors: 2018–. Interim review in 2020).



## 4.2. Cities as a platform for lead markets

Diverse, intelligent mobility solutions will support the growing attractiveness of urban regions and improved competitiveness. A comprehensive, viable public transport system will enable the development of new, user-driven and cost-effective transport services. Smooth travel chains will be built on a combination of public transport and private mobility services. These services will provide companies with the means to offer new, user-oriented services and users with a more financially attractive and trouble-free option than owning and using a private car.

**The urban transport of the future will be emission-free and efficient.** Low-emission and electronic solutions are a way to improve the living environment of city-dwellers and meet national targets for reducing emissions. Joint use services, such as carpooling, will have an especially significant impact. The emissions target for public transport will be achieved through the systematic electrification of public transport and by giving preference to low-emission fuels in buses not running on electricity, such as 100% biodiesel.

Cities aim to increase the share of walking, cycling and public transport in people's modes of transport. Cheaper, more sustainable ways of getting from one place to another are being sought as an alternative to private cars. The introduction of new transport services will be a boost for local business, with positive effects on the regional economy and, in the longer term, on the country's current account.

**Automation solutions will enhance the cost-effectiveness of mobility and improve mobility services.** In the initial phase, automatic buses will probably operate as feeder traffic or as an interconnected system. 5G networks constructed in connection with automatic transport will also support other intelligent solutions.

**The procurement of transport services by cities themselves will pave the way for companies to provide these services.** New services mean that cities will be able to procure solutions flexibly to meet the transport needs of passengers and goods. If necessary, it will



Photo: City of Helsinki Materials Bank / Roni Rekomaa

be possible to replace a city's own fleet of vehicles with service contracts.

A precondition for intelligent, low-carbon urban development is a good standard of mobility services. Cities are an excellent partner in the development of new solutions and a testing platform for services that supplement public transport. The speedy development of transport services also challenges and prompts urban development in a positive way.

**Cities can promote businesses in a variety of ways, and business will be built and develop around intelligent and sustainable mobility solutions.** Urban development offers companies interesting objects of innovative procurement, progressive testing, trialling and piloting environments, and the opportunity for obtaining domestic market references and developing new business models.

## MEASURES 2018-2022

- 1. To promote sustainable and low-emission transport systems and mobility ecosystems.** Emission-free public transport is favoured on a systematic basis, and construction of recharging points for electric vehicles and the availability of alternative power sources are promoted. New innovative incentives for sustainable, responsible mobility are tested and introduced, such as a user-driven emissions trading model for transport. Companies are encouraged to be involved in the promotion of emission-free mobility. The visibility and competitive advantages of travel chains in relation to car ownership and use are ensured. (Major cities, Helsinki Regional Transport Authority, City of Lahti CitiCAP project, Growth Corridor Finland network: 2018-).
- 2. To enable seamless door-to-door travel chains using different modes of transport produced by public and private operators within and between cities.** The roles and vision of different actors in the development and deployment of MaaS services (Mobility as a Service) are described. The strengthened roles are supported through ecosystem work. The work of MaaS operators is allowed in line with the Transport Services Act, the second phase entering into force on 1 July 2018. Station districts are developed as transport nodes to improve standards in travel chains and mobility services. (The 6Aika cities, Ministry of the Environment, Helsinki Regional Transport Authority, ITS Factory, Growth Corridor Finland network: 2018-2019).
- 3. To evolve intelligent transport trialling, development and service platform work in an urban environment together with companies in the sector.** Trials are used to bolster the growth of an intelligent transport ecosystem and improved competitiveness. (Traffic Lab, major cities, other intelligent transport development areas, Helsinki Metropolitan Smart & Clean Foundation, Growth Corridor Finland network, ITS Factory, Helsinki Regional Transport Authority: 2018-).
- 4. To create automatic transport development areas in urban areas.** Automatic public transport areas in urban environments and automatic transport testing and development areas with data transfer networks are established. Robot buses in an urban environment are piloted, especially in station district and feeder traffic as a mobility solution for the first and last kilometre, with the aim of making robot buses a permanent feature of everyday mobility scenarios. Areas are established that allow the piloting of Citylogistiikka ('city logistics action programme'), city centre distribution systems, the automation of ports and C-ITS solutions. (Traffic Lab, ITS Factory & intelligent transport development areas, major cities, National Land Survey of Finland, Growth Corridor Finland network: 2018-2019).
- 5. To develop a real-time snapshot of the transport system in urban areas that takes account of all modes of transport.** Projects on the theme of transport that utilise artificial intelligence and funding for them will be applied. The skills of companies and research institutes in the collection, storage and analysis of mass data will be strengthened. Concrete trials to develop competence and obtain references are initiated. (Major cities: 2018-).
- 6. To ensure the use of digital solutions for transport in big urban development projects right from the start.** Active dialogue on available solutions is conducted and projects are used as development platforms. (Cities, urban development projects: 2018-).

### 4.3. Digital data will be put into effective use

**Data is the building material for new transport services and the fuel of the future.** The collection and availability of data is a key factor in the transparent development of innovation activities, growth and society. Data resources flexibly combined with developing methods for exploiting big data offer brand new opportunities for business and society.

The growth and internationalisation of Finnish companies are greatly affected by how successful companies are in using the opportunities afforded by platform economy and in creating scalable services for the global market. The domestic operating market has a major impact here.

**At present, knowledge capital in the transport industry is scattered among different actors and has over the years become siloed in line with those actors' roles.** The platform economy solutions and new actors are challenging the prevailing structures, both those related to the actors and the current information structures in the transport sector. New radical innovations frequently emerge through a fresh approach for integrating the knowledge and information that exist in different sectors.

**From the viewpoint of company growth, it is important for the various actors to work closely together.** This development work will aim at mainstreaming and productising knowledge capital in the transport sector and specifying the rules governing the use of knowledge interfaces, their intervention logic and data.

**To guarantee preconditions for business and growth, the quality and availability of data resources must be ensured (data at the core).** The elements of this will include the following actions:

1. An up-to-date overall picture will be formed of the existing data resources in the transport sector.
2. The build-up and opening up of data resources in the transport sector will be continued, taking into account the needs of different operators and sectors.
3. Information will be as accessible as possible and easy to exploit.
4. Adequate software competences will be available to support the business.
5. Bold openings that cross traditional sectoral boundaries and are genuinely revolutionary will be encouraged.



Photo: Siemens



An inspiring operating environment will also appeal to international actors and lower the threshold for investing in research and product development, trials and production in Finland.

**In the future, users will be offered a wider range of opportunities for releasing (voluntarily) personal data to service providers.** Such My Data models will open the doors to the development of new application and service structures, where the individual will have more say on the data collected on him or her and its use. This will create new opportunities to develop the responsible use of data in business. Users will use their own data trails, for example by putting out to tender all mobility services, or buy mobility services meeting their needs as a tailor-made package. The transport sector service range will be extended with the full use of the transport sector's data resources and by harnessing them as the raw material of service development.

**Rather than seeing information and its use as a separate entity or measure, they should be considered part of the entire range of actions aimed at promoting the growth of the transport sector.**

## MEASURES 2018–2022

- 1. To continue the opening up of transport sector data according to needs, focusing in particular on measures to harness the data of private actors supporting the growth and development of the transport sector in a more effective way.** At the same time it will be invested in measures to improve the availability and quality of transport data. (The 6Aika cities, Growth Corridor Finland network, companies, Finnish Transport Agency, Traffic Lab, Trafi, Ministry of the Environment, Helsinki Regional Transport Authority, ITS Factory, Finnish Meteorological Institute and other bodies that produce and/or manage data linked to transport and mobility: 2018–).
- 2. To develop and trial methods and operating models to be able to integrate the data in different sectors (for example, transport, energy, health, housing).** Companies are encouraged to make use of aggregated data resources in the shaping of new services. (Trafi, Traffic Lab, Finnish Transport Agency, Business Finland, companies: 2018–2020).
- 3. To implement transport services in accordance with My Data principles.** Trials are initiated where new services are generated by integrating personal data in the possession of more than one actor, with the user's consent. (Trafi, Traffic Lab, companies: 2018–2022)

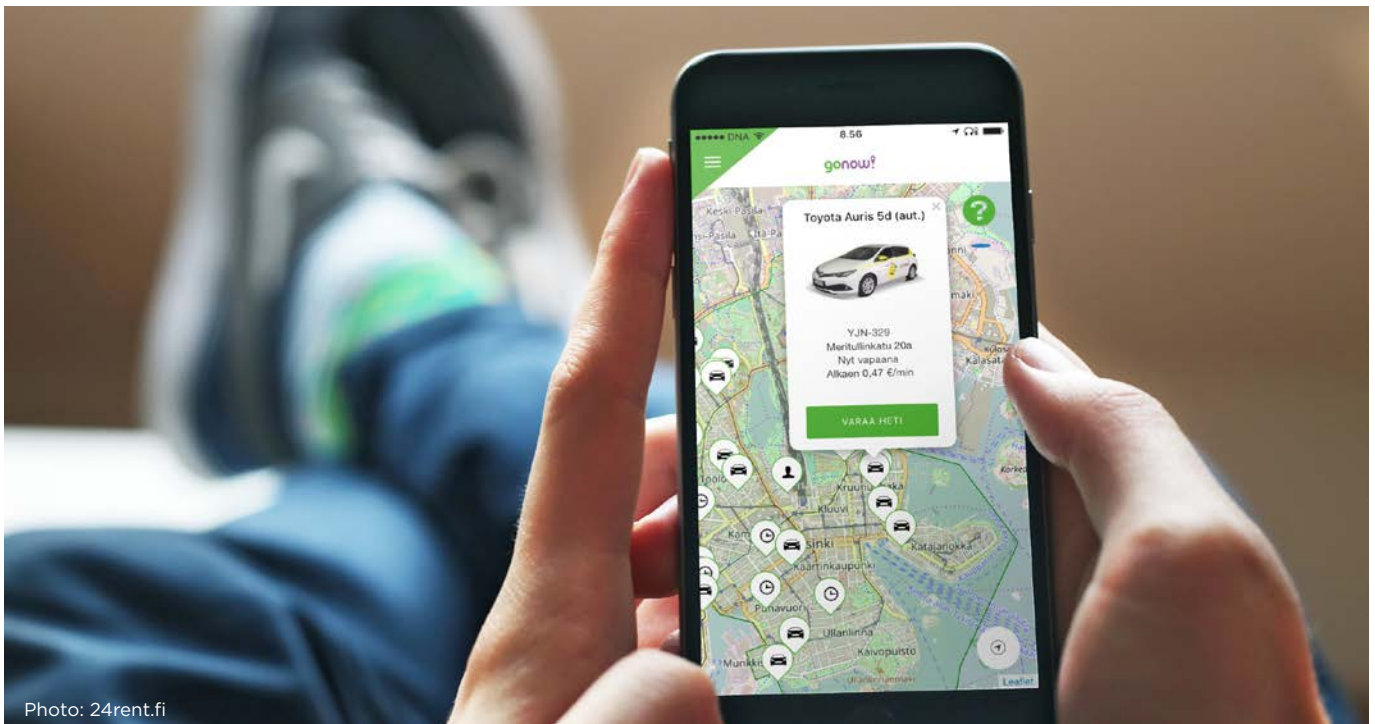


Photo: 24rent.fi

## 4.4. Achieving a competitive advantage through research and education

The identification of national potential and the promotion of interests require a comprehensive overview of the situation. A national view that is wide-ranging and takes account of the opinions of various parties supports an approach to research, development and innovation that is in line with common aims and identified opportunities of different administrative branches.

Prioritising the most important issues requires a profound appreciation of the effectiveness of solutions and decisions as regards both national objectives and the competitiveness of companies. Robust dialogue at the preparatory stage and open communication are required in order to exert international influence effectively (e.g. in standardisation or the drafting of EU R&D funding programmes).

Due to the limited resources available for research, an understanding of the big picture and an ability to allocate resources prudently are required. There is also a need for open-minded cooperation across administrative branches. This way, R&D results are used more effectively and innovations that produce significant business opportunities can be achieved. Information exchange on current and future research and development projects of different parties will enable an exchange of knowledge and experiences and allow synergies to be identified. Information exchange between R&D actors and companies helps to identify and take stock of top domestic expertise.

**Active dialogue and meetings between public sector actors in different branches of administration,**

**companies and research institutes will promote information exchange, new ideas, and doing things together.** Closer cooperation between different parties will help to direct measures and competence development towards common goals. Joint efforts and cooperation in research support the function of growth ecosystems and help identify new user needs, weak signals, business opportunities and applications.

**Identifying information gaps and needs serves as a ‘project incubator’ for new opportunities and partnerships.** It also supports the implementation of major national multi-actor-driven R&D activities and enhances international visibility. Cooperation encourages the use of actor networks in opening up international collaboration and creating references. An open exchange of information among research organisations helps to identify information gaps, complementary skills and cooperation opportunities among other things. The duplication of work is also reduced. Larger and more versatile centres of excellence can attract more EU funding to Finland in key areas and facilitate the establishment of national projects linked to them.

Public piloting environments, research institute testing laboratories and business development platforms make robust trials and experiments possible. Shared resources of research institutes and companies, platforms and networks encourage the spin-off and start-up activity stemming from the work of areas of content-rich services and technologies.

### MEASURES 2018–2022

- 1. To start up the cooperation and innovation platform TransDigi.** The platform brings together public actors from different administrative branches, private sector actors in various areas of interest (smart infrastructure, energy and vehicles, and information and mobility services), and a large number of researchers (universities and universities of applied sciences). The developing transport system and the business operations linked to it as well as issues of innovation are examined as a whole. (VTT Technical Research Centre of Finland Ltd coordinates the work of several universities and universities of applied sciences, ministries, and other organisations: 2018–2020).
- 2. The competence anticipation forum foresight group for transport and logistics identifies significant changes in the sector that have an impact on skills and employment needs over a 10–15-year period.** The group looks into what sort of skills and competences will be needed in the future in the transport and logistics sectors. A priority is to ensure that training in transport and logistics meets the needs of professional life in terms of both quantity and quality. (Foresight group for transport and logistics coordinated by the Finnish National Board of Education: 2017–2020).



Photo: Shutterstock

## 4.5. Broad funding base as a lever for development

**Robust cooperation between public administration, companies, investors and research institutes is required to develop and finance business and innovations that will revolutionise the transport sector.**

Research, development and innovation (RDI) is fragmented in Finland, and this frequently results in rather small-scale projects and hampers systemic change. When aiming for international success and competing with the world's best, a common view of the right direction to take and the areas for improvement in the future is required. Instead of fragmentation, there should be an effort to combine resources into larger entities that have an ambitious aim, a sound financial basis and broad participation. Bodies that do not necessarily need financing but wish to be involved in ecosystemic development can also be a part of these entities.

**To achieve breakthroughs internationally, both cross-sectoral and cross-national cooperation is needed.** Through innovative **Public-Private-People-Partnerships**, an effort can be made to secure long-term investment on the part of cities, companies and capital investors. This helps to finance such areas as the management of ecosystems, skills development, business incubators, start-up companies working alongside universities and research institutes or spin-offs from large companies.

**The transport sector could exploit EU funding programmes a lot more than it does now, but this will**

**require greater involvement on the part of actors and more time and effort spent on application processes.** EU projects are an opportunity (i) to finance larger projects, (ii) to increase the visibility and effectiveness of domestic solutions and actors, (iii) to promote international cooperation, networking and communications, and (iv) to open the door to global markets by means of pilot projects.

EU projects mainly support long-term research, piloting and innovation. The application processes may take as long as one year or more and the competition is extremely fierce. That is why it is very important to spend time and effort on application processes and invest in the relevant skills. Close national cooperation can also shape policies and project contents in advance and, for example, help prioritise those matters in which Finnish actors excel.

**In Finland, capital investment in the transport sector will mainly support the early stage business of startups or growth companies.** When companies start to scale their operations and dominate international markets, international investors will step in. Networking and personal relationships (including with Finnish capital investors and large companies) are needed to obtain financing.

**A growth story that spans the entire transport sector, and the Growth Programme that supports it, will create trust, enhance predictability and attract**

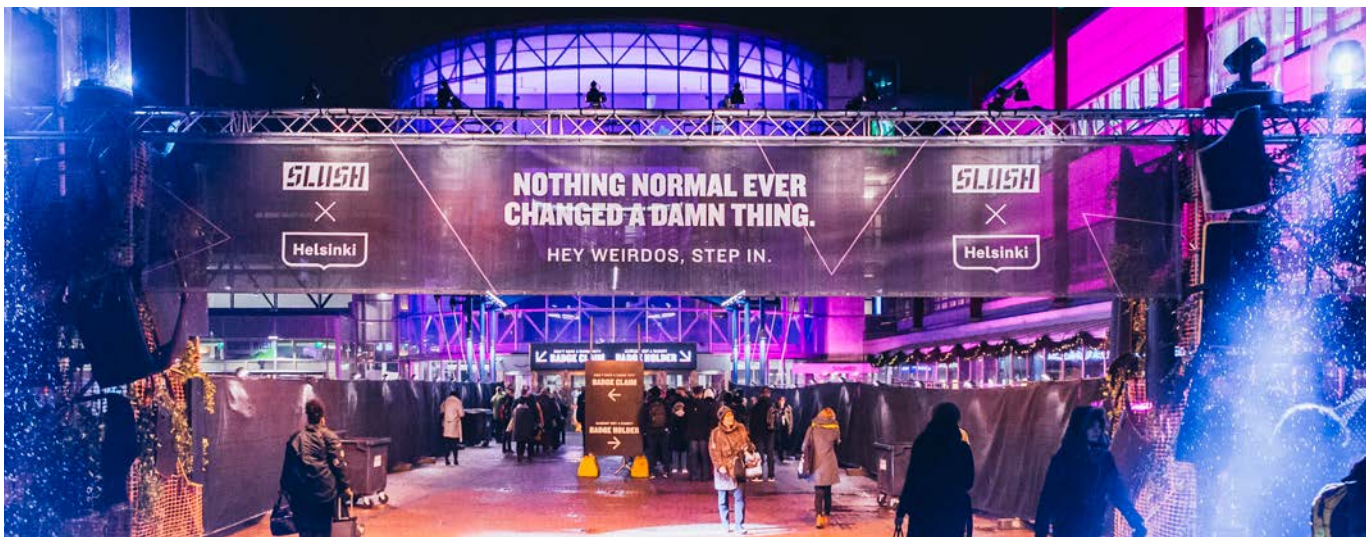


Photo: Slush media / Petri Anttila

**investors.** The trial platforms linked to the growth story will help keep the RDI activities of companies in Finland. Companies seek top skills in the industry, an entrepreneur-friendly environment and attractive business clusters. This way, product development investments of international companies and research institutes' Centres of Excellence can be attracted to Finland.

**In the National Growth Programme for the Transport Sector, the aim is to look at innovation from the broadest possible angle, including innovative products, services and business models.** It is also important to identify all areas relevant to ecosystem competitiveness. Besides those mentioned, such areas include innovations in finance and insurance.

**The finance element is more or less present in all life cycle stages of a product or service.** Issues of finance play an essential role in all this, and the big-

ger the area, the more important the matter of finance becomes. The impact of financing can be enhanced by better planning, innovative funding models, coordination and the long-term nature of the arrangement. Ecosystem finance encourages the development of large-scale solutions and attracts big international investors and financiers.

**Resolving questions of responsibility unambiguously is a precondition for market testing and early deployment of new solutions.** In Finland, for example, the introduction of automated cars is facilitated by a motor insurance system that is exceptionally comprehensive on the global scale. With automation becoming more commonplace, the extent to which insurance cover is valid must be confirmed. This should be done by also extending responsibility for cost-relatedness and the 'polluter pays' principle to the vehicle manufacturer, importer or seller.

## MEASURES 2018–2022

- 1. To draw up a transport development and internationalisation programme.** The aim is a comprehensive, multi-annual programme featuring RDI financial instruments and Export and Invest in measures. (Business Finland: 2018).
- 2. A call for applications related to regional mobility funding for innovative projects and pioneering trials to make transport significantly more efficient from the perspective of resource-wise and the circular economy.** Projects for funding are aimed at broad systemic change in society. They exploit forthcoming administrative reforms and build cooperation between various bodies both public and private actors. (Sitra, companies, public sector actors, research institutes: 2018–2019).
- 3. To initiate common activities to systematically improve the quality of applications for EU funding.** Current active actors will be networked and the number of those in consortia extended. International networks will be used in a more effective way. The supply of a wide range of skills is ensured to bring together operators of different sizes and to improve opportunities for success in applications. (Business Finland, VTT Ltd, universities and universities of applied sciences, growth companies: 2018–).
- 4. To develop a systematic approach for informing actors in the transport sector about the most suitable public and private funding opportunities at different stages of the innovation process.** This will also promote the credibility of operators and measures in the eyes of financiers. (Business Finland and other public financiers, private sources of funding, growth companies: 2018).
- 5. To start a forum for cooperation between key actors, whose task it would be to ensure that the Finnish transport insurance system was comprehensive, given that the position of drivers will change as automation becomes more commonplace.** The aim of the forum would be to ensure that the transport insurance system was up to date amid all the changes and give the system a competitive advantage nationally, enabling the testing and early introduction of new innovations in Finland. (Finnish Motor Insurers' Centre, insurance companies, Trafi: 2018–2022).

## 4.6. Through experimentation and trials to the leading edge

In the vision of the Research and Innovation Council, Finland will be the most attractive and competent environment for experiments and innovation by 2030. Finland's welfare, sustainable growth and competitiveness will be based on high levels of competence, education, creativity, openness, trust, high productivity, adaptability and unbiased reform based on experimentation. We will grasp the opportunities and needs for change resulting from megatrends, such as digitalisation and artificial intelligence, at the right time. We will produce solutions to global problems and respond to global demand.<sup>37</sup>

**In the future, testing platforms that support business development and preconditions for different types of experimentation will be more important than ever as international factors of competition.** Companies will gravitate towards countries where they have the best opportunities for developing solutions, experimentation and scaling.

The first market references are highly valuable, especially for young companies, demonstrating how their solutions work in authentic environments. A well-functioning, user-oriented experimental and cooperative environment will persuade both Finnish and international companies to settle in Finland and ensure their long-term commitment to this country. In particular, this will be true of companies offering digital platform economy services, as competitiveness will be based on factors other than production costs.

**Testing platforms have strong links to the public sector, funding, procurement, RDI and Finland's transport sector growth story, among other things.** Public sector actors will play an enabling role in experiments and trials with new technologies and services and their potential scaling. RDI can support the creation and development of new services or assess their viability. The transport sector's growth story will encourage companies in their drive to internationalise and attract foreign operators to Finnish testing platforms.

To support transport sector growth, platforms suited to the development of both technology and services will be needed. A platform ecosystem should be sufficiently comprehensive and diverse, taking account of the operators' different needs. Furthermore, each platform should have a clear purpose, rules, policies and marketing exercises.

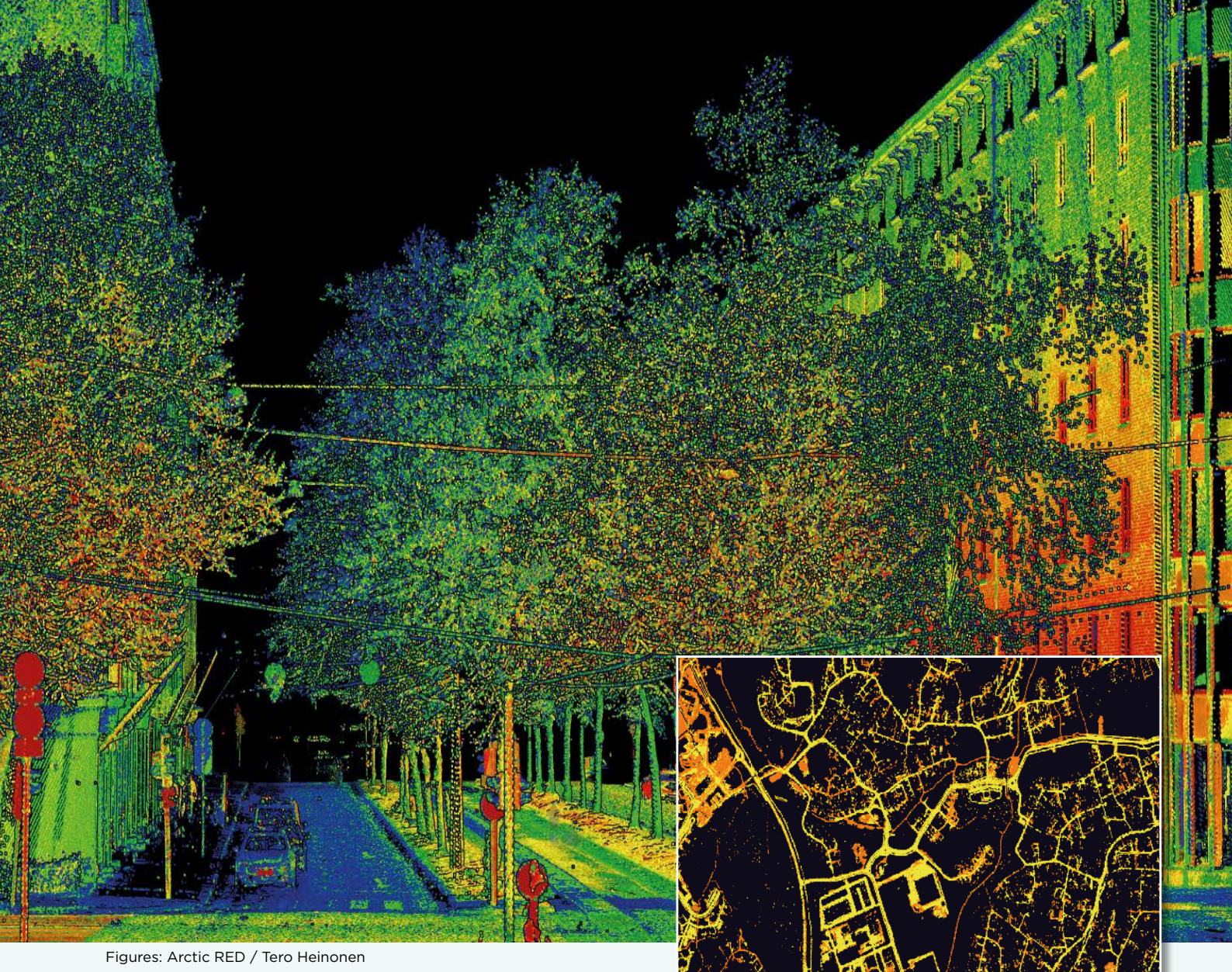
**Identification of Finland's international strengths and the factors that make the country stand out should be part of platform building.** These factors include its location in the Arctic, its prevailing conditions and the knowledge and skills associated with them, and Finland's progressive attitude to promoting experimentation and service development, also in terms of legislation. These strengths have already been widely exploited. Examples of this are the testing areas in Lapland used by major tyre and car manufacturers, the intelligent road Aurora in Muonio, the Jaakonmeri autonomous maritime traffic testing area, and numerous testing and trialling environments established in urban areas.

**Cities will have a key role in enabling experimentation.** Urban development projects are frequently linked to innovation and experiment, with cities seeking new solutions to identified challenges. Feedback from business suggests that such experiments also produce valuable data and lessons for cities. In trials and procurement within the context of urban projects, attention should be paid to mechanisms for scaling up successful solutions.

**Trials, experimentation and testing platforms should focus on the potential for synergy and scalability, with successful experiments generating new services.** National exchanges of information, search for synergies and marketing are promoted by such organisations as Trafi's Traffic Lab, a hub for test environments, trials and projects.

---

<sup>37</sup> Government 10/2017, Research and Innovation Council vision and roadmap.



Figures: Arctic RED / Tero Heinonen

## MEASURES 2018–2022

1. **To establish a globally first-rate network of intelligent transport test sites that enables testing out the market, and is designed for electronic and autonomous vehicle families, covering transport by road, rail, air and sea.** The network would cover both urban environments and different test sites run by public and private actors. (Finnish Transport Agency, Trafi, the 6Aika cities, Business Finland, Helsinki Metropolitan Smart & Clean Foundation, Growth Corridor Finland network, ITS Factory and other intelligent transport development areas, enterprises in the sector: 2018–).
2. **To make the Smart Countryside theme a strong Finnish area of expertise.** Transport and rural sector experts will network to develop competence in research and launch

experimentation activities. The potential for a Smart Countryside ecosystem will be examined. (Ministry of Transport and Communications, Ministry of Economic Affairs and Employment, Ministry of Agriculture and Forestry, Ministry of the Environment, Traffic Lab, Growth Corridor Finland network, companies: 2018–).

3. **To compile key data from test site network testing platforms in one place, making them readily available.** Network marketing materials are developed and progressive testing will be a part of the wider Finnish story. (Trafi, Traffic Lab, Business Finland, bodies running testing platforms, enterprises in the sector: 2018–).

## 4.7. Market references and scaling through public procurement

**Public procurement will play a key role in renewing the transport sector and boosting business development and growth.** The combined value of public procurement in the transport sector is around EUR 4 billion a year. Spending just one tenth of that amount on new trailblazing solutions would represent an injection of EUR 400 million in the development of company innovations. Public procurement creates demand for pioneering solutions, and needs-based solutions provide references for companies, helping them succeed amid global competition.

**Improved procurement competence and increased exchanges of information between operators are crucial in the search for cost-effective solutions that promote business.** When procurement is successful, the public sector obtains a better solution at a smaller cost. Companies have an opportunity to develop new products and acquire valuable references. Through international cooperation, Finnish companies can gain better access to export markets.

**The opportunities for innovative procurement are greatest in projects where a public actor's needs meet companies' innovative solutions and technologies.** The expertise that companies have in the areas of automation, IoT, mass data, data analysis, artificial intelligence, etc. will deliver new solutions to recognised challenges. In major procurement and investment ventures, even small improvements can lead to tremendous progress in overall productivity and effectiveness.

**Active market dialogue between buyers and service providers is essential in order to specify the needs and the offer and to identify opportunities.** Talks need to be held to crystallise these objectives at both the strategic level and when preparing individual procurements. Strategic opportunities will be identified proactively, providing companies with sufficient time to react and develop new solutions to meet needs. A functional ecosystem requires trust and openness between customers and suppliers. The fact must also be accepted that several iterations in the procurement process may be needed to create innovations. It is essential to improve the exchange of information and share the lessons learnt from good and bad experiences.



**Specifications of procurement objectives and criteria to be applied in invitations to tender have a fundamental impact on providing innovative solutions with access to the public sector organisations market.** If the definition of the solution to be procured is too inflexible, the opportunity for innovations is lost and the procurement merely becomes a price competition. The basic approach is to acquire solutions to problems rather than precisely defined services, performances or methods.

**Contract models and intellectual property rights practices should provide an incentive for companies to innovate and, at the same time, check that there is a fully functioning market for the innovation.** The buyer and the supplier must find a balance concerning the ownership of new innovations that emerge during the procurement process, giving each party an incentive to commercialise the developed solutions more widely and the right to exploit them. The digitalisation of transport will increase the need to use open standard interface definitions and data models, which permit the rapid scaling of solutions. They enable connectivity to other parts of the ecosystem, avoiding a situation where the customer is dependent on a single operator. As multi-operator solutions become more common, new contract models will be needed to enable agile activities and simple contractual processes.



## MEASURES 2018-2022

- 1. Development of procurement expertise.** The transport sector actively uses the help of experts provided by the centre of excellence for innovative public procurement. The centre will help develop the relevant objectives of the Growth Programme with the aid of operating models based on modular products and interfaces which make possible viable markets and encourage businesses to invest in RDI. (All public procurement actors, centre of excellence for innovative procurement: 2018-).
- 2. The market dialogue.** Each public procurement unit will adopt a systematic operating model to conduct a market dialogue in all major procurement exercises. The operating model will incorporate a prediction of the future needs and the systematic promotion of innovative procurement. The importance to the economy of innovative procurement and the opportunities it offers will be ensured at strategic level. (Government agencies, cities and enterprises in the sector: 2018-).
- 3. Development of procurement criteria.** The procurement criteria are to become target-based rather than solution-based, putting the emphasis on technological neutrality, innovativeness and the openness of data. A suitable level of openness will be determined – a win-win situation – where the buyers and the suppliers are both winners. (Government agencies, cities and enterprises in the sector: 2018-).
- 4. International cooperation.** Cross-border cooperation is to be stepped up and a common Nordic market created in all its aspects. In particular, the development of a common Nordic transport and infrastructure market must be promoted and guaranteed that service providers in the different countries are not prevented from taking part in the international competition. (Transport administration actors and other bodies involved in international cooperation: 2018-).
- 5. Development and harmonization of contract processes.** Contract models for ecosystem-based activity are investigated as well as models for sharing the benefits of intellectual property rights, and for multi-operator projects and sharing liability for intellectual property rights, risks and damages. The new opportunities afforded by the data economy (escrow solutions, blockchains, etc.) are explored to resolve issues relating to the determination of rights and contract management. (Government agencies, cities, enterprises in the sector and the centre of excellence: 2018-).

Photo: Transtech



## 4.8. Internationalisation within reach of all companies

**International cooperation, promotion of interests, visibility in networks, and a strong story shared by the sector pave the way for company growth.** International growth depends on uniqueness, a focus on carefully considered market segments and global networks and contacts. The sector's common story lends credibility to all operators when selling solutions to large international actors.

The greatest market potential lies outside the Finnish borders. Access to global markets is a laborious, challenging process for an individual company, however, so it is important for growth-seeking companies to connect to networks and cooperation forums. These forums and networks open doors and speed up access to new markets. Finding suitable local partners is a prerequisite for growth. Export networks familiar with the local business culture and targeted high-profile export promotion trips will also be used.

**The fruitful marketing and sales of Finnish expertise and innovations stem from recognized competitiveness, successful ecosystems and success stories.** Finnish growth ecosystems and the companies involved in them offer genuine added value in international markets. Special attention needs to be paid to the way in which we describe what Finland has to offer. The common story will benefit all the operators in the sector. Instead of technology-driven marketing, common ways to create stories that attract international interest around Finland's strengths will be sought.

**A coherent, credible story needs to be created for the transport theme that will help business ecosystems as well as individual companies achieve visibility and win new business.** A common message that companies can use in their own marketing should be crafted. In this way, the communications of each operator also serve to support other companies in the industry.

**Current domestic strengths need to be exploited in the creation of the growth story.** Finland is a

world leader in many areas, and the country's image – its country brand – should obviously be built on that. First-rate, versatile digital competence combined with a strong national intent and thought leadership in the areas of sustainable and responsible mobility are an excellent basis for telling the story about transport sector expertise. An existing practical example of this is the fact that the Mobility as a Service approach developed in Finland has become a global theme and made its way to company strategies, EU project applications and national transport policies. High-profile export promotion visits and all those attending international forums and fairs will be harnessed to the internationalisation efforts of the industry, not forgetting the hosting of international conferences (e.g. Slush, Aurora Summit 2018, TRA Conference 2020 and ITS Europe 2022).

**This will bring benefits for both businesses and society, and individual companies will be better placed to open up international sales channels as part of a wider and more credible entity.** The 'team spirit' in the Finnish transport sector will be stronger than ever. A credible, interesting growth story will contribute to attracting international companies, research institutes and investments.

**Closer international cooperation will increase the potential of Finnish growth ecosystems in global markets.** From the world market perspective, the offer of Finnish companies can sometimes focus on too narrow a sector. The success of Finnish companies can also be stepped up by promoting cross-border cooperation in the transport sector, lobbying and exertion of influence on standards. Potential and willingness to engage in closer cooperation can be found in the east, the south and, in particular, the Nordic countries. Finland could be a driver of closer Nordic cooperation, for example in the harmonisation of the digital and electric infrastructure of a common Nordic transport system.



Photo: Linkker

## MEASURES 2018-2022

- 1. To develop an attractive common story about the Finnish transport sector, draw up a marketing strategy and produce marketing materials to attract greater international attention.** Finland's general strengths and companies' success stories will be presented, for example, at international conferences and on export promotion trips. The common story will be created in such a way that all operators can readily add to it. (Trafic, Traffic Lab, Business Finland, Helsinki Metropolitan Smart & Clean Foundation: 2018-).
- 2. In cooperation with the public and private sector, relevant international forums and working groups will be mapped out in order to strengthen effectively activities of Finland.** This would include details of influential forums in the industry and agree on the activities linked to them and relevant to the growth of the transport sector. Finnish expertise, best practices and success stories would be highlighted. One target will be to have a profound influence in international forums and in development work linked to transport growth sectors. (Agencies, Ministry of Transport and Communications, ITS Finland: 2018-).

## 4.9. Business-driven growth ecosystems as drivers of exports

A rapid rise in the quantity and availability of information, developments in communications technology, and the globalisation of value networks have already altered the nature of innovation logistics. Due to these changes, new ideas can be created and deployed everywhere in the world, making competition truly global. Changes in the global operating environment underline the importance of a systemic approach, cooperation and transparency in the creation of innovations. **Ideally, this will take place in close interaction between companies, research institutes, the public sector, consumers and other actors, i.e. in innovation ecosystems.**<sup>38</sup>

**The overarching idea of the National Growth Programme for the Transport Sector is to ensure that the basic lessons of the ecosystemic approach will be more widely used as tools for developing the transport sector and its internationalisation.** This development is underpinned by years of work in the area of exploiting data reserves and information, excellent, wide-ranging skills in the various areas of transport digitalisation, and a strong vision of using this competence more comprehensively for the benefit of people, companies and society.

Growth ecosystems partly overlap. They are dynamic, fast-evolving entities in which links between actors and the choices they make combine to affect the outcome. **The transport sector has been identified as a major application area for the digital platform economy, artificial intelligence<sup>39</sup>, the IoT and diagnostics, VR and AR solutions, machine learning and computer security.** A growth ecosystem must be sufficiently open to allow the selection of the best applicable technologies from the perspective of the system as a whole. As part of the links between growth ecosystems, it must

also be possible to continuously monitor and predict future business and technological potential, make use of the best expertise available in the global network, and identify the most promising areas for development in which to invest.

**The basic premise in the bringing together of successful business-driven ecosystems must be the identification of new market potential and even its creation, both nationally and internationally. Digital platforms are one way to produce new solutions to present and future needs.** Despite the advances made possible by digitalisation, transport growth ecosystems do not come about by themselves. It is also tremendously important to understand the role played by research, training and the public sector in the practical realisation of ecosystems. Research and training ensure the existence of an improved knowledge base, and it is the role of the public sector to support the development of ecosystems in as comprehensive a manner as possible, with recourse to such instruments as legislation and finance.

**The identification of business potential, the formulation of a common vision, and a roadmap to its realisation lay the foundation for bringing together and coordinating ecosystems.** Other crucial elements are the commitment of parties with complementary competence and the clear role of a credible leader company or companies as the 'owner', with a commitment to the entire venture. Those who bring ecosystems together must recognise the areas of top expertise that are required and any skills gaps, and involve international competitive operators in the ecosystems as needed. There can be no weak links in a winning ecosystem.

---

<sup>38</sup> Government analysis, assessment and research publication 28/2017. Innovation ecosystems as reinforcers of cooperation in business and research.

<sup>39</sup> Finland's Age of Artificial Intelligence. Turning Finland into a leading country in the application of artificial intelligence. Objective and recommendations for measures. Publications of the Ministry of Economic Affairs and Employment 47/2017. [https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160391/TEMrap\\_47\\_2017\\_verkkajulkaisu.pdf?sequence=1&isAllowed=y](https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160391/TEMrap_47_2017_verkkajulkaisu.pdf?sequence=1&isAllowed=y)

## MEASURES 2018-2022

- 1. To identify and commit key growth ecosystem actors and recognise the global business potential.** The following areas are included: ensuring the existence of a knowledge base, a common vision, the roles and responsibilities of actors and operators, links to the orchestration of global business ecosystems, the potential for the scaling of business, and the sufficiency of opportunities for financing in Finland. (Leader companies, Knowledge Intensive Business Services [KIBS] actors, Business Finland, key actors for ecosystems, financiers and research institutes: 2018).
- 2. To establish common rules for growth and individual ecosystems.** The following areas are covered: practices relating to data, technology and the sharing and ownership of business models, and the rules relating to effort-sharing. This should also take account of changes with growth ecosystem

actors, such as new entrants coming on board and current ones leaving (Key ecosystem actors and coordinator[s], Business Finland: 2018).

- 3. To organise the common and coordinated development of identified growth ecosystems,** including the specification of a control model for continuous facilitation, information sharing and the mature stage of the ecosystem (steering group, monitoring and indicators). It is crucial to integrate in the development work themes that greatly impact on the transport sector and cut across ecosystems, such as artificial intelligence, big data, the platform economy, automation and computer security. (Ecosystem coordinator[s], Ministry of Economic Affairs and Employment, Business Finland and other key actors: 2018-2022).

Photo: Finnpiilot





↑ KOSKENPÄÄTY

125

↑

PARVI

235

↙ TULLINPÄÄTY

544



TULLINRAMPPI

→ RONGANRAMPPI

125

Photo: Finnpark

# 5. Implementation, measuring and monitoring

In the implementation of the Growth Programme it is important that public actors, companies and the research sector together commit to the broad implementation of measures. The creation of a pioneering

market and building of winning ecosystems calls for systematic work and contribution from all parties. The measures need to be introduced quickly, because there is global competition in knowledge, and also in speed.

## 5.1. The organisation and measurement of the implementation process

The organisation of the monitoring of implementation, having people take responsibility for it and the commitment of the various parties involved are all assurances of the quality and effectiveness of the implementation process. The following is a description of the key points in the organisation of the monitoring of implementation:

1. The Growth Programme will be a tool deployed in the planning of strategies, programmes, guidelines and different projects shaping the future of the industry.
2. The Growth Programme will be presented to the Research and Innovation Council, and the decisions needed to be taken on its implementation will be made by the participating organisations.
3. The steering group that is set up to monitor implementation and follow up the progress will decide on the measures to be included in the Programme and appoint bodies responsible for coordinating new tasks and functions. The steering group will include representatives from the research sector, the Government, the cities and businesses. It will meet two to four times a year.
4. A project manager will be appointed for the Growth Programme with the task to aid its progress. The project manager will also act as secretary to the steering group.
5. Each participating organisation will appoint its own contact person in the implementation of the Growth Programme. The project manager and the appointed contact persons will form a Growth Programme implementation network. The network will produce proposals for new openings to the steering group and take part in the maintenance of the Growth Programme portal.
6. Impact indicators will be prepared for the Growth Programme and they will be monitored by the steering group. The indicators will be decided by actors and operators in the sector working together with Statistics Finland.
7. An external assessment of the Growth Programme's implementation will be organised twice while the Programme is up and running. The first assessment will be in 2020. The assessment should take account of the turnover of operators in the sector, their staff, research and product development inputs.

## 5.2. Monitoring of the effectiveness of the work and measures

A dynamic Growth Programme portal is to be created to describe the general situation with respect to the Growth Programme and as a tool for measuring and monitoring results. The portal, which is to be updated continuously, will describe the actors, operators, networks and key facilities associated with the transport sector ecosystem. The measures contained in the Programme, the parties responsible for them and timetables as well as the latest Programme news will be presented on the portal. The portal will help ensure that the Roadmap and its content are updated and moni-

tored sufficiently. The Growth Programme portal will also function as an information portal, to make all the various actors and operators aware of projects and programmes in the sector, its reserves of experts and current events. The portal will also be used for the formation of EU consortia and the presentation of Finnish know-how and expertise. The Traffic Lab of the Finnish Transport Safety Agency will be responsible for coordinating the implementation and maintenance of the Growth Programme portal.

Photo: City of Helsinki / Riku Pihlanto





# APPENDICES

## Appendix 1. Criteria for evaluating the ecosystem's business potential

Criterion	Questions relating to the requirements for ecosystems and an examination of its strengths
Common vision and objectives	<ul style="list-style-type: none"> <li>• Are there <b>motivated (and established) companies</b> that wish to work together to develop this business area and its ecosystems?</li> <li>• Are the <b>investment for development</b> provided by the parties and their plans compatible, meaning the risks associated with the venture are diminished and actors commit to a common vision for the operating environment and its development?</li> </ul>
Need for an ecosystem	<ul style="list-style-type: none"> <li>• Will the thorough exploitation of the business potential here require <b>the cooperation of several different actors</b>?</li> <li>• Will an open ecosystem produce <b>added value</b> as compared with a closed ecosystem model (for acting alone)?</li> </ul>
Advantage and competitiveness	<ul style="list-style-type: none"> <li>• Is this a new <b>global business opportunity</b> based on a current or potential <b>Finnish competitive advantage</b> (such as expertise, the difficult circumstances surrounding demand, other resources).</li> <li>• Is the <b>Finnish operating environment</b> (e.g. climate conditions or regulation) an opportunity to develop the international competitive advantage?</li> </ul>
The skills needed for critical tasks	<ul style="list-style-type: none"> <li>• Does the ecosystem have one or more suitable <b>key actors</b> and a coordination team to shape strategy and cooperation?</li> <li>• Can Finland provide the sort of <b>diverse and complementary expertise</b> and enthusiasm that are required?</li> <li>• What <b>complementary skills</b> will be required of foreign actors?</li> <li>• Can a suitable and motivated <b>orchestrator and facilitator be found to develop the ecosystem</b> that can function in the longer term without public support?</li> </ul>
Requirements for a key role	<ul style="list-style-type: none"> <li>• What roles will Finnish companies play <b>in the value network</b> (current position vs. target position)?</li> <li>• Do the Finnish actors and operators have what it takes to <b>lead the development work</b> of products, platforms or solutions (as opposed to a Finnish-driven ecosystem in the role of a subcontracting network or supplier of components)?</li> </ul>
Systemic barriers and structural bottlenecks	<ul style="list-style-type: none"> <li>• Are there any <b>systemic barriers or structural bottlenecks</b> that could prevent/hinder the development of the ecosystem (e.g. legislation, regulation, standards, infrastructure, absence of testing platforms), which call for public intervention?</li> </ul>
The potential for growth and attracting foreign experts and companies	<ul style="list-style-type: none"> <li>• Is the <b>ecosystem's potential for growth</b> in Finland founded on, for example, the manufacturing industry, favourable testing environments or a strong knowledge/competence cluster?</li> <li>• What will be the main <b>pull factor to persuade foreign companies</b> to concentrate their operations in Finland and their employees to move there?</li> </ul>

## Appendix 2. Examples of business ecosystems

### An ecosystem offering growth potential: An intelligent tram system combining leader companies in manufacturing and Finnish excellence

Finland is in an excellent position to engage with globally significant research and development into electric and intelligent city public transport, including intelligent trams. The current trams, designed and made in Finland, are very competitive. Projects over the next few years will provide both a reference and an opportunity for better than ever product development and for raising the country's profile as a global forerunner. The potential for growth gains strength from the international growth in light rail. The general direction is the provision of more comprehensive packages, which will require an ecosystemic approach. There is a diverse range of knowledge and skills associated with trams, including that relating to structural solutions, technology, diagnostics and the artificial intelligence applications.

Urbanisation and the Smart City theme boost opportunities for the growth of a tram ecosystem. Light rail ecosystems have a lot in common as urban traffic networks, concrete areas of knowledge and skills, and technologies, e.g. with the Finnish Linkker intelligent electric bus ecosystem. This ecosystem combines *design and planning* (Valmet Automotive), *technology* (Visedo, VTT, Toshiba, Singapore Technologies Engineering/STK, Alstom), *infrastructure* (Helsinki City Transport [HKL], the Employment and Economic Development Offices [TE], Virta, ABB, Engie/Ineo, Vinci, Ekoenergetyka, Heliox), *manufacture* (Fortaco,

Promeco) and *research* (VTT). Furthermore, the situational picture of transport, its management and passenger services are closely linked to them and knowledge and expertise in these areas can be found in Finland.

Automation will also result in significant potential for improvements in trams and will be a key factor for future competitiveness. In the international context, Finland is still in the early phase of business development in the automation of trams, compared, for example, to metro and bus ventures. However, the country would have a chance to become a forerunner in tram transport automation development. Major benefits are to be had faster, for example, from more progressive lifecycle management solutions, such as the development of maintenance and operations. New, integrated condition monitoring solutions offer significant savings potential, which will have an impact on the profitability of ecosystem customers for decades.

The ecosystem's core strength will be based on the core competence associated with domestic tram production. The versatile skills and wide-ranging know-how that Finland has to offer will make possible investment in RDI and the scaling of manufacture instead of its outsourcing. With key product competence in place and a viable manufacturing industry, the ecosystem will be able to function as an international skills centre magnet rather than merely assuming the role of a supplier in a network of subcontractors.

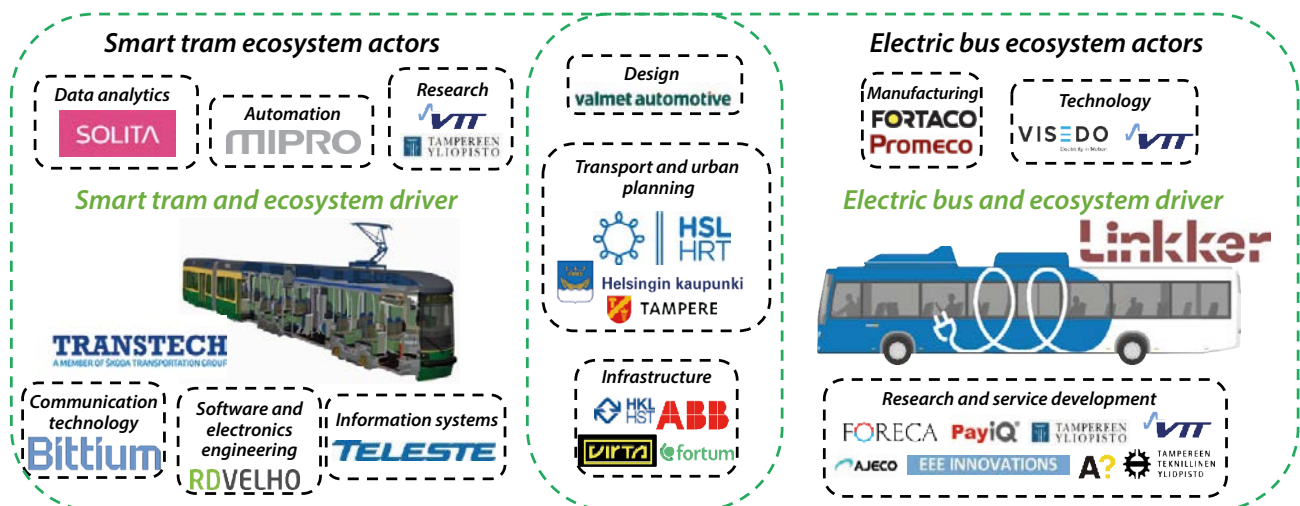


Figure 7. Sustainable transport ecosystem operators. (Source: VTT Ltd)

## An ecosystem offering growth potential: Intelligent infrastructure and autonomous driving

A transport infrastructure that is workable is vital for society and business to run successfully. Already at present the Finnish Transport Agency has at its disposal some 700 road traffic stations and cameras, largely reliant on the first-rate international expertise of the Finnish company Vaisala. Because, however, society cannot afford to equip the road infrastructure with intelligence systems that cover everything, the use of intelligence in vehicles and the data they collect employed together with infrastructure solutions are essential. These systems are based on automatic communication among vehicles or travellers and between travellers and the transport infrastructure.

In the future, the large-scale deployment of cooperative intelligent transport systems, C-ITS, and digital monitoring of the condition of roads may be seen to be an important objective. This would suit Finland splendidly: distances in the country are considerable, traffic volumes are low and conditions are challenging and variable from the angle of the maintenance of the road infrastructure and in terms of traffic. The challenge will be to find cost-effective solutions for obtaining comprehensive, accurate and up-to-date observational data and a situational picture to be able to take the necessary action in a timely manner and in all circumstances.

To have a proper situational picture, it will be ecosystems which have interrelated subsystems that work in harmony with one another. Themes to significantly bolster Finnish competitiveness would be, in particular, an intelligent and real-time adaptable traffic control system and intelligent maintenance of the road

infrastructure, employing, for example, dynamic systems and artificial intelligence. Here are a few examples of Finnish operators with a strong global market position:

- Dynniq Finland, which delivers intelligent transport control and communication solutions (in 2016 Dynniq Global turnover was EUR 330 million and it employed a staff of 1,800). The company has expressed a wish to head the entire ecosystem and the traffic management subsystem.
- Vaisala (turnover in 2016 EUR 320 million, 1,600 employees) delivers climate and weather observation technology and related services.
- Nokia plc (turnover in 2016 EUR 24 billion, 101,000 employees) has expertise relating to communications between vehicles and between vehicles and the infrastructure, both locally and over larger geographical areas.

The global market potential for such an ecosystem is enormous. Poor weather and road conditions in the United States, for example, result in around EUR 50 billion in costs to road transport (U.S. Department of Transportation 2014), and annual costs in the EU vary between EUR 13 and 18 billion (EWENT 2012). Furthermore, the land transport infrastructure accounts for a major part of the national wealth (in Finland approximately EUR 50 billion), so its condition and sustainable use are important for the nation's competitiveness (ROTI [State of the nation on built infrastructure] 2017).

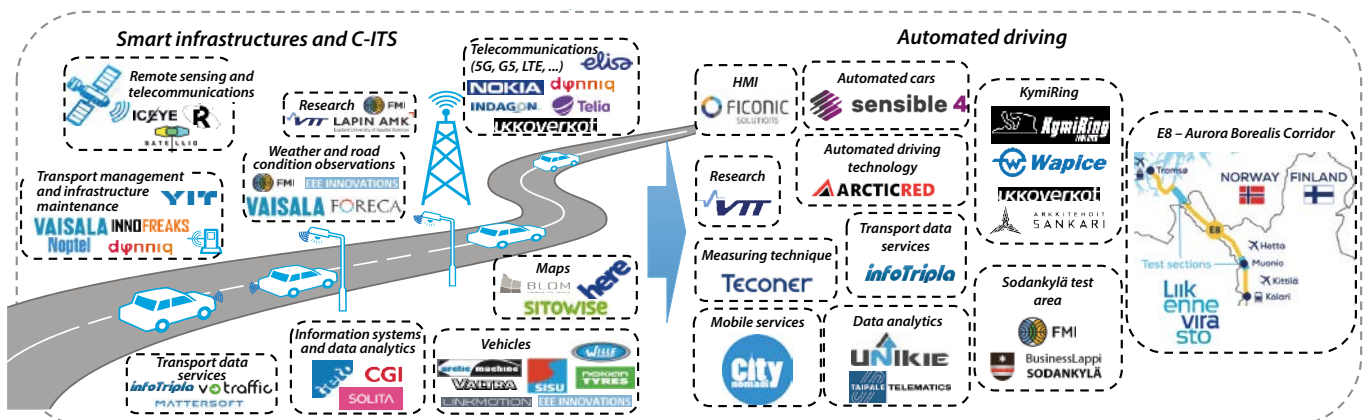


Figure 8. Intelligent infrastructure and autonomous driving ecosystem operators. (Source: VTT Ltd)

A key factor encouraging growth potential is to be seen in the comprehensive and open PPP testing and experimental environments, where knowledge, skills and the conditions that an Arctic climate can guarantee may be exploited. An intelligent infrastructure and C-ITS ecosystem is closely related to the automation of

transport. In Finland there are also the versatile skills and competences as well as the technologies in place for the development of autonomous driving. Developments in the sector and its competitiveness gain support from the Finnish legislation, which is an enabler of experimentation.

### An ecosystem offering growth potential: Mobility as a Service, MaaS

In a world which is fast becoming digitalised and mobilised, the lives and behaviour of consumers and customers have changed in many areas, such as communications and banking. The change in mobility is still in its infancy, but new consumer expectations and needs have been identified and are visible in such areas as mobility service reservations, use and payment (24/7 accessibility, ease of use, ecological considerations, trouble-free experience, flexibility in transport choice and the ‘one-stop shop’ principle). The technology enables a response to these needs safely and effectively and based on the notion of ‘a mobile application in the pocket and a couple of clicks and you are on the way’. In the emerging market, reaching a critical mass of users is a challenge and the Growth Programme is needed to promote cooperation between actors, their development and

their operations, the interoperability of interfaces and standards, and the establishment and organisation of new ecosystem-based business.

Finland is in an excellent position to act as a driver and beneficiary of change. First of all, the aim of the Finnish Government’s ‘Building a growth environment for digital business’ priority project is to promote the digitalisation of business. As regards mobility, the Government’s key enabling measure is the complete reform of transport legislation in the shape of the Transport Service Act, which will facilitate the deployment of new innovations, digitalisation and automation and the implementation of the transport service concept (Mobility as a Service, MaaS). Moreover, Finland’s thought leadership is also visible in the market entry of mobility services and mobile solutions that utilise the

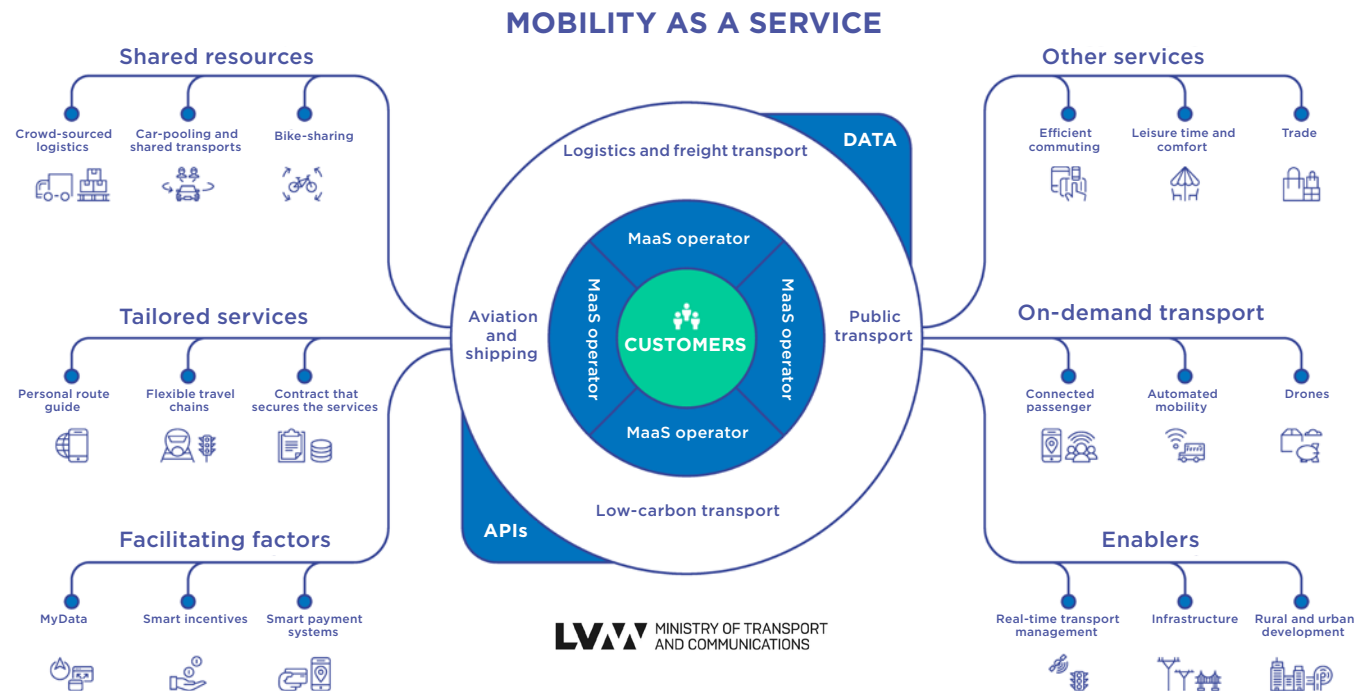


Figure 9. Mobility as a service. (Source: Ministry of Transport and Communications)

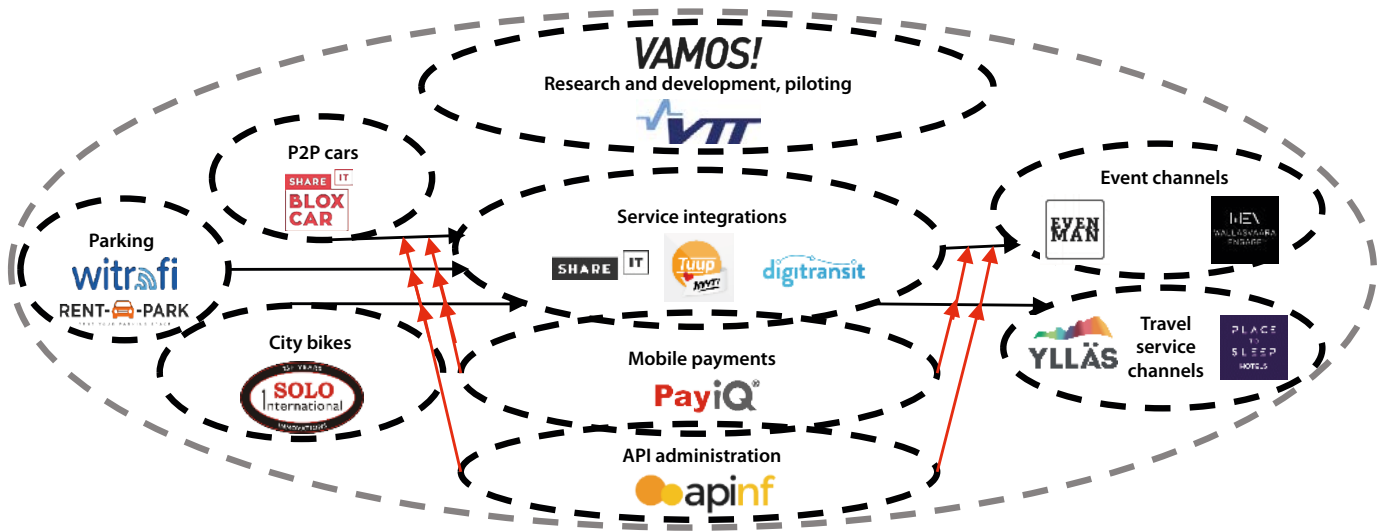


Figure 10. Travel chain service ecosystem operators. (Source: VTT Ltd)

latest technology and in their internationalisation (e.g. Whim, Kyyti, PayiQ). The international growth potential associated with the digitalisation of mobility and mobile solutions is nevertheless only just starting, and support actions will be needed, especially if the aim is to broaden the scope of the business of innovative startups

and SMEs so that they can begin exporting. There are several MaaS projects just starting or already under way in Finland and VTT, for example, is providing support for R&D work and the development of the VAMOS! ecosystem, the specific goal being properly branded, viable and verified domestic market references for companies.

### An ecosystem offering growth potential: E-freight services as an enabler of transparent and robust logistics

A transport infrastructure that is workable is vital for society and business to run successfully. At the same time, an efficient logistics system provides its users with a competitive advantage. A logistics system is by nature multidimensional, a place where subcontractor chains and services meet. Cooperation and information relating to logistics support logistical efficiency and, in particular, the optimisation of the whole system. Those working in logistics share the six same 'right' goals: right quantity, right product, to the right place, at the right time, at the right service level, at the right price. If this objective is to be achieved effectively, the flow of information on the logistics chain must be first-rate and reliable.

Looked at in the global context, the role of logistics is increasing in importance in Finland, because employing people is expensive, distances to international markets are long and the flow of goods is only moderate. On the other hand, Finland has the best experience in

Europe of HCT vehicles: Finland was among the first countries to promote electronic supply chains and e-freight. Owing to its geographical location, multimodal transport chains are commonplace.

It should be possible for Finland to develop new e-freight services where logistical information is a driver and embraces different areas of logistics, such as logistics relating to trunk routes, urban environments or the countryside (forest). Crucial to e-freight services will be more open networks among stakeholders and the utilisation of new technologies, such as C-ITS solutions and blockchain technology. Switching to a transparent, robust and more open information-oriented operating model would provide a competitive advantage in the international market, because the logistics sector is still relatively undeveloped as far as the ability of operators to work together is concerned.

Finnish competence and know-how and C-ITS solutions could improve the way logistics is monitored,

controlled and managed. They would promote the reliability of transport chains, their cost-effectiveness and effectiveness. E-freight solutions also provide an opportunity for reorganising the operations of logistics firms, for example by means of an open logistical supply space approach or tailor-made monitoring solutions for each individual shipment. The enhanced transparency and better management resulting from e-freight solutions would mean that the capital committed to traffic flows

could be managed more effectively and that lead times could be speeded up.

A key role in all this would be played by current C-ITS actors as well as the big Finnish logistics firms (including Finnair, Stevedco, VR transpoint and Kaukokiito), the big organisations that depend on logistics (including Kesko, Inex Partners, Stora Enso, ABB and Valmet Automotive), and those agencies promoting international electronic supply chains (including GSI).

## An ecosystem that is up and running: Autonomous maritime traffic

### One sea – autonomous maritime ecosystem



The Maritime Strategic Research Agenda 2017-2025, compiled by Finnish Maritime Industries and its stakeholders and published on 1 November 2016, spells out the guidelines for research in the sector. Finnish Maritime Industries is a high technology organisation whose aim it is to be a role model in the deployment of new technologies. The aim is for the *Finnish maritime cluster to be the world's most creative, flexible and adaptable network for maritime activities by 2025*.

Digitalisation will be realised on autonomous vessels in their intelligent equipment, systems and digital services. The objective over the next few years will be for the first autonomous vessels to be in service by 2025. It is hoped that the Baltic Sea will be a testing site for a broad range of digital solutions. There are new opportunities for the developing of shipping in the area, such as an open maritime data platform. The autonomous maritime (traffic) ecosystem brings together global pioneering companies, such as ABB, Cargotec, Ericsson, Meyer

Turku, Rolls Royce, Tieto and Wärtsilä, as well as agile ICT startups, which together will develop the world's first unmanned maritime transport solution. The ecosystem, which is headed by DIMECC, will show the way for autonomous and unmanned maritime transport and try to devise the world's first unmanned shipping products and services by 2025. This will require new skills and expertise. One Sea will establish a new business development community to work alongside autonomous maritime transport, and this will support the growth of startup enterprises.

The ecosystem is very business-oriented, although it also works closely with public actors. Tekes (Business Finland from the 1<sup>st</sup> of Jan 2018) will encourage the market entry of new innovations and the start of new business by financing an ecosystem projects as part of the Arctic Seas programme. Meanwhile, the Ministry of Transport and Communications has provided DIMECC with assistance in the drafting of test site applications. The world's first test site, open to all companies, research institutes and others, Jaakonmeri, is to be a testing field until 2025, enabling the testing of self-driving seagoing transport, vessels and technologies. One Sea will develop a business-driven comprehensive development plan and roadmap for autonomous maritime transport in partnership with national and international experts. The aim will be the introduction of autonomous sea transport as quickly as possible, to take account of legislative, operational, technical and ethical issues.

## Appendix 3. Projects and programmes supporting the Growth Programme

### Other measures and programmes supporting city growth

- Planning and land-use and construction control create demand for intelligent mobility services and innovations. The start of companies that provide services is dependent on an adequate user base, and that can be established by planning and building intact urban structures and a pleasant urban environment. The process is ongoing and those responsible for it are the cities (land-use planning), the Ministry of the Environment (legislation and the general development of land-use planning) and the construction and property sector.
- The involvement of experts in the field of intelligent transport is ensured in large urban development projects right from the start. This provides an assurance that future mobility solutions and new mobility-related technologies will have a role in projects and that companies are afforded the opportunity first to influence the mobile solutions of the future and then to realise them. Intelligent mobility pilots are being undertaken in connection with new urban development projects under construction (including new city areas). The process is ongoing and those responsible for it are the cities and their urban development project coordinators.
- A methodology is being established for how cities and companies can agree on and promote the use of alternative fuels in cities. The use of alternative fuels is being promoted appropriately (electric, gas and hydrogen). The process is ongoing and those responsible for it are the cities.
- Station districts as trialling platforms - urban development and market trials. The responsible bodies are the Helsinki Region Environmental Services Authority (HSY), the Ministry of the Environment, the Finnish transport agency, the S&C Foundation, the MAL network and the Tampere regional local authority.
- Helsinki's mySMARTLife project and the Jätkäsaari Smart Mobility Lab
- The Smart Tampere ecosystem programme
- Lahti's CitiCAP project
- The Growth Corridor Finland network projects
- The 6Aika cities projects

### Strategies, programmes of measures and agreements enabling growth

- The land-use, housing and transport agreements (MAL agreements): [http://www.ym.fi/en-US/Land\\_use\\_and\\_building/Steering\\_of\\_land\\_use\\_planning/Landuse\\_housing\\_and\\_transport\\_letters\\_of\\_intent](http://www.ym.fi/en-US/Land_use_and_building/Steering_of_land_use_planning/Landuse_housing_and_transport_letters_of_intent)
- The Finland's Artificial Intelligence Programme, mid-term report released on 23.10.2017: [www.tekoälyaika.fi](http://www.tekoälyaika.fi)
- The platform economy roadmap: <https://www.tekes.fi/ohjelmat-ja-palvelut/kampanjat/alustalous/>
- Government resolution to promote digitalisation in rural areas: <https://www.lvm.fi/lvm-site62-mah-ti-portlet/download?did=248192>
- Roadmap of development measures for transport automation and robotics 2017–2019: <https://julkaisut.valtioneuvosto.fi/handle/10024/79868>
- Government resolution on intelligent automation and robotics: <http://valtioneuvosto.fi/paatokset/paatos?decisionId=0900908f804c7484>
- The digital logistics action programme: <https://www.lvm.fi/digitalisaatio>
- The digital infrastructure strategy (in preparation): <https://www.lvm.fi/-/laajakaistan-edistamises-ta-digitaalisen-infrastruktuurin-strategian-kuulemistilaisuus-16.11.-957033>
- Government resolution on the use of data in business: <http://valtioneuvosto.fi/paatokset/paatos?-decisionId=0900908f804c23c7>
- The effective use of satellite navigation systems in Finland action programme (to be published soon)
- Finland's information security strategy: <https://julkaisut.valtioneuvosto.fi/handle/10024/78106>

- The opening up and utilisation of the data of the administrative branch of the Ministry of Transport and communications in business and decision-making: <http://julkaisut.valtioneuvosto.fi/handle/10024/79150>
- Ministry of Transport and communications administrative branch data roadmap: <http://julkaisut.valtioneuvosto.fi/handle/10024/160317>
- Study on traffic and mobility data sources used on the private sector in Finland: [https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160522/LVM\\_20\\_2017\\_Yksityisen\\_sektorin\\_liikkumistiedot.pdf?sequence=1&isAllowed=y](https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160522/LVM_20_2017_Yksityisen_sektorin_liikkumistiedot.pdf?sequence=1&isAllowed=y)
- Ministry of the Environment: The National Sustainable Urban Development Programme (in preparation; to be published in 2018)
- Finland's roadmap for the circular economy 2016–2025: <https://www.sitra.fi/artikkelit/kierrolla-karkeeseen-suomen-tiekartta-kiertotalouteen-2016-2025/>

### Examples of test platforms:

- Finland's test sites and environments: [https://www.trafficlab.fi/testing\\_zones#/0](https://www.trafficlab.fi/testing_zones#/0)
- E8 – Aurora: <http://www.snowbox.fi>
- One Sea: <https://www.oneseaecosystem.net/>
- Growth Corridor Finland: <http://suomenkasvukaytava.fi>
- Kymiring: <https://en.kymiring.fi/>
- Living Lab Bus: <http://livinglabbus.fi/>
- E75 Stargate: <http://dates.airportsodankyla.fi/>
- ITS Factory: <http://www.hermiagroup.fi/its-factory/>
- UAS Centre Finland: <http://uasfinland.eu/eng/index.html>
- Testbeds and major transport and mobility projects in Finland: [https://www.tekes.fi/globalassets/global/ohjelmat-ja-palvelut/ohjelmat/fiksu-kaupunki/tekes\\_testbeds\\_0711.pdf](https://www.tekes.fi/globalassets/global/ohjelmat-ja-palvelut/ohjelmat/fiksu-kaupunki/tekes_testbeds_0711.pdf)



## Appendix 4. List of experts involved in the preparation of the Growth Programme

### Steering group for the preparation of the Growth Programme

**Mika Aalto**, Ministry of Economic Affairs and Employment, chair  
**Laura Eiro**, Ministry of Transport and Communications  
**Matti Vatilo**, Ministry of the Environment  
**Juha Vilhomaa**, National Land Survey of Finland  
**Pasi Laitala**, City of Espoo  
**Matti Matinheikki**, City of Oulu  
**Teppo Rantanen**, City of Tampere  
**Raine Hermans**, Tekes (until 30.6.2017)  
(deputy member Pekka Sivonen, Tekes)  
**Karin Wikman**, Tekes  
**Kari Herlevi**, Sitra  
(deputy member Heikki Sorasahi, Sitra)  
**Tiina Kähö**, Helsinki Metropolitan Smart & Clean Foundation  
**Raine Hautala**, VTT Ltd  
**Karri Salminen**, ITS Finland  
**Marko Forsblom**, ITS Finland, secretary of the steering group  
*The steering group met five times*

### Working group for the preparation of the Growth Programme

**Marko Forsblom**, ITS Finland, chair  
**Eija Laineenoja** and **Reijo Munther**, Ministry of Economic Affairs and Employment  
**Krista Huhtala-Jenks**, Ministry of Transport and Communications  
**Petteri Katajisto** and **Kaisa Mäkelä**, Ministry of the Environment  
**Marja Hilska-Aaltonen**, Ministry of Agriculture and Forestry  
**Johanna Nyberg**, City of Espoo  
**Reetta Putkonen**, City of Helsinki  
**Harri Vaarala**, City of Oulu  
**Mika Kulmala**, City of Tampere  
**Päivi Kynkäänniemi**, City of Turku  
**Markus Holm**, City of Vantaa  
**Anne Horila**, Growth Corridor Finland network/  
City of Hämeenlinna  
**Heikki Sorasahi**, Sitra  
**Ville Miettinen**, Helsinki Metropolitan Smart & Clean Foundation  
**Juho Kostiainen**, VTT Ltd  
**Asta Tuominen** and **Juuso Kummala**, Finnish Transport Agency  
**Tommi Arola**, Trafi  
**Heikki Karintaus**, Taipale Telematics  
**Jukka Viitanen**, Resolute HQ  
**Tommi Lampikoski**, project secretary, Gaia Consulting  
*The working group met 11 times*

### Experts contributing to the workshops and interviews connected with the preparation of the Transport Sector Growth Programme

Four workshops were organised during the preparation of the Growth Programme: Transport Sector Ecosystems 31.8.2017, Expertise and RDI 28.9.2017, The role of the public sector as an enabler of export-

driven business 26.10.2017 and The Growth Programme Roadmap 9.11.2017. Below is a list of experts who took part in one or more workshops:

<b>Aalto</b>	<b>Mika</b>	Ministry of Economic Affairs and Employment
<b>Aaltonen</b>	<b>Pekka</b>	Association of Logistic Enterprises in Finland
<b>Ahde</b>	<b>Arto</b>	IBM
<b>Aherva</b>	<b>Sami</b>	City of Helsinki, Stara Logistics

<b>Ahonen</b>	<b>Anna-Mari</b>	Regional Council of Päijät-Häme
<b>Ahonen</b>	<b>Hannu</b>	Finnpilot Pilotage
<b>Ahvenlampi</b>	<b>Henni</b>	CoReorient
<b>Alanissi</b>	<b>Jukka-Pekka</b>	Dynniq Finland

<b>Alaviiri</b>	<b>Tapani</b>	LähiTapiola
<b>Andersson</b>	<b>Jukka</b>	Sitowise
<b>Chai</b>	<b>Yali</b>	Neste plc
<b>Eiden</b>	<b>Niko</b>	Almotive
<b>Eiro</b>	<b>Laura</b>	Ministry of Transport and Communications
<b>Era</b>	<b>Tero</b>	Fortum Charge & Drive
<b>Forsblom</b>	<b>Marko</b>	ITS Finland
<b>Granvik</b>	<b>Tom</b>	Linkker
<b>Haapamäki</b>	<b>Taina</b>	FLOU
<b>Haapasalo</b>	<b>Tiina</b>	Confederation of Finnish Industries EK
<b>Haapiainen</b>	<b>Ella</b>	IBM
<b>Haavasoja</b>	<b>Taisto</b>	Teconer
<b>Haikkola</b>	<b>Päivi</b>	DIMECC
<b>Hakala</b>	<b>Olli</b>	ALD Automotive
<b>Hansson</b>	<b>Konsta</b>	Reaktor
<b>Hartikainen</b>	<b>Heidi</b>	VR-Group Ltd
<b>Hautala</b>	<b>Raine</b>	VTT Ltd
<b>Heikkinen</b>	<b>Vesa</b>	Haaga-Helia University of Applied Sciences
<b>Heimo</b>	<b>Jarmo</b>	City of Salo
<b>Heinonen</b>	<b>Tero</b>	Arctic RED
<b>Hermonen</b>	<b>Kai</b>	Transtech
<b>Hilaska-Aaltonen</b>	<b>Marja</b>	Ministry of Agriculture and Forestry
<b>Hippula</b>	<b>Arto</b>	University of Tampere, TAUCHI, COMS
<b>Honkanen</b>	<b>Minna</b>	City of Vantaa
<b>Horila</b>	<b>Anne</b>	The Growth Corridor Finland network
<b>Huhtala-Jenks</b>	<b>Krista</b>	Ministry of Transport and Communications
<b>Hulkkonen</b>	<b>Jussi</b>	World Alliance for Low Carbon Cities
<b>Jaakkola</b>	<b>Jarkko</b>	MaaS Global
<b>Jokinen</b>	<b>Jani-Pekka</b>	Aalto University
<b>Jääskelä</b>	<b>Juha</b>	Arctic Machine
<b>Kenraali</b>	<b>Juha</b>	Trafi
<b>Ketola</b>	<b>Salla</b>	VR-Group Ltd

<b>Kiviranta</b>	<b>Veli-Matti</b>	CGI
<b>Koivu</b>	<b>Tero</b>	Rightware
<b>Kosonen</b>	<b>Iisakki</b>	Aalto University
<b>Kostiainen</b>	<b>Juho</b>	VTT Ltd
<b>Kotilainen</b>	<b>Ilkka</b>	Finnish Transport Infrastructure Agency
<b>Kulmala</b>	<b>Mika</b>	City of Tampere
<b>Kuoppamäki</b>	<b>Mervi</b>	Arctic Machine
<b>Kutilla</b>	<b>Matti</b>	VTT Ltd
<b>Kynkäänniemi</b>	<b>Päivi</b>	City of Turku
<b>Kähö</b>	<b>Tiina</b>	Helsinki Metropolitan Smart & Clean Foundation
<b>Laineenoja</b>	<b>Eija</b>	Ministry of Economic Affairs and Employment
<b>Laitala</b>	<b>Pasi</b>	City of Espoo
<b>Laitinen</b>	<b>Petri</b>	Service Sector Employers Palta
<b>Lampikoski</b>	<b>Tommi</b>	Gaia Consulting
<b>Lankinen</b>	<b>Matti</b>	Indagon
<b>Lankinen</b>	<b>Matti</b>	Vediafi
<b>Lausvaara</b>	<b>Janne</b>	Tietorahti
<b>Lehmuskoski</b>	<b>Ville</b>	HKL
<b>Leino</b>	<b>Jarmo</b>	EEE Innovations
<b>Levo</b>	<b>Juha</b>	Tieto Corporation
<b>Lindfors</b>	<b>Jukka</b>	City of Lahti
<b>Lindholm</b>	<b>Sakari</b>	Trafi
<b>Linna</b>	<b>Juhani</b>	University of Tampere
<b>Lintusaari</b>	<b>Jukka</b>	University of Tampere
<b>Lybeck</b>	<b>Aarno</b>	TTS
<b>Lähde</b>	<b>Noora</b>	Trafi
<b>Majala</b>	<b>Timo</b>	Nodeon Finland
<b>Malmgren</b>	<b>Jan</b>	Semel
<b>Matinheikki</b>	<b>Matti</b>	City of Oulu
<b>Miettinen</b>	<b>Ville</b>	Helsinki Metropolitan Smart & Clean Foundation
<b>Munther</b>	<b>Reijo</b>	Ministry of Economic Affairs and Employment
<b>Mustajärvi</b>	<b>Martti</b>	Nokia plc
<b>Mäkinen</b>	<b>Reijo</b>	HSL

Niskanen	Pekka	Tuup
Nissinen	Sampsa	Tekes
Nurmi	Jukka	Elisa plc
Nyberg	Paul	Shareit
Nykänen	Esa-Pekka	MaaS Global
Pajuoja	Heikki	Metsäteho
Parikka	Juho	Mediamobile / V-Traffic
Parjanen	Tuomo	PayIQ
Pasanen	Emmi	City of Vantaa
Pellikka	Timo	CGI
Pirhonen	Veikka	Siemens
Poutiainen	Jani	Finnish Meteorological Institute
Pöyhönen	Aapo	YSP
Pöyry	Elias	Virta
Ranta	Juha	TVV lippu- ja maksujärjestelmä
Rantanen	Teppo	City of Tampere
Rissanen	Kari	HSL
Sahala	Sami	Forum Virium Helsinki
Salminen	Karri	ITS Finland
Santamala	Harri	Sensible 4
Seimola	Matti	V-Traffic (Mediamobile)
Seppänen	Sampsa	Federation of Finnish Enterprises

Silvonen	Paula	EEE Innovations
Sorasahi	Heikki	Sitra
Suojanen	Ilkka	Esri Finland
Suutarla	Hanna	Arctia
Tierala	Lauri	Finnair plc
Timmerbacka	Erkki	KauppaHali24/Seulo Palvelut
Toivonen	Kalle	City of Helsinki
Tuominen	Asta	Finnish Transport Infrastructure Agency
Tuominen	Timo	Finance Finland
Ulmanen	Tommy	South-Eastern Finland University of Applied Sciences, North European Logistics Institute
Vakkuri	Matti	Tieto
Wallander	Jouni	Solita
Valovirta	Ville	VTT Ltd
Vanhanen	Kerkko	Traficon
Varjos	Mikko	Solita
Viitanen	Jukka	Resolute HQ
Wikman	Karin	Tekes
Voutilainen	Jari	Metsä Group
Vuorenmaa	Tero	Robots Expert Finland
Ylisiurunen	Kimmo	Infotripla

## Interviewed experts and meetings

- Päivi Haikkola, DIMECC
- Essi Huttu, DIMECC
- Harri Kulmala, DIMECC
- Risto Lehtinen, DIMECC
- Roope Ritvos, Forum Virium
- Tommo Koivusalo, City of Helsinki
- Miska Hakala, Helsinki Business Hub
- Timo Tirkkonen, Inventure
- Hanna Uusitalo, Kone plc
- Tapani Alaviiri, LähiTapiola
- Tiina Jauhiainen, Finnish Transport Agency
- Alina Koskela, Finnish Transport Agency
- Antti Vehviläinen, Finnish Transport Agency
- Reija Viinanen, Finnish Transport Agency
- Arto Salonen, Metropolia
- Heikki Pajuoja, Metsäteho
- Markku Rauhamaa, Nokia plc
- Martti Mustajärvi, Nokia plc
- Risto Tiainen, Nokia plc
- Sami Finne, Posti Group Corporation
- Konsta Hansson, Reaktor
- Jonas Geust, Rightware
- Samuli Salmela, Schenker
- Jouni Jaakola, S Group
- Sami Aherva, Stara
- Pekka Soini, Tekes
- Henri Harmia, Telia
- Jouni Sintonen, Telia
- Taneli Tikka, Tieto Finland
- Kari Wihlman, Trafi
- Lasse Orre, Transtech

## National Growth Programme for the Transport Sector 2018–2022

The main aim of the National Growth Programme for the Transport Sector is the promotion of the transport sector's business-driven growth as a collaboration with the public and private sectors. The measures under the Growth Programme rely on a combination of enabling legislation, proactive research and the diverse skills and expertise of innovative companies. Renewal and modernisation in cities are to be promoted by enabling market experimentation and pilots and by stepping up the scaling of good solutions through procurement. The introduction of new innovations and the growth in business ecosystems are to be promoted through the development of the availability and quality of information, carefully channelled RDI funding, and support for the assembly and orchestration of business-driven ecosystems. The internationalisation of companies and the Invest in venture are to be encouraged through the strengthening of Finland's internationally recognised reputation as a forerunner in the field of transport and through the promotion of internationalisation activities.

The Programme's preparation was overseen by the Ministry of Economic Affairs and Employment, the Ministry of Transport and Communications, the Ministry of the Environment, the Ministry of Agriculture and Forestry, the cities of Espoo, Helsinki, Oulu, Tampere, Turku and Vantaa, Tekes (from the 1<sup>st</sup> of Jan. 2018, Business Finland), Sitra, the Helsinki Metropolitan Smart & Clean Foundation, VTT Ltd, the Regional Council of Häme (Growth Corridor Finland) and ITS Finland. The programme was drawn up openly with public actors, the research sector and businesses working closely together in various workshops and discussion meetings.

